SESSION I

GENETICS, BIOSECURITY AND BIOTECHNOLOGY

GBB-01

Polymorphism of prolactin and growth hormone genes in Kadaknath and their association with egg production traits

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The present study was carried out to identify the polymorphism of prolactin and growth hormone gene in Kadaknath and their association with egg production traits was carried out by using PCR-RFLP technique. The parameters like body weight (g) and feed consumption (g/bird) showed highly significant (P ≤ 0.01) difference in all the three laying period and significant (P ≤ 0.05) difference was observed in hen day egg production (per cent) and feed efficiency (kg egg mass) during second and third laying periods. Polymorphism was observed in *PRL24*, but no polymorphism for *PRLR5* in prolactin gene. The genotype frequency of AA and BB was 0.2 and 0.8, and frequency of A and B allele was 0.175 and 0.825, respectively. In *PRLR5*, the genotype frequency of AA was 1, and allele frequency for A allele was 1. The polymorphism was observed for both *GH-I* and *GH-II* for growth hormone gene. The genotype frequency for AA, AB and BB genotype was 0.33, 0.42 and 0.29 and allele frequency for A and B was 0.475 and 0.375 for *GH-I*. However, the observed genotype frequency for AA (0.583) and BB (0.417) and the allele frequency of A and B was 0.8 and 0.2, respectively for *GH-II*. There was no association observed for egg production traits with the polymorphism of prolactin and growth hormone gene in Kadaknath. Based on the results, it can be concluded that non significant association of egg production traits with polymorphism of prolactin and growth hormone genes could be due to the small population.
Keywords: Kadaknath, Polymorphism of prolactin, growth hormone genes

GBB-02

Polymorphism of prolactin and growth hormone genes in Aseel and their association with egg production traits

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The study was conducted to identify the polymorphism of prolactin and growth hormone genes in Aseel and their association with egg production traits by using PCR-RFLP technique. A significant difference was observed for production parameters such as body weight (g), hen day egg production (per cent), hen housed egg production (number) (P ≤ 0.05) during first laying period and feed efficiency (kg egg mass) during first and second laying periods. By using PCR-RFLP method, polymorphism was observed in PRL24, but no polymorphism for PRLR5 in prolactin gene. However, polymorphism was observed for both GH-I, and GH-II pertaining to growth hormone gene. The observed genotype frequency for AA and BB allele was 0.2 and 0.8 and frequency of A and B allele was 0.35 and 0.65, respectively for PRL24. In PRLR5, the genotype frequency of AA was 1, and allele frequency for A allele was 1. For, GH-I genotype frequency for AA, AB and BB genotype was 0.33, 0.42 and 0.29 and allele frequency for A and B was 0.525 and 0.475, respectively. The observed genotype frequency for AA and BB was 0.583 and 0.417, respectively for GH-II. The allele frequency of A and B was 0.55 and 0.45, respectively. There was no association observed for egg production traits with the polymorphism of prolactin and growth hormone genes in Aseel chicken. Based on the results, it can be concluded that non significant association of egg production traits with polymorphism of prolactin and growth hormone genes could be due to the small population.
Keywords: Aseel, Polymorphism of prolactin, growth hormone genes

GBB-03

Production performance of a coloured three way cross chicken developed at AICRP on poultry for eggs, Mannuthy for rural backyard purpose

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Crossbreeding has been a major tool for the development of present day commercial breeds of chicken and could likewise be used to improve the rural chicken. A three way cross bred chicken was developed utilizing White Leghorn N strains (25%), Tellichery chicken of Kerala (25%) and Rhode Island Red (50 %). The cross bred chicken developed has multi colour plumage with brown, black and red shades and the egg shell with brown tinch. Production performance of 105 number birds housed in individual cages were evaluated in farm condition. The birds were given feed ad libitum as per BIS (1992) and were reared under standard managemental conditions. The body weight at 20th and 40th weeks of age was 1423 and 1584 g respectively. The average age at sexual maturity for the cross bred was156 days. The egg weight during 28th, 40th and 64th weeks were 47.51±0.17, 50.46 ±0.25 and 54.88±0.29g, respectively. Egg production up to 40th week of age on hen housed, hen day and on survivor basis were 84.76±1.05, 94.68 and 87.80±0.97 respectively. Egg production up to 64th week of age on hen housed, hen day and on survivor basis were 145.82±2.46, 160.47 and 159.98±2.33 respectively. The plumage colour, tinched egg and production performance shown by the cross bred are favourable traits for backyard rearing.

Keywords: Three way cross chicken, AICRP, backyard purpose

GBB-04

Modulation of growth and immune genes by dietary supplementation of Sea buckthorn leaf meal in coloured breeder and their post hatch during winter season

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An experiment was conducted at Poultry farm of U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan (DUVASU), Mathura to study the effect of sea buckthorn (*Hippophae rhamnoides*) leaf meal (SBTLM) in coloured breeder & their post hatch to assess the modulation of growth (IGF1 and IGF2) and immunity (IL-2) related genes during winter season. Ninety coloured breeder (Chabro) hens and eighteen viable cocks in 1:5 sex ratio were randomly distributed into three treatment groups: Control (Basal), standard breeder diet (BIS, 2007); basal+0.5% and basal+1.0% SBTLM. The fold changes in expression of IGF1 amongst the nine post hatch treatment groups were 1.00±0.00, 1.16±0.19, 1.50±0.23, 1.55±0.31, 2.15±0.22, 1.60±0.18, 1.59±0.16, 1.70±0.29 and 1.64±0.13 revealed that the fold changes in IGF1 gene was 2.15 times higher in (BB+0.5%SBTLM)+(BP+0.5%SBTLM) as compared to BB+BP while the fold changes in expression of IGF2 (Insulin Like Growth Factor 2) were 1.00±0.00, 1.26±0.21, 1.45±0.18, 1.76±0.25, 3.25±0.17, 1.70±0.11, 1.79±0.10, 1.57±0.32 and 1.44±0.15 respectively revealed that the fold changes in IGF2 gene was 3.25 times higher in (BB+0.5%SBTLM)+(BP+0.5%SBTLM) as compared to BB+BP. The fold changes in expression of IL2 (Interleukin 2) amongst the nine post hatch treatment groups were 1.00±0.00, 19.80±0.92, 50.89±2.46, 4.13±0.25, 140.83±10.25, 272.69±15.32, 13.20±0.85, 134.20±10.29 and 24.96±0.18 among the all nine treatment groups revealed that the fold changes in IL2 gene was 272.69 times higher in (BB+0.5%SBTLM)+(BP+1.0%SBTLM) group as compared to BB+BP.

Keywords: IGF1, IGF2, IL-2, RT-PCR and SBTLM

GBB-05

Molecular phylodynamics of fowl adenovirus-11 from inclusion body hepatitis

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Fowl adenovirus serotype 11 was found to be predominant serotype causing IBHwith variable mortality ranging from 4 percent to 50 percent.Hexon gene L1 and L2 region is considered for molecular studies. Whereas, molecular features of hexon L3 and L4, fiber, and penton genes of FAdV-11 may provide valuable information to understand the epidemiology. This investigation was conducted to study the phylodynamicsof FAdV-11 usingthese genes.The partial hexon gene (L3 and L4), fiber, and penton genes were amplified and the designed primers found useful for molecular diagnosis of FAdV-11.The deduced amino acid sequences showed 99.30 to 100 percent, 97.26 to 100 percent and 99.79 to 100 percent similarity among the FAdV-11 strains, respectively. The fiber gene showed single stretch deletion of 17 and 34 amino acids in two and 12 FAdV-11 isolates, respectively. Phylogenetic analysis nucleotide and amino acid sequences inferred FAdV strains in different clades according to FAdV species A to E, indicating that any of these genes can be utilized for studying phylogenetic relationship of FAdVs. The Bayesian time scale analysis of partial hexon gene demonstrated Austrian FAdV-11 as most recent common ancestor and tMRCA in first quarter of 2021. The Saudi Arabian FAdV-11 strains were determined as most recent common ancestor and tMRCA in 2018 and 2019, based on fiber gene. The penton gene analysis showed an Indian FAdV-D strain most recent common ancestor and tMRCA in 2014.

Keywords: FAdV-11, Hexon, Fiber, Penton, India

GBB-06

The study of expression of different stress-related genes in transported stressed & antioxidant supplemented Broilers

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In recent era, gene expression analysis is widely used and established as a powerful method for investigating the transcriptional behaviour of biological systems, understanding stress, classifying cell states in disease, and for many other purposes. The goal of our study was to see the effect of antioxidant supplementation on the gene expression of genes that are SOD (superoxidedismutases), and glucocorticoids (GC). A total of 240 Cobb broiler chickens divided the birds randomly into six distinct treatment groups labelled as T1 to T6. Post 42 day of rearing, birds were kept off-feed for 12 hr before transport. Treatment T1 (8 hr transport), T2 (8 hr transport +1 hr rest: normal housing lairage condition), T3 (8 hr transport + 1 hr rest :20-25°C lairage temp.) T4 to T6 were administered with an antioxidant package in drinking water 72 hr with the same respective conditions as in T1 to T3. After transport, the broilers were unloaded and slaughtered following which liver and jejunum tissue samples were collected aseptically, and stored for further processing for stress gene expression. The results showed that the supplemented groups exhibited significant down-regulation ($P<0.05$) in the expression of the SOD and GC genes. The findings indicated that groups receiving the anti-oxidant package exhibited a decrease in the expression of stress-related genes, validating the effectiveness of our package.

Keywords: Lairage,antioxidant supplementation, superoxide dismutases, glucocorticoids.

GBB-07

ExpressionProfile of different cytokines in guinea fowl spleenocytes after *in vitro* exposure to Salmonella enteritidis

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The in-depth knowledge of mechanism of disease resistance is important to unravel the host-pathogen interactions for the manipulation of immune responses to develop effective control strategies against poultry diseases. Since, guinea fowl has the unique characteristics related to resistance to the common diseases occurring in chicken. Therefore, the present study was aimed to study the Differential expression analysis of different cytokines in in vitro cultured spleenocytes of guinea fowl and chicken. Screening of birds for circulating antibodies against Salmonella species was done. Purity of Salmonella enterica serovar Enteritidis (SE) culture was checked. Gene specific standard curve was generated using qRT-PCR to estimate the primer binding efficiency. In vitro mRNA expression kinetics of different cytokine genes, in SE induced and uninduced spleenocytes of GF and CK at different p.i. time, was estimated in terms of LS mean adjusted 40-CT values and fold change. All analyses were performed using the GLM procedure of JMP statistical program package. Expression of Pro-inflammatory cytokines (IL-1β, IL-6 and TNF-α) was very high in guinea fowl in comparison to broiler particularly at 1 & 12 hrsp.i. In contrast, Guinea fowl spleenocytes expressed anti-inflammatory cytokines (TGF-β4) at lower level than broiler, particularly at 12 hrsp.i., which may be the cause of the higher expression of pro-inflammatory cytokines at 12 hrsp.i. in GF. Expression of the IL-10 (Th2) cytokine was exceptionally higher in GF than broiler. In vitro Pathogen induction studies revealed that guinea fowl was more responsive than broiler chicken in terms of expression of immune molecules. The unique response of guinea fowl was in contrast to the broiler which had the history of intense genetic selection for the increase growth. Finally, the results of the present investigation are encouraging to establish the guinea fowl as a model for the disease resistance studies in poultry species.
Keywords: Guinea fowl, disease resistance, cytokines, differential expression, spleenocytes.

GBB-08

Genetic diversity of Newcastle disease viruses circulating in domestic and wild birds in Assam, India and a strategy to control its emerging variants

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Newcastle disease virus (NDV) or *Avian Orthoavulavirus-1*(AOaV-1) is one of the major pathogens of domestic and wild birds affecting at least 250 bird species. Despite the fact that all AOaV-1 members belong to one serotype, various NDV genotypes have emerged as a result of continuous virus evolution. The commercially available NDV vaccines are effective at reducing clinical disease/ mortality but ineffective at reducing virulent heterologous virus shedding. The protective effectiveness of vaccines is seriously threatened by the considerable antigenic variation between vaccine strains and circulating field strains, highlighting the need to develop genotype-matched vaccines.In the present study, we genotypically and pathotypically characterized 19 NDVs isolated from domestic chickens, pet

psittacines, zoo-captive ostriches and hornbills, conserved vultures, and caught wild birds between 2015 and 2023 from various locations in Assam. Molecular analysis showed fusion (F) protein with cleavage site motif (^{112}GRQGR/L^{117}) and (^{112}RRKQR/F^{117}) confirming both avirulent and virulent nature of the isolates. Phylogenetic analysis revealed avirulent/lentogenic genotype II as well as virulent genotypes VII and XIII NDVs to be in circulation in Assam. However, it is noteworthy to mention that genotype II NDV from wild birds grouped with vaccine strain that is being commonly used in commercial poultry. Additionally, the majority of the wild bird isolates were highly similar to isolates from poultry, and vaccine virus strains. Our findings suggested that wild birds could disseminate NDV and,poultry-derived and vaccine virus strains may spillover to wild birds, as a result playing a remarkable role in interspecies transmission.Our results indicated the occurrence of genetically diverse NDV strains in wide range of hosts. Therefore, an attempt may be made to improve ND control strategy by rational design of genotype-matched vaccines with circulating immunogenic NDV strains.

Keywords: Newcastle disease virus (NDV),*Avian Orthoavulavirus-1* (AOaV-1), genotype-matched vaccines

GBB-09

Nutrigenomics in poultry

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The global demand for chicken meat and eggs has been rising constantly. Balanced nutrition plays crucial role in profitable rearing of poultry, as feed cost occupies 70 percent of the recurring expenditure. Recent innovations of biotechnological applications helped in identifying the role of the dietary nutrients on the gene expression and their consequent role in metabolic pathways. Nutrigenomics is the study of interactions between diet and genes, relatively novel field gaining attention of poultry scientists to explore the possibilities for improving the production, developing alternatives to antimicrobial feed additives. Nutrients possess the bioactive signals to alter the phenotypic expression of genetic material by upregulation and down regulation of the genes, conversely how genes interact with the dietary chemicals is understood with the knowledge of "omics" technology. These molecular level interactions of feed and genetic material can be studied through the techniques of transcriptomics (DNA microarray, real time PCR), proteomics (ELISA, mass spectrometry), metabolomics (NMR, GC, HPLC). Furthermore, dietary nutrients also have an effect on the epigenetic pathways that occur during early postnatal phase. Conventional studies of nutrition require the replication of experimental units to obtain precise interpretation, with the help of molecular approaches underlying mechanism of metabolic events can provide better understanding of the beneficial results on health and productivity. Besides, nutrigenomic approaches can pave the reason behind the favourable effects of organic sources of minerals, example organic form of selenium is proven to have effective defense against oxidative stress than its inorganic counterpart. Nutrigenomics provides the way for identification of precision feeding and helps in choosing optimal nutrient combinations for reducing the incidence of metabolic disorders in fast growing strains under stress.

Keywords: Nutrition, nutrigenomics, health, productivity

GBB-10

Phenotypic and genetic parameters for body weight and production traits of Uttara Chicken

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The aim of the present study was to estimate genetic and phenotypic parameters of body measurements and production traits in Uttara. Body weight was recorded on an electronic balance in morning before feeding starting from day old to 40 weeks at 4 week intervals. The sex dimorphism effects were estimated at 2 weeks of age and were present at later ages. The means of body weights at day old, 4, 8, 12, 16, 20, 24, 28, 32, 36 and 40 weeks were 34.95±0.38, 138.08±4.53, 435.72±9.70, 735.69±18.31, 1036.00±19.49, 1309.78±19.36, 1394.62±3.76, 1547.86±19.47, 1563.44±20.03, 1575.82±25.18 and 1585.78±27.35 g respectively. The mean values of production traits *viz.* egg production, egg weight and egg mass up to 40 and 58 weeks of age were 74.79±0.53 and 148.90±1.71 eggs, 55.29±0.54 and 59.74±0.77 g and 4134.83±42.86 and 8895.21±70.88 g respectively. Heritability of all body measurements was estimated by paternal half-sib method. The heritability was higher for females than males for body weight at 0 to 20 week. The heritability values for body weight at 24, 28, 32, 36 and 40 weeks were moderate to high and egg production traits were low to high in magnitude, respectively. The adult body weight was negatively associated with egg production and positively with egg weight and egg mass at genetic and phenotypic levels. Information on various production traits of this breed could be useful in documentation of its actual genetic worth under intensive system of rearing and this germplasm may be utilized for development of new crosses/strains of dual type colored chicken for backyard/niche markets.

Keywords: Body weight, Heritability, Uttara chickens

GBB-11

Molecular detection of ILTV from respiratory infections of poultry in Andhra Pradesh

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The 228 pooled Cloacal swabs, 228 pooled nasal swabs, 228 pooled tracheal swabs samples from the ailing birds and 152 pooled tracheal tissues, 152 pooled lung tissues and 76 pooled oviduct samples from the dead birds were collected from the suspected 19 poultry farms in A.P. and were labelled farm wise and specimen wise.The extracted DNA was screened for ILTV by targeting ICP4 gene and produced 635 bp PCR product in two farm samples. In ILT affected trachea revealed epithelial cells desquamation, intranuclear inclusions and syncytial cells. ILTV field isolate showed 94.28 to 100 per cent similarity with vaccine isolates and GenBank isolates. The variations of nucleotides and aminoacids observed by comparing the vaccine isolates and GenBank isolates and showed nucleotide variations at G56C and G111T positions in case of TSSVVU ILT field isolate and amino acid variations at C18S and insertion H35P in case of TSSVVU ILT field.The TSSVVU ILT field isolate was closely related with USA strain and the vaccine ILT isolate was closely related with Italian strain.

Keywords: ILTV, respiratory disease, poultry, molecular detection

GBB-12

Expression profiling and association studies of *CRBP IV*and *cGH*gene with egg production in Kadaknath

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Expression profiling and association studies are among the major tools that can be used in identification of the role of important candidate genes and their effect on level of egg production. The egg production up to 40 weeks were recorded in 120 pedigreed Kadaknath birds kept at Desi fowl unit of ICAR-CARI, Izatnagar, Bareilly. Three different tissues viz., kidney, liver and oviduct were collected from eight birds belonging to two different egg production groups viz., four each from high and low egg producing groups.Quantitative Real Time- Polymerase Chain Reaction (qRT-PCR) was used to study the

mRNA expression of *CRBP IV* and *cGH* gene. The data retrieved was analyzed using JMP-SAS (2010). It was found that the mRNA expression of *CRBP IV* gene differ significantly among the two egg production groups in liver (P<0.01). The mRNA expression of *cGH* gene differ significantly in all the three tissues i.e. kidney (P<0.2), liver (P<0.001) and oviduct (P<0.01) in case of high and low egg producing groups.The level of expression of *CRBP IV* gene in liver (P<0.0001) and kidney (P<0.15) had significant effect on egg production up to 40 weeks. Similarly, the level of expression of *cGH* gene in liver and oviduct (P<0.001) had significant effect on egg production up to 40 weeks. The birds with higher expression of the two genes in these three tissues had significantly higher egg production.The study revealed significant and interesting findings on the expression of candidategenes and their potential application both in advanced marker assisted selection programs and inconventional full sib selection programs for genetic improvement of layer economic traits inKadaknath native chicken breed.

Keywords: Kadaknath, *cGH*, *CRBPIV*, qRT-PCR, egg production traits

GBB-13

Modulation of growth and immune genes by dietary supplementation of Sea buckthorn leaf meal in coloured breeder and their post hatch during winter season

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An experiment was conducted at Poultry farm of U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan (DUVASU), Mathura to study the effect of sea buckthorn (*Hippophae rhamnoides*) leaf meal (SBTLM) in coloured breeder & their post hatch to assess the modulation of growth (IGF1 and IGF2) and immunity (IL-2) related genes during winter season. Ninety coloured breeder (Chabro) hens and eighteen viable cocks in 1:5 sex ratio were randomly distributed into three treatment groups: Control (Basal), standard breeder diet (BIS, 2007); basal+0.5% and basal+1.0% SBTLM. The fold changes in expression of IGF1 amongst the nine post hatch treatment groups were 1.00±0.00, 1.16±0.19, 1.50±0.23, 1.55±0.31, 2.15±0.22, 1.60±0.18, 1.59±0.16, 1.70±0.29 and 1.64±0.13 revealed that the fold changes in IGF1 gene was 2.15 times higher in (BB+0.5%SBTLM)+(BP+0.5%SBTLM) as compared to BB+BP while the fold changes in expression of IGF2 (Insulin Like Growth Factor 2) were 1.00±0.00, 1.26±0.21, 1.45±0.18, 1.76±0.25, 3.25±0.17, 1.70±0.11, 1.79±0.10, 1.57±0.32 and 1.44±0.15 respectively revealed that the fold changes in IGF2 gene was 3.25 times higher in (BB+0.5%SBTLM)+(BP+0.5%SBTLM) as compared to BB+BP. The fold changes in expression of IL2 (Interleukin 2) amongst the nine post hatch treatment groups were 1.00±0.00, 19.80±0.92, 50.89±2.46, 4.13±0.25, 140.83±10.25, 272.69±15.32, 13.20±0.85, 134.20±10.29 and 24.96±0.18 among the all nine treatment groups revealed that the fold changes in IL2 gene was 272.69 times higher in (BB+0.5%SBTLM)+(BP+1.0%SBTLM) group as compared to BB+BP.

Keywords: IGF1, IGF2, IL-2, RT-PCR and SBTLM

GBB-14

Association of growth hormone gene (exon 3 and partial intron 3) polymorphism with growth and carcass traits in Kuttanad ducks of Kerala

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Kuttanad ducks are the dual-type native ducks of Kerala. The genetic variability of the duck growth hormone (*GH*) gene with respect to its exon 3 and partial intron 3 (227 bp)locusand its

association with importantgrowth traitslike body weightfrom hatch to 16 weeks of age, body measurements of length of trunk, neck, shank, breast bone and chest girth as well as carcass traitslike percentage of dressed weight, breast, leg and giblet yield was studied in 100Kuttanad ducks. The HRM analysis and sequencing methods revealed one SNP g. 71A>Gin the 139 bp regionwith two alleles A and G, and three genotypes, AA, AG and GG in the population.The frequency of allele G (0.54) was higher than that of allele A (0.46) and the predominant genotype was AG (0.38).The observed and expected heterozygosity estimated for the polymorphic locus were 0.38 and 0.50, respectively.Chi-square test showed that the duck population was in Hardy-Weinberg equilibrium for the locus.The association analysis revealed that GGhomozygotes were superior ($p<0.05$) with respect to body weight at 6, 14 and 16 weeks of age and body measurements of length of trunk, neck and shank from 6 to 10 weeks of age as well as the chest girth from 10 to 16 weeks of age. AA genotype had larger breast bones during the grower phase from 8 to 10 weeks of age and a greater pre-slaughter live weight and dressed weight per cent than other genotypes ($p<0.05$).Based on the study, it can be concluded that the 139 bp region of the partial intron 3 of *GH* gene and the SNP g.71A>Gexerted a marked influence on the body weight, body measurements and dressed weight per cent of ducks and hence can serve as a potential candidate marker for the early selection of Kuttanad ducks for these traits.

Keywords: Growth hormone, gene, polymorphism, ducks

GBB-15

Comparative study of molecular variations in *Mycoplasma synoviae* field isolates from common respiratory infections of poultry in Andhra Pradesh

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Samples collected from 19*Mycoplasma* suspected poultry farms in A.P.including 228 pooled Cloacal swabs, 228 pooled nasal swabs, 228 pooled tracheal swabs samples from the ailing birds and 152 pooled tracheal tissues, 152 pooled lung tissues and 76 pooled oviduct samplesfrom the dead birds. The PCR test was standardized by targeting *vlhA* gene. In this study the homology comparison between MS field strains (TH11, TH13, MSTH17 and MSTH18), vaccine strain (MS vac, (MS-H strain)) and other gene bank sequences revealed 99.81% to 100% homology between field, vaccine and published sequences. In MS field isolates showed variations between 24th to 338th nucleotide positions and unique mutations observed at C70T,T93C,T99G, C101A, T132C, G138A, C181T, T199G, G203A, A263C, C266A, A292G and A117G these variations reflected the amino acids sequence variations at 9th to 112th positions in field MS isolates in *vlhA* gene. The phylogenetic tree revealed that MS vaccine isolate was closely related with T2/3X*vlhA* (AY907704) Australian strain, the field TH13 and the field MSTH17 was closely related and all the field strains TH11,TH13 and MSTH17 were evolved from MSTH18 field strain and also the GenBank isolates also evolved from MSTH18.

Keywords: *Mycoplasma synoviae,* respiratory infection, poultry, nasal swab

GBB-16

Growth performance evaluation by one way cross in Uttara breed of chicken

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The studies on growth pattern and gain in body weight were conducted at Instructional poultry farm Nagla, GBPUAT, Pantnagar, Uttarakhand to evaluate the one way cross performance of on elite germplasm of Uttara Fowl (U), Kadaknath (K) and White Leghorn (WL) and its reciprocal crosses U (M)

x K (F), K (M) x U (F), U (M) x WL (F) and WL (M) x U(F). The chicks were obtained from a single hatch and their biweekly body weight were recorded (0 day, 2nd week, 4th week, 6th week, 8th week, 10th week, 12th week, 14th week, 16th week, 18th week and 20th week). The average biweekly gain in body weight of crosses U (M) x K (F) at 8th week, 12th week, 16th week and 20th week were 465.52 ± 7.06, 665.12 ± 5.91, 827.48 ± 15.75 and 1025.59 ± 14.65 gm respectively. K (M) x U (F) at 8th week, 12th week, 16th week and 20th week were 451.02 ± 2.60, 657.99 ± 6.36, 804.97 ± 6.17 and 1008.96 ± 4.13 gm respectively. U (M) x WL (F) at 8th week, 12th week, 16th week and 20th week were 463.19 ± 7.63, 686.61 ± 10.12, 855.79 ± 11.35 and 1041.23 ± 8.58 gm respectively. WL (M) x U (F) at 8th week, 12th week, 16th week and 20th week were 473.74 ± 5.24, 674.52 ± 15.78, 832.85 ± 17.97 and 1033.56 ± 6.31 gm respectively. From the present study it may be concluded that U (M) x WL (F) cross chickens could be suitable with respect to growth performance. Both sexes' growth patterns exhibited linear increases in body weights. The sex differences in body weights are due to sex dimorphism in favor of males.

Key words: Body weights, growth rate, uttara fowl, kadaknath, white leghorn, sex-dimorphism.

SESSION II

NUTRITION AND PHYSIOLOGY

NP-01

Effect of dietary supplementation of Marigold flower powder (*Tagetes erecta)* on the performance parameters of commercial broiler chicken

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One hundred twenty numbers of unsexed day-old commercial broiler chicks (Cobb-430y) were used to evaluate the effect of feeding Marigold flower powder (MFP*)* on the performance parameters of broiler chicken. The chicks were randomly separated into 4 groups *viz.* C (control), T_1, T_2, and T_3, each of which contained 30 chicks. Each group was further divided into three replicates, each with ten chicks. The chicks were raised under deep litter system for 6 weeks with standard and uniform managemental protocols and were fed with basal diet C (basal diet + no MFP), T_1 (basal diet + 0.3 % MFP), T_2 (basal diet + 0.6 % MFP) and T_3 (basal diet + 0.9 % MFP) in feed during the experimental period of 42 days. The total feed consumption and the final body weight per broiler was significantly (P>0.05) higher in T_2 group than other groups. The overall FCR for the entire period of the experimental groups was found best in T_2 group (1.70) followed by T_1 (1.72), T_3 (1.75) and C (1.77) groups. All the experimental groups had 100% livability. The cost of production per broiler was also found to be highest in T_2 (₹284.50) group, followed by T_1 (₹282.60), T_3 (₹261.86) and C (₹252.00) groups. In addition, the highest gross profit per broiler was found in T_2 (₹28.91) group, followed by T_1 (₹25.14), T_3 (₹14.74) and C (₹9.13) groups. Hence, it may be concluded that MFP could be utilized cost-effectively as a natural feed additive in the diet of broiler chickens at a level of 0.60 % to enhance their productive performances.

Key words: Broiler chickens, Marigold flower powder, productive performances, feed additives, performance promoter.

NP-02

Performance of chicken broilers on feeding dietary sodium sulphate and fish oil in fish meal free ration

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The present research was designed to analyze the effect of dietary supplementation of Sodium Sulphate and Fish Oil on the performance of chicken broilers in fish meal free ration. One hundred and eighty day- old unsexed broiler chicks were used on a completely randomized design in four groups with three replicates, each consisting of 15 broilers. The treatments included the T_0 group (negative control i.e. Basal diet without fish meal), T_1 group (control i.e. Basal diet with fish meal), T_2 group (Basal diet without fish meal + 0.35% Sodium Sulphate) and T_3 group (Basal diet without fish meal + 0.35% Sodium Sulphate + Fish Oil). Standard feeding and all other managemental practices were followed during the experimental period of 42 days. At the end of the experiment, three birds from each replicate were sacrificed for estimation of carcass characteristics.The results obtained regarding performance of the broilers showed significant (P<0.05) differences in body weight, feed intake as well as carcass characterstics of T_3 group as compared to control group during whole experimental period. Feed conversion ratio between the groups differed non-significantly. The cost of production calculated at the end of experiment revealed that net profit on drawn weight (Rs/kg) were Rs. 23.34 and on live weight (Rs/kg) was Rs. 7.12 in Sodium Sulphate with Fish Oil supplementation with respect to control group. Through this experimentation, it can be concluded that fish meal can be replaced by Sodium Sulphate

alone as well as Sodium Sulphate with Fish Oil without any adverse effect on performance of chicken broilers.

Keywords: Broilers, fish meal, fish oil, performance, sodium sulphate

NP-03

Effect of feeding dietary sodium sulphate and fish oil on weekly production performance of chiken broilers in fish meal free ration

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This experiment was conducted to study the effect of supplementation of Sodium Sulphate and Fish Oil in fish meal free ration on the performance of chicken broilers. One hundred and eighty day- old unsexed broiler chicks were divided in four groups with three replicates, each consisting of 15 broilers. The treatments included the T_0 group (negative control i.e. Basal diet - fish meal), T_1 group (control i.e. Basal diet), T_2 group (Basal diet - fish meal + 0.35% Sodium Sulphate) and T_3 group (Basal diet - fish meal + 0.35% Sodium Sulphate + Fish Oil). Standard feeding and all other management practices were followed during the experimental period of 42 days. The weekly weight and feed intake was recorded and FCR was calculated from the recorded data. The results obtained showed significantly ($P<0.05$) higher weekly body weight of T_2 and T_3 group in comparison to control group. The weekly body weight of T_2 and T_3 varied non-significantly with each other except at 42 days of age where T_3 secured significantly higher weight than T_2. The mean weekly feed intake was significantly ($P<0.05$) high during whole experiment in T_2 and T_3 group as compared to control group except in T_2 group at 42 days of age where it was significantly ($P<0.05$) lower than control group. Feed conversion ratio between the groups differed non-significantly. Therefore, it can be concluded that fish meal can be replaced by Sodium Sulphate alone as well as Sodium Sulphate with Fish Oil without any adverse effect on performance of chicken broilers.

Keywords: Broilers, fish meal, fish oil, performance, sodium sulphate

NP-04

Effect of feeding sea buckthorn leaf and seed meal on the performance of broiler chicken

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An experiment was carried out to study the performance of broiler chicken fed with graded levels of Sea buckthorn leaf and seed meals on isonitrogenous and isocaloric basis. One hundred and fifty day old broiler chicks were procured from a commercial hatchery and brooded for a week. After one week the chicks were weighed by using an electronic balance and the chicks having similar body weights were distributed randomly into five treatment groups fed with graded levels of Sea buckthorn leaf and seed meals viz, T_1: (Control), T_2: 5% leaf meal, T_3: 5% seed meal, T_4 :10% leaf meal and T_5 :10% seed meal. The birds were reared in cage system following standard managemental conditions. The birds were reared up to six weeks of age. The Sea buckthorn seed and leaf meal contains 91.04±1.25 and 90.51±1.02% Dry matter (DM), 23.52±0.65 and 13.94±0.56% Crude protein (CP), 3.13±0.12 and 2.70±0.18% Ether extract (EE).The Metabolizable energy (Kcal/kg) of Sea buckthorn seed and leaves were calculated as 2810.47 and 2470.74 respectively. The results indicated that the final body weight at 6^{th} week of age of T_3 (1898.36± 5.92g) and T_5 (1876.42±6.85g) groups was significantly ($P\leq0.05$) higher than other groups and lowest in T_4 (1778.48±4.98g) group. Statistical analysis revealed

significantly (P≤0.05) highest mean body weight gain in T_3 (1753.28 ± 6.42g) treatment group and lowest mean body weight gain was recorded in T_4 (1636.28±4.09g) treatment group. The cumulative feed consumption was recorded to be significantly (P≤0.05) higher in T_5 (3000.59±9.86g) and T_3 (2980.57±6.48g) groups than all other groups.The Cumulative FCR was significantly (P≤0.05) improved in T_3 (1.70±0.02)and T_5 (1.72±0.02) groups than other groups and was poor in T_4 (1.79±0.03) group. During the entire experimental period the mortality of 3.3 per cent was recorded in T_1 and T_4 treatment groups and in remaining groups no mortality was recorded.

Key words: Sea buckthorn, composition, Broiler chicken, performance

NP-05

Effect of combination of hydroxy trace mineral and organic trace mineral (IntelliOpt) on performance of broilers

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Trace minerals play a crucial role in poultry. The negative impacts of inorganic sulphate and oxide minerals are well documented; henceTrouw'sR&D team have developed IntelliOpt based on combination hydroxy and proteinate-based chelated minerals. The present study was conducted in commercial Vencobb broiler birds to evaluate the efficacy of IntelliOpt (CHM) minerals on broiler performance against inorganic (ITM) and organic trace minerals-based combination (OMP) in Indian environmental conditions. The trial was conducted in the Ramadoota Poultry Research Centre, Hyderabad with a basal diet (as per the standard requirement of birds) plus various trace mineral sources under the same environmental conditions (ITM levels are twice the CHM and OMP levels). CHM-fed broilers showed better growth, body weight (BW), feed conversion ratio (FCR), and return of interest (ROI) when compared with the other two treatments. The CHM groups achieved 2.292 kg weight by 42ndday against the ITM (2.25 kg) and OMP (2.26 kg) weights respectively, which are on average 1.5% higher than the other 2 groups. Both CHM and OMP treatments achieved better FCR (1.62 vs. 1.63) compared to the ITM group. Both CHM and OMP treatments gave better ROI when compared to the ITM group. So, IntelliOpt, with a combination of both proteinate based organic minerals (OTM) and hydroxy minerals (HTM), outperforms both ITM and OTM to achieve performance and sustainability without any negative environmental impact. This innovative solution exemplifies Trouw Nutrition's commitment to advancing animal nutrition and promoting sustainable livestock production for a healthier future.

Keywords: Hydroxy, Trace Minerals, animal nutrition, minerals, proteinate-based

NP-06

Effect of substituting rice polish with mulberry (*Morus alba*) leaf powder on production performance of laying hens

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Poultry production in India is recognized as an efficiently organized and scientifically advanced industry. This sector contributes around 1% to the overall GDP and about 13% to the livestock GDP and experiences an annual growth rate of 6-8% in egg production (DAHD in 2019). Feed cost typically accounts for 60-75% of the total cost of poultry production. Due to challenges in sourcing conventional chicken feed, there's a quest for cost-effective and locally available alternatives. One such option being

explored is the utilization of mulberry leaves, which offer substantial nutritional value. Mulberry leaves contain protein (15-35%), minerals (2.42-4.71%), and metabolizable energy (1,130-2,240 Kcal/kg) (Saddul *et al.,* 2004). The richness in amino acids might help mitigate the impact of fiber present in these leaves. The present study was conducted to examine the effects of substituting rice polish with mulberry leaf powder. Feeding trial of 12 weeks duration was conducted at IPF, Nagla, GBPUA&T, Pantnagar, on 72 White Leghorn laying hens. Four dietary treatment groups were T1(Basal diet with 4.5% rice polish); T2(1.5% Mulberry leaf powder + 3% Rice polish); T3: (3% Mulberry leaf powder + 1.5% Rice polish); T4: (4.5% Mulberry leaf powder + 0% Rice polish). The overall cumulative performance in various treatment groups remained consistent for feed intake, weight gain, egg production, and feed conversion rate (FCR), with no significant differences. However, dry matter utilization was significantly increased in the T4 group. The egg shell quality attributes showed no significant differences among groups. Cost per kg feed in all the treatment groups were lower than the control, with lowest cost per kg feed in T4 group. Based on these results, it can be concluded that rice polish (up to 4.5% in the diet) can be completely substituted with mulberry leaf powder in poultry feed, without negatively impacting laying hen performance.

Keywords: Performance, Conventional, Amino acids, Mulberry, Egg production

NP-07

Effect of dietary supplementation of curry leaves (*Murraya keonigii*) powder on the performance of commercial broiler chicken

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A total of 144 numbers of unsexed commercial broiler chicks (Cobb-400) with uniform body weight were utilized to assess the effect of supplementing curry leaves powder (CLP) in broiler basal diet. The chicks were divided into four experimental groups *viz*. T_0, T_1, T_2 and T_3 with 36 chicks in each group. Each group was further divided into 3 replicates with 12 chicks each. The chicks were reared under deep litter system with standard managemental practices and were fed basal diet T_0 (control), T_1 (basal diet + 0.25 % CLP), T_2 (basal diet + 0.50 % CLP) and T_3 (basal diet + 0.75 % CLP) groups during the experimental period of 42 days. The results showed that the final body weight/broiler was found to be significantly ($P<0.05$) higher in the T_3 group (1989.43±43.16g) than other groups. During the 6th week of age, the body weight gain was significantly ($P<0.05$) higher in T_3 group (546.37±27.97g) and lowest in the T_1 (360.11±17.48g) group. The overall FCR was best in the T_3 group (1.67) than other groups. The highest BPEI was found in the T_3 group (119.11) than other groups. The per cent livability in T_1, T_2 and T_3groups was found to be higher than control group. The gross profit and production cost per broiler also was better T_3 group as compared to other groups. Hence, it can be concluded that, the CLP can be supplemented @ 0.75% of the diet to improve the overall performance of broiler chicken with higher gross profit per broiler.

Key words: Broiler chicken, curry leave powder, production performance

NP-08

Effect of supplementation of Rough Lemon, Amla and Aloe vera on physio-biochemical and hematological parameters of broiler chicken during summer season

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Herbal additives are rich in vitamin C, A and other biological active compounds and may act as a good alternative source to overcome heat stress in broiler chicken. Among herbal additives, rough lemon, amla and aloe vera were easily available during summer and also has an additional advantage of throw away price in comparison to synthetic feed additives available in market. In order to investigate the effect of supplementation of rough lemon, amla and aloe vera on the performance of broiler chicken (Cobb strain) under heat stress conditions**,** 240-day old chicks were randomly distributed to four treatment group (n=60). Basal diet (Maize-Soya based; T_0) was same for all the groups except the supplementation of rough lemon, amla and aloe vera @ 2% in drinking water in T_1, T_2 and T_3, respectively. Experiment trial lasted for 42 days during June-July at F.V.Sc. & A.H., R.S. Pura, Jammu. Feed and water were offered *ad-libitum* throughout the trial. Results revealed significantly higher ($P<0.05$) body weight in T_3 and T_2 followed by T_1 and least in T_0 at 42 days of age. pH value, PCV (%), Sodium (mmol/L) and Potassium (mmol/L) was higher in T_3 than rest of the groups**.** HL ratio is significantly lower ($P<0.05$) in T_3, T_2 followed by T_1 than T_0 at 42 days of age. It may be inferred that amongst these phyto-additives, aloe vera leads in alleviating heat stress in broiler chicken in an economical way followed by amla and rough lemon.

Key word: Rough lemon, Amla, Aloe vera, Heat stress, Broiler

NP-09

Evaluation of haematological parameters of chicken broilers on feeding *Moringa oleifera* alone or in combinationwith fibrolytic enzyme

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An experiment was designed to study the effect of feeding *Moringa oleifera* with fibrolytic enzyme on varioushematological parameters of chicken broilers. Two hundred forty, day old chicks were randomly divided into 4 treatment groups i.e.Negative Control group or T_0 which were offered basal diet without antibiotics and treatment groups (T_1), T_2 and T_3 which were fed basal diet with antibiotics, basal diet with 2% *Moringa oleifera* and basaldiethaving 2% *Moringa oleifera*with 0.5% fibrolytic enzymerespectively. All standard management practices werefollowedthroughout the experimentalperiodwhichwas 42 days. At the end of the feeding trial i.e. 42 days,the birds were starved for twelve hours and blood was collected from the jugular vein of the 4 broilers per treatment i.e. one broiler per replicatewith the aid of needle and syringe. Approximately 4 ml blood was collected from each chicken broiler and transferred immediately into a set of sterile EDTA vials.Haematological parameters such as Haemoglobin (Hb; g/dl), Total Erythrocytic Count (TEC; million/mm^3) and Total Leucocyte Count (TLC; thousand /mm^3) were analyzed with the automated haematologyanalyser MS45 blood cell counter.Data obtained were subjected to statistical analysis as per Snedecor and Cochran (1994) using Completely Randomized Design (CRD). The values of haematological parameters in treatment groups T_0, T_1, T_2 and T_3forHb were 10.21, 10.11, 10.12, 10.28, for TEC were 2.21, 2.38, 2.33, 2.35, and for TLC were 25.51, 25.50, 25.61 and 25.54 respectively. They varied non-significantly among all treatment groups of chicken broilers and were within normal range.Thus, itcanbeconcludedfrom the presentstudythat inclusion of2% *Moringa oleifera*alone or in combinationwith 0.5% fibrolytic enzymehad no adverse effect on haematological parametersof chicken broilers.

Keywords: Broilers, Moringa, fibrolytic enzyme, Haematological parameter

NP-10

Effect of feeding *Moringa oleifera* alone or in combinationwith fibrolytic enzyme on the body weight gain of chicken broilers

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An experiment was designed to study the effect of feeding *Moringa oleifera* with fibrolytic enzyme on the body weight gain/bird of chicken broiler. Two hundred forty, day old chicks were divided into 4 treatment groups viz., T_0 (Control): offered basal diet without antibiotic; T_1: fed basal diet with antibiotics; T_2: offered basal diet with 2% *Moringa oleifera* and T_3: Basal diethaving 2% *Moringa oleifera*with 0.5% fibrolytic enzyme. All standard management practices werefollowedthroughout the experiment.Data obtained were subjected to statistical analysis as per Snedecor and Cochran (1994) using Completely Randomized Design (CRD).During the feeding trial of 42 days, body weightwasrecordedweeklyusingweighing balance and weekly gain per birdwascalculatedfrmrecorded data. Findings of the studyrevealedthatthere was no significant difference in weekly mean weight gain/ bird among different treatment groups at 7 days of age. At 14, 21, 28 and 42 days of age, T_3 group had significantly ($P<0.05$) higher weight gainthan T_0 and T_1. Also there was no significant difference in body weight gain of T_2 and T_3 as well as T1 and T_0 during entire experimental period of 42 days.In similar way, T_2also varied non-significantly with control group during whole experiment. Thus, itcanbeinferredfrom the presentstudythat inclusion of 2% *Moringa oleifera*alone or in combinationwith 0.5% fibrolytic enzyme hadbetter effect on weekly weight gain of chicken broilers without any adverse effect on health of birds.

Keyword: Broilers, Moringa, fibrolytic enzyme, Body weight

NP-11

Efficacy of herbal choline on production performance of commercial broilers

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An experiment was conducted at SSPS, recognized facility of Nagpur Veterinary college, Nagpur to evaluate the comparative efficacy of herbal choline vis-a-vis commercially available synthetic choline. Accordingly, 450 day-old Cobb broilers chicks were divided into 15 groups of 30 chicks in each group. Three maize-soybean meals based experimental diets were formulated i.e. pre-starter (0-11 d), starter (12-22 d) and finisher (23-42 d of age), respectively. The basal diet without herbal or synthetic choline served as control (C) diet. The basal diet added with commercial herbal choline @ 500g/ton of feed served as treatment 1 (T1) and basal diet + synthetic choline @ 1.0 kg per ton of feed served as T2. During 0-42d of age, the gains in body weight did not differ significantly but were apparently higher than control. Synthetic choline supplementation from the source improved FCR by 4.79% for commercial source and 6.58% for herbal choline from Amorvet. Survivability of birds though did not differ significantly but was lesser (96.00%) in choline un-supplemented diet but survivability improved on choline supplementation (Survivability 99.33% in diet supplemented with herbal choline in comparison to synthetic one 98.00%). The EPEF value was lower ($P<0.05$) in choline un-supplemented diet in comparison to test diets. Again highest value of EPEF during 0-42 days of age was calculated in diet with herbal choline @ 500g per ton of feed, followed by in diet with synthetic choline @ 1 kg per ton of feed. Both the dietary treatments having either source of herbal choline had significantly ($P<0.01$) higher EPEF value than the control diet without choline. Therefore, the results lead to conclude that the efficacy of herbal choline from Amorvet source was better than commercially available synthetic source.

Keywords: Broiler, economics, European production efficiency factor, growth performance, herbal choline

NP-12

Dietary addition of betaine on the performance of broilers fed with diets with a reduction in methionine and choline

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A six-week bio-assay was conducted to evaluate the performance of broiler chicken(n=560) fed with diets with the reduction in methionine and choline with the dietary addition of betaine.There were five treatments, each with eight replicates comprising fourteen birds, each. The negative control group (NC) received a basal diet, according to BIS (2007). The positive control (PC) group was fed a basal diet with 0.05% betaine. The three treatment groups received the basal diet containing 0.05% betaine with 20, 40, and 60% reduction in methionine and choline, respectively. Standard management practices were followed in the rearing of the birds.Study parameters included growth performance, immune response, and carcass traits. The PC group recorded the highest body weight gain, followed by T1, NC, T2, and T3. The birds fed 0.05% betaine showed a significant (P<0.001) increase in the foot web index, serum antibody titer, and relative immune organ weights (bursa, spleen, and thymus) in the PC and T1 groups. The dietary addition of 0.05% of betaine significantly reduced shrinkage loss and fat pad thickness. Significantly higher eviscerated and ready-to-cook yields with substantially better relative heart, breast, and neck weights were recorded in PC and T1. Betaine hydrochloride at a dietary level of 0.05% with a 20% reduction in methionine and choline significantly improved growth performance, livability, immunity, and carcass traits of broiler chickens.

Keywords: betaine hydrochloride, methionine, choline, abdominal fat, ready-to-cook yield, FCR, feed intake

NP-13

Effect of combination of curcuma longa, lutein and cissus quadrangularis on production performance and carcass quality of broilers

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This study was conducted to evaluate the effect of combination of *Curcuma longa*, lutein and *Cissusquadrangularis* on production performance and carcass quality of broilers. The trial was conducted on 360 'Cobb 430 Y' broilers for a period of five weeks. The day-old chicks were randomly divided into four groups of 90 birds each, which were further sub-divided into six replicates of 15 birds each. Group A was the control, receiving corn soybean diet. Group B, C and D received diets supplemented with combination product @ 250 g/T, 500 g/T and 750 g/T, respectively. The combination product contained *Curcuma longa* extract 6%, Lutein 3% and *Cissusquadrangularis* 55%. The parameters like live weight, gain in weight, feed consumption, feed conversion ratio (FCR), mortality, carcass quality, tibia ash, tibia calcium and phosphorus contents and economics of production were evaluated. It was observed that the birds from group D receiving diet supplement with combination product @ 750 g/T showed marginally better live weight, gain in weight and feed consumption. Significantly better feed conversion ratio was recorded by the birds receiving combination product @ 750 g/T than the control group. The results pertaining to the carcass quality parameters like edible carcass, giblet weight and heart weight percentages indicated comparable results. However, liver weight percentage and gizzard weight percentage were significantly higher for the birds receiving combination product @ 750 g/T. The tibia ash, calcium and phosphorus contents showed non-significant difference amongst the birds from different group. The net returns were also higher for the birds receiving combination product @ 750 g/T than all the treatment groups, including

control group. Hence, it is concluded that, the supplementation of combination product containing *Curcuma longa*, Lutein and *Cissusquadrangularis* @ 750 g/T to the diets is beneficial in improving production performance, carcass quality and profit margins in broiler production.

Keywords: *Curcuma longa* extract, Lutein, *Cissusquadrangularis*, production performance, carcass quality.

NP-14

Effect of supplementation of *Moringa oleifera* and citric acid on performance index of chicken broilers

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An experiment was conducted to study the effect of *Moringaoleifera* and Citric acid supplementation on the performance of broilers. Two hundred and twenty five day old unsexed commercial broiler chicks were subjected to five dietary treatments consisting of 15 broiler chicks in each replicate reared for a period of 6 weeks to find the effect of following treatments namely T_0 group (negative control i.e. basal ration without antibiotic), T_1 group (control i.e. basal ration with antibiotics), T_2 group (basal Ration + 1% *M. oleifera*), T_3 group (basal Ration + 0.5 % Citric acid) and T_4 group (basal Ration + 1% *M. oleifera* + 0.5% Citric acid).Temperature and humidity of the shed were recorded daily to calculate Temperature Humidity Index (THI). Standard feeding and all other managemental practices were followed during the experimental period of 42 days. Supplementation of 1% *Moringaoleifera* and 0.5% Citric acid (T4) gave best result and statistically ($P<0.05$) improved performance index. The values of Performance index during last week of experiment ranged from 208.52 (T0) to 239.59 (T4).There was no detrimental effect of 1% *Moringaoleifera* and 0.5% Citric acid on health and performance of broiler chicken. It can be concluded that addition of 1% *Moringaoleifera* and 0.5% Citric acid alone or in combination can be effectively supplemented as an alternative to antibiotic growth promoter in broiler chicken ration without any adverse effect on survivability of birds.

NP-15

Effect of multienzymes and phytase on the different stages of commercial layers

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An experiment was conducted to evaluate the effect of multienzymes(G7B) and phytase (Phytogene)in layer ration. The feed sample was analysed to know the action of enzymes by feed digestion. A total of 40000 Bovans laying hen from 19th week to 60th week were equally distributed into two experimental diets i.e., control group (enzyme mix @200 gm + phytase @ 100 gm) and treatment group with (G7B stable cocktail enzyme mix @ 200 gm + phytase @100 gm). The production traits like egg shell quality, egg shell color, total egg production was observed.The analysis of feed sample with stable cocktail enzyme mix showed there was increased Methionine and Threonine, improvement in MUFA and PUFA was observed when compared to untreated feed. The energy and nutritional matrix valuesshowed that there was a release of 1780.34 Kcal / kg of energy. The inclusion of Phytase showed that there was decrease in 6.5 kg DCP in the ration. There was no significant improvement in egg production, but the shell color showed significant improvement.

Key words: Cocktail enzymes, Phytase, Egg shell quality

NP-16

Growth response of broiler chicken supplemented with *Moringaoleifera* and Citric acid

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An experiment was conducted to study the effect of *Moringaoleifera* and Citric acid supplementation on the performance of broilers. Two hundred and twenty five day old unsexed commercial broiler chicks were subjected to five dietary treatments consisting of 15 broiler chicks in each replicate reared for a period of 6 weeks to find the effect of following treatments namely T_0 group (negative control i.e. basal ration without antibiotic), T_1 group (control i.e. basal ration with antibiotics), T_2 group (basal Ration + 1% *M. oleifera*), T_3 group (basal Ration + 0.5 % Citric acid) and T_4 group (basal Ration + 1% *M. oleifera* + 0.5% Citric acid).Temperature and humidity of the shed were recorded daily to calculate Temperature Humidity Index (THI). Standard feeding and all other managemental practices were followed during the experimental period of 42 days. Supplementation of 1% *Moringaoleifera* and 0.5% Citric acid (T4) gave best result and statistically ($P<0.05$) improved body weight, weight gain. The highest body weight and weight gain values were recorded in T_4 (1957.12g, 525.30g) and lowest in T_0 (1851.13g, 494.38g) at 42 days of age.There was no detrimental effect of 1% *Moringaoleifera* and 0.5% Citric acid on health and performance of broiler chicken. It can be concluded that addition of 1% *Moringaoleifera* and 0.5% Citric acid alone or in combination can be effectively supplemented as an alternative to antibiotic growth promoter in broiler chicken ration without any adverse effect on survivability of birds.

NP-17

Evaluation of biomass as novel protein source for broiler chicken production

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In agrarian economies, the poultry industry stands out as the fastest-growing sector, making a significant contribution to the national GDP. The major challenge to poultry industry is the perpetual presence and high fluctuating cost of conventional feed resources like maize soybean meal. To find alternatives to protein sources, the present study was targeted towards evaluating the effect of biomass, as a newer protein source in broiler chickens on growth performance, immune response, serum biochemistry and cost economics. The experiment was conducted in 4000 commercial broiler birds for 6 weeks, birds were distributed under four dietary treatments to study the effect of the inclusion of different levels of biomass (0, 2.5, 5and 7.5%).Corn-soybean meal based basal diet was formulated for Pre-starter (22.0% protein and 3000kcalME/kg), Starter (21.5% protein and 3050kcalME/kg) and Finisher (19.5% protein and 3100kcalMEkg) phases as per ICAR2013 guidelines. The dietary treatments were, T_1 or control (basal diet without biomass), T_2 (2.5% biomass), T_3 (5%biomass),T_4 (7.5%biomass).The present study revealed that there was significant($P<0.05$) improvement in bodyweight (BW)and body weight gain (BWG) in biomass inclusion groups compared to control whereas FCR & FI were comparable in all the groups. CMI response was high in T_4 but ELISA titer showed no difference. Serum parameters like total protein, albumin, globulin, ALT, AST were unaffected butyric acid levels increased ($P<0.05$) significantly with the least value in control. From the study, therefore, it could be concluded that basal diet with 5% biomass inclusion in the diet is an effective alternative protein source for better growth performance, immune response, guthealth and better economics of broiler production system.
Key words: biomass, broiler, protein source, unconventional.

NP-18

Betaine supplementation in methionine and choline deficient diets has an impact on the performance of broilers

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Betaine supplementation may reduce the need for methyl donors like methionine and choline in diets lacking these nutrients. Scientific evidence suggests that betaine supplementation may produce effects like those of methionine and choline.A total of 270 commercial broiler chicks Cobb 400 purchased from a local hatchery were wing banded and weighed separately. Each of the nine treatments received six replicates and five chicks in each replicate (9X6X5). Three trials were carried to know the efficacy of betaine in broiler chicken diets with methionine and choline at 25% and 50% less than the recommendation and addition of betaine at 0.1,0.2,0.3% levels and a control diet as per NRC. The first two trials indicated that betaine at 0.3% level with deficiency of methionine and choline in diet showed better performance in broiler chicken. Trial III was done to optimize the betaine level based on the outcomes of trials I and II. Trial III optimized betaine levels using 0.3% betaine in combination with low methionine and choline diets. Results showed increased body weight gain(2167.93g), better FCR(1.5 and 1.52), higher carcass yield (80.69%), and breast meat yield compared to the control diet. Net revenue over feed cost was higher in birds fed with 0.3% betaine (Rs.159.62/bird) compared to the control diet (Rs.122.03/bird). Betaine supplementation in low methionine and choline diets significantly improved broiler performance at 42 days of age. The ideal inclusion level is 0.3%, maintaining immune response, antioxidant properties, and supporting weight gain, breast meat yield, and reduced cholesterol.
Keywords: Betaine, Methionine, Broiler performance

NP-19

Effect of Vitamin E and Selenium supplementation on growth performance and heat shock protein 70 level in broiler chickens exposed to summer heat stress

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The effect of vitamin E and Selenium supplementation in diet of broiler chicken on growth performance and Heat shock protein 70 (HSP70) level under heat stress during summer was studied in this experiment. The study was conducted on 240 day-old commercial broiler chicks, which were divided randomly into four treatment groups of 60 numbers, with three replicates of 20 in each group. The control (T_0) group was allotted with basal diet (As per recommendation), group T_1 (basal diet + Vitamin E @ 100 mg/kg and Selenium @ 0.2 mg/kg), T_2 (basal diet + Vitamin E @ 125 mg/kg and Selenium @ 0.25 mg/kg) and T_3 (basal diet + Vitamin E @ 150 mg/kg and Selenium @ 0.3 mg/kg). It has been observed from the study that, vitamin E and selenium supplementation in the diet of broilers during summer season influenced the body weight (P=0.002), Body weight gain (P=0.001), Feed Intake (P=0.311) and BPEI (P=0.013) except Feed Conversion Ratio. The Heat shock protein level was improved (P<0.001) by dietary supplementation of vitamin E and Selenium under heat stress.

The study indicated that growth performance and Heat Shock Protein 70 (HSP70) level can be improved by dietary vitamin E and Selenium supplementation under heat stress.

Key words: Broiler, Growth performance, HSP70

NP-20

Effect of supplementation of a combination of *Kaempferia galanga* and *Curcuma longa* on body weight and FCR of broiler chickens

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The purpose of this study was to assess the synergistic effect of *Kaempferia galanga* and *Curcuma longa* on body weight and FCR of broiler chickens. Day-old Vencobb 430Y broiler chicks (n=100) were equally distributed into two treatment groups having five replicates each with 10 birds. Isocaloric and isoprotein diets were fed as per BIS (IS 1374: 2007) for all the groups from day one to the forty-second day. The basal diet was fed to control group (T1) and T2 was fed with a combination of shade dried powder of *K. galanga* (0.156%) and *C. longa* (0.019 %) along with basal diet. The concentration of herbs were fixed by microbroth dilution technique and checker board assay. A significant change in body weight was noted at weekly intervals from week 1 to week 6. Throughout the study, higher body weight (P< 0.01) was noted in T2 followed by T1. Observed values of T1 and T2 groups from first week to sixth week were, 141.39 ± 0.32 and 149.87 ± 1.13; 362.81 ± 1.74 and 381.49 ± 1.78; 718.44 ± 16.81 and 829.44 ± 3.91; 1152.15 ± 21.24 and 1249.20 ± 1.89; 1803.68 ± 7.72 and 1927.17 ± 1.68; 2330.83 ± 16.71 and 2559.60 ± 3.84 respectively. The weekly feed conversion ratio was significantly lower (P<0.05) in T2 during second, fifth and sixth weeks. Weekly feed conversion ratio up to sixth week of age T1 (1.50 ± 0.03, 1.41 ± 0.04, 1.66 ± 0.20, 1.75 ± 0.15, 1.75 ±0.02 and 1.98 ± 0.03) and T2 (1.38 ±0.041, 1.32 ± 0.014, 1.25 ± 0.023, 1.49 ± 0.01, 1.56 ± 0.046 and 1.69 ± 0.037). To conclude, chicken fed with combination of *K. galanga* and *C. longa* group showed significantly higher body weight and better feed conversion ratio compared to control group.
Keywords: *K. galanga*, *C. longa*, Phytobiotics, Herbal growth promoter

NP-21

Effect of natural choline and herbal liver supplement on growth performance in commercial broilers

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Feed is the main element influencing the productive performance and it accounts for more than 75% of the poultry production cost. Due to the ban on the use of some antibiotics and dangerous aftereffects the use of herbal feed additives is becoming more and more important in the production of chickens. Supplementation of choline in poultry ration is well established to improve growth, performance. Naturally, phosphatidylcholine, free choline, and sphingomyelin are all forms of choline that can be found in plants. Many herbs tone up the liver of poultry birds for maximum performance and productivity through their therapeutic action, such as liver cell rejuvenation (hepato-generative), hepato-stimulative, hepato-protective, anti-hepatotoxic, and positive anabolic effect, enabling them to reach their full growth and performance potential. On these backgrounds a research was conducted to evaluate effect of natural (herbal) choline and herbal liver supplement on growth performance in commercial broilers. A total of 90 day-old Vencobb chicks were allocated to three experimental groups each consisting of three replicates with 10 chicks each. The basal diet (control - T1) was formulated in accordance with the BIS (2007) standards of nutrient requirements. the experimental diets were prepared by incorporating natural Choline and herbal liver supplement to the treatment groups T2 and T3, respectively each at 0.1% to the basal diet. Results revealed that significantly (P ≤ 0.05) higher body weight and feed intake and better feed conversion ratio in the birds supplemented with herbal liver supplement was observed compared to the control group and natural choline treatment groups but non-significant (P > 0.05) difference among natural choline treatment group and control group. Whereas, survivability was similar (P > 0.05) among treatment groups and control group.

Keywords: Choline, phosphatidylcholine, Broilers

NP-22

Effect of natural vitamin E and vitamin C on growth performance in commercial broilers

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Feed is the main element influencing the productive performance and it accounts for more than 75% of the poultry production cost. Due to the ban on the use of some antibiotics and dangerous aftereffects the use of herbal feed additives is becoming more and more important in the production of chickens. Vitamin E is a fat-soluble vitamin and is recognized to be a powerful antioxidant. The naturally occurring molecule is the D-α-tocopherol (RRRtocopherol) configuration, which has the maximum vitamin activity and found in many herbs and plants. Typically, it is believed that poultry's endogenous production of vitamin C synthesis is insufficient to meet their biological needs, particularly under adverse environmental conditions. When vitamin C was added to the diet of stressed birds, there were noticeable improvements in the growth of the chicks. A research was conducted to evaluate effect of natural (herbal) vitamin E and vitamin C on growth performance in commercial broilers. A total of 90 day-old Vencobb chicks were allocated to three experimental groups each consisting of three replicates with 10 chicks each. The basal diet (control - T1) was formulated in accordance with the BIS (2007) standards of nutrient requirements. the experimental diets were prepared by incorporating natural (herbal) vitamin E and vitamin C to the treatment groups T2 and T3, respectively each at 0.1% to the basal diet. Results revealed that no significant ($P > 0.05$) difference in body weight, feed intake, feed conversion ratio and survivability among the birds supplemented with natural (herbal) vitamin E, vitamin C and the control group.
Key words : Vitamin E, Vitamin C, Broilers

NP-23

Performance of commercial broilers under separate sex rearing and feeding during the finisher period

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The performance of commercial broiler chickenwas evaluated under separate sex rearing and feeding during the finisher stage (22-42 days of age).A total of 210, (21 days-old) commercial broilers were randomly assigned to five groups viz., A (Male & female mixed), B (Male), C (Male), D (Female), and E (Female) containing 42 birds in each group. Male and female sexes were separated by observing the early appearance of the comb in males.The birds from groups A, C, and Ewere fed with a commercial broiler finisher diet containing 3250 kcal ME/kg, 19.5% CP, 1.00% Dig. Lysine and 0.49% Dig. Methionine, while birds from group B were fed with a special male diet containing 3000 kcal ME/kg , 18% CP and 2% higher Dig. Lysine and Methionine than group A,and birds from group D were fed with a special female diet containing 3100kcal ME/kg, 19.5 % CP, and 2% higher Dig. Lysine and Methionine than group A. The performance parameters like body weight, weight gain, feed intake, feed efficiency were recorded.The economics of production was calculated at the end of the experiment. The experiment concluded that the separate sex rearing of broilers may be followed by feeding males with a diet containing 3000 kcal ME/kg, 18% CP and 2% higher Dig. Lysine (1.02%) and Dig.Methionine (0.50%); and females with 3100 kcal ME/kg, 19.5% CP, and 2% higher Dig. Lysine (1.02%) and Dig.Methionine (0.50%) for both males and females to achieve similar body weight, weight gain, and feed efficiency to that of males and females fed with a commercial diet (3250kcal ME/kg, 19.50% CP and

1% Dig; Lysine and 0.49% Dig. Methionine).Moreover, separate sex rearing of broilers with special feeding is highly economical than commercial diets fed to mixed and separate sex.

Key Words: Broiler chicken, Sex separate feeding, Special diet

NP-24

Study of using Neem (*Azadirachta indica*) leaves powderas feed supplement inbroiler chicks

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The experiment was conducted in broiler chicks to study the effect of Neem leaves (*Azadirachta indica*) as feed supplement on their growth. A total of 75-dayold chicks of same hatch wererandomly distributed into 5 treatments of 15 chicks each i.e.T_0 T_1,T_2,T_3 and T_4. Chicks of each treatment were further divided into three replicates of 5 chicks each. Chicks were fed standard starter ration up to 1-2 weeks (1-14 days) and then broiler finisher ration up to 3-4 weeks (15-28 days). Birds in T_0, T_1,T_2,T_3 and T_4 were supplemented with neem leaves @ 0_g, 2.0 $_g$, 4.0$_g$,6.0$_g$ and 8.0$_g$ /kg of broiler ration respectively. Birds in each treatment were observed weekly for live body weight, weekly gain in weight, weekly feed consumption and feed conversionuptofour weeks of age. At the end of the experiment, it was concluded that feed supplementation with Neem leaf powder significantly influenced the body weight, gain in body weight, feed intake and feed efficiency of broiler chicks. Based on feed intake and feed efficiency, the best performance of broilers was obtained with feed supplementation of 6 g neem leaf powder per kg of standard ration, followed by 8 g Neem leaf powder. Almost all the treatments were economically superior over the control group.

Keywords: Broiler chicks, Growth performance and Neem leaves

NP-25

Effect of dietary supplementation of Aloe vera (*Aloe barbadensis* M.*)* leaves powder on the performance and carcass quality of commercial broiler chickens

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The phytogenics found in herbal plants have been proven to have numerous salutary properties. Therefore, herbs may be added in broiler chicken feed to improve their performance by remodelling feed quality.The present study was designed to determine the Effect of dietary supplementation of Aloe vera (*Aloe barbadensis* M.*)* leaves powder (AVP) on the performance and carcass quality of commercial broiler chickens.A total of 144 numbers of day oldbroiler chicks from a single hatch were randomly distributed into five treatment groups*viz.,* T_0 (Control), T_1 group (0.2 % AVP), T_2 (0.3% AVP)and T_3 (0.4% AVP) comprising of 36 chicks in each group.Theweekly feed consumption, body weight, FCR, carcass quality traits, haematological and blood biochemical parameters in different treatment groups were studied.In the present investigation, the final body weight was significantly highest in T_3 group (2201.16g) as compared to other groups.The feed consumption, FCR, economics of production, pre-slaughter live weight (2250.20 g) and dressed weight (1565.46 g)werefound to be betterin T_3 group. The blood serum glucose level was significantly lowered in T_3 group.The study revealed significant increase in body weight, betterFCR, economics of production, certain carcass traits and hypoglycemic effect in T_3 group as compared to other groups.Thus, it can be suggested that AVP be efficiently and economically used as a natural feed additive in the diet at the level of 0.4% to enhance the overall performance of broiler chicken.

Keywords: Phytogenics, Aloe vera, Haematological, Biochemical, Carcass, Additive, Performance.

NP-26

Effect of Rumexacetosaleaf powder as feed additive on the performance of broiler chicken

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An experiment was conducted to assess the effect of *Rumexacetosa* leaf powder as feed additive on performance of broiler.A total of 200 day-old commercial broiler chicks were procured from reputed source and divided into 5 treatment groups, having four replicates having ten birds each. The birds in groups T_3, T_4, and T_5 were fed basal diets supplemented with 0.5%, 1%, and 1.5% of *Rumexacetosa* leaf powder meal, respectively. The T_2group (positive control) received a basal diet supplemented with antibiotic @ 1gm/10 kg of feed and T_1(control) was given a basal diet only.The birds of $T_5$and T_2group attain highest body weights (P≤0.05) compared to other groups.Statistical analysis revealed significantly (P≤0.05) highest mean body weight gain in T_5 and T_2 groups followed by T_4, T_3 and T_1 groups respectively. Significant (P≤0.05) differences were also observed among T_4, T_3 and T_1 treatment groups. The cumulative feed consumption was recorded to be significantly (P≤0.05) highest in T_2(2409.02 ±3.83g) followed by T_5, T_4, T_3 and lowest in T_1(2250.575±3.61g) groups respectively. The Cumulative FCR was significantly (P≤0.05) improved in T_5 groups compared to all other groups. It was concluded that birds in T_5 (1.5% *Rumex acetosa*) group outperformed those in T_1, T_3 and T_4 groups in performance indices, and they had a similar effect to the T_2 group supplemented with antibiotic.

Keywords: Performance, Rumexacetosa, feed additive, antibiotic, broiler

NP-27

Effect of superdosing of phytase enzyme on availability of certain trace minerals of laying hens under varying levels of phosphorous

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A study was carried out to find out the effect of superdosing of enzyme phytase (One g contained 3410 U of phytase activity) supplemented at 300, 600, 900 and 1200 U/kg in layer chicken diets containing available phosphorus (AP) at 0.20, 0.30, and 0.40 per cent from 25 to 40 weeks of age . After the laying period, four birds from each treatment were randomly selected to conduct a metabolism trial and data on availability of manganese, copper, zinc and iron were determined. The availability of trace minerals in phytase supplemented experimental diets fed treatment groups was significantly (P<0.01) higher when compared with control diets fed group. The performance of layers fed diet with 0.20 per cent AP with 1200 *IU* per kg phytase supplementation was comparable to the BIS recommendations.

Keywords: Phytase, superdosing, trace minerals

NP-28

Plant based nanobiotics as novel feed additive improved the performance and expression of growth genes in broiler chicken

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A biological study was conducted to investigate the effect of utilizing nanoencapsulated Lavender essential oil (LEO) as green alternative to antibiotic growth promoters on performance, and expression of growth related genes in broiler chicken. A total of 420 day old Cobb broiler chicks at one week of age were randomly distributed into 7 dietary treatments: CN (Control)-fed basal diet only; AB (Antibiotic)-basal diet + 10 mg/kg Enramycin; CS (Chitosan)-basal diet + 300 mg/kg chitosan nanoparticles; LEO_{F200} (basal diet + 200 mg/kg free LEO); LEO_{F400} (basal diet + 400 mg/kg free LEO); LEO_{N200} (basal diet + 200mg/kg nanoencapsulated LEO) and LEO_{N400} (basal diet + 400mg/kg nanoencapsulated LEO). Each group contained 4 replicates and each replicate had 15 birds fed with a corn-soybean based diet for 42 days of age. The results revealed that during the overall period (7-42 d), nanoencapsulated LEO groups (LEO_{N200} and LEO_{N400}) exhibited significantly ($p< 0.05$) higher body weight gain (BWG) and lowest feed conversion ratio (FCR) than all other groups. BWG and FCR of LEO_{F400} and AB groups were comparable ($p> 0.05$). NC showed reduced performance than other groups except LEO_{F400}. A significantly ($p< 0.05$) lowest feed intake (FI) was recorded in LEO_{F400} during all the periods. Rest of the groups had no difference ($p> 0.05$) in the FI among themselves. The mRNA expression of Mucin-2 and PepT1 genes was significantly ($p< 0.05$) upregulated in LEO groups with best values in nanoencapsulated groups (LEO_{N200} and LEO_{N400}) compared to other groups including CN. In conclusion, nanoencapsulated LEO @ 200 and 400 mg/kg could serve as promising antibiotic alternative for improving the performance and expression of growth related genes in broiler chicken.
Keywords: Lavender essential oil, growth performance, nanoencapsulation, growth genes, broilers

NP-29

Production performance and blood-biochemical parameters of laying hen supplemented with herbs during heat stress condition

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An experiment was conducted to study the effect of dietary supplementation of herbs (Mulberry leaf; *Morus alba*), Curry leaf; *Murraya koenigii* and Chinese palak;, *Talinum triangulare*) on the production performance and blood-biochemical's parameters in laying hens exposed to heat stress for 14 days. A total of 50 laying hens were divided into five equal groups/treatments - T1, T2, T3, T4 and T5 groups; each group comprised of 10 birds for feeding experiment. Except T1 (Control), other four groups of birds were maintained in artificially induced heat stress condition (37±1 0C, daily for 3 hr), while control group (T1) of birds was reared in normal environment for 14 days. The T1 and T2 group was fed with basal diet only, whereas the T3, T4 and T5 group of birds were fed with basal diet containing mulberry leaf (5%), curry leaf (3%) and chinese palak (5%), respectively during the experiment. The results revealed that there was significant decrease in production performance like feed intake, egg production, egg weight, egg mass and FCR in all heat stressed groups in comparison to the control group. The highest reduction in feed intake, egg production, egg weight, egg mass and FCR was recorded in heat stressed group (T2) having basal diet only. However, egg production, egg weight, egg mass feed intake and FCR were improved in heat stressed group (T4) supplemented with 3% curry leaf powder than other heat stressed groups but not upto control level. The blood glucose level in heat stressed birds were significantly ($P<0.01$) increased, whereas the serum protein level was significantly ($P<0.05$) decreased as compared to control. In conclusion, dietary supplementation of curry leaf (3%) improved production performance and blood-biochemical's parameters of laying hen in heat stress condition.

Key words: Heat stress, herbal supplement, curry leaf, production performance, blood-biochemical profile.

NP-30

Effect of feeding lianol, xcelsio and bacitracin methylene disalicylate on performance of broiler chickens

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Performance of broiler chicken was studied fed Lianol, Xcelsio and Bacitracin Methylene Disalicylate (BMD) in their diet in this study. Trial was conducted at experimental poultry shed of College of Veterinary Science and AH, Anjora, Durg, Chhattisgarh on 450 broiler chicksVencobb 430y strain.Feeding standard was followed as per ICAR, 2013 recommendation. Total 450 day-old chicks were divided into five groups each group comprising 90 chicks. Lianol was added at the rate of 750 gm/MT (T1) and 500 gm/MT (T2), Xcelsio 500 gm/MT (T3) and BMD 150 gm/MT (T4).The body weight gain during starter phase was similar among the experimental groups. At the end of trial feed intake in T0, T1 and T3 were comparable, whereas in T4 and T2 it was significantly higher.At the end of 5th week FCR was better in T4 and T1 followed by T2, T3 and highest in T0. Growth performance revealed that T4 was best among all treatments however T3, T2 and T1 also have comparable growth.Overall net profit per bird was better in T4 followed by T2, T1 and T3 as compared to control.No significant difference is reported on day 24 and 36 in ileum and jejunum morphometric observation among treatment and control groups on the basis of lesion scores.Thus,it may be concluded thatsupplementation of Lianol (750 gm/MT and 500 gm/MT), Xcelsio (500 gm/MT) and BMD (150 gm/MT) revealed highest performance in T4 followed by T2, T1 and T3 and the lowest in T0..
Keywords: Lianol, Xcelsio,BMD, broiler,performance

NP-31

Evaluation of semen characteristics of native chicken

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The present study was conducted to evaluate the semen characteristics of different native chicken i.e. Aseel (ASL), Kadakanath (KN), Nicobari (NB) and Naked neck (NN). The ASL birds gave better result, followed by KN, NB and NN. The values for volume (ml) were 0.51 ± 0.03, 0.44 ± 0.02, 0.38 ± 0.032, 0.31 ± 0.02 and the values for pH were 8.19 ± 0.13, 7.76 ± 0.04, 8.01 ± 0.04, 7.79 ± 0.04 for ASL, KN, NB and NN, respectively. The same order of merit was followed in colour (creamy white, white, creamy white, white) and consistency (thick, thick, watery, watery) in these birds. The ASL birds gave better result, followed by KN, NB and NN and the values for mass activity (1-5 scale) were 4.67 ± 0.33, 3.67 ± 0.33, 3.67 ± 0.33, 3.33 ± 0.33, motility (%) were79.01 ± 0.57, 72.67 ± 0.88, 73.33±2.03, 65.01±1.15, concentration (x 109) were 2.99 ± 0.05, 2.69 ± 0.07, 2.44 ± 0.12, 1.94 ± 0.13, per cent live sperms were 81.01 ± 1.01, 72.33 ± 3.52, 67.67 ± 5.86, 64.67 ± 2.52 and the per cent abnormal sperms were 41.05 ± 0.99, 25.82 ± 1.12, 8.14 ± 0.45, 35.12 ± 1.72 for ASL, KN, NB and NN, respectively. The perivitelline membrane penetration study was also carried out in four different native chicken to assess the fertility. DAPI staining was done to determine the number of nuclei and to assess gross cell morphology. The results showed that Aseel had better semen characteristics than other native chicken studied.
Keywords: Native chicken, Semen volume, mass activity, live and dead count.

NP-32

Effect of feeding different calcium levels during extended laying cycle on production performance of commercial layers

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Dietary calcium in laying hens is an essential key factor in the nutritional management of layers, especially in the longer production cycles of current highly producing commercial layers. Total 192, BV-300 strain of commercial layers assigned to four groups A, B, C, and D during extended laying cycle (81st-100th week). The iso-caloric and iso-nitrogenous diets contained 3.85, 4.00, 4.20, and 4.40% Ca in groups A, B, C, and D, respectively. The diets included calcium as 65% coarser and 35% fine powder form. Egg production indices, daily feed intake and calcium intake, feed efficiency, performance efficiency index (PEI) and egg feed price ratio (EFPR), and serum Ca and P were recorded during the experiment. Inclusion of 4.00, 4.20, and 4.40% Ca (4.69 to 5.29g daily Ca intake/hen) improved body weight than 3.85% without altering daily feed consumption. Egg number and production were significantly ($p<0.05$) higher with improved FCDE and FCE for 4.00 and 4.40% Ca than 3.85 and 4.20%. A 4.00, 4.20, and 4.40% dietary Ca significantly ($p<0.05$) increased serum Ca and elevated Ca:P ratio than 3.85% Ca. The 4.0 to 4.40% Ca was more economical (improved PEI and EFPR) than the 3.85% Cain the extended laying cycle. Using 4.00 to 4.40% dietary Ca during an extended laying cycle in commercial layers is beneficial.

Keywords: Layers, Extended laying cycle, Egg production

NP-33

Tibia and femur bone status and keel bone scoring in commercial layers fed with dietary calcium during extended laying cycle

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The effect of dietary calcium (Ca) was assessed on Tibia and Femur bone parameters and keel bone scoring in commercial layers during an extended laying cycle (81-100 weeks of age). A total of 192, 80-week-old commercial layers(BV-300)were randomly assigned to four groups viz., A, B, C, and D,(48 hens/group; 4 replicate/group).Laying hens from groups A, B, C, and D were fed with 3.85, 4.00, 4.20, and 4.40% Ca (65% coarser and 35% fine powder form)in their diets, respectively, from 81stto 100thweeks. Six hens per group were slaughtered at the end of 100th week to study the tibia and femur bones, and keel bone scoring.Results indicated that the dietary Ca levels from 3.85-4.40% did not influenceweights, ash content, relative bone index, and biometrical parameters (length and width) of tibia and femur. Significantly increased medullary cavity width in groups A and B indicated laying hens efficiency to utilize 3.85 and 4.0% Ca than 4.20 and 4.40%. Significantly ($p<0.05$) higher femoral cortical thickness was observed in B and C than A and D but the tibia cortical thickness was non-significant. Significant decrease in tibia trabecular thickness and numerical decrease in femur trabecular thickness indicated good laying efficiency of hens from group B fed with 4.0% Ca. Femur trabecular number was significantly ($p<0.05$) increased in groups B and D than in A and C. The tibia trabecular number was significantly ($p<0.05$) increased in groups C and D than in A and B. There was variability in the trabecular number of the femur and tibia bones.A moderate dietary Ca (4.00%) decreased the keel bone deformity (75% hens with normal keel bone of score 1) as compared to lower (3.85%) and higher (4.20 and 4.40%) dietary Ca. In conclusion, maintained bone cortical thickness, ash content and decreased trabecular thickness of tibia and femur bones and improved keel bone condition indicated good laying efficiency of 4.0% Ca fed layers with potential to extend laying cycle

Keywords: Layers, Extended laying cycle, tibia, femur, keel bone

NP-34

Effect of nano-selenium and nano-curcumin supplementation on lipid and growth status in broiler chickens

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The present study was aimed to evaluate the dietary influence of nano-selenium and nano-curcumin on lipid profile, immune status and growth performance in Cobb broiler chickens. A total of 360 broiler chicks were divided into four groups and each group comprised 90 chicks. Chickens kept in group I was fed with a broiler basal diet and it served as the control group. While chickens kept in groups II, III and IV were fed with nano-Se (0.3 mg/kg diet), nano-curcumin (200 mg/kg diet) and combination (0.15 + 100 mg/kg diet) of both, respectively. Immune status of the birds was determined by measuring serum antibody titre against Newcastle Disease and Infectious Bursal Disease (IBD) and lipid profile also estimated on days 21st, 28th, 35th and 42nd. **S**ignificantly (P< 0.05) higher levels of serum high-density lipoprotein cholesterol, antibody titre against IBD and relative weights of spleen and thymus were recorded in Group II, III and IV compared to the control group. Significantly (P< 0.05) lower serum cholesterol levels were observed in Group III and IV compared to Group I. Significant (P< 0.05) improvement in body weight and feed conversion ratio were recorded in Group II and IV compared to Group I on sixth week. It is concluded that supplementation of Nano-Seleniumat 0.15 mg/kg diet and nano-curcumin at 100 mg/kg diet in broiler chicken feed improves the production performance and exerts a hypo-lipidemic effect.

Keywords: Nano-selenium, nano-curcumin, body weight, cholesterol, immunity and chickens.

NP-35

Effects of supplementation of red seaweed meal (*Gracilaria salicornia)* on performance of broiler chicken

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An experiment entitled “Effects of supplementation of red seaweed meal (*Gracilaria salicornia*) on performance of broiler chicken” was conducted to evaluate the growth performance, nutrients retention, carcass traits, blood biochemical parameters, immunity status, economics of broiler production and mortality rate. For the study three hundred (Vencobb-430y) straight run one-day old commercial broiler chicks were distributed randomly into one control group (G_0) and four treatment groups (G_1, G_2, G_3 and G_4) which were incorporated with red seaweed meal *(Gracilaria salicornia)* at levels of 0.0, 0.5, 1.0, 1.5 and 2.0 kg per 100 kg of feed, respectively. Experimental results indicated that supplementation of red seaweed meal (*Gracilaria salicornia*) had significantly positive effect on body weight gain, feed conversion ratio and final body weight. It also had significant (P<0.05) effect on percent retention of nitrogen, digestibility of EE and CF. Experimental data also indicated that there was significantly (P<0.01) increase in live weight, weight of carcass, edible meat, percent of edible meat and dressing percentage, while there was significantly (P<0.01) reduction in TBA and tyrosine values on zero and third day, however significantly (P<0.01) increase in ERV values on third and sixth day in all treatment groups than control group. Dietary inclusion of red seaweed meal (*Gracilaria salicornia*) positively reduced mortality rate in treatment groups than control group. It improved net profit per bird, net profit per Kg live weight, economic efficiency, relative economic efficiency, in all treatment groups than control group, but it was more efficient at at 0.5 and 1.0kg/100kg of feed, especially at

1g/100kg of feed achieved higher net profit per bird. From the experiement it was concluded that red

SESSION III

MANAGEMENT, ENVIRONMENT AND WASTE UTILIZATION

MEW-01

Composting with yeast probiotic addition and potential uses for handling poultry farm waste

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Intensive poultry farming in India is seriously facing challenges due to inappropriate management and disposal of poultry waste which has consequential environmental and social concerns. Despite of established methods of disposal, the sustainable and well suited method to poultry farms at all scales is still in infancy. The present study outlines a way for enhancing the use of rotary compost bins in the disposal of poultry waste. With the inclusion of yeast as a probiotic, an attempt was made to increase the biological activity of the composting process. Fresh poultry waste along with dead bird carcass, paddy straw and yeast @7.5% of the total compost (T_2) was subjected to composting process. The initial C:N ratio was fixed at 30:1 with moisture of 45 percent. The effect of adding yeast probiotic, on the physical parameters viz; pH and temperature of the composting process and their impact on total microbial load and actinomycetes was evaluated & compared with those under aerobic composting (T_1) for a period of 90 days. The data indicated that inoculating yeast as probiotic in the poultry litter along with carbonaceous material had achieved required pH and temperature earlier than those in aerobic composting. Futhermore, yeast probiotic compost was recorded with lower microbial load and early maturity into finished compost than that in aerobic composting. Overall, the probiotic assisted composting had improved quality thus rendering it into a stable and odour free produce. Moreover, the in-vitro analysis of the compost thus produced had > 70% germination index indicating negligible phytotoxic effect on crop application.

Keywords: Poultry waste, yeast, aerobic composting

MEW-02

Analysis of duck farming systems in Morigaon district of Assam

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A survey was conducted in twelve villages from six development blocks of Morigaon district of Assam to analyze the duck farming systems. The data were gathered using a carefully designed interview schedule by personal interview method.The results indicated that duck keeping was practiced by people from all social classes, regardless of their occupation, religion or educational background in Morigaon district of Assam and raised ducks primarily for eggs and meat and kept their flocks close to their homes. The demographic distribution of ducks revealed the presence of eight distinctive groups of ducks viz. Pati, Graded, Khaki Campbell, White Pekin, Muscovy, Chara-Chemballi, Indian Runner and Nageswari. The flock strength ranged from 15-150 having a male to female ratio of 1: 5. The natural incubators were broody ducks or chickens but few farmers practiced artificial incubation. About 85% of duck farmers hatched duck eggs during the month of April to July. According to the size of the bird, 10-12 and 14-18 numbers of hatching eggs were set under each broody hen and duck, respectively. Most of the farmers fed their duckling from 2nd day onwards with raw ingredients like whole paddy grain, broken rice, cooked rice, wheat bran and rice polish upto 4 weeks of age. Grower and adult ducks reared by the farmers under scavenging or free range system. Majority (98.61%) of farmers followed free range system of rearing for adult ducks and allowed to scavenge in the foraging field during day time. Supplementary feeds in the form of kitchen waste mixed with cooked rice and rice polish was provided to the adult ducks. The major diseases encountered were duck plague, duck cholera, anatipestifer infection, hepatitis (aflatoxicosis) and botulism. None of the farmers vaccinated their birds. Duck

farming was found to be a subsidiary source of income for almost all the farmers. Non-availability of vaccine was the major constraints faced by the duck farmers.

Keywords: Duck farming, systems of rearing, Assam

MEW-03

Utilization of broiler litter for biogas production employing pretreatment and conditioning techniques

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The global poultry industry is experiencing rapid growth due to the increasing demand for poultry products. However, this growth also leads to a significant rise in poultry waste production. Scientific management of these poultry wastes is crucial from both economic and environmental perspectives. Biogas production from broiler litter can serve the problem of handling poultry waste and additionally generates income for the enterprise. Despite its potential, several challenges hinder the efficient production of biogas from broiler litter. These include higher ammonia concentration, basic pH level, lower carbon-nitrogen ratio (C:N), presence of non-degradable bedding materials, and lack of methanogens.To address these issues, a study was conducted at ICAR-Central Avian Research Institute (CARI) Izatnagar, India. Three biogas digesters were used, each with different pretreatment methods for broiler litter. The first digester served as a control (B_0) with no pretreatment, the second digester (B_1) had pretreatment with alkali @ 0.1mol/L, and the third digester (B_2) had pretreatment with the same alkali @ 0.2 mol/L. The pretreatment was given for 15 days, after which the digesters were filled following conditioning techniques to create optimal conditions for biogas production. During experimental duration various parameters related to biogas production were monitored andthe results revealed that the highest biogas production and the shortest Hydraulic Retention Time (HRT) of 28 days were observed in B_1 treatment compared other treatments. The highest average yield of biogas production was measured as 0.0373m^3/kg of broiler litter in B_1, with methane content ranging between 42.73-61.27%.It was concluded that by employing optimal conditioning techniques, broiler litter has significant potential to produce biogas at the farm level. This approach not only addresses the environmental concerns associated with poultry waste but also presents an economically viable solution for the broiler industry's waste management.

Keywords: Biogas, Broiler litter, Methane, Poultry.

MEW-04

Effect of pre-incubation sprays on hatchability and post hatch performance in Vanaraja chicken

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Microbial infection of hatching eggs leads to reduced hatchability and suboptimal chick performance. Commonly employed methods for egg sanitation include fumigation, UV light exposure and spray application of disinfectants. The establishment of a robust hatchery sanitation regimen is imperative to attain higher hatchability and high-quality chicks. A study was conducted on 120 Vanraja chicks to study the effect of pre-incubation sprays on hatchability and post hatch performance in chicken. 1224 were divided into four groups, each group having 306 eggs and three replicates. Group 1 (G1) normal standard fumigation was done, Group-2 (G2) water spray, Group (G3) acetic acid, Group-4 (G4) cocktail combination of lactic acid, citric acid, formic acid, acetic acid and tartaric acid was done at a concentration of 0.625% each. The results indicated that hatchability on total eggs set (HTES) of G1,

G2, G3 and G4 where 65.9%, 62.24%, 68.92% and 74.13% respectively. Notably, a significatnt increase in hatchability by 8.23% and 11.2 % was seen in G4 (cocktail) than control groups of G1 and G2. Further these chicks were reared for 42 days to study their post hatch performance, reveling higher weight gain for G4, G3, G1 and G2 respectively. It was concluded that the application of 0.625% of organic acid cocktail 30 minutes prior to incubation resulted in higher hatchability and increased chick performance.
Keywords: Pre-incubation, spray, hatchability, chicken.

MEW-05

Comparative study on production performance of different germplasms developed for rural poultry farming

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The present study was conducted to compare the different germplasms being developed for rural poultry farming. A total of 336 chicks (day old) were used in the study, comprised of 48 chicks of each germplasms namely G1, G2, G3, G4, G5, G6 and G7. The chicks were fed standard layer ration as per ICAR 2013 during chick phase (0-8 week) and grower phase (9-12 week).The mean body weight at 12th week of age were significantly different ($p<0.05$) between groups. Highest body weight was recorded for G3 (1403.83g) and lowest was for G7 (960.54g). At 12th week cumulative FCR for groups were 3.92, 3.72, 3.52, 3.69, 3.62, 3.72 and 5.17 for G1, G2, G3, G4, G5, G6 and G7 germplasm, respectively. In numerical terms cumulative FCR was best for G3 (3.52) and poorest for G7 group. Shank length in G2 differ significantly from other groups, however breast angle and keel length in G7 group were differ significantly from other groups in females. Eviscerated weight for G5 was significantly ($p<0.05$) higher than all the other germplasms in both the sexes. Most of the carcass traits were highest for G5 in both the sexes.The meat quality parameters were estimated from breast meat of different germplasms. Crude protein for all the germplasms differed non-significantly with highest CP was recorded for G5 and lowest was recorded for G1 and G2. Valued pH was highest for G1 and lowest for G7 group. Water holding capacity was highest for G1 and G2 group. The net profit up to 12th week of age was range from Rs. 21.37 to 64.90 for different germplasms with highest profit in G3 group and lowest profit in G7 group. Considering the results germplasm G3 was found best among all the germplasms on the basis of different parameters undertaken in the present study.
Keywords: Rural Poultry,Germplasm,FCR,Crude Protein,Water Holding Capacity.

MEW-06

Product maturity and stability of vermin-compost developed from Poultry litter, sheep manure and cattle dung

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A study was conducted in the Division of Livestock Production and Management, Faculty of Veterinary Sciences and Animal Husbandry (SKUAST- Kashmir) to assess the product maturity and stability of vermin-composting of cattle dung, sheep manure and poultry farm waste under the temperate agro-climatic conditions of Kashmir Valley. Farm wastes in the form of cattle dung, sheep manure and poultry litter were utilized for this study. Four groups were formulated for carrying out vermin-composting was: Group G_1: Cattle dung (Control), Group G_2: Cattle dung + Sheep manure, Group G_3: Cattle dung + Poultry manure and Group G_4: Cattle dung + Sheep manure + Poultry litter. Maturation time of vermin-compost was significantly ($P<0.05$)lessin group G1 (4 months) and higher in group G_3(5 months).Significant ($P\leq0.05$) improvement in nitrogen content of end product was observed in all the treatment groups (from initial to final stages) with highest increase in G_1(2.47per cent). The phosphorus

content in end product was also significantly ($P \leq 0.05$) highest (0.85 per cent) in treatment group G_1. Similarly a significant ($P \leq 0.05$) highest potassium content of 0.96 per cent was observed in group G_2.Parasitic/larval load at the end of vermin-composting drastically decreased to non-detectable levels (ND) in almost all the groups. **S**ignificantly ($P \leq 0.05$) highest and lowest seed germination of 95.75 per cent and 43.00 per cent were observed in groups G_1 and G_3 respectively.**S**ignificantly ($P \leq 0.05$) highest and lowest sieving percentage of 95.83 per cent and 55.14per cent were observed in groups G_1 and G_3 respectively. A secure, mature and stable end product was attained while vermin-composting of poultry litter, sheep manure and cattle dung.

Key words: Poultry litter, Cattle dung, Seed germination, NPK

MEW-07

Geographical Information System (GIS) based Poultry Waste Management

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Due to large number of problems and flaws associated with the conventional methods of waste disposal of poultry farms like: air pollution, soil contamination and different menaces in the form of flies, rodents, smell and birds. Consequence of such issues have directly or indirectly effect on livestock and public health. A safe and secure place or space is required for effective, eco-friendly, valorizable and biologically sound waste disposal and utilization technology. In this regard GIS technology which works on analysis of special data generated on daily basis via satellite imaging and scanning. Thus distance between different sited from water bodies, ground water surface and human dwelling can be generated. A forecast can be given to different agencies to locate access and manage the landfill, burial or burning site based upon the special data like rain fall, humidity, sunshine hours, temperature, wind speed and direction as well as satellite imaging. A more comprehensive, improvised and refined technology can be developed by using different AI equipments. In Europe and other developed countries such technology is being used very effectively. Around 50-60 reduction of soil and 40 % reduction of air pollution have been observed by using GIS based waste management strategy. Moreover 30-40 % of efficient land utilization can be attained by this technology. Under Indian conditions this technology has got a huge scope, keeping in view the shrinking of total land availability and degradation and other ecological changes. Hence a comprehensive strategy can be framed for a safe and secure waste management of poultry farming.

Keywords: GIS, Poultry Waste, AI, Spatial Data

MEW-08

Food & Economic Security through Vanraja Poultry Farming in High Mountain Region of Kargil, Ladakh- A success story

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Subsistence agriculture is the mainstay of economy in Mountain agro-ecosystem of Ladakh. Livestock in general and poultry in particular can play an important role in uplifting the socio-economic status in this region in terms of providing nutrition and generating income. Ladakh, situated at 3000-3500 above msl, has harsh environment characterized by hypobaric-hypoxia, low-humidity, high UV-radiation, and extreme variation in ambient temperature, which causes high-altitude stress to poultry. ICAR-Poultry Seed Project SKUAST-Kashmir conducts programs around the year for the tribal farmers in terms of distributing Vanraja birds and poultry feed, and also organizes trainings on backyard poultry. A similar activity was conducted in Kargil, Ladakh. Impressed by the performance of Vanraja one of the

beneficiaries, Anwar Hussain R/O Kanoor, Kargil approached Poultry Seed Project, SKUAST-Kashmir for purchase of Vanraja birds and sought consultation to start an enterprise. He purchased 800 Vanraja chicks at Rs. 85/- per chick amounting to Rs.68,000/- and incurred transportation charges of Rs.7800. About 31 chicks died due to long distance transportation stress and chilly winds en-route. At his farm, he reared chicks following scientific method imparted during training and also remained in touch with PSP-SKUAST-Kashmir for time-to-time advice. In the next 4 months, he suffered 14 more mortalities. The average weight gain was 2 kg. Total expenses on feed and labor were Rs. 2.1 lakh approximately. In February, when the roads were closed and the market price was high, he decided to sell the birds @ Rs. 660 per bird. He was able to clear his stock in 22 days with total sale proceeds of Rs 4,98,300. Despite the high initial mortality a net profit of Rs. 2,12,500 was made. The women in the household actively participated in bird rearing. Encouraged by this, he has booked 1200 Vanraja chicks for this year and has plans to start a small-scale commercial broiler farm besides backyard poultry. The success story demonstrates successful rearing of Vanraja birds in cold arid mountainous region of Ladakh.

Keywords: Economic, Vanraja, Poultry, Mountain Region, Kargil.

MEW-09

Economics of poultry production by whey supplementation

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About 70% expenditure in poultry production is on feeding alone. This study was conducted with an aim to reduce the feeding cost and increase the profit margin in poultry production. Thestudy was conducted at poultryunit of Bihar Animal Sciences University, Patna. Liquid whey was supplemented to broiler and layer chickens separately to assess the economics of poultry production. Day old broiler chicks (120) were divided into four groups of 30 chicks each and were supplemented liquid whey along with drinking water for a period of 42 days. They were fed commercial broiler feed as per norms. Group T^1 (Control) was not supplemented with whey and other three groups namely T^2,T^3 and T^4were supplemented liquid whey @ 5%, (v/v) 10% (v/v) and 15% (v/v),respectively along with drinking water. Standard managemental practices were followed. It was observed that body weight gain and B:C ratio (1.11:1)was found to be bestin T^3 groups, supplemented with 10% liquid whey among all the treatment and control groups of broiler chicks. Similarly, six months old Gramapriyalayer (120) birds weredivided into four groups, T^5being control T^6, T^7 and T^8group and weresupplemented with liquid whey @ 5%, (v/v) 10% (v/v) and 15%(v/v), respectively for a period of 90 days.They were fedstandard commercial layer ration and, standard manage mental practices were followed.It was found that net profit per egg production and B:C ratio (1.37:1) was highest in T_6 group supplemented with 5% whey.Increase in egg weight was observed in all the treatment groups as compared to that of control group. It is concluded that liquid whey can be supplemented @ 10% (v/v) along with drinking water for better performance and profit margin in broilers and @ 5% (v/v) for better performance and profit margin in layers.

Keywords: Broiler, Economics, Layer, Supplementation, Whey.

MEW-10

Extent of knowledge of scientific broiler farming practices among commercial poultry farmers in temperate and sub-tropical area of Jammu and Kashmir

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The present comparative study was conducted with objective to know the extent of knowledge about scientific broiler farming practices among commercial poultry farmers in temperate and sub-tropical area of J&Kwith sample size of 120 commercial poultry farmers from both areas. Data was collected through a structured interview schedule.The results revealed that Sixty percent of the broiler poultry farmers in temperate area and 73.33 percent in sub-tropical area had medium level (2.7-5.2) knowledge about scientific brooding management practices. Sixty five percent of the broiler poultry farmers in temperate area and 53.33 percent in sub-tropical area had mediumlevel (2.7-5.2) knowledge about scientific housing management practices. More than 53 percent of the broiler poultry farmers had high (5-6)knowledge about scientific feeding management practices in temperate area. While in sub-tropical area, 60 percent of the broiler poultry farmers had medium (3-4)knowledge level. More than 48 percent of the broiler poultry farmers in temperate area and majority (63.34%) in sub-tropical area had low (0-5.3) level of knowledge about biosecurity and health practices. Majority of the broiler poultry farmers (76.67%) in temperate area and a huge majority of poultry farmers (85 %) in sub-tropical area had medium level (12.8-25.4) knowledge about scientific broiler farming practices. In temperate area, averageknowledge score about scientific brooding, housing, feeding and biosecurity and health management practices were3.57, 3.22, 4.43 and 8.80, respectively. In sub-tropical area, average knowledge score about scientific brooding, housing, feeding and biosecurity and health management practices among broiler poultry farmers were4.22, 3.82, 3.78 and 7.57, respectively. The overall average knowledge about scientific broiler poultry farming practices in temperate and sub-tropical area was 23.07 and 18.37, respectively. The poultry farmers in temperate and sub-tropical area were significantly different with respect to knowledge about scientific broiler farming practices.

Keywords: Scientific Broiler farming, Knowledge Level, Poultry farmers.

MEW-11

Cost effectiveness of broilers fed with herbal product "BM 201"

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Validation of nutritional benefits of BM 201 (herbal product) in broiler ration was carried out by using one hundred and ninety two, sex separated, day-old, commercial (Vencobb) broiler chicks belonging to single hatch. All chicks were wing banded, weighed and randomly allotted into four treatment groups (T_1 - Basal diet with antibiotic, T_2 - Basal diet without antibiotic, T_3 - Basal diet + 100 g BM 201/kg feed and T_4 -Basal diet + 200 g BM 201/kg feed) with six replicates of eight chicks each. The broiler chicks were reared up to five weeks in deep litter system. The experimental feed was formulated according to the Vencobb standards. The broiler pre-starter, starter and finisher diets were fed *ad libitum* to the birds from 1 to 14, 15 to 28 and 29 to 35 days of age, respectively. The total feed cost per bird was the highest in T_2 group (Rs. 105.750) and the lowest in T_3 group (Rs. 101.354). The production cost per kg live weight was the highest in T_1 group (Rs. 74.24) and the lowest in T_4 group (Rs. 72.52). The net profit per bird ranged from Rs. 17.54 to Rs. 21.22, which was the highest in T_4 group (Rs. 21.22) and the lowest in T_1 group (Rs. 17.54). Based on the results, it is observed that supplementation of BM 201 in broiler ration irrespective of dose (100 g / kg or 200 g / kg feed) recorded better profit margin than both the control groups (T_1 - Basal diet with antibiotic and T_2 - Basal diet without antibiotic).

Keywords: Commercial broiler, herbal product BM 201, cost effectiveness

MEW-12

Evaluation of Lysozyme as potential feed supplement for growth performanceand cost

economics in broiler birds

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An experiment was conducted to study the effect of lysozyme as feed supplements on growth performance and cost economics of the productionon 360 (Vencobb400) straight run commerciall broiler chicken upto 6weeks.The birds were distributed into six treatment group's *viz*., A, B, C, D, E and F on the basis of equal body weight. The control groups A and D were given basal diet. The groups B and E were supplemented with flavomycin at the rate of 100 g/ton of basal diet. Groups C and F were supplemented with lysozyme at the rate of 250 g/ton of basal diet. On 17, 18 and19 day birds in groups D, E, and F were exposed to *Clostridium perfringens*challenge. Results of the present study conclude that at the end of 42 d the non medicated broiler birds supplemented with lysozyme (C) showed significant (P<0.05) BW gain compared to other treatment groups. The *C.perfringens* infection in non medicated group(D) suppressed the body weight gain significantly (P<0.05) as compared to its counterpart supplemented with lysozyme (F) whereas, *C. perfringens* infectedbirds supplemented with lysozyme performed significantly (P<0.05) higher body weight gain. Feed conversion ratio and feed consumption did not differ amongdifferent treatment groups during entire study period. The net profit per bird found highest in antibiotic supplemented group without NE challenge. However, with NE challenge the net profit per bird found highest inlysozyme supplemented group. The costs of lysozyme can make up with the replacement of dietary antibiotic growth promoter. It indicates that in the near future lysozyme can be good alternative for antibiotics as feed supplements without affecting much cost as well as performance of the broiler bird.

Keywords: Broiler, *C. perfringens,* growth performance, lysozyme, economics, etc

MEW-13

Effect of dietary supplementation of capsaicin on growth performance and economics of broiler production exposed to heat stress

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An experimental trial was conducted on 300 day-old male Vencobb-430Y broiler chicks for the period of six weeks (42 days). The experimental chicks were randomly allotted into 5 treatments groups. Each treatment has 5 replicates with 12 chicks per replicate (n = 60). The positive control (PC) group T1 received basal diet, treatment group T2 and T3 received basal diet (PC) with Capsaicin(Capcin) @ 150 and 200 mg/kg in feed, respectively. The treatment group T4 received basal diet (PC) with induced heat stress (HS) by maintaining temperature between 35-37°C from 14th to 42nd day and treatment group T5 received basal diet with induced heat stress and supplemented withCapsaicin @ 200 mg/kg in feed.The significantly (P<0.01) higher live body weight and weight gain was recorded in treatment group T3 as compared to heat stressed treatment groups T4 and T5 from 4thto 6th weeks of age,Whereas, there was non-significant difference in between treatment group T5 and control group T1 at end of 6th week.At 5th and 6th week, the cumulative feed consumption was significantly (P<0.01) higher in non-heat stressed groups T1, T2 and T3 as compared to heat stressed groups T4 and T5.The significantly (P<0.01) better cumulative feed conversion ratio was recorded in treatment group T3 as compared to control group T1, T4 and T5 from 3rd to 6th weeks of age.The cost of production per kg live weight for the treatment groups T1, T2, T3, T4 and T5 were Rs. 78.46, 77.64, 76.63, 80.30 and 79.94, respectively. The net profit rupees per kg live weight in treatment groups T2 and T3 were increased by Rs. 0.81 and

1.83, respectively than the control group. However, net profit rupees per kg live weight in group T5 was increased by Rs. 0.36 than group T4.Hence, it is concluded thatthe supplementation of Capsaicin@200mg/kg in broiler diet is more beneficial in improving overall growth performance of broilers and found to be economically beneficialin normal and heat stress climatic conditions.

Keywords: Broilers, Capsaicin, Growth performance, Economics

MEW-14

Consumerawarenessfor the purchase of enriched eggsin cosmopolitan cities of Gujarat

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There is increasing urbanization which has certainly impacted the food consumption of people worldwide. This change in pattern is further expected to rise and will lead to a greater shift towards a non-vegetarian and protein-rich diet. Moreover, it is believed that the increase in productivity of food grains has not been able to successfully meet consumers' nutritive demand, for which functional food and specifically an enriched egg could be of great importance. To understand the awareness and behavior of consumers towards enriched eggs, this study was conducted in Anand and Vadodara cities of Gujarat. 100 consumers from each city were interviewed with a structured schedule through purposive sampling. It was found that most youth populations that were educated were attracted to the intake of the enriched egg. Awareness about enriched eggs was higher in Anand (28%) compared to Vadodara (24%), possibly due to a larger number of non-resident Indians (NRIs) residing in Anand with exposure to foreign countries. Family and relatives (71%) were the major sources of information about enriched eggs in Anand, while educational institutions and online sources were the primary sources in Vadodara. Respondents in both cities generally had a correct understanding of the nutrient enrichment (omega-3 fatty acid) in enriched eggs, although a higher proportion in Anand (43%) held incorrect information compared to Vadodara (17%). Further, it was found that consumers perceived an enriched egg to be better than an ordinary egg in terms of health benefits and other properties but when it came to the price, they were hesitant in consuming it. Enriched eggs may be targeted with a greater look, freshness, color, and nutritive value through effective leveling for enhancing more value to the consumers.

Keywords: Enriched egg, Nutritive value, Protein, Anand city, Vadodara city

MEW-15

Transforming village poultry rearing system: An egg model village for sustainable livelihood

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One of the major poultry sectors that draws significant investment from throughout the world is the egg sector. Eggs are considered as the cheapest and healthiest source of animal protein.Therefore, development of cost-effective and practically applicable strategies is necessary to improve egg production. In the present study, the effectiveness of a model for sustainable rural poultry farming for egg productionwas examined by adapting ethno-veterinary practices and in terms of proposed sustainability indicators i.e., productivity, efficiency, stability, durability, compatibility and equity.

Additionally, the possible influence of hot red pepper, bird eye chili, neem and Tulsi leaves extract on performance and immunity of laying hens was investigated. The study was conducted in purposively selected villageof Assam, India. Twenty farmer households were selected randomly and from a listing of non-participating farming households, 10 farmer households were selected. Farmers were trained and provided with credit to carry out small scale intensive poultry production (cage layering system) based on a 100 bird-unit (BV-380). The study shows that majority of the respondents' belonged to highly productive, efficient, compatible, stable, equitable and durable flock category. The overall sustainability was 91.1. Moreover, the birds supplemented with hot red pepper (bhut jalakia) extract showed better feed conversion ratio (FCR), improved intestinal morphophysiology and enhanced immunogenic effect to live Newcastle disease virus vaccine. Therefore, transition from conventional to enriched or cage production systems can potentially be used in layer farms for sustainable egg production. In addition, wide use of plant/ herbal substance as dietary supplements in layer's diets can positively impact layer hens' physiological, productive and immunological performance. Overall, this will aid in supporting real-life situations of the rural farmers by increasing productivity and profitability, generating employment and establishing small medium enterprises.

Keywords: Egg model village, rural farmers, sustainability, ethno-veterinary practices

MEW-16

Empowering tribal women through small scale layer farming in Goriaghuli cluster under Samriddhi Poultry project in Assam

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Domestic egg production in North Eastern Region of India is highly dependent on the supply of eggs from other states.Samriddhi poultry, asmall-scale commercial layer farming project, forlivelihood and nutritional security throughempowerment of rural women was initiated in 2021 with a target of creating model egg village in Assam. A total of 30 farm women were incorporated as beneficiaries under the project and given support in various ways like support in building infrastructure for housing poultry birds and development of skills for management of BV-380-layer birds through organization of capacity building activities. A baseline survey at the starting of the project revealed negligible household income from poultry birds with an average of Rs 5000.00 per year which is mostly from sale of live local chicken. The beneficiaries were provided with 100 nos of BV-380-layer ready to lay pullets and guided to maintain proper managemental practices including strict biosecurity measures. After 2 years of the project intervention the average income with the beneficiaries were assessed to be Rs. 6000.00 per month which is remarkably higher. There was significant rise in the household consumption of eggs thereby contributing immensely to the household nutritional security as well.It was further observed that the attitude of the beneficiaries towards commercial layer farming was very high and positively correlated with the age of the farm women.

Keywords: Samriddhi poultry, BV-380-layer, nutritional security

MEW-17

Comparative evaluation of different watering systems on production performance of broiler chicken

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A biological trial was conducted in broiler chicken from 0 to 35 days of age for comparative evaluation of different watering systems on production performance of broiler chicken. One hundred and eighty, sex separated commercial broiler chicks were randomly allotted in to five treatment groups with three replicates per treatment. The treatment groups were reared with one of the five experimental watering systems as follows: Bell drinker (T_1), nipple drinker (T_2), floating cup drinker (T_3), basin drinker (T_4) and linear channel drinker (T_5). The chicks were reared in deep litter system in a gable roofed, open sided house under standard management conditions. The result revealed that T_5 had significantly ($P<0.01$) highest body weight and weight gain among all the groups followed by T_3 and the group (T_2) had the lowest body weight and weight gain, whereas T_1 and T_4 had significantly higher body weight gain than T_2 but lower than T_3. There were no significant differences in feed intake among the treatment groups. The cumulative FCR was significantly ($P<0.01$) better in T_5 and T_3 than T_2, whereas T_4 and T_1 did not differ significantly with either T_5 and T_3 or T_2. The overall livability was lowest in treatment T_2 with 94.4 per cent, whereas the other treatment groups had 100 per cent livability. The return over feed cost per kg live-weight was highest (Rs. 14.33) in T_5 followed with Rs. 13.32 in T_3 and was lowest (Rs. 8.09) in T_2. Hence, it is concluded that linear channel drinker system followed by floating cup drinker system could be used for higher weight gain and better feed efficiency with higher return-over-feed in broiler chickens.

Keywords: Watering systems, broiler, performance, return

MEW-18

Influence of different watering systems on water consumption and ratio of water consumption: feed intake of broiler chicken

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A biological trial was conducted in broiler chicken from 0 to 35 days of age to assess the influence of different watering systems on water consumption, ratio of water consumption: feed intake of broiler chicken. One hundred and eighty, sex separated broiler chicks were randomly allotted in to five treatment groups with three replicates per treatment. The treatment groups were reared with one of the five experimental watering systems as follows: Bell drinker (T_1), nipple drinker (T_2), floating cup drinker (T_3), basin drinker (T_4) and linear channel drinker (T_5). The chicks were reared in deep litter system in a gable roofed, open sided house under standard management conditions. The result on weekly water consumption revealed that T_5 had significantly ($P<0.01$) highest water consumption and T_2 recorded lowest water consumption, whereas T_1, T_3 and T_4 recorded intermediate results at all the weeks of age. The result on cumulative water consumption at the end of experimental period revealed that T_5 had significantly ($P< 0.01$) highest water consumption followed by T_3 and the group with nipple drinker system (T_2) recorded lowest water consumption, whereas T_1 and T_4 recorded intermediate water consumption between T_3 and T_2. At the end of experimental period, T_5 had significantly ($P<0.01$) higher cumulative ratio of water consumption: feed intake than T_2, T_1 and T_4, whereas T_3 did not differ with either of the groups. Based on result of the study, it may be concluded that linear channel drinker system could be used for higher water consumption and ratio of water consumption: feed intake in broiler chickens.

Keywords: Watering systems, broiler, water consumption, water consumption: feed intake

MEW-19

Influence of different watering systems on litter quality of broiler farm

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A biological trial was conducted in broiler chicken from 0 to 35 days of age to assess the influence of different watering systems on litter quality of a broiler farm. One hundred and eighty, sex separated commercial broiler chicks were randomly allotted in to five treatment groups with three replicates per treatment. The treatment groups were reared with one of the five experimental watering systems as follows: Bell drinker (T_1), nipple drinker (T_2), floating cup drinker (T_3), basin drinker (T_4) and linear channel drinker (T_5). The chicks were reared in deep litter system in a gable roofed, open sided house under standard management conditions. The result revealed that the group with basin drinking system had significantly ($P<0.01$) lower pH of litter than the nipple drinker system whereas other treatment groups showed intermediate results, on 35th day of age. The group with floating cup drinker system had significantly ($P<0.05$) lower litter moisture than all other treatment groups. On 35th day of age, the group with nipple drinker system followed by floating cup drinker system had significantly lower litter nitrogen than linear channel drinker system, whereas the treatment groups (T_1, T_4) had intermediary results. Total bacterial count in litter was significantly ($P<0.05$) lower in the groups with basin drinker system and floating cup drinker system than bell drinker system and nipple drinker system, while T_5 did not differ significantly with either of the above groups. Similarly, the total coliform count of litter was significantly ($P<0.05$) lower with floating cup drinker system than bell drinker system while other treatment groups (T_2, T_4, T_5) did not differ significantly with either of the above groups.
Keywords: Watering systems, broiler, litter, moisture, pH, nitrogen, microbial quality

MEW-20

Pre-Hatch Cold conditioning effects on Growth parameters, Mortality and Economics of production in Vanaraja chicken

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Early life cold conditioning is believed to have long-term consequences in chicken. Effect of pre-hatch cold conditioning on Vanaraja chicken performance, economics, and overall mortality were investigated. A total of 600 hatching eggs from Vanaraja were used in the study. While control group was incubated normally, the eggs in two treatment groups were subjected to cold conditioning treatments comprising exposure to 15-16°C temperature for 1 hour on day 5th and 18th of incubation respectively. The chicks hatched out in each of the three groups were divided into 4 replicates of 15 chicks each and reared upto 6 weeks of age. Various parameters like performance, economics of production and mortality of birds were studied to identify the ideal pre-hatch cold conditioning regimen that resulted in least mortality and augmented production. The results indicated that pre-hatch cold conditioning done on 18th day of incubation significantly resulted in improved FCR, economics of production and decreased mortality of birds.
Keywords: Vanaraja, Pre-Hatch, Cold conditioning

MEW-21

Production performance of long- term selected pure White Leghorn strains

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Two pure strains of White Leghorn chicken IWN and IWP selected for thirty-three generations and a control population were evaluated for various egg production traits from 17 to 72 weeks of age under AICRP on Poultry Breeding, Mannuthy centre. A total of 845, 856 and 124 pullets of IWN, IWP and IWC were housed in individual cages after completion of 16th week of age. The estimate of average age

at sexual maturity was 129.45± 0.33, 132.00 ± 0.34 and 142.81 ± 0.67 days in the pure strains and control respectively. The body weight at 16th weeks of age was 1179, 1112 and 1022 grams in IWN, IWP and IWC respectively. Estimates for egg weight at 28th weeks of age were 48.01 ± 0.12, 51.48 ± 0.13 and 54.01 ± 0.15g, at 40 weeks of age the estimates were 48.73± 0.11, 52.02 ± 0.11 and 55.12± 0.17g and at 64 weeks the estimates were 46.20± 0.30, 50.11± 0.50 and 55.52 ± 0.41g respectively. Egg production up to 40th week of age on hen housed basis averaged 127.50 ± 1.13, 124.57 ± 1.02 and 97.58 ±2.08 eggs in IWN, IWP and IWC respectively. Egg production up to 64 weeks of age on hen housed basis averaged 256.77 ± 2.69, 249.03 ± 2.63 and 199.69 ± 4.66 eggs in N, P strains and control respectively. The egg production up to 72 weeks of age on hen housed basis for IWN and IWP strains were 295.82 ± 3.26 and 286.32 ± 3.21 and on hen day basis it is 323.70 and 318.03 respectively. The results revealed that the production performance of IWN and IWP strains has increased due to selection over generations.

Keywords: White Leghorn strains, egg production

MEW-22

Poultry litter compost with paddy straw

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One of the major issues the poultry industry is currently facing is the accumulation of large amount of wastes, especially manure and litter, generated by intensive production, which is causing major environmental problem. To overcome environmental issues related to pollution, environmentally and economically sustainable management technologies are to be evolved to mitigate the adverse effect of poultry waste and evolve the means to utilize those for producing the meaningful by products, which can be used by other stakeholders.This concern has brought the need to focus attention on the techniques used for managing and utilizing poultry waste in agriculture and how it influences yields and well-being of farmers. Converting poultry litter into compost is one of the best solutions which can take care of productivity and also minimise the environmental pollution. The compost was prepared having C/N ratio of 35:1 by mixing poultry litter with paddy straw having Relative Humidity 45%, pH 5.5 and Temperature 32^{0}C. 6 Kg of litter was mixed with 40 Kg of paddy straw. The humidity was maintained at around 45%. The temperature was changing due to the growth of the microbes inside the pile. The compost was ready on 47th day.The compost was prepared having C/N ratio of 30:1 by mixing litter with paddy straw as supplement having Relative Humidity 45%, pH 5.5 and Temperature 32^{0}C. 8.7 Kg of litter was mixed with 40 Kg of paddy straw. The compost was ready on 47th day.The compost was prepared having C/N ratio of 25:1 by mixing litter with paddy straw as supplement having Relative Humidity 45%, pH 5.0 and Temperature 31^{0}C. 14.3 Kg of litter was mixed with 40 Kg of paddy straw. The compost was ready on 47thday.

Keywords: Poultry litter, compost, paddy straw

MEW-23

Vermicomposting with poultry litter – Wealth out of Waste

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For natural farming, the usual practice is to go for composting. There are certain facilitators like earthworms which helps in converting the compost into Vermicompost. The advantages of vermicomposting include enriching soil, increasing harvest yields and suppressing plant disease. The compost was prepared having C/N ratio of 35:1 by mixing poultry litter with paddy straw having Relative Humidity 45%, pH 5.5 and Temperature 32^{0}C. 6 Kg of litter was mixed with 40 Kg of paddy straw. The

humidity was maintained at around 45%. The temperature was changing due to the growth of the microbes inside the pile. The compost was ready on 47th day. Once the compost was ready, earthworms were introduced into the pile of compost for converting it into vermicompost. The final product (vermicompost) was ready on 45th day after introduction of earthworms. The Relative Humidity was 50%, pH was 5.5 and Temperature was 24^{0}C on 45th day. The compost was prepared having C/N ratio of 30:1 by mixing litter with paddy straw as supplement having Relative Humidity 45%, pH 5.5 and Temperature 32^{0}C. 8.7 Kg of litter was mixed with 40 Kg of paddy straw. The compost was ready on 47th day. Once the compost was ready, earthworms were introduced into the pile of compost for converting it into vermicompost. The final product (vermicompost) was ready on 45th day after introduction of earthworms. The Relative Humidity was 50%, pH was 5.5 and Temperature of the pile was 25^{0}C on the final day. The compost was prepared having C/N ratio of 25:1 by mixing litter with paddy straw as supplement having Relative Humidity 45%, pH 5.0 and Temperature 31^{0}C. 14.3 Kg of litter was mixed with 40 Kg of paddy straw. The compost was ready on 47thday. After the compost was ready, earthworms were introduced into the pile for converting it into vermicompost. The final product (vermicompost) was ready on 45th day after introduction of earthworms. The Relative Humidity was 50%, pH was 5.5 and Temperature was 25^{0}C on the final day of vermicompost formation.

Keywords: Poultry litter, vermicompost, waste

MEW-24

Comparative evaluation of different litter materials on performance of commercial broilers

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A 6 week study was conducted on 240 Commercial broiler chicks (day old). The birds were randomly assigned to four treatments (4 replicates of 20 birds each) consisting different litter material like paddy husk, ragi husk, shredded areca nut sheath waste and smashed maize cobs. The birds were reared on deep litter system of housing. All the groups were provided with similar environmental and managemental conditions throughout the experimental period. T1; paddy husk, T2; ragi husk, T3; shredded areca nut sheath waste and T4; smashed maize cobs on the performance and cost of production of commercial broilers reared in deep litter system of rearing. Among different litter materials like paddy husk, maize cob, ragi husk and shredded areca nut sheath waste, there was an improvement in body weight gain, feed consumption, FCR and mortality rate in paddy husk group when compared to other litter materials. BCR ratio is comparable among different treatment groups. Therefore, In addition to paddy husk, other litter materials can be used as an alternative in broilers if available at cheaper cost.

Keywords: Broilers, Performance, Litter materials.

MEW-25

Influence of Day-old Chick Length on the Performance of Broiler Chicken

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The quality of the day-old chick has an important effect on the growth performance of the broiler. Visual score, Tona or Pascarscore, and day-old chick weight are used formeasuring chick quality.However,a strong positive correlationbetween Tona or Pascar score and broiler performance

has not been demonstrated andday-old weight is also affected by the residual yolk. There are limited findingsabout the relationship between chick length and its effects on the growth performance of broilers. Hence the experiment was conducted to study the influence of Day-old chick length on broilerperformance and its correlation with body weight. The chick length of 144 chicks was measured from the toe to the beak by stretching the chick on the scale. The mean chick length of day-old chicks recorded was 19.29 cm and the standard deviation (SD) was 0.58. Based on the values of day-old chick length& SD the chicks were categorized into 3 groups viz., A: Chick length lessthan 18.71 cm (less than mean – SD), B**:** chick length between 18.72 cm – 19.87 cm, and C: Chick length more than 19.87 cm (above Mean + SD). Day-old chick weights of groups A, B, and C did not differ significantly. However, the first-week live weight of group C was foundto be significantly ($p<0.05$) higher than A & B. In the fifth-week body weights in groups A, B, and Cdid not differ significantly. Similarly overall weight gain, feed consumption, and feed conversion ratio were comparable. The positive correlation ($p \leq 0.05$) between day-old chick length and live body weights was found in the first weekonly and was absent in subsequent weeks.Overall results indicated that Day-old chick length had no effect on the performance parameters of broilers.

Keywords: Chick length, Body weight, Correlation

MEW-26

Influence of Egg Weight on Chick Weight & Post Hatch Performance of Vanaraja Chicks

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For hatcheries, not only is it important to have a high level of hatchability, but the quality of the chicks provided also has to be good, because poultry farmers are looking for chicks with a high growth potential. However, chick quality has proven to be a difficult and subjective matter to define. Therefore, the aim of this study was to investigate the predictive value of different chick quality measurements for chick weight and post hatch performance of Vanaraja chicks. An experiment was carried out in hatchery & Poultry farm division of Livestock Production and Management, Faculty of Veterinary Science and Animal Husbandry, Shuhama, Alusteng, Srinagar. The eggs set over 3 consecutive hatches of a minimum 500 eggs/hatch were included in the study. The eggs on the basis of weight were classified into 3 groups viz. Small (45.1-50g), Medium (50.1-55g) and Large (55.1-60g) and incubated in automatic, digitally controlled forced draft incubator. Medium sized egg group showed highest hatchability but lowest total embryonic mortality. Highest number of cripples was observed in large sized egg group. Body weight as well body weight gain of chicks was highest in large sized egg group, followed by medium sized egg group and then small sized egg group from 0 to 6 weeks. Feed consumption was lowest in medium sized group and highest in large sized egg group. FCR was better in medium sized group and poor in small sized egg group. Therefore, it was concluded that medium sized eggs had better hatchability and the chicks hatched out from them performed better in terms of FCR. It is recommended that medium sized eggs should be used for incubation.

Key words: Egg-size, FCR, Hatchability, Performance, Vanaraja

MEW-27

Effect of supplementation of graded levels of Betaine Hydrochloride on the performance of commercial broiler birds during summer stress

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SESSION IV

HEALTH, BIOSECURITY AND WELFARE

HBW-01

Comparative efficacy of fermented soybean meal, probiotics and organic acids on growth performance, intestinal morphology, microbial count and serum parameters in broilers

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A study was conducted to compare the effects of fermented soybean meal (FSBM), probiotics and organic acids inclusion in the diet of broiler chicken on growth performance, intestinal morphology, microbial count and serum biochemical parameters. A total of 160, day-old Vencobb 430Y broiler chicks were randomly selected and divided into five treatments with four replicates of eight birds each, reared up to 42 days of age. The dietary treatment groups were as follows: T_1 -basal diet with a corn-soybean meal (control); T_2 -control diet with 100 percent replacement of soybean meal by FSBM; T_3 - control diet supplemented with 0.05 percent probiotics; T_4 - control diet supplemented with 0.1 percent organic acids; T_5 - control diet supplemented with both probiotics and organic acids. The results indicated that dietary treatments were not showed any significant effect on body weight gain, feed intake and carcass characteristics of broilers. However, the FCR of the FSBM group during the first and third weeks ($p<0.05$) and cumulative FCR (Day-old to 3 weeks) was significantly better compared to all other groups. Overall FCR was also improved in the FSBM group when compared to other treatment groups even though the variations between groups were non significant. However, significant improvement was observed in the duodenal and jejunal morphology and microbial count of broilers in all the experimental groups compared to the control group. Serum total cholesterol and LDL levels were significantly lowered in T2, T3 and T5 groups. Total cost of production was lowered in T2, followed by T1, T5, T4 and T3. From the overall results, FSBM showed similar effects to probiotics and organic acids. Therefore, FSBM can be recommended as an effective and cheaper alternative to commercial probiotics and organic acids in broiler diets.

Keywords: Fermented soybean meal, probiotics, organic acids, intestinal morphology

HBW-02

Effect of feeding Marigold Flower (*Tegetes erecta*) powder on hematological and histomorphometry characteristics of commercial broiler chicken

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The present study was undertaken to evaluate the effect of feeding Marigold flower powder(MFP) on hematological and histomorphometry parameters of commercial broiler chickens. Unsexed 120-day-old commercial broiler chicks (Cobb-430y) were randomly divided in to 4(Control, T_1, T_2 and T_3) groups with 30 chicks each. Each group of chicks were further divided in to 3 replicates with 10 chicks each. The chicks were reared under deep litter system in standard managemental protocols and were fed with basal diets with no MFP (C), and basal diet with 0.3, 0.6 and 0.9% of MFP of feed in T_1, T_2 and T_3groups respectively for a period of 42 days. At the end of experiment, blood was collected from 4 birds from each group to study hematological parameters and were then slaughtered to study histomorphometry characteristics. The results showed that all the hematological parameters were normal and within the standard range, indicating that feeding MFP did not cause adverse effects in broilers. In the gut histomorphometric study, it was found that the overall duodenal villi height(µm)along with the number of villi was found to be highest in T_2 group, followed by T_1, T_3 and C. The jejunal villi height was also recorded highest in T_2 group followed by T_1, T_3 and C. The duodenal and

jejunal villi crypt ratio were also the highest in T_2 group (4.07 and 12.39), followed by T_1(2.93 and 10.57), T_3 (2.12 and 9.84) and C (1.02 and 8.49) groups. It may be concluded that use of MFP in broiler diet did not show any adverse effect on hematological parameters of broiler chicken. Further, increased in jejunal and duodenal villi heights @ 0.6% supplementation of MFP indicated increase absorption of nutrients, improves the resistant to disease and increased the overall growth performance in broilers.

Key words: Broiler chickens, Marigold flower powder, hematological parameters, feed additives, villi height, Crypt depth, hematological parameters, histomorphometry characteristics.

HBW-03

Pathomorphological studies of Infectious bursal disease by electron microscopy

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Infectious bursal disease is a highly contagious immunosuppressive viral disease of poultry occurring 3-6 weeks of age and often known as Gumboro disease. IBD caused sequential ultrastructural changes in the different organs which can be seen under electron microscope. In the present study both scanning electron microscopy and transmission electron microscopy was used. The epithelial surface morphology was studied by scanning electron microscopy, whereas the IBDV replication was sequentially followed by transmission electron microscopy. In Scanning electron microscopic study revealed moderate to severe erosion and ulceration of mucosal plica. At higher magnification, exuviations of epithelial and other cells were observed with exposure of reticular fibers. Button like depressed structures were seen in some bursal follicles and few follicles appeared empty craters due to lymphocytic depletion. Spleen and thymus also showed patchy homogeneous mass due to necrosis and depletion of lymphocyte. Spherical virus particle without a clear membrane were seen under transmission microscopic study in the cytoplasm of the follicular cells. Mitochondrial changes like crystolysis were also observed.

Keywords: IBD, TEM, SEM, bird.

HBW-04

Effect of dietary supplementation of sea buckthorn leaf meal in coloured breeder on histological changes during winter season

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An experiment was conducted at Poultry farm of U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan (DUVASU), Mathura to study the effect of sea buckthorn (*Hippophae rhamnoides*) leaf meal (SBTLM) in mature farm borned coloured breeder on histological changes in livesr, bursa, spleen and caeca during winter season. Ninety coloured breeder (Chabro) hens and eighteen viable cocks in 1:5 sex ratio were randomly distributed into three treatment groups: Control (Basal), standard breeder diet (BIS, 2007); basal+0.5% and basal+1.0% SBTLM. Histological study of liver tissues showed the aggregation of lymphoid cells in the liver parenchyma in both 10x and 40x magnification in group (BB+1%SBTLM)+(BP+0.5%SBTLM) as compared to control group while supplementation of SBTLM in various post hatch dietary groups, (BB+0.5%SBTLM)+(BP+0.5%SBTLM) group had increased amount and density of white pulp with more

number of lymphoid nodules in spleen, accumulation of diffused and nodular enlargement of lymphatic nodule with few crypts of liberkuhn in caecal tissue and projections of numerous bursa follicles with basophilia, but no clear cut demarcation of cortex and medulla in bursa tissue as compared to control group after completion of experimentation, while showed maximum accumulation of lymphoid cells in liver parenchyma in (BB+1.0%SBTLM)+(BP+0.5%SBTLM) group as compared to control group (BB+BP).

Keywords: Sea buckthorn, breeder, histology, winter

HBW-05

Effect of nutrients and herbal products on immune status of broilers experimentally infected with mixed Eimeria species

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The present study was conducted to seek herbal alternatives and nutritional modulation to solve the problem of coccidiosis, a deadly protozoan disease of broilers. For the purpose, an experiment of 35 days' duration (days 0-21 pre-infection period and days 22-35 post-infection period) was conducted to test the efficacy of herbal/natural products/dietary nutrients for the management of mixed coccidial infection prevalent under field conditions. In the experiment, wheat grass juice, chelated mineral supplement, herbal anticoccidial containing bark of Holarrhena antidysentrica and seeds of Embeliaribes without and with sodium bicarbonate, organic chromium, herbal vitamin E-Selenium without and with organic chromium were tested for immunological parameters of un-infected/healthy and coccidia-infected (dose 60,000 sporulated oocysts) broilers. Results of the experiment revealed that LST in terms of ΔOD of T- and B-cells was maximum in wheat grass juice while ELISA titre against ND was maximum in herbal vitamin E-Selenium group. All the types of dietary modulation were found to be effective up to different extent in the management of poultry coccidiosis. Further research should focus on micro-array and proteomic technologies to solve the problem.

Keywords: Dietary modulation, Immunological parameters, Poultry coccidiosis

HBW-06

Comparative scoring for lesions induced by Velogenic Newcastle Disease Virus (vNDV) in indigenous and exotic chicken

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Newcastle disease (ND) is one of the most devastating viral diseases that results in massive economic losses in poultry industries across the world.NDvirus leads to pathological changes in varied organs and lesions in spleen are considered to be of primary importance to detect the pathological changes induced by the viral genes. A challenge study was carried out to assess the effect of vNDV inpure stocks of exotic White Leghorn (WLH) and indigenous (Aseel, Nicobari and Kadaknath) chicken breeds. The birds were challenged with velogenic Newcastle disease virus (vNDV) with an egg infective dose (EID_{50}) of $10^{3.83}$ per 0.1 mLthrough the intraocular and intranasal routes. Four birdsfrom each breed were sacrificed at 2 dpi (days post infection) 6 dpi and 10 dpi. For necropsy, spleen was collected and was fixed in 10 % buffered Formalin. Formalin-fixed Paraffin embedded tissues were prepared. Tissues were sectioned, stained with Haematoxylin and examined under light microscopy. Scoring for the lesions was done as per the system proposed by Hussein *et al*(2018). Lesions in spleen were scored as

follows:0 = normal; 1 = mild hyperplasia or hypertrophy in the ellipsoids; 2 = proliferative lymphoid follicles; 3 = degeneration in a mild focus form and numerous lymphoid follicles in an active form; 4 = necrosis in a disseminated focal manner and lymphoid follicles which were moderately active; 5 = necrosis in a diffuse and disseminated form and lymphoid follicles in a very active state. The least lesion score was observed in the spleen of Aseel which was indicative of better tolerance of the breed to vNDV.
Keywords: Lesion scoring, Newcastle Disease Virus, indigenous chicken, exotic chicken

HBW-07

Role of betaine as a feed supplement on growth performance and immunity of broilers during summer season

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The present experiment was conducted to study the role of betaine as a feed supplement on growth performance and immunity of broilers during summer season on 234 (Vencobb 430) straight run commercial broiler chicken up to 6 weeks. The birds were distributed into three treatment group's viz., control, T1 and T2 on the basis of equal body weight. The treatment groups were control (birds fed on basal diet, control diet), T1 (birds fed on basal diet, supplemented with Optibetaine @1kg/ton of feed), T2 (birds fed on basal diet, supplemented with BetaineHCL @1kg/ton of feed. The broiler birds supplemented with betaine showed significant improvement in live body weight or weight gain compare to basal diet fed broiler birds. The feed conversion ratio recorded best in optibetaine fed broiler birds. The birds received dietary optibetaine recorded lowest mortality 6.41 %, whereas, betaine HCl recorded 8.97% compared to highest mortality in control group 12.82 %.Humoral response of haemagglutination inhibition (HI) titer infered that supplementation of HI titer value were non significantly differ among betaine supplementation and basal diet groups. However, the numerical higher values were noted in betaine supplemented broiler birds. Optibetaine supplemented broiler birds recorded highest values of cell mediated immunity response compare to basal diet received birds The Heterophil : Lymphocyte ratio was significantly high ($P<0.05$) in optibetaine supplemented group on 42 day. Conclusively, in broiler rearing Optibetaine @ 1 kg/Ton of feed gave better results than betaine HCL to achieve higher live body weight, better feed conversion ratio and better immunity during summer season.
Keywords: Betain, broiler, growth performance, immunity, Optibetaine, etc

HBW-08

Effect of CIMENOL ring of botanical origin combined with citric acid in stimulating growth performance and preserving intestinal health of *Clostridium perfringens* challenged broiler chicken

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A biological trial was conducted to evaluate the efficacy of CR for intestinal health in a *Clostridium perfringens* (CP) challenge model as a treatment in drinking water and as a preventative in feed. The biological trial was conducted using 480 Vencobb broiler chicks with four treatments each with six replicates of 20 birds. T1, Negative control (NC), no CP, no CR; T2, Positive Control (PC), CP challenge on d 14, 15 and 16, no CR; T3, Cimenol Ring Liquid (CRL) group, CP challenge on d 14, 15 and 16, CRL in drinking water @ 1 ml per litre from d 20 to 26; T4, Cimenol Ring Premix (CRP) group, CP challenge on d 14, 15 and 16, CRP in feed @ 0.5 Kg per tonne from d 0 to 40. For bacteria challenge, *C. perfringens* culture @ 2.5 X 10^8CFU was administered through drinking water per bird per day. The intestinal lesion

scores were 0.00±0.00, 2.33±0.24 and 1.02±0.16 in NC, PC and CRP groups on d 17. The morbidity (0 to 40 d) due to bacterial challenge and vent pasting was remarkably less in CRP group than PC group birds. The complete loss of the intestinal architecture with hemorrhages, total necrosis with ulceration at the tip of the villi, reduction of goblet cells and capillary engorgement and clubbing of the villi with desquamated intestinal epithelial cells in the lumen were noticed in PC birds. Whereas, normally appearing villi, no prominent haemorrhages, normal GALT tissue and adequate goblet cells were seen in CRP birds. The Colony Forming Units (CFU) of *C. perfringens*/ g of ceacal content on d17 were 0.012, 2.269 and 1.479 in NC, PC and CRP groups respectively. These findings established a baseline upon which mechanisms of plant-based performance enhancers in regulation of animal growth can be investigated. The results reveal the possibility of using phytogenic products as alternatives to antibiotic growth promotor to protect the intestinal integrity from infection and consequently production performance of commercial broilers.

Keywords: Phyobiotic, cimenol ring with citric acid, commercial broilers, intestinal integrity.

HBW-09

Effects of Mycotoxin binders on commercial broiler performance and Immunity

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Multiple mycotoxins are a challenge due to interactions-synergies and additive effectswhich can hamper productivity in commercial broilers and affect farm economics.An experiment conducted to investigate the efficacy of bentonite based (Toxo-MX)and b-glucans based toxin binder(Toxo-XL) in mitigating the effect of multiple mycotoxinson the performance and health of broilers. 430 Cobb broiler chicks were assigned to one of four dietary treatments with 5 replicate pens of 16 birds each.The treatments included a NC (a basal diet with multiple mycotoxins), PC (a basaldiet contaminated with 11 ppb of AFB1) + 10 ppb Ochratoxin A (OTA) +toxin binder -1kg/Mt);Treatment Group1 (TG1)-(a basal diet contaminated with 11 ppb ofAFB1) + 10 ppb OTA+ 17 ppb T2 & HT2 + Toxo MX -1kg/Mt),Treatment Group2 (TG2)-(a basal diet contaminated with 18 ppb of AflatoxinB1 (AFB1) + 12 ppb Ochratoxin A (OTA)+ 18 ppb T2 & HT2 +Toxo XL -750 g/Mt till 21 days and 500g/Mt in finisher).Broilers were reared on floor pens in an open-sided poultry house. The broiler's body weight gain (ADG), feed consumption and FCR were recorded during the 39-day study. The serum antibody titres (Ab) againstInfectious bursal disease virus (IBDV)were evaluated when broilers were 21 and 39 days old. In the TG1 and TG2, FCR is reduced compared to NC and PC. 2% reduction in FCR in TG2 vs PC and 1 % reduction in FCR in TG1 vs PC. In relation to the NC, PC, TG1-Toxo MX and TG2-Toxo XL elicited better mean titre levels.

Keywords: Multiple mycotoxins, smectites, Immunity, yeast cell wall.

HBW-10

Pathology of hydropericardium-hepatitis syndrome in broiler chicken in Jammu region

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Hydropericardium syndrome (HPS) also known as hydropericardium–hepatitis syndrome/Angara disease (in Pakistan) /Litchi heart disease (in India) or inclusion body hepatitis-hydropericardium syndrome (IBH–HPS), is an economically important poultry disease. In India, HPS was first reported in the poultry belt of Jammu and Kashmir and Punjab in 1993. The causative agent Fowl adenovirus is a member of the family adenoviridae and consists of a non-enveloped capsid icosahedral in shape, measuring 70-90 nm in size and containing a linear dsDNA of approximately 45 kb in size as its genome. A study was conducted to investigate the pathology and molecular diagnosis of HHS in poultry birds from March 2022 to May 2023 in Jammu region. Outbreak of HHS was recorded in

4 different farms with sudden onset of mortality in broiler birds of 4-6 weeks of age. Necropsy examination of dead birds showed characteristic straw coloured fluid in pericardial sac; pale, friable and enlarged livers with minute, petechial or ecchymotic haemorrhages and enlarged kidneys. Histologically, the liver of affected birds revealed presence of basophilic intranuclear inclusion bodies in hepatocytes,haemorrhages, centrilobular or diffuse hepatocyte degeneration. The kidneys displayed subcapsular haemorrhages, hyperemia, denuded tubular epithelium, tubular degeneration and moderate interstitial lymphoplasmacytic nephritis. Tissue samples (liver) of infected birds were used for DNA isolation and detection of FAdV using PCR to amplify hexon gene. The amplified PCR was analyzed by agarose gel electrophoresis indicated DNA fragments of approximately 890 bp as expected revealed presence of HPS virus.

Keywords: Fowl adenovirus, hydropericardium syndrome, molecular diagnosis, pathomorphology

HBW-11

Effect of Bentonite based binder on Performance and Health of broiler chicken fed Aflatoxin contaminated diet

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A 42 days trail was conducted with day old broiler chicks to evaluate the efficacy of Binder (Bentonite clay,) to ameliorate the toxicological effects of Aflatoxin. The birds were assigned to seven groups with 150 in each group allocated to 10 replicates per group at random.Group 1 was the negative control, group 2 was supplemented with Binder. Group 3 was positive control, challenged with 0.5 ppm aflatoxin. Groups 4, 5 and 6 were positive controls supplemented with Binder, , commercial binder 1 and commercial binder 2, respectively. Birds challenged with aflatoxin revealed depressed body weight gain, reduced feed intake and efficiency. Liver enzymes (AST, ALT and GGT),creatinine and BUN levelsin serum were elevated. Aflatoxin challenge reduced antioxidant and immune status in birds and also weights of liver and kidneys increased indicating potential damage. Supplementation of different binders significantly (P≤0.05) improved growth performance, antibody titres against ND and IBD virus and antioxidant status (reduced serum MDA and increased SOD). Serum levels of AST, ALT, GGT, creatinineand BUNwere reduced with inclusion of binders. Weights of liver and kidney significantly reduced in all binder fed groups. Intestinal morphometry revealed improved villous height in binder supplemented groups, especially with bentonite based binder. Among different binders, bentonite based binder was better in improving growth performance and hence can be used to counteract aflatoxicosis in broilers.

Keywords: Aflatoxin, Binder, Bentonite, Preformance

HBW-12

The fowl adenovirus outbreak in broiler chicken farm: the clino-pathological characterization and phylogenetic analysis

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Fowl adenovirus (FAdV) is an emerging viral threats to the poultry industry, impacting broiler chicken farms worldwide. This study aims to comprehensively investigate the recent FAdV outbreak in a broiler chicken farm in Kashmir, focusing on both clinico-pathological characterization and phylogenetic analysis.Clinical observations were conducted on affected broiler chickens, revealing

prominent signs of respiratory distress, depression, anorexia, and a notable increase in mortality rates. Detailed necropsy examinations uncovered characteristic lesions, including hepatomegaly, spleenomegaly, enlarged kidneys, and Hydropericardium.Histopathological analysis further elucidated the disease manifestation, demonstrating distinctive hepatic necrosis, lymphoid depletion, and intranuclear inclusion bodies in the affected organs. The molecular characterization of the FAdV strain was performed through the amplification and sequencing of the hexon gene using polymerase chain reaction (PCR) technique.Phylogenetic analysis of the obtained sequences unveiled the identification of FAdV serotype 11 responsible for the outbreak in the broiler chicken farm. The phylogenetic relationship of this strain was compared with known FAdV strains from different geographic regions to ascertain its evolutionary origin and potential sources of transmission.The results of this study shed light on the clinico-pathological characteristics of the FAdV outbreak in broiler chickens, providing valuable insights into disease dynamics and manifestation. Additionally, the phylogenetic analysis offers essential information about the genetic diversity and evolutionary patterns of the FAdV strain involved in the outbreak.Understanding the clinico-pathological features and the phylogenetic relationship of FAdV strains is crucial for devising effective control measures, including vaccination strategies and biosecurity protocols, to mitigate the impact of FAdV outbreaks in poultry. The findings from this study contribute to the knowledge base and assist in enhancing disease management and prevention strategies to safeguard the poultry industry from potential economic losses associated with FAdV outbreaks.

Keywords: Fowl adenovirus, clinico-pathology, molecular characterization, Kashmir, India

HBW-13

Bacillus species as feed additive in broiler diet on gut health and production performance

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A study was conducted to assess the addition of probiotic (*Bacillus licheniformis, B.Subtilis/* CHR-I and CHR-II) in diets of broilers on performance, gut health and pathogenic microbial counts. A total of 480, day old Cobb chicks were randomly distributed into six groups (6x4x20). Basal diet was prepared and addition of probiotics was done at T1/control (0%), T2/CHR-I at 500g /T, T3 CHR-I at 250g /T, T4, CHR-II at 400g/T, T5/ CHR-II at 200g/T and T6/Competitor at500g/T) and fed from one to 42 days. Improvement ($P<0.05$) in body weight, body weight gain and better FCR was noticed in groups fed with CHR-II at 400g/T (T4) followed by T2, T6, T5, T3 and lowest was noticed at control (T1). Increase in the villi length (2.7%) along with proliferation of glandular epithelium in comparison to control was noticed during morphometry in groups fed with T4, T2, T3, T5 and T6 respectively. The *E. Coli(447-28.12X10^{7}CFU/g), Salmonella(412-122X10^{5}CFU/g)* and *Clostridium(58-6.4X10^{1}CFU/g)* counts were significantly lowered in probiotics supplemented groups. Birds provided with combination of probiotics at higher level has shown lesser gut pathogenic microbial load ($P<0.05$) than other supplemented groups. Among different pathogens *clostridium* counts were ($P<0.05$) lower in all the treatment groups.It can be concluded that CHR-II at 400g /T (T4) or CHR-I at 500g /T (T2) in diet are recommended for better FCR, and to minimize the food born pathogens infection and to maintain intestinal integrity of the birds.

Key words: Probiotics, broilers, gut health, *clostridium*, growth performance.

HBW-14

Comparative impact of Lactobacillus spp. postbiotic metabolite supplementation in water versus feed on broiler chicken performance

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This study investigates the effectiveness of metabolites generated by a new combination of postbiotics, administered via either feed or water, in enhancing the growth and gut responses of broiler chickens. A cohort of 180-day-old CARIBROVISHAL chicks was divided randomly into three groups of 60 birds each, with each group replicated three times. The postbiotics, derived from a blend of two Lactobacillus spp were incorporated into the feed of the first group from the 3rd to the 6th week of age. In the second group, the same postbiotic combination were introduced into the birds' drinking water. The third group served as the control. Statistical analysis employed one-way ANOVA, and significance was determined at $p<0.05$.The outcomes revealed noteworthy enhancements ($P<0.05$) in growth performance and a simultaneous reduction in jejunal coliform levels in birds fed postbiotic-infused feed, compared to those provided with postbiotic-treated water and the untreated control group. In summary, the inventive amalgamation of postbiotic positively influences gut health and growth performance, while also mitigating jejunal coliform populations when administered through the feed of broiler chickens. This investigation emphasizes the potential of postbiotic metabolites as environmentally friendly alternatives to antibiotic supplementation in poultry feed.
Keywords: Metabolites, Postbiotics, Growth enhancement, Gut health

HBW-15

Prevalence of *Clostridium perfringens* type-A in chicken products and carcass washings in Srinagar, Kashmir

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The present investigation was undertaken to study the prevalence and level of contamination of some chicken products and carcass washings with *C. perfringens* in Srinagar city. Further virulence characterization of the isolates was also studied by PCR. The overall incidence of *C. perfringens* was 21.45%. Incidence of *C. perfringens* in chicken curry and chicken pickle was 8%. The mean viable counts of *C. perfringens* in carcass washings was $4.433\pm0.18\log_{10}$ cfu/ml. Freezing of the products reduced the viable count of raw chicken from $5.146\pm0.37\log_{10}$ cfu/g to $0.369\pm0.23\log_{10}$ cfu/g. Among the 44isolates of *C. perfringens* type A, 13 were *cpe* positive and 31 as *cpe* negative. Both *cpe* positive and *cpe* negative strains of *C. perfringens*type A field isolates were unable to sporulate within 8 hour of incubation at 25°C, however, maximum spore formation was observed at 37°C in 45 hr. Among the isolates recovered from all sources, 22.73% were heat resistant and 77.27% as heat sensitive. Highest percentage (100.0%) of heat resistant strains was found in chicken pickle. All the strains recovered from chicken kabab, chicken curry and poultry carcass washings were heat sensitive. Isolates recovered these products showed highest sensitivity towards penicillin (97.14%), metronidazole (88.57%) and ampicillin (82.86%) and resistance against streptomycin (91.43%), vancomycin (88.57%) and erythromycin (62.86%). Isolates recovered from carcass washing were also sensitive to penicillin (88.89%), metronidazole (77.78%) and ampicillin (77.78%) but resistant to vancomycin (88.89%) and streptomycin (88.89%).
Key words: *C. perfringens* type A, prevalence, chicken products, carcass washing *cpe* gene.

HBW-16

Effect of supplemental vitamin E and zinc (Zn) on the carcas traits, hematology, blood biochemical and antioxidant status of broiler chickens under heat stress

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A six-week biological experiment was conducted in a factorial (3x3) manner. Nine dietary treatments were formulated with three levels of vitamin E (50, 100 and 150 IU/kg) each with three levels of Zn (40, 80 and120 mg /kg) during broiler starter (0-3 weeks) and finisher (4-6 weeks) diets to evaluate Carcass traits, Hematology, blood biochemical and antioxidant status of broiler chickens under heat stress. The temperature humidity index (THI) of 85.18 of the shed was obtained from the recorded temperature (minimum 31.54±0.08 and maximum 35.00±0.36) and humidity (minimum 59.25±1.21 and maximum 69.25±0.89) during the whole experimental period. All procedures used in the experiment on the birds were reviewed and approved by the Animal Ethics Committee of the Indian Veterinary Research Institute in Izatnagar, India. Following a completely randomized design, 288 one-day-old straight-run broiler chicks of uniform body weight were distributed at random into 36 replicates (8 chicks in each) and housed in specially designed broiler battery brooder cages for 6 weeks. Each battery in the cage housed 8 birds, providing a space of 1160 cm2. Results of the experiment revealed that Significantly (P<0.05) lower abdominal fat % was recorded at 100 and 150 IU/kg vitamin E than that recorded at 50 IU /kg vitamin E.Significant (P<0.01) higher hemoglobin, lymphocyte and monocyte percentage were observed with supplementation of 100 and 150 IU/kg vitamin E than that recorded at 50IU/kg vitamin E. Significantly higher total protein (P<0.01) and lower SGPT (P<0.05) were observed in a dietary combination of 100 IU/kg vitamin E with 80mg/kg zinc. The superoxide dismutase and glutathione peroxidase enzymes were significantly increased linearly with increased levels of vitamin E and zinc in the diets.

Keywords: Broiler, THI, Biochemical, Antioxidant status and Heat stress

HBW-17

Histomorphometry of small intestine in chicken layers upon dietary supplementation of Aloe vera (*Aloe barbadensis*)

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A total of 225 chicken layers of22 weeks of age were randomly divided into 5 dietary treatment groups consisting of 3 replications having 15 birds in each replication i.e. T_0 (basal diet without antibiotics- negative control group), T_1 (basal diet with antibiotic- control group), T_2 (1% aloe vera), T_3 (2% aloe vera) and T_4 (3% aloe vera). After an experimental feeding period of 20 weeks, the tissue samples from duodenum, jejunum and ileumof two birds per replication werecollected in 10% formalin and further processed by standard paraffin embedding technique. There was significant (P<0.05) increase in the mean values of villi height andwidth in the treatment groups.There was significant (P<0.05) increase in the mean values of villi height in jejunum from 879.04 microns in negative control group T_0 to 1017.89 microns in treatment group T_2. The mean values of villi width and crypt depth in jejunum portion of small intestine were non-significantly different among various treatment groups.there was significant (P<0.05) increase in the mean values of villi height in ileum from 579.82 microns in negative control group T_0 to 694.96 microns in treatment group T_2 supplemented with 1% aloe vera in diet. The mean values of villi width and crypt depth in ileum differed non-significantly among various treatment groups.From the present findings, it can be concluded that dietary inclusion of aloe veraimproves the morphology of small intestine in layerchicken enhancing the gut health and gut development.

Keywords: Aloe vera, chicken layers,small intestine, morphology.

HBW-18

Effect of dietary supplementation of Aloe vera (*Aloe barbadensis*) on the immune response of chicken layers

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The present research was undertaken to study the immune response through differential expression level of TLRs, viz. TLR 2, TLR 4 and TLR 7 gene transcripts by relative quantification method in the chicken layers upon dietary supplementation of aloe vera (*Aloe barbadensis*). A total of 225 chicken layers of 22 weeks of age were randomly divided into 5 dietary treatment groups consisting of 3 replications having 15 birds in each replication i.e. T0 (basal diet without antibiotics- negative control group), T1 (basal diet with antibiotic- control group), T2 (1% aloe vera), T3 (2% aloe vera) and T4 (3% aloe vera). After an experimental feeding period of 20 weeks, the blood samples of two birds per replication were collected and further processed to study the differential expression level of TLRs, viz. TLR 2, TLR 4 and TLR 7 gene transcripts by relative quantification method. The level of target mRNA in different treatment groups was determined by comparative CT method (ΔΔCT method). The nutrigenomic expression analysis revealed that relative mRNA expression of TLR 2 and TLR 4 of layer birds was found to be ($p<0.05$) significantly different in the treatment groups. However, the data pertaining to the relative mRNA levels of TLR 7 in the plasma of experimental birds revealed no significant differences in the experimental groups. The study showed that experimental treatments containing aloe vera at different levels in the layers' diet have potent immune modulating activity by showing significantly ($P<0.05$) down regulatory effect on relative mRNA expression of TLR 2 and TLR 4 and non-significant down regulation pattern of TLR 7 in the laying hens.

Keywords: Aloe vera, chicken layers,Toll-like receptors, immune response.

HBW-19

Hepatoprotective effect of Dozliv Forteon CCl_4 inducedhepatic stress in broilers with special reference to liver weight, nutrient digestibility and histomorphology

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The experiment was conducted up to 35th day on 240Vencobb-430Y*straight-run* day old broiler chicks, randomly distributed into four treatment groups with four replicates of 15 birds each. The control group Afedwith basal diet as per BIS-2007and negative control group B (NC) received basal diet with liver challenges with Carbon tetrachloride (CCl_4) @ 1ml/kg body weight orally at every 3rd day interval from 15 to 28th day, group C received NC+Dozliv Forte @ 2ml/liter of water from 15to 35th days and group D received NC+ Standard liver tonic @ 10ml/100 birds from 15 to 21stday and 20ml/100 birds from 22 to 35th day.At the end of 28thday, the mean liver weight percent relative to live body weightwere significantly ($P<0.05$) increased in treatment group B as compared to groups A, C and D. At 35thday, relative weight of liver remained non-significant amongst treatment and control groups.The nitrogen retention, digestibility of dry matter, crude fibre and ether extract were numerically improved in birds challenged with CCL_4 with Dozliv forte and standard liver tonic as compared to birds challenged with CCL_4 only. On 28th day, the tissue samples of liver from CCL_4 treated groups revealed minimal to mild, focal congestion, granular degenerative changes, focal minimal fatty changes, occasional periportal necrosis and dilatation of central vein. The sections of liver from group C, D and control group A didn't show any considerable histopathological changes. On 35th day, the sections of liver from birds of group

A, B, C and D didn't show any remarkable histoarchitectural alterations. Thus, it was concluded that liver weight percent relative to body weight was significantly higher in birds challenged with CCL_4 as compared to control group and groups C and D.The CCL_4toxication impaired hepatic function in broilers and treatment with Dozliv Forte @ 2ml/ litre through drinking water reported better nutrient digestibility as compared to standard liver tonic. The hepatotoxicity induction with CCL_4 in broilers was evidenced with histomorphological alterations in liver.

Keywords: Broilers, CCl_4, Dozliv forte, Nutrient digestibility,Liver weight and Histomorphology.

HBW-20

Scrutinizationof waste Silkworm pupae meal incorporated rationon blood biochemical parameters in broiler chickens

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We conducted a study to evaluate the effect of incorporation of waste silkworm pupae meal (WSWPM)in ration on the blood-biochemical profile of broiler chicken.Day-old broiler chicks (n = 225; VenCobb;unsexed) were randomly divided into 5 groups,with each group comprising of 3 replicates of 15 chicks each. The control (C) group was fed a basal diet as per ICAR (2013); whereas four treatment groups namely T1, T2, T3 and T4 were diets with meat and bone meal (MBM) replaced with WSWPM at the rate of 25, 50, 75 and 100%, respectively. At the end of the growth trial (42 days age), two birds from each replicate were slaughtered to collect blood samples for analysis.No significant difference was observed for ALT, AST activity and serum levels of total protein, albumin, globulin, A:G ratio, triglycerides and HDL cholesterol among different dietary groups. All the analysed parameters were within normal physiological range, suggesting no adverse effect of replacing MBM with WSWPM. It may be concluded that WSWPM may replace MBM upto 100% level in boiler ration with no adverse effects on health as indicated by serum biochemistry.

Keywords: Waste silkworm pupae meal, Meat-cum-bone meal, Broiler, Blood biochemistry

HBW-21

Effect of Aflatoxin B_1 on egg type breeders

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Two Biological trials were carried out to study the effect of incorporation of graded levels of aflatoxin $B_1$and to assess the inclusion of direct fed microbials in ameliorating the effect of aflatoxin B_1 in Meyer strain white leghorn egg type breeders.Increased spermatazoan abnormality, reduction in egg production, feedconsumption and hatchability, increase in 'dead in shells' and malpositions and malformaitons, were directly proportionate to the level of increase in aflatoxin B_1incorporation in the breeders diet. However semen volume, motility and concentration, were not affected. Similarly fertility and dead germs were also not influenced by the incorporation of aflatoxin B_1 in the breeders diet. Chicks hatched from breeders fed diets with aflatoxin B_1 did not show any carry over effect during 0-8 weeks post hatch performance.Inclusion of Lactobacillus acidophilus (LA) to 1.5 ppm of aflatoxin $B_1$was able to degrade the aflatoxin B_1 completely and produced highest per cent hatchability, lessor semen abnormality comparable with that of the control. However addition of Saccharomyces cervisiae (SC) and the combination of SCLA to 1.5 ppm of aflatoxin B_1have only marginally improved per cent hatchability and reduced semen abnormality. Similar trend was also noticed with regard to egg production and malpositions, and malformations. However 0-8 week post hatch performance of chicks did not show any

variation between treatments due to the inclusion of direct fed microbials in the breeders diet along with 1.5 ppm aflatoxin B_1.

Key words: Aflatoxin B_1, Sachromyces cervisiae, Lacrobacillus asidophillus, Mal formations, Malpositions.

HBW-22

Assessment of welfare and meat quality parameters of desi birds reared under deep litter versus cage rearing system

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The poultry industry has experienced rapid growth in the livestock sector globally. Between 1961 and 2001, there was a remarkable 621% increase in the annual number of poultry slaughtered. While chickens and humans differ significantly, there's an acknowledgment that chickens can experience emotions such as pain and frustration. Ethical considerations must be applied to poultry farming, to ensure the well-being of such large poultry populations. Looking at poultry welfare, it entails meeting the fundamental needs of birds on a daily basis, which encompass accessible food and water, the freedom to move, stand, turn, stretch, sit, and lie down, as well as visual contact. Adequate shelter or housing that safeguards birds from weather conditions without causing them harm or distress is also essential. Nevertheless, different nations and regions have enacted regulations and standards relating to poultry welfare and housing systems. These regulations can influence the utilization of cages. For instance, the European Union (EU) has established criteria for responsible poultry production systems and has introduced regulations like the cage ban, aiming to address the welfare of birds.With this context the present is designed to study the welfare, stress and meat quality parameters of the desi birds reared under deep litter versus cage system. The results pertaining to welfare parameters such asfecal score, feather score, hock burn score, and footpad dermatitis score revealed significant variations ($P<0.05$). However, parameters such as Gait score, Runaway test, and tonic immunity did not exhibit any statistically significant differences. Furthermore, the meat quality (pH, WHC, shear force and drip loss) and stress parameters(H/L ratio) not displayed significant variations in both rearing system types.In desi birds, rearing under cage haven't impacted much significantly as like commercial broilers and layers.

Keywords: Cage, Deep litter, desi birds, welfare

HBW-23

Effect of probiotics as an alternate to antibiotics on production performance, immunocompetence and gut health in broiler chicken

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The present scenario of the poultry industry has been concerned about decreasing the usage of antibiotics and thereby reducing risk of antimicrobial resistance within the food chain. So, probiotics can be used in the broiler industry as a safe alternative for antibiotic growth promoters. This study was conducted toevaluate the effect of differentprobiotic species on growth performance, immune status and gut health in broiler chicken.Broiler chicks (360) were randomly divided into 6 groups having 4 replicates of 15 birds each. The treatment groupsincluded T1 (control diet with antibiotic), T2 (control diet without antibiotic), T3 (control without antibiotic + Probiotics-1@500mg/ kg diet), T4 (control diet without antibiotic+ Probiotics-2@500mg/kg diet), T5 (control diet without antibiotic with Probiotics-

3@ 20g/1000L of drinking water and T6 (control diet + commercial product @ 500mg/kg diet). The trial was conducted for 6 weeksand birds were reared under deep litter system following standard managemental practices. Body weight and feed efficiency at the end of 6 weeks was significantly ($P<0.05$) higher in all probiotic supplemented groups as compared to both the controls. better immune response was recorded in probiotic groups as against the control group. Pathogenic bacterial load in the intestine viz., *E.coli* and *Salmonella* significantly reduced, while *Lactobacillus* counts significantly improved in probiotics groups. The EPEI was also significantly higher in all probiotic supplemented groups. among different probiotic groups, no significant difference was noticed for majority of the parameters recorded. It can be concluded that supplementation of multi-strain probiotics proved to be beneficial as an alternative to antibiotic growth promoter without hampering the production performance.

Keywords: Probiotic, Gut health, Growth promoter, Broiler.

HBW-24

Campylobacter infection in broiler chicken: From prevalence to antimicrobial resistance.

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*Campylobacter spp,*is responsible for intestinal colonization in poultry and food-borne enteritis in humans.The present study was undertaken with the view to generate information regarding prevalence,molecular identification, and antimicrobial resistance of campylobacter from poultry and poultry handlers from 10 districts of Kashmir valley viz, Srinagar, Ganderbal, Budgam, Anatnag, Baramulla ,Pulwama, Shopian , Kupwara , Bandipura and kulgam .In the present study poultry samples from organized farms of different areas of kashmir were screened for the presence of *Campylobacter spp*.A total of 1350 samples were tested for the presence of*Campylobacter* species which included 900 samples from poultry and 450 samples from poultry handlers The study revealed that 161 (17.8%) of 900 samples from poultry and 37 (8.2%) of 450 poultry handlers were positive for Campylobacter spp using PCR. Out of 161 samples 143(12.8%) were positive for *Campylobacter jejuni* and 18 (1.8%) for *Campylobacter* coli in poultry and out of 37 samples 30 were positive for *Campylobacter jejuni* and 7(1.8%) for *Campylobacter coli*in poultry handlers based on PCR amplification of species specific gene mapA, and ceuE respectively.The highest prevalence of campylobacter was found in Srinagar (26.6% in poultry and 17.7% in poultry handlers) followed by Ganderbal (24.4% and 11.1%), Budgam (21.1% and 11.1%), Anatnag (21.1% and 6.6%), Baramulla (18.8% and 4.4%),Pulwama (16.6% and 6.6%), Shopian (14.4% and 11.1%), Kupwara (14.4% and 6.6%), Bandipur (12.2% and 4.4%) and kulgam (11.4% and 2.2%). *C. jejuni* and *C.coli* isolates obtained from the different samples were analysed for their antibiogram pattern against six antibiotics. Majority of *C. jejuni* and *C. coli* isolates (89.8% and 95.5%) were sensitive to gentamycin and erythromycin.

Keywords: Campylobacter, infection, chicken, Kashmir, prevalence.

HBW-25

Efficacy of capsaicin supplementation in diet on microbial counts, immune response and organ weights in male broilers exposed to normal and heat stress condition

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Experiment was conducted on 300 day-old male Vencobb-430Y broiler chicks for the period of six weeks. The experimental chicks were randomly allotted into 5 treatments groups. Each treatment has 5 replicates with 12 chicks per replicate. The positive control (PC) group T1 received basal diet, groups T2 and T3 received basal diet (PC) with Capsaicin (Capcin) @ 150 and 200 mg/kg in feed, respectively. The group T4 received basal diet (PC) with induced heat stress (HS) by maintaining temperature between 35-37°C from 14th to 42nd day and group T5 received basal diet with induced heat stress and supplemented withCapsaicin @ 200 mg/kg in feed.On 28th day, the microbial counts of *E. Coli* and *Clostridium* spp. were non-significantly reduced in Capcinsupplemented groups than their respective control groups.The *Clostridium* spp. countson 42nd day was significant (P<0.01) higher in heat stress groups T4 and T5 as compared with T1, T2 and T3.The log_2 values for ND titers on 21st day in groups T1, T2 and T3 were significantly (P<0.01) more protective than heat stressed group T4.At 42nd day, non-significant difference was recorded for ND titers in all groups.It was recorded that mean liver weight percent was significantly (P<0.05) decreased in heat stress groups T4 and T5 as compared to group T3.The spleen relative weight percentwas non-significant in all groups. Thus, it was concluded that the supplementation of Capcin@ 200mg/kg of feedduring normal and heat stressed condition improved overall gut health and immune response in male broilers and liver weight was significantly decreased in heat stressed groups.

Keywords: Male broilers, Capsaicin, Gut health, Immune response, Organ weights

HBW-26

Comparative serum amino acid profile ofRajasri and commercial layer birds by high throughput LCMS

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Rajasri is a backyard dual purpose (meat and egg) desi bird acts an important source of livelihood for rural people. Raising of these birds can improve food security and economic status of below poverty line families in India. Whereas commercial layer bird raised mainly for egg production in India. Commercial layer birdproduces more eggs about double in quantity compared to Rajasri bird, but the meat of Rajasri is more delicious and believed to have nutritional values.However, no data is available on the significance of the amino acids in meat and egg quality.To understand the amino acids present in serum during egg laying, A Study was conducted to evaluate the comparative serum amino acid profile on 28 weeks old Rajasri and commercial layer birds.birds were divided into 3 groups and each group contain 9 birds. Serum samples collected from 9 birds pooled to 3 in each group respectively.Later serum was separated by centrifugation at 2000xg for 10 minutes. Thereafter, the serum samples were processed and subjected to LC/MS/MS analysis using an API 3000 triple quadrupole mass spectrometry system. and results were analyzed by using Prism9 Statistical software and observed,the concentration of alanine, glutamine,threonine, serine and histidine are higher in Rajasri birds when compared to commercial layer birds.Based on earlier the studies the observed Amino acids play a specific role in modulating metabolic pathways, antioxidant system and enzymatic processes, which can potentially influence meat production and quality.

Keywords: Rajasri; Commercial layer; amino acids; LC-MS, Meat quality

HBW-27

Development of an immunization regimen to combat multiple viral co-infections in broilers

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In recent years, multiple viral co-infections have induced more growth retardation and higher mortality rate in broilers. The current study was undertaken to investigate and isolate avian viruses that were in circulation in commercial broiler flocks from 2018-2023.Accordingly, disease outbreaks in various commercial broiler farms in different districts of Assam and West Bengal, India were investigated. Clinical symptoms were noted and overall mortality rate was about 37.85%.Carcasses were subjected to necropsy, and tissues were collected for histopathological and molecular confirmation of the infection by polymerase chain reaction (PCR)/ reverse transcriptase-PCR (RT-PCR) targeting the virus specific genes. Multiple co-infections by fowl adeno virus (FAdV), nephropathogenic infectious bronchitis virus (IBV) and Newcastle disease virus (NDV) was detected by amplification of virus specific hexon, nucleocapsid and fusion genes respectively. All the positive samples were inoculated onto 9-days-old embryonated eggs through respective routes of inoculation. Our study showed circulation of virulent FAdV, IBV and NDV strains causing outbreaks in vaccinated flocks. Virus infection dynamic studies revealed infection with single etiology viral pathogens NDV (6.25%), IBV (4.375) and FAdV (7.50%) and co-infection with multi-etiology viral pathogens (NDV+IBV: 9.375%, NDV+FAdV: 21.25%, IBV+FAdV: 22.5% and NDV+IBV+FAdV: 28.75%). Our results indicated that multiple co-infectionscaused more serious synergisticpathogenic effects, growth retardation, immunosuppression leading to higher mortalitiesthan those with a single infection ($P<0.05$). Therefore, there is need to develop an effective and stable multivalent vaccine that could broadly protect against multiple infection as well as help in simplifying immunization programme in broilers that usually involves multiple vaccination with a range of different vaccines.

KeyWords: broilers, multiple co-infections, fowl adeno virus (FAdV), nephropathogenic infectious bronchitis virus (IBV), Newcastle disease virus (NDV), multivalent vaccine

HBW-28

Diagnostic and therapeutic management of chalky white diarrhoea in chicken

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A poultry farmer came to Veterinary Clinical Complex, College of Veterinary and Animal Science, Navania, Udaipur and complainedthat his two birds have died and other thirty birds are lethargic or depressed, anorectic and having profused, watery and white color diarrhoea and total egg production has decreased. Complete physical and clinical examination of affected birds revealed that the birds were sick in appearance, depressed, ruffled feathers, vent pasted with chalky white diarrohea. Some birds showed gasping and having closed eyes.Haematology and faecal culture examination of affected birds were carried out.Postmortem examinationof dead chickens were also conducted. Gross postmortem examination of birds revealed discoloration of liver, splenomegaly and necrotic foci on liver & spleen. Based on history, clinical findings, laboratory investigations and post mortem examination birds were found to be affected with salmonellosis. Poultry farmer was advised to mix 20 per centSulphadimidinepowder at the rate of 5mg/liter of drinking water for seven days. After this

treatment, out of thirty birds, two birds diedduring course of treatment due to severe diarrohea and rest of the birdshave got complete recovery.

Keywords: Poultry, Chalky White Diarrohea, Salmonellosis and Sulphadimidine

HBW-29

Virulence and antimicrobial resistance of thermophilic campylobacters isolated from poultry farms of Uttarakhand

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Thermophilic campylobacters are leading cause of food-borne gastroenteritis worldwide and considered a major food safety concern. With highly complex epidemiological cycle and multiple sources of contamination, it is important to create a framework of effective measures to control these organisms. The present work was carried out to study the prevalence of thermophilic campylobacters in eight poultry farms of Uttarakhand. A total 545 samples comprising 345 poultry faecal and 199 environmental samples (51 litter, 52 feed, 50 water and 46 manure) were processed. Genus specific PCR targeting 16S rRNA gene (816 bp) and a multiplex PCR targeting lpxA gene for simultaneous identification of *C. jejuni* (331 bp) and *C. coli* (391 bp) was used. A total of 67 *Campylobacter* isolates were recovered with an overall prevalence of 12.29%. Out of total 67 *Campylobacter* isolates, 51 (76.11%) were identified as *C. coli* and 16 (23.88%) as *C. jejuni*. *C. coli*was found to be more prevalent than *C. jejuni*. Of 48 isolates screened for virulence genes, *cadF* and *flaA* gene was present in all isolates, while 6 (12.5%), 44 (91.66%) and 11 (22.9%) isolates harboured*ciaB*, *cdtB* and *cgtB* genes, respectively. None of the isolates was positive for *wlaN* gene. Kirby Bauer disc diffusion assay for antibiotic sensitivity testing of 42 isolates revealed highest resistance was for cefoxitin (97.9%)followed by ciprofloxacin (64.28 %), nalidixic Acid (33.33 %), ampicillin (28.5%), ceftriaxone (14.28), tetracycline (4.76%), clindamycin (2.38%), sulfafurazole (2.38%) and erythromycin (2.38%).All isolates were susceptible to levofloxacin and gentamicin. β-lactam resistance gene blaOXA-61 was detected in 18 (58.06%) isolates. Resistance genes *cmeB* and *tet(O*) were detected in 19 (79.16%) and 2 isolates (100%) respectively. The *ermB* gene was absent in a single erythromycin resistant isolate. The study warrants strict measures for judicious use of antimicrobials in poultry farms.

HBW-30

Nanoencapsulation of Rosemary essential oil as novel feed additive improved serum biochemistry, haematological indices and antioxidant status of broiler chicken

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This study aimed to investigate the effect of supplementation of nanoencapsulated Rosemary essential oil (REO) as a novel feed additive against antibiotic growth promoters on serum biochemical parameters, immune status and antioxidant parameters of broiler chicken. 420,one week old broiler chicks (Cobb 400) were randomly allocated to 7 treatments of 4 replicates (floor pens) each having 15 chicks.The treatment groups included: CN (Control) fed basal diet only, AB (Antibiotic) fed basal diet+ 10 mg/kg enramycin, CS fed basal diet+ 150mg/kg Chitosan nanoparticles, REO_{F100} and REO_{F200} fed basal diet+100mg/kg and 200 mg/kg free REO respectively, REO_{N100} and REO_{N200} fed basal diet +100mg/kg and 200 mg/kg nanoencapsulated REO respectively The results revealed no significant differences in serum blood biochemical parameters except cholesterol and low density lipids, wherein significant

reduction was observed in free oil and nanoencapsulated groups. The highest reduction in cholesterol and LDL was observed in REO_{N200} group. Heterophil:lymphocyte ratio was significantly reduced in nanoencapsulated REO groups. The serum antioxidant parameters like superoxide dismutase, glutathione peroxidise, total antioxidant status, revealed a significant ($p< 0.05$) increased while malondialdehyde and total oxidant status showed a significant ($p< 0.05$) decrease particularly in nanoencapsulated REO groups. In conclusion, supplementation of nanoencapsulted REO improved the health and antioxidant status of broiler chicken.

Keywords: Broiler chicken, essential oil, nanoencapsulation, serum biochemistry, antioxidant

HBW-31

Effect of Turmeric oil free concentrate (TOC) supplementation on performance, immunity and oxidative stress in commercial broiler chicken

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The present study was conducted with an aim to study the effect of TOC supplementation on growth performance, immunity and oxidativein commercial broilers. Experiment was conducted on 252 broiler chicks reared in deep litter systemand were randomly categorized into seven dietary treatments with six replicates for each treatment and six birds in each replicate. A standard corn-soy diet was prepared forprestarter, starter and finisher phases. Seven experimental diets were prepared by mixing the TOC at 0, 0.25, 0.5, 0.75, 1.00, 1.25 and 1.5% levels. The results of present study revealed that birds fed TOC supplemented diets gained higher body weights and consumed more feed compared to basal diet fed birds. The highest ($P<0.01$) body weight and feed intake was recorded in broilers fed 1.5% TOC supplemented diet. The feed conversion ratio was significantly lowered in birds fed 0.25, 0.5, 1.0 and 1.25% TOC supplemented diets.Thus it was imperative that the TOC supplementation up to 1.25% improved the body weights without affecting feed efficiency. However, supplementation of TOC at higher level at 1.5% improved the performance but reduced the feed efficiency.The humoral(HI) and cell mediated immune responses (CMI) were significantly ($P<0.01$) affected among dietary treatments. The higher ($P<0.01$) CMI response was observed with TOC supplementation irrespective its level of supplementation. The higher ($P<0.01$) HI was recorded with TOC supplementation at 0.5% and 1.00% level. The activities of antioxidant enzymes viz., glutathione peroxidase, glutathione reductase and super oxide dismutasewere significantly improved with all the levels of TOC supplementation, with the simultaneous reduction of lipid peroxidation in TOC supplemented groups.Thus it was concluded that TOC supplementation up to 1.5% is beneficial in commercial broilers rearing for improving the growth performance, immunity and antioxidant enzyme activities.

Keywords: Antioxidants, Broilers, Immunity, Performance, Turmeric oil free extract

HBW-32

Effect of phytogenic feed additives on growth performance, antioxidant status and immune response in broilers under summer stress

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This study was conducted to evaluate the heat stress alleviating effects of phytogenic feed additives on growth performance, mortality, immunity, carcass parameters, serum antioxidant response, serum biochemical profile, hematological parameters and morphology of intestine in broiler chicken. 240-old commercial broiler male chicks were randomly allotted to four dietary treatments with twelve replications of 5 birds each and reared in battery brooder up to 6 weeks of age. Broilers were fed on corn-soy-based broiler pre starter (0-2 weeks), starter (3-4 weeks) and finisher (5-6 weeks) diets. The treatments consist of a control diet (CD), CD supplemented with PFA-I containing Clove and

Eucalyptus essential oil @25g/100kg, PFA-II containing blend of oregano, cinnamon, citrus peel and fructooligosaccharides @10g/100kg and PFA-III containing Amla and Linseed powder @10g/100kg. At the end of 6 th week, the results showed that body weight gain (BWG) was significantly (P0.05) difference by supplementation of phytogenic feed additives. Carcass parameters revealed significant (P0.05) difference was observed in giblet, breast, thigh and drumstick percentage. The mortality rate was xiv within limits in all dietary treatment groups and no specific outbreak was recorded. Dietary supplementation of PFA has reduced lipid peroxidation (MDA levels) significantly (P0.05) difference was found in other hematological parameters like TEC, PCV, DLC and H:L ratio. Dietary supplementation of PFA had significantly increased the duodenal and ileum villus height, crypt depth and villus height to crypt depth ratio of duodenum at 6th week of age. Based on the overall results, it can be concluded that, the supplementation of PFA in the diets of broilers have improved body weight gain, feed consumption, feed efficiency, dressing percentage, antioxidant response, serum biochemical profile, total leucocyte count and morphology of intestine in broilers during summer season with an average temperature range of 33.8°C to 37.5°C and relative humidity of 46-75%.

Keywords: Broilers, bodyweight, feed conversion ratio, immunity, peroxidation, serum biochemistry.

HBW-33

Comparative study of saponin, insoluble fibre, symbiotics and acidifiers on performance and gut health in broilers

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The experiment was conducted to comparesaponin, insoluble fibre, symbiotics and acidifiers on broilers' performance and gut health. The trial was conducted on 450 'Cobb 430 Y' strain straight-run broilers for five weeks. The day-old chicks were randomly divided into five groups of 90 birds each. Each group was further divided into six replicates of 15 birds. Group A received the control diet, group B received a control diet with saponin @ 100 gm/T, group C received a control diet with wheat hulls @ 2%, group D received a control diet with symbiotics @ 500 gm/T, group E received a control diet with acidifiers @ 1 kg/T. The performance of birds from all groups was studied for growth, gut health and economic parameters. Live weights and average gain in weights of birds receiving control diet were the highest followed by birds from groups E, C, B and D. The average feed consumption of birds receiving wheat hulls from group C was the highest followed by the birds from groups E, A, D and B. The average FCR of the birds from group A receiving the control diet was the best followed by the birds from groups B, E, D and C. The differences in all growth parameters among different groups were statistically non-significant. The total viable count from intestinal contents recorded by the birds from different groups at the end of fifth week was significantly lower (P ≤0.01) as compared to the birds from the control group. Birds from control group recorded highest profit per bird followed by groups B, E, D, C. Thus, it is concluded that, birds from all treatments in this experiment had comparable performance when compared to control and were found beneficial in improving the gut health during the study and could be used for broiler production.

Keywords: Saponin, wheat hulls, symbiotics, acidifiers, gut health, broiler performance, economics

HBW-34

Determination of Prenatal Aflatoxin tolerance of White Pekin embryos, with or without amelioration through *In Ovo* injections

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An experiment was conducted at ICAR-DPR, Bhubaneswar involving 450 fertile-eggs of Pekinsfor*in-ovo* interventionon day-23 of Incubation to determine prenatal Aflatoxin (AFB1) tolerance White Pekin ducks. Purified AFB1 was used at 3 experimental dilutions, namely@ 2.0, 4.0 and 8.0ng per egg, to be delivered, *in-ovo*, in sterile normal-saline solution (NSS at pH 7.0) following standard procedures. A simultaneous treatment comprising of purified lysine and L-methionine in-combination (L+M)@10mg each, was delivered along with AFB1 at above 3 doses, besides a sham-control (in sterile NSS). The results showed that despite exposure to AFB1, Pekins- embryos hatched out at reasonablepercentages (fertile-eggs basis) ranging from 50 to 82% correlating well to their *in-ovo* delivered AFB1 levels. Necropsy of all dead-in-shell embryos, showed up typical inflammatory hepatotoxic-lesions, for all AFB1 groups starting with 2ng/egg levels. On standard rearing, weekly growth measured up significantly higher for duckling's group which received L+M,besidesAFB1 exposure. The mortality levels (upto 5 weeks) varied from28 to 51% levels, for all treatments that received *in-ovo* AFB1, compared to sham-control and L+M supplemented ducklings. The *in-ovo*supplementations of L+M combination showed up significantly better growth and tolerance compared toonly-AFB1 exposed birds. The peak 5th-week weight remained significantly-lower (by~l1%) even in the group receiving AFB1(@ 2ng/egg) along with L+M supplementation than the control (1750g at 5Weeks). The weekly live weight gains remained lower than the control,for allAFB1-groups, while the L+M groups retained their significant-superiority over only-AFB1 groups, indicating ahepato-protective effect fromthisamino acid combination. The study concluded that despite pre-natal AFB1-exposures, the amino-acid combo (lysine and methionine) offered distinct ameliorative effects in juvenile-growth, evidenced from higher growththrough2-5 weeks period, inall AFB1-recipients.In determining threshold of AFB1-tolerance, *in-ovo*, it was revealed that Pekin-embryos could withstand intra-amniotic AFB1-exposure,up to8ng/egg and hatch out reasonably, despite toxic-effectsevident during growth phase, for allexperimental ducklings.

Keywords: Aflatoxin B1; Ducks; *In-Ovo*; Khaki Campbells; Lysine and Methionine.

HBW-35

Comparative analysis of resistance to *Salmonella enterica serovar Enteritidis*in guinea fowl and chicken

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The nature of the challenge presented by infectious disease in poultry industry is continuously changing as the result of environmental change, pathogen evolution, changes in rearing and market legislation. Bearing these points in focus, the ultimate aim of our research is to generate essential knowledge on mechanism of disease resistance to reduce the economic burden and zoonotic threat that accompany infectious diseases. Therefore, in present study the *In-vitro* mRNA expression kinetics of different cytokine genes, in *Salmonella enterica serovar Enteritidis*(SE) induced and un-induced spleenocytes of guinea fowl (GF) and chicken (Ck) was estimated using Real Time PCR. In terms of fold change, the expressions of IL-1 β, IL-6 and IL-10 were up-regulated in induced spleenocytes in GFrelative to those of Ck. In contrast the expressions of TGF-β4 and TNF-α were down-regulated in GF relative to those of BC. Interestingly, the expression of the IL-10 (Th2) cytokine was exceptionally higher in GF than Ck. Finally, the studyhas revealed that the guinea fowl has higherresistance to *Salmonella enterica serovar Enteritidis* (SE) compared to chicken may be due to the higher expression of pro-inflammatory cytokines and unique pattern of IL-10 expression in guinea fowl.

Keywords: Guinea fowl, disease resistance, cytokines, spleenocytes.

HBW-36

Effect of dietary supplementation of sea buckthorn leaf meal in coloured breeder on histological changes during winter season

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An experiment was conducted at Poultry farm of U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan (DUVASU), Mathura to study the effect of sea buckthorn (*Hippophae rhamnoides*) leaf meal (SBTLM) in mature farm borned coloured breeder on histological changes in livesr, bursa, spleen and caeca during winter season. Ninety coloured breeder (Chabro) hens and eighteen viable cocks in 1:5 sex ratio were randomly distributed into three treatment groups: Control (Basal), standard breeder diet (BIS, 2007); basal+0.5% and basal+1.0% SBTLM. Histological study of liver tissues showed the aggregation of lymphoid cells in the liver parenchyma in both 10x and 40x magnification in group (BB+1%SBTLM)+(BP+0.5%SBTLM) as compared to control group while supplementation of SBTLM in various post hatch dietary groups, (BB+0.5%SBTLM)+(BP+0.5%SBTLM) group had increased amount and density of white pulp with more number of lymphoid nodules in spleen, accumulation of diffused and nodular enlargement of lymphatic nodule with few crypts of liberkuhn in caecal tissue and projections of numerous bursa follicles with basophilia, but no clear cut demarcation of cortex and medulla in bursa tissue as compared to control group after completion of experimentation, while showed maximum accumulation of lymphoid cells in liver parenchyma in (BB+1.0%SBTLM)+(BP+0.5%SBTLM) group as compared to control group (BB+BP).

HBW-37

Expediency of yeast derived ß-glucans and mannan oligosaccharide on immune status and gut health in broilers

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The present experiment was conducted to study the expediency of yeast derived ß-glucans & mannan oligosaccharide as a feed supplement on immunity and gut healthof 240 (Vencobb 430) straight run commercial broiler chicken up to 6 weeks. The birds were distributed into four treatment group's viz., T1, T2, T3 and T4 because of equal body weight. The treatment groups were T1(birds fed on basal diet, control diet), T2(birds fed on basal diet, supplemented with antibiotic (lincomycin & Spectinomycin) @1kg/ton of feed), T3(birds fed on basal diet, supplemented with combination of ß-glucans & Mannan-oligosaccharide @100g/ton of feed in pre-starter diet followed by 50g/ton of feed in starter & finisher diet), T4(birds fed on basal diet, supplemented with combination of ßglucans & Mannan-oligosaccharide @200g/ton of feed in pre-starter diet followed by 100g/ton of feed in starter & finisher diet). Haemagglutination inhibition (HI) titer were significant on 21st(P<0.01), 28th(P<0.05) and 35th(P<0.01) day of age against the NCDV and highest titre values observed in BG & MOS supplemented group. The cell mediated immune response was significantly (P<0.05) differed at the end of rearing period with higher values in BG & MOS supplemented group compared to all treatments. The relative weight of thymus (P<0.01) and bursa of fabricius (P<0.05) were significantly higher on 24thday and on 42ndday weight of bursa of fabricius was significantly (P<0.01) higher in high dose of BG & MOS supplemented group. However, relative weight of spleen did not show significant difference among treatment groups during entire study period.Supplementation of BG & MOS did not significantly

(P>0.05) change the caecal microbial count during entire study period. It can be concluded that ß-glucans & mannan oligosaccharide could improve immune response at various growth phases.
Keywords: Broiler, ß-glucans, mannan-oligosaccharide, immune status, gut health, etc

HBW-38

Nano-selenium and nano-curcumin effect on antioxidants, certain serum biochemical parameters and histology in broiler chickens

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The present study was designed to compare the impact of dietary supplementation of different sources of Se on growth performance, Se concentration of breast meat, and immune response of broiler chickens. The present study was designed to compare the impact of dietary supplementation of different sources of Se on growth performance, Se concentration of breast meat, and immune response of broiler chickens. The broiler chicks were randomly divided into four groups. Group I chicks stood as control with standard broiler diet. While chickens kept in groups II, III and IV were supplemented with nano-Se (0.3 mg/kg diet), nano-curcumin (200 mg/kg diet) and combination of both nano-Se (0.15 mg/kg diet) and nano-curcumin (100 mg/kg diet) along with basal diet, respectively. Significantly increased activities of super oxide dismutase, glutathione peroxidase, and catalase were recorded in supplemented groups compared to control group. The levels of serum *malondialdehyde* were significantly lower in Group II and Group IV compared to control group. Non-significant ($p<0.05$) differences were observed in activity of serum gamma-glutamyltransferase, lactate dehydrogenase, glucoseand total protein between the supplemented and control group. Serum alanine transaminase activities were significantly lower in supplemented groups compared to control groups. The histopathological photomicrographs of the liver and kidney sections in Group II and IV revealed very well-maintained cellular architecture, whereas, degenerative changes were noted in Group I. Thus, Nano-Se and nano-curcumin were found to be more effective in ameliorating oxidative stress of broiler chickens.
Key words: Nano-curcumin, nano-selenium, antioxidants, chickens, enzymes.

HBW-39

Efficacy of dietary supplementation of *Kaempferia galanga* on growth performance of broiler chickens and its antimicrobial activity against MDR-*S.* Typhimurium

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The present study was conducted to analyse the efficacy and antimicrobial activity of *Kaempferia galanga* against multi-drug-resistant, non-typhoidal *Salmonella* spp. (MDR- NTS). Out of 31 samples collected from broiler farms of Wayanad district, 24 samples came positive for NTS, whereas the PCR assay confirmed 2 isolates positive for *S.* Typhimurium and 18 for *S.* Enteritidis. Among these, 18 isolates were confirmed to be MDR-NTS in the antimicrobial susceptibility test done using the disc diffusion technique. The *in vitro* minimum inhibitory concentration of *K. galanga* on the selected MDR-*S.* Typhimurium isolates were determined to be 25 mg/mL and LD_{50} dose of MDR-*S.* Typhimurium strains were determined to be 1×10^9CFU/mL. The chicks (n=90) were grouped into three treatments each with three replicates having 10 broiler chickens (T1 to T3). The birds were fed

as per BIS 2007 specification in which the level of shade-dried *K. galanga* was fixed at 2.5% for T2, 5% for T3, and only basal diet was fed to T1 (all were confirmed to be isocaloric and isoprotein feeds). The *Salmonella*-free birds (tested on 5th day of age) were administered with 0.5mL of selected MDR–*S.* Typhimurium culture orally on the seventh day of age. Higher body weight (P<0.01) was observed in treatment T3 followed T2 in comparison to T1 throughout the study. From the fourth week onwards, a significantly better body weight was exhibited by T3 (P<0.01) followed by T2. Moreover, the caecal and liver counts of *Salmonella* tested negative on the fourth week of post-infection; however, T1 remained positive until the forty-second day. Furthermore, a higher pre-slaughter live weight, carcass weight, and dressing percentage were noted in T3 and T2 in comparison to T1 (P<0.01). In conclusion, feeding the birds with *K. galanga* at 5 and 2.5% was found to be effective againstMDR-*S.* Typhimurium and also resulted in higher body weight, higher carcass weight, higher dressing percentage and better immunity which could be further employed as a growth promoter.

Keywords: *K. galanga*, Broiler chicken, MDR, *Salmonella,* Phytobiotics

HBW-40

Probiotic mediated lipase production for enzymatic production of medium chain triglycerides

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The intensive research is in full swing for identification of agents as an alternate therapeutic molecule for food animalsincluding poultry without compromising their productivity orproduct quality. The alternatives includeplant derived molecules, secretary bioactive compounds, probiotic microbes. Among the bioactive compounds, medium chain triglycerides area unique substance which is safe and potent bactericidal and viricidal agent in addition to itsimmune stimulating effects. These compounds are considered as generally recognized as safe.The bioactive medium chain lipid molecules are being produced by the chemical hydrolysis or enzymatic esterification process which has the concerns of foodsafety, consumer mindset, residues and on environment. Considering their biological activity and other concerns, the microbial especially of probiotic mediated production of bioactive medium chain triglycerides would be an ideal approach. Based on the extensive *in silico*screening,probiotic isolates possessing have been identified. Screening for the microbial lipase production was carried out on phenol red agar plates with two different oil sources (olive oil and vegetable oil) at different incubation periods. The zone of discolouration started during the initial four hours of incubation, but itspreads entire plate after completion of 12 hours and the quantificationof zone of activity has been carried out using the tributyrin agar. Among the probiotics screened, the probiotics *Lactobacillus casei*and *Lactobacillus rhamnosus*exhibited higher lipase activity at 12 hours of incubation at 37°C.

Keywords: GRAS, bioactive molecules, medium chain triglycerides, immune stimulant.

HBW-41

Effect of cimenol ring of botanical origin combined with citric acid on growth performance of Clostridium perfringens challenged broiler chicken

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A biological trial was conducted to evaluate the efficacy of CR for intestinal health in a Clostridium perfringens (CP) challenge model as a treatment in drinking water and as a preventative in feed. The biological trial was conducted using 480 Vencobb broiler chicks with four treatments each

with six replicates of 20 birds. T1, Negative control (NC), no CP, no CR; T2, Positive Control (PC), CP

SESSION V

PRODUCTS TECHNOLOGY AND VALUE ADDITION

PV-01

Utilisation of Jackfruit seed powder incorporated in Duck meat sausage

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A study was conducted to analyze physico-chemical properties of duck meat sausage incorporated with jackfruit seed powder. Jackfruit (*Artocarpus heterophyllus* Lam.) is a tropical fruit native to India, and is now found in many parts of Asia, Africa, South America, and northern Australia. After the consumption of the edible potion of the ripe fruit, the seeds rich in carbohydrate and protein are usually discarded as waste. Although, jackfruit seeds are not utilized and less popular, they offer significant nutritional advantages and could be used as a functional food ingredient. It can be an alternative source of binding agent for the preparation of poultry meat products.The scope of duck meat as a potential source of protein and jack fruit seed powder as supplemental ingredient has been explored in our study. Jack fruit seed powder was prepared by drying and grinding using hot air oven and mixer grinder. Duck meat sausage was prepared with 0% (T_0), 2.5% (T_1), 5% (T_2) and 7.5% (T_3) levels of jackfruit seed powder. Results revealed a linear increment in chemical properties with increase in the inclusion levels of jackfruit seed powder and significantly higher ($P<0.05$) emulsion stability, protein, moisture, fat, and ash content in duck meat sausage in T_3 group. On sensory evaluation, no significant variation was noticed in the product. However, sensory qualities were decreasing with increase in storage days under refrigerated temperature (4 ± 1°C). This research concluded that the jackfruit flour of 7.5% level can be used and has enormous potential in the production of new food formulation.
Keywords: Duck meat sausage, Jackfruit seeds, physic-chemical and sensory evaluation.

PV-02

Storage behaviour of *Taraxacum officinale* (*dandelion)* extract incorporated chicken meat loaves under aerobic refrigeration conditions

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Broiler meat is cherished widely among the white meats being a major source of higher biological value proteins, lower saturated fatty acids and higher mono and poly-unsaturated fatty acids. However, the unsaturated fatty acids render the chicken products more prone to lipid oxidation compared to red meats thereby reducing their storage stability. Therefore, it is desirable to use preservatives with both antioxidant and anti-bacterial properties for the product preparation. Now -a - days, natural alternatives are preferred over the synthetic ones owing to their potential health benefis. Locally available natural sources like *Taraxacum officinale* (dandelion) being rich source of functional ingredients can therefore, are exploited for their functional role. The study was thus designed with the aim to optimize the level of Dandelion Leaf Extract (DLE) for the development of functional chicken meat loaves and to ascertain its storage stability. DLE was incorporated at 2.5% (T1), 5% (T2), 7.5% (T3) and 10% (T4). The optimum level of DLE for the development of functional chicken meat loaves was found to be 10% based on the physico-chemical parameters. The product was packed in LDPE bags and stored at 4±1°C for 28 days. The pH and TBARS showed significant increase while as moisture and DPPH-RSA values followed significant decrease with storage. The microbiological parameters (total plate count, coliform count and yeast and mould count) showed significant increase from day 0 to day 28 but the increase was slower in the treated loaves. Although, the sensory scores decreased with storage period for all attributes but remained acceptable up to 21 days. Thus, it was concluded that Dandelion leaf extract can efficiently improve the storage stability of chicken meat loaves.
Keywords: Aerobic, Chicken meat loaves, Dandelion, LDPE, Refrigeration, Storage Stability, TBARS

PV-03

Sex-related growth difference and carcass characteristics of Commercial broilers

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An experiment was conducted from day old to 40 days of age to study the effect of sex on growth pattern and carcass characters of commercial broiler (Vencobb 400). Twenty-four birds consisting of 12 males and 12 females were wing banded, weighed and reared up to 40 days of age under standard management conditions. The body weight was individually recorded from all the birds on 7, 14, 21, 28, 35 and 40 days of age. The birds were slaughtered and processed to record the carcass characters on 40 days of age. The body weight between males and females were similar up to the 14 days of age and thereafter, males recorded significantly ($p<0.01$) higher body weights at 21, 28, 35, 40 days of age, weighing 7, 36, 107.69, 179.73, 211.88g respectively. The weekly body weight was also significantly different between males and females during third ($p<0.01$) fourth ($p<0.01$) fifth ($p<0.01$) and sixth ($p<0.05$) weeks of age, with males weighing more than females. Among cut of parts drumstick percentage was significantly ($p<0.05$) higher in males, whereas, the wings percentage was significantly ($p<0.05$) higher in females. The ready to cook weight (%) was significantly ($p<0.05$) higher in males; whereas, New York dressing percentage (%) was significantly ($p<0.05$) higher in females. Among processing yields and losses, only shank and feet (%) had significant ($p<0.05$) difference between sexes; while, feather and blood loss and head, viscera, kidney, fat and total offal yields had non-significant difference between sexes. Among giblets, only the heart yield was significantly ($p<0.05$) different between sexes with higher values in females. The results show that the males attain marketable weight early, therefore can be marketed early; therefore sex-separate rearing will be economical.

Keywords: Commercial broiler, male and female, effect of sex, growth pattern, carcass characters

PV-04

Effect supplementation of *Rumex acetosa* leaf powder on carcass characteristics, proximate composition and oxidative stability of broiler chicken meat

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An experiment was carried out to study the effect of dietary supplementation of Rumex acetosa leaf powder on carcass characteristics, proximate composition and oxidative stability of broiler chicken meat. Two-hundred-day old broiler chicks were procured from reputed sources. The chicks brooded in battery cages for a period of one week. On8th day the chicks were distributed randomly into five treatment groups viz. T1: (Control), T2: Antibiotic feed additive, T3: 0.5% Rumex acetosa, T4: 1% Rumex acetosa and T5: 1.5% Rumex acetosa having 40 chicks in each groups each group having four replicates of 10 chicks each. The dressed yield (%) recorded was ranged from 73.68±1.37 in T4to 76.62±0.94 in T1 groups. Among the cut up parts, the breast yield (%) was highest ranged from 31.32±0.32 in T1 to 32.36±0.60 in T4 groups. However, no significant difference was seenon carcass traits of broilers fed diets supplemented with Rumex acetosa leaf powder. Statistically, no significant difference was observed among the different treatment groups for slaughter traits viz. blood loss, feather loss and dressing yield. No significant differences were observed in proximate composition and carcass traits among different treatment groups. The TBARS values were highest in T1 (0.503±0.06) and lowest in T5 group (0.463±0.003). Statistically significant ($P>0.05$) difference was observed among the various

treatment groups. The oxidative stability of meat expressed in terms of Malondialdehyde concentration differed significantly (P≤0.05) between treatment groups. The Malondialdehyde concentration in T1 (Control) was significantly (P≤0.05) increased as compared to other treatment groups which were supplemented with Rumex acetosa. Thus supplementation of broiler diets with Rumex acetosa leaf powder improved the oxidative stability of broiler meat without adversely affecting the meat quality.

Keywords: Rumex acetosa, oxidative stability, carcass, meat composition, broiler.

PV-05

Comparative analysis of the nutrient composition of different types of chicken eggs and meat

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A study was conducted to evaluate the nutrient composition native chicken, non-descriptive chicken reared at the Poultry research Station, Tamil Nadu Veterinary an Animal Sciences University, Tamil Nadu. Commercial chicken eggs and meat also collected from the retail shop for comparison. A total of six raw meat and egg samples were collected for this study. The collected samples were analyzed for proximate analysis such as moisture, protein, crude fiber, ether extract, total ash, energy and fatty acid composition. The moisture content of meat showed significant (P<0.01) difference among various type of chicken. The higher moisture content was observed in Nicobari meat (77.97 ± 0.05 %) followed by *Peruvidai* (75.22 ± 0.12 %) and *Siruvidai* (74.38 ± 0.08 %) chicken meat. The Kadakanath meat had higher level (23.63 ± 0.06**)** of crude protein followed by *Siruvidai* (23.09 ± 0.02) chicken. The low level of crude fiber (0.11 ± 0.01 %), higher level of ether extract (4.76 ± 0.01 %) and gross energy (1701.4 2 ± 28.85 Kcal/kg) were observed in commercial broiler chicken meat, when compared to native and non-descriptive chicken. Higher level of Saturated fatty acids (%) was recorded in Nicobari meat (44.45 ± 0.36) and lower level was recorded in Aseel (35.73 ± 0.45) meat. Monounsaturated fatty acids content was higher in *Peruvidai* chicken meat (46.27± 0.25) followed by *Siruvidai* chicken (45.78± 0.77) meat. Kadakanath meat (26.98 ± 0.11) had significantly higher (p<0.01) level of Polyunsaturated fatty acids (%) followed by commercial broiler chicken (24.67 ± 2.80) meat. Meat of native chicken reared in free range had lower (20.11 ± 1.42) level of polyunsaturated fatty acids, when compared to commercial chicken meat (24.67 ± 2.80). The moisture (%) content of different types of chicken eggs ranges from 43.42 ± 1.37 to 73.13 ± 1.25. White leghorn egg had significantly higher (p<0.01) level of crude (%) protein (19.19 ± 0.38), ether (%) extract (16.88 ± 0.58), total (%) ash (15.01 ± 0.19) and gross energy (2899.67 ± 74.42 Kcal/kg). The Saturated fatty acids (%) content of various chicken eggs ranges from 37.12 ± 0.29 to 50.78 ± 0.23. *Peruvidai* chicken eggs had higher (46.36±1.02) level of Monounsaturated fatty (%) acids, whereas Aseel chicken egg had higher (20.78 ± 0.25) level of polyunsaturated fatty (%) acids.

Keywords: Nutrient composition, chicken eggs and meat, Native chicken

PV-06

Impact of temperature and duration on chicken egg quality

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Despite its tropical environment and climatic variations, India has emerged as a leading global egg producer and a prominent player in the poultry business. Poultry production in India pertained to very limited regions, where produces like eggs and live birds transported from one place to other for marketing. Eggs, being perishable product pose lots of challenges in maintaining their quality, also

having limited storage facilities during long transportation. To concern this issue at field level, a study was conducted to analyse the impact of duration of days and storage conditions on egg quality and its correlation to spoilage. A total of 108 fresh laid white eggs from ICAR-CARI layer house were collected and divided into two treatment groups,T_1group eggs were stored under ambient conditions, while the T_2 group eggs were refrigerated at 4°C.The egg quality study was studied at 0, 3, 6, 12, 18 and 24th days of age. In results it was evidenced that quality of eggs was significantly ($P<0.05$) affected by different storage conditions. The standard parameters such as Haugh unit, yolk index, and pH, were significant decline ($P<0.05$) in the eggs stored under ambient conditions. In contrast, the refrigerated eggs maintained significantly ($P<0.05$) better in all the evaluated parameters. Microbiological study revealed that ambient-stored eggs exhibited higher Total Plate Count (TPC) when compared to refrigerated eggs, showed lower TPC. The findings indicate that storing eggs at ambient temperatures leads to a rapid deterioration in all quality parameters after the 15th day, while refrigerated eggs maintain their quality throughout the entire study period. This study highlights the importance of maintaining a cold chain during the storage and transportation of eggs, especially in tropical countries, to preserve their quality and minimize the risk of spoilage.

Keywords: Ambient, Refrigerated, Egg storage, yolk index and Haugh units

PV-07

Quality evaluation and shelf life study of chicken meat patty incorporated with chicken blood plasma and mint powder (Mentha spicata)

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The demand and popularity of ready-to-eat or ready-to-cook chicken products is increasing in urban areas. Chicken patties are one of such products. Chicken blood is the by-product which can successfully enhance the nutritive value of the product. Mint is the herb with multiple beneficial properties like antioxidant, antimicrobial etc. The present study was conducted for quality evaluation and shelf-life study of chicken meat patty incorporated with chicken blood plasma (CBP) and mint powder (MP). Total 5 treatment groups were made; viz., T_0 (Control), T_1 (15% CBP), T_2 (15% CBP+0.5% MP), T_3 (15% CBP+1.0% MP) and T_4 (15% CBP+1.5% MP). The physiological, microbiological, organoleptic and shelf-life studies were evaluated at every 3 days interval till 15th day. The TBARS value was found to be the lowest in T_4 (0.50) among all groups on the first day. The water activity and microbial count was noted to be decreased in T_4. Emulsion stability was improved among plasma added groups (T_0, T_1 T_2, T_3 and T_4). The study revealed that chicken meat patties can be prepared with 15 % meat replacement by chicken blood plasma incorporating mint powder at three different levels. Among all the treatment groups, chicken meat patties with 15% CBP and 1.0% mint powder gave the best results in terms of economy and value addition.

Keywords: Mint powder, chicken meat patty, shelf life, chicken blood plasma

PV-08

Effect of dietary supplementation of thyme and garlic essential oils on the growth performance, carcass characteristics and meat quality in commercial broilers

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This study was conducted to evaluate the effect of dietary supplementation of thyme and garlic essential oils on the growth performance, carcass characteristics and meat quality. Two hundred day old commercial broiler chicks were randomly allotted to four dietary treatments with ten replications of 5 birds each and reared in battery brooder up to 42d of age. Broilers were fed on corn-soy-based broiler pre starter (1-14 d), starter (15-28d) and finisher (29-42d) diets. The treatment consists of

control diet supplemented with no essential oil (CD), control diet supplemented with thyme essential oil (TEO) or garlic essential oil (GEO) @ 25 g/100kg and thyme and garlic essential oil (TGEO) @ 50g/100kg.At the end of 42 d the results showed that body weight gain (BWG), Overall feed consumption and FCR were significantly (P<0.05)increased in birds supplemented with essential oils. Carcass parameters were not influenced by dietary treatments. Physicochemical properties in terms of drip loss, cooking yield, cholesterol and shear force and fatty acid profile were significantly (P<0.05) improved by supplementation of essential oils. Proximate composition such as dry matter, crude protein, crude fat and total ash were not influenced by dietary treatments. Meat quality in terms of texture profile analysis, meat colour, sensory quality, pH, TBARS and microbial count were significantly (P<0.05) improved in birds fed with essential oils compared to control. Based on the overall results, it is concluded that TEO@25g/100kg or GEO@25 g/100kg may be supplemented to broiler diet for improved growth, better meat quality and storage stability. Combination of thyme and garlic essential oils @50g/100kghad no additional advantage on growth parameters and meat quality.
Keywords: Body weight, Broiler chicken, feed intake, Garlic, Thyme, Meat Quality, Storage studies, Microbiological studies

PV-09

Comparative evaluation of conventional vis à vis herbal antioxidant supplementation on enhancing broiler chicken performance and meat quality

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Under intensive production systems, broiler chickens are exposed to various stress factors that can lead to oxidative stress, ultimately affecting their production performance and meat quality. To mitigate this stress, feed additives containing antioxidants are commonly used. Conventionally, Vitamin E and Selenium have been the preferred antioxidants in poultry production. In this study, a comparative evaluation was done between conventional and herbal antioxidants *viz.*, garlic and thyme on the performance and meat quality. Day-old broiler chicks (405) were randomly divided into 9 treatment groups with three replicates having 45 birds each. The treatment groups were supplemented with two levels of sodium selenite *viz*., 0.15 ppm (T2) and 0.3 ppm (T3); two levels of vitamin E *viz*., 150 IU/kg (T4) and 300 IU/kg (T5); two levels of garlic powder *viz*., 0.5 % (T6) and 1 % (T7); two levels of thyme powder *viz*., 0.5 g/kg (T8) and 1 g/kg (T9) and T1 group was the control, fed with the basal diet (Selenium, 0.23 ppm and vitamin E 40 IU/kg). After 42 days of feeding, three birds from each group were slaughtered conventionally, and their carcasses were stored in polyethylene bags at 4°C for 10 days. Carcass characteristics were then measured on days 1, 3, 7, and 10 of storage. The supplemented groups did not affect cumulative body weight, feed intake, and feed efficiency. Dietary selenium, Garlic and Thyme increased spleen weight and antibody titers against IBDV. Meat colour - lightness (L*), redness (a*)and yellowness (b*) values during storage showed no significant difference except for the b* value on day 10 with the lowest value found in the selenium group (0.15 ppm) group. Selenium (0.15 and 0.3 ppm), garlic powder (1 %) and thyme powder (0.5 g/kg) supplementation retained a slightly lower pH in thigh meat. Garlic (1 %) decreased the drip loss and in all the supplemented groups, the water holding capacity of the breast and thigh meat increased during storage. Dietary selenium (0.3 ppm) and both the levels of Vitamin E, Garlic and Thyme influenced the oxidative stability of the meat during storage. Vitamin E and thyme supplementation reduce breast meat's fat (%) content. The results demonstrated that Garlic powder (1 %) and Thyme powder (0.5 g/kg) were as efficient as selenium (0.3 ppm) and Vitamin E (300 IU/kg) in enhancing the meat quality and immune status of broilers.
Keywords: Antioxidants, Garlic powder, Herbal antioxidants, Meat quality, Thyme powder

PV-10

Influence of different watering systems on carcass characteristics and intestinal histomorphometry of broiler chicken

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A biological trial was conducted in broiler chicken from 0 to 35 days of age to assess the influence of different watering systems on carcass characteristics and intestinal histomorphometry of broiler chicken. One hundred and eighty, sex separated commercial broiler chicks were randomly allotted in to five treatment groups with three replicates per treatment. The treatment groups were reared with one of the five experimental watering systems as follows: Bell drinker (T_1), nipple drinker (T_2), floating cup drinker (T_3), basin drinker (T_4) and linear channel drinker (T_5). The chicks were reared in deep litter system in a gable roofed, open sided house under standard management conditions. The result revealed that percentage of dressing yield, eviscerated carcass yield and giblet yield were significantly ($P<0.01$) higher in T_3, T_5 and T_4 than T_1. The percentage of small intestine was significantly ($P<0.01$) higher in T_5 and T_4 than T_1 and T_2, whereas T_3 recorded intermediary result. The abdominal fat yield was significantly ($P<0.01$) higher in T_5 and T_4 than T_2, whereas T_1 and T_3 recorded intermediary result. There were no significant differences in the yield of back, thigh and wings. The breast yield was significantly ($P<0.01$) higher in T_3, T_5 and T_4 than T_1 and T_2. Similarly, the drumstick yield was significantly ($P<0.05$) higher in T_3 than T_1, whereas other treatment groups had intermediary result. The neck yield was significantly ($P<0.05$) higher in T_1 than T_4 and T_5. The intestinal villi length was significantly ($P<0.01$) higher in T_5 and T_4 than T_2, whereas T_1 and T_3 did not differ significantly with either of the groups. The ratio of *villi* length: crypt depth was significantly ($P<0.01$) higher in T_5 than T_3 and T_2, while other treatment groups (T_1, T_4) did not differ significantly with either of the groups.

Keywords: Watering systems, broiler, carcass characteristics, villi length, villi length:crypt depth

PV-11

Effect of *Spirulina platensis* and *Garcinia indica* extracts as natural antioxidantson physico-chemical qualities of chicken patties at different shelf life intervals

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The purpose of the current study was to optimize the level of incorporation of *Spirulina platensis* extract (SPL) and *Garcinia indica* extract (GID) in chicken patties. Different solvents viz. ethanol, methanol and water were used to finalize the best extracting solvent.Three different levels for SPL (0.5% 0.75% and 1%) and GID (0.25%, 0.5% and 0.75%) were analyzed on the basis of pH, color, texture and sensory evaluation for the development of chicken patties. Based on the observation of these parameters the best suitable level of incorporation of SPL extract (0.75%) and GID extract (0.5%) were finalized and incorporated in chicken patties. The chicken patties developed with 0.5% GID extract had better color, flavour, texture and overall acceptability than the other sample levels. The control samples (T-1), BHT (100ppm) treated chicken patties (T-2), SPL treated chicken patties (0.75%) (T-3) and GID treated chicken patties (0.5%) (T-4) were stored under aerobic conditions at 4±1ºC for 28 and evaluated for physio-chemical, oxidative stability, instrumental color, textural, microbiological and sensory properties at regular interval of 7 days. The increasing trend in pH, TBARS, FFA, peroxide value, microbial counts were observed in control samples, but the rate of increase was significantly lower ($p<0.05$) for the treatment products. It was concluded that under aerobic packaging, chicken patties incorporated with 0.5% *Garcinia indica* extract had better storage stability, which was compared to BHT (100ppm) i.e., the synthetic anti-oxidant.

Keywords: Antioxidant, extraction, physio-chemical, oxidative stability, storage stability, aerobic packaging

PV-12

Carcass characteristics of Ducks and formulation of Duck meat tandoori

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In order to promote duck meat consumption, this study was undertaken to determine the carcass characteristics of ducks and development of a duck meat product i.e. Duck Meat Tandoori. It was observed that the live weight of White Pekin, Khaki Campbell and Kuzi ducks were2131g, 1324g and 1468g respectively. The dressing yield measured in terms of percent eviscerated wt. was to the tune of 71.58, 67.32 and 68.23% following respective pattern. A meat product namely "Duck Meat Tandoori" was prepared in laboratory using White Pekin meat in 3 batch trials with varying in marination and cooking time combinations. The carcass was cut into pieces weighing 40g each and marinated for 3 time periods (5, 10, 15 hrs) with curd, vinegar, duck eggs, spices and condiments powder. The pieces were subjected to cooking in a pre-heated microwave oven for 3 cooking variables viz. 25, 30, 35 minutes followed by in combi-grill mode cooking. The Tandoori product so obtained was examined for organoleptic evaluation (Colour and appearance, flavour, binding, texture, juiciness, after taste, overall acceptability) by test panel. The initial 2 batches had average acceptability score of 3.27, 4.42 while in third batch combination with 15hrs marination and 35-35 min. cooking was accorded a score as 5.53 - Good in the 8 point descriptive scale (8 indicates extremely desirable and 1 indicates extremely undesirable). The majority panel members suggested for averting a peculiar meaty flavour in after taste category. It was concluded that the duck meat tandoori is a good delicacy and may be used by consumers
Keywords: Duck meat, carcass characteristics, duck meat tandoori, organoleptic evaluation

PV-13

Comparison of the carcass characteristics of farm reared Siruvidai Native Chicken with Free range Siruvidai, cross native chicken and commercial broilers

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A study on carcass characteristics was conducted among the four groups of chicken namely farm reared Siruvidai, free range Siruvidai, commercial broiler and commercially reared native chicken. 48 samples were used for slaughter studies (Each group of 12 birds). The carcass parameters namely live weight, blood loss percentage, feather loss percentage, New York dressed weight, eviscerated weight, ready to cook weight and giblet weight were studied. The results revealed that the broiler attained a significantly higher body weight (2243.16 ± 108.21) than all other groups but among the native chicken, farm reared siruvidai attained higher body weight (1560.33 ± 85.21) than all other native chicken. Blood loss percentage was highly significant in free range Siruvidai (3.54 ±0.48) and the lowest value was observed in cross native chicken (2.17^{c} ±0.29). New York Dressed weight was highly significant in broiler (2072.83 ± 102.58) compared to other groups but among the native chicken farm reared siruvidai New York Dressed weightwas highly significant (1461.33 ^{b}±79.66) than the other native chicken. Eviscerated carcass weight was highly significant in broiler (1585.08 a±76.45) but compared to the native chicken farm reared siruvidai ECW was (1144.16 ±60.23) and the lowest value was observed in free range Siruvidai (767.33 ±38.69). Ready to cook weight was highly significant in broiler (1684.83 ± 80.95) but among the native chicken, farm reared siruvidai (1194.25 ±60.92) andleast value is 812.50 ±39.36 in free range siruvidai. Giblet weight was also highly significant in broiler (99.75^{a}±6.74). Amongthe native chicken, Cross native chicken had high giblet weight (62.83 ±3.79) and

the lowest value was obtained in free range siruvidai (45.16 ±2.96). It can be concluded that the major carcass characteristics were observed to be significantly higher in commercial broilers but among the native chicken group farm reared siruvidai chicken significantly higher in carcass characteristics than other native chicken

Keywords: Native chicken, slaughter studies, Carcass weight, Giblet weight of native chicken.

PV-14

Effect of black soldier fly larvae meal on production performance and egg quality in layers

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An experiment was conducted on the effect of black soldier fly larvae meal on production performance and egg quality traits in layers by using 144 BV-300 hens. Birds were randomly allotted into 4 dietary treatments with 6 replicates comprising 6 birds per replicate. The treatments were control- T1 (basal diet), T2(1.5% BSFL meal), T3(3% BSFL meal) and T4(4.5% BSFL meal). Productive performance was expanded for 10 weeks and egg quality was determined once two weeks from 2 eggs per replicate collected randomly. The result showed that layer birds fed with 4.5% BSFL meal recorded significantly ($P<0.05$) higher feed consumption, weekly egg production, weekly egg biomass, and average egg weight per bird as compared control birds. The weekly FCR on egg biomass basis achieved by the birds fed with 4.5% BSFL meal recorded significantly ($P<0.01$) better FCR as compared to the control and 1.5% BSFL meal fed birds, however, non-significant with 3.0% BSFL meal fed birds . The provision of BSFL meal up to 4.5% had non-significant effect ($P>0.05$) on body weight, HHEP, HDEP, and FCR on egg number basis. The egg quality parameter viz. egg weight, shape index, yolk index, yolk color score, eggshell thickness were found non-significant fed in BSFL meal as compared to control. The livability was observed cent percent during experimental period. In conclusion, dietary supplementation of BSFL meal up to 4.5% in basal diet may be feasible for the effective increase in production performance of laying hens partially enhanced egg quality parameters and economically beneficial.

Keywords: Black soldier fly larvae, Layers. Egg production,

PV-15

Comparative efficacy of various decontaminants on shelf life of chicken at refrigeration temperature

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The current study was planned to assess the efficacy of Sodium hypochlorite, Lactic acid and UV-C light decontamination technique on shelf life of fresh raw chicken stored at refrigeration temperature (0-4^{o}C). A total of 60 raw chicken carcasses were collected DST Poultry and Goat Meat Processing Demonstration Unit, Parbhani (India). Carcasses were splitted in two equal halves and a total of 120 splitted carcasses grouped in 4 groups (n=30) were treated with Control ('C'), Sodium hypochlorite ('SH', 50 ppm), Lactic acid ('LA', 2%) and UV-C light ('UV', 415.75 mJ/cm^2). The carcasses were sampled at 0, 24, 48, 72 and 96 hours of storage (0-4^{o}C) to assess microbial, physicochemical, sensory and instrumental quality. On 96 hours of storage, TVC and *Staphylococcus* spp. count of all treatment groups remains significantly lower than 'C' group. Whereas 'LA' and 'UV' treatments were successful in reducing the load of *E. coli* count. Further, the 'LA' group significantly ($p<0.05$) lowered Yeast and Mould count at 0 hours than the other groups. All the groups were found to be negative for *Salmonella* spp. Throughout

the storage period, pH, Peroxide (POV) and TBARS values increased significantly ($p<0.05$) in each treatment group, however, 'LA' group displayed significant ($p<0.05$) lower pH, higher TBARS and POV values. The sensory score was significantly lower in 'LA' treatment group compared to the other groups. The Instrumental Hunter colour and Texture Profile Analysis values between treatment groups showed non-significant correlation. The Sodium Hypochlorite (50ppm), Lactic acid (2%) and UV-C light (415.75mJ/kg) decontaminants were found to extend the shelf life of chicken by 1 day at refrigeration storage (0-4ºC), but based on microbial, physicochemical and sensory qualities, UV-C light (415.75 mJ/cm^2) decontamination technique was found effective.

Keywords: UV-C light, Lactic acid, Sodium hypochlorite, Shelf life, Chicken

PV-16

Nanoencapsulation of plant based essential oil as novel substitute to antibiotic growth promoters enhanced the quality of broiler chicken meat

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A biological study was conducted to investigate the effect of utilizing nanoencapsulated Lavender essential oil (LEO) as green alternative to antibiotic growth promoters on meat quality parameters in broiler chicken. A total of 420 day old Cobb broiler chicks at one week of age were randomly distributed into 7 dietary treatments: CN (Control)-fed basal diet only; AB (Antibiotic)-basal diet + 10 mg/kg Enramycin; CS (Chitosan)-basal diet + 300 mg/kg chitosan nanoparticles; LEO_{F200} (basal diet + 200 mg/kg free LEO); LEO_{F400} (basal diet + 400 mg/kg free LEO); LEO_{N200} (basal diet + 200mg/kg nanoencapsulated LEO) and LEO_{N400} (basal diet + 400mg/kg nanoencapsulated LEO). Each group contained 4 replicates and each replicate had 15 birds fed with a corn-soybean based diet for 42 days of age. The results revealed a significant difference in the physicochemical parameters like water holding capacity (WHC), drip loss (DL), extract reserve volume (ERV), cholesterol, wherein WHC and ERV was significantly increased and DL and cholesterol was significantly decreased in nanoencapsulated REO supplemented groups. Lipid peroxidation parameters like thiobarbituric acid reactive substance, free fatty acids and peroxide value showed a significant decrease in free oil and nanoencapsulated REO supplemented groups. The antioxidant parameters like ABTS and DPPH values indicated a significant increase in free oil and nanoencapsulated REO supplemented groups. In conclusion, supplementation of nanoencapsulated LEO @ 200 and 400 mg/kg can prove to be beneficial in improving the meat quality in broiler chicken.

Keywords: Lavender essential oil, meat quality, nanoencapsulation, broilers

PV-17

Effect of different dietary energy and protein levels on egg quality traits of Aseel cross at 40 weeks of age

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A study was conducted to optimize energy and protein requirement in native chicken variety (Aseel cross) for a period of 0-60weeks age involving 540 chicks. In the first phase, nine diets were formulated with three levels of energy (2500, 2600, 2700 kcal ME/Kg) each with three levels of protein

(16, 17 and 18% CP) following 3x3 factorial design. Each treatment was allotted with six replicates with 10 chicks each. In the second phase (13-20 wks)the birds fed with same three levels of energy each with three levels of protein (12,13, and14 % CP) and in third phase (21-60 wks)birds fed with three levels of energy (2400, 2300, 2200 kcal ME/Kg) each with three levels of protein (12,13, and14 % CP).Different treatments received same management practices and eggs were collected at 40 weeks of age and analysed for egg quality traits. The treatments T6 (48.64 g) and T7 (48.56 g) showed significant (P<0.05) difference in egg weights than T8 (44.07 g) treatment. Low protein (P3:12%) diet had significantly (P<0.05) higher egg weight (47.49 g) and high surface area(70. 91sq.cm) than medium (45.60 g;68.66 sq.cm) 13% CP diet. Shape index, specific gravity and Yolk index were not influenced by the different dietary levels. Albumen index was significantly higher in treatment T3 (0.17) than T1 (0.09) and T8 (0.11).Treatment T3(107.45) had significantly (P<0.05) higher Haugh unit than T1(92.06), T2 (91.35) and T8 (91.85). Yolk colour was significantly higher in T5 (7.56) and T6 (7.56) than T9 (0.40) treatment group and also shell thickness shown significant effect in T1 (0.45) than T3 (0.39) and T8 (0.40) treatment groups. The results of egg quality traits revealed that the egg weight, surface area, albumen index, Haugh unit, shell thickness and yolk colour showed significant differences among other egg equality traits.

Keywords: Energy, Protein, Egg quality Traits and Native Chicken

PV-18

Development and assessment of ready-to-cook chicken chips for its physico-chemical, antioxidant and antimicrobial properties

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Ready-to-cook chicken chips were developed with fenugreek leaves (FL) and fenugreek seeds (FS) powder. For this, 20 numbers of spent hens were used and chips were prepared. Four groups T_0 (Control), T_1 (FL with 0.25% leaves powder), T_2 (FS with 0.25% seed powder) and T_3 (FL+FS with 0.25% each) were formed. The ethanolic extracts of fenugreek leaves and seed powder demonstrated remarkable antioxidant activity in terms of DPPH, Total phenolic and Ferric reducing activity. The extracts of fenugreek seeds exhibited anti-bacterial effect against *E. coli.* Proximae findings revealed moisture level to increase on 30th days of storage while crude protein was significantly (P<0.05) high in T_2 and T3. Ether extract and total ash showed no alterations. The pH significantly decreased (P<0.05) while water activity augmented on 30th day when compared with 0th to 20th day of storage. Cooking yield revealed no significant changes. The TBA decreased significantly (P<0.05) on the 10th day but remained static up to 30 days of storage. The cholesterol content of the chips showed no changes. The product scored very low in terms of flavour, after-taste and overall acceptability with increase in level of leaves and seeds powder. Groups as T_0, T_1 (FL with 0.25% leaves powder), T_2 (FS with 0.25% seed powder) and T_3 (FL+FS with 0.25% each) were formed. Increase in DPPH activity in all the groups revealed its potential antioxidant capacity. The products were found free from Coliform, Salmonella, Staphyloccocal bacteria, yeast and mould which ensures the microbial safety of the product and evidence of viable microbial growth was noticed up to 20th day under aerobic packaging storage. Chicken chips can be prepared effectively with Fenugreek leaves at 0.25% level using spent hen meat with 'good' acceptability and having considerable health benefits.

Keywords: Chicken chips, fenugreek seeds, fenugreek leaves, physico-chemical

PV-19

Reducing cholesterol in Japanese quail meat by feeding spice mixture

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An experiment was conducted to study the changes in the level of cholesterol in Japanese quail meat along with their production performance when feeding with different levels of spice mixture viz. 0 per cent (T_1), 0.25 per cent (T_2), 0.50 per cent, (T_3), 0.75 per cent, (T_4) and 1.00 per cent (T_5) spice mixture inclusion in the basal diets. The spice mixture consisted of 12% turmeric, 24% cumin, 24% coriander, 24% fennel, 8% fenugreek, 4% dried ginger and 4% black pepper. The results revealed a significant difference ($p<0.05$) in second and third week body weights, however no difference in final fifth week body weight. Similarly no significant difference was noticed in feed consumption, feed conversion ratio and livability due to inclusion of spice mixture at different levels. Though insignificant difference was observed in carcass characteristics viz. dressing percentage, giblets percentage and ready-to-cook yield percentage, a significant reduction ($p<0.01$) in abdominal fat percentage was noticed in all spice mixture included treatment groups at fifth week of age. The total serum cholesterol level in males ($P<0.05$), females ($p<0.05$) and combined sex ($p<0.01$) was significantly lower in T3, T4 and T5 when compared to T1 and T2. Highest total serum cholesterol was noticed in T1 (196.3 mg %) and lowest in T3 (150.0 mg%). However, an inconsistent result was obtained in meat cholesterol level due to spice mixture inclusion. Addition of spice mixture at 0.25 per cent level in Japanese quail increased the relative economics of producing Japanese quail meat.

Keywords: Japanese quail meat, Spice mixture, cholesterol

PV-20

Comparative efficacy of various decontaminants on shelf life of chicken at refrigeration temperature

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The current study was planned to assess the efficacy of Sodium hypochlorite, Lactic acid and UV-C light decontamination technique on shelf life of fresh raw chicken stored at refrigeration temperature (0-4^{o}C). A total of 60 raw chicken carcasses were collected DST Poultry and Goat Meat Processing Demonstration Unit, Parbhani (India). Carcasses were splitted in two equal halves and a total of 120 splitted carcasses grouped in 4 groups (n=30) were treated with Control ('C'), Sodium hypochlorite ('SH', 50 ppm), Lactic acid ('LA', 2%) and UV-C light ('UV', 415.75 mJ/cm^2). The carcasses were sampled at 0, 24, 48, 72 and 96 hours of storage (0-4^{o}C) to assess microbial, physicochemical, sensory and instrumental quality. On 96 hours of storage, TVC and *Staphylococcus* spp. count of all treatment groups remains significantly lower than 'C' group. Whereas 'LA' and 'UV' treatments were successful in reducing the load of *E. coli* count. Further, the 'LA' group significantly ($p<0.05$) lowered Yeast and Mould count at 0 hours than the other groups. All the groups were found to be negative for *Salmonella* spp. Throughout the storage period, pH, Peroxide (POV) and TBARS values increased significantly ($p<0.05$) in each treatment group, however, 'LA' group displayed significant ($p<0.05$) lower pH, higher TBARS and POV values. The sensory score was significantly lower in 'LA' treatment group compared to the other groups. The Instrumental Hunter colour and Texture Profile Analysis values between treatment groups showed non-significant correlation. The Sodium Hypochlorite (50ppm), Lactic acid (2%) and UV-C light (415.75mJ/kg) decontaminants were found to extend the shelf life of chicken by 1 day at refrigeration storage (0-4ºC), but based on microbial, physicochemical and sensory qualities, UV-C light (415.75 mJ/cm^2) decontamination technique was found effective.

Keywords: UV-C light, Lactic acid, Sodium hypochlorite, Shelf life, Chicken.

PV-21

SESSION VI

ALTERNATE, FREE RANGE, PET AND WILD LIFE

AFP-01

Performance of Daothigir chicken breed in an intensively managed system in Assam

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This study presents an investigation of the performance of *Daothigir* chickens in intensive management system. Various parameters including body weight at different weeks of age, conformation traits, Feed Conversion Ratio (FCR) at the 5th week, age at maturity, egg weight at the 32, 42, 52 and 72 weeks, egg production up to the 72nd week, egg fertility and hatchability, carcass characteristics, and egg quality were assessed. The combined-sex day-old body weight was recorded as 27.30±0.12 g. At 20 weeks of age, the *Daothigir* breed reached a body weight of 1190±3.05 g. Parameters measured at the 5th week included Feed Conversion Ratio (3.10), breast angle (42.20°±0.18), shank length (51.30mm±0.17), and keel length (55.7mm±0.19). Egg production at the 72nd week was noted as 116.70 eggs. Egg quality indicators, albumen index (3.85±0.93), yolk index (0.49±0.43), and Haugh units (83.16±3.34), were determined at the 72nd week. Dressing and giblet percentages for males and females were 73.88±2.68, 72.22±3.51 and 5.76±0.67, 6.75±1.02, respectively. In conclusion, the *Daothigir* breed exhibits significant production potential within an intensive management setting.

Keywords: Daothigir, performances, egg quality, dressing percentage, intensive system.

AFP-02

Comparative analysis of backyard chicken egg and meat production and their consumption among producers for household needs in Anantapur and Satya sai districts of Andhra Pradesh

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Rural backyard chicken farmers produce a significantly lower amount of meat and chicken than commercial poultry farmers. In spite of low production numbers, backyard producers consume only a small percentage of their produce, limiting their household nutritional requirements. The present study investigated the self-utilization patterns of backyard chicken eggs and meat produced by local farmers and their impact on household food security. Data was collected through a structured questionnaire administered to 200 backyard chicken farmers in each of the districts of Anantapur and Satya Sai in Andhra Pradesh. Demographic information, backyard chicken egg and meat production, consumption practices, and factors influencing production and consumption were included in the survey. In the study, it was found that most producers use the majority of their eggs for purposes other than household consumption. Primarily, eggs are used either for hatching chicks or sold to local vendors and were occasionally consumed by the producers. Conversely, the chicken meat produced by the surveyed producers is mostly used for household consumption and occasionally sold as live birds to local vendors and nearby markets. However, the consumption of chicken meat is heavily influenced by seasonal variations and festive occasions. It is inferred from the study that producers prioritize income generation and future production over immediate consumption for household needs. Considering food security and nutritional needs, the study highlights the importance of exploring sustainable strategies for increasing egg and meat utilization among rural backyard poultry producers to ensure their nutritional security.

Keywords: Backyard poultry production, consumption, household utilisation, nutritional security

AFP-03

Replacement of wheat with Cassava (*Manihot esculenta Crantz, Euphorbiaceae*) for meat production in White Pekin Ducks

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An experiment was conducted to find out the effect of replacing wheat with cassava (*Manihot esculenta Crantz, Euphorbiaceae*) in the diet of White Pekin ducks for meat production. White Pekin ducks (240, day old) were divided into three treatment groups with four replicates in each group and each replicate had 20 ducklings. Three experimental diets without (Cassava-0) and with cassava, replacing 25 (Cassava-25) and 50 (Cassava-50), percent wheat were prepared. The above three diets were offered randomly to the above three groups for 8 weeks; and the data recorded were daily feed intake and weekly body weight. Carcass characteristics parameters were studied on four ducks from each group (one duck from each replicate), following standard procedures. All the three experimental diets were isonitrogenous (22.04-22.25% CP) and isocaloric (2866.25-2888.95 kcal ME/kg). There was no significant difference (P>0.05) in the body weight (2290.39-2338.83 g) among the groups. The daily feed intake in Cassava-50 group (127.59g) was similar (P>0.05) to Cassava-0 group (126.69g) and Cassava-25 (136.04g) group. The cumulative feed intake in Cassava-50 group (5548.01 kg) was similar (P>0.05) to Cassava-0 group (5573.61 kg); but significantly lower (P<0.05) than the Cassava-25 group (5689.30 kg). Although, there was significant difference (P<0.05) in the feed conversion ratio values between Cassava-25 group (2.54) and Cassava-50 group (2.42); but both were similar with Cassava-0 group (2.49). The body weight (2517.00-2563.25, g) and eviscerated weight (62.43-63.22, %) was similar (P>0.05) among the groups. There was no significant difference (P>0.05) in different body parts as percentage of eviscerated weight *viz.* neck (9.95-11.47), legs (22.35-22.76), breast (24.32-26.46), back (23.82-24.78) and wings (15.04-15.39). It can be concluded that wheat can be replaced with cassava up to 50% level in the diets of white Pekin ducks for meat production.
Key words: Cassava, Ducks, Meat, Wheat, White Pekin

AFP-04

Duck production in Assam: its flock dynamics, management, diseases and preventive measures

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The present study was conducted to investigate flock dynamics, management practices and occurrence of diseases and their prevention in ducks. Data were collected through questionnaires distributed among 200 duck farmers in Sivasagar, Sonitpur, Dhubri and Nagaon districts of Assam. Fifty duck farmers were selected from each district randomly. Primary data were collected by personal interview method and were analyzed with descriptive statistics using range and percentage. Results showed that majority (79.0%) of duck farmers had a flock size ranged between 1-10, while some (13.0%) had flock strength of 11-25 and remaining (8.0%) had flock size of more than 25. The most common breed of duck was Pati (82.50%) followed by graded (15.50%) and local (Muscovy) duck (2.0%) reared by duck farmers. Majority (94.0%) of respondents raised duck in extensive system without any supplemental feed except kitchen wastes. However, they provided night shelter/housing (98.0%) and commercial chicken feed (2.0%) for ducks. Cooked rice and rice bran were the most (68.0%) common feed provided for ducks. Most (98.0%) of the farmers practiced natural brooding, while only few farmers (2.0%) practiced artificial brooding. Most prevalent disease of ducks were duck plague (95.0%), duck cholera (2.0%), botulism (2.0%) and miscellaneous (1.0%). Most common causes of mortality in ducklings were cold shock (58.0%), drowning (26.0%) and predators (16.0%). None of the ducks were vaccinated against any diseases. Non-availability of vaccines (93.0%) and non-

availability of vaccines package with minimum *i.e.* <50 doses (5.0%) and lack of skilled person (2.0%) were the main causes of non-vaccination of ducks as responded by the owners. Improved management practices including proper housing, good nutrition, improved health care and vaccination facilities would be a boon for the duck farmers to improve productive performance and reduce occurrence of duck diseases.

Keywords: Duck production, flock dynamics, management, disease, preventive measures

AFP-05

Evaluation of diverse economic characteristics of Kamrupa and Indigenous chickens within the context of backyard rearing in Assam

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Kamrupa, a dual-type, high-yielding chicken breed developed through the efforts of the AICRP on Poultry Breeding at AAU, Khanapara, has been successfully introduced across various regions of the North East. The productive performance and economic characteristics of Kamrupa chickens within the context of the backyard rearing system in Assam were evaluated. The average body weights for Kamrupa chickens were 37.60±2.90 (day old), 220.50±38.20 (5 weeks), 1030.50±110.30 (20 weeks), 1710.60±410.50 (40 weeks), 1790.60±380.30 (52 weeks), and 2010.20±290.10 g (72 weeks). In comparison, the indigenous chicken recorded weights of 34.20±2.60, 110.30±32.70, 720.70±110.70, 1260.60±410.60, 1410.20±320.40, and 1630.30±310.20 g at the respective age points. The shank length, breast angle, and keel length were documented for Kamrupa and indigenous chickens raised under free-range conditions. Specifically, Kamrupa exhibited shank lengths of 49.90mm±4.30, a breast angle of 51.70 degrees ±7.20, and a keel length of 53.90mm±8.20. The corresponding measurements for indigenous chickens were 50.30mm±3.10, 49.70 degrees ±6.40, and 52.10mm±7.30. Egg production data highlighted that Kamrupa chickens achieved higher production figures. They yielded 43.90±2.60, 85.50±5.60, and 148.60±10.80 numbers of egg up to 40, 52, and 72 weeks, respectively. In contrast, indigenous chickens yielded 24.90±2.50, 44.80±3.50, and 76.30±4.30 numbers of egg over the same time spans. In conclusion, the study implies that Kamrupa chickens exhibit superior performance compared to indigenous chickens in terms of body weight, egg production, and various other traits when reared under the backyard system in Assam.

Keywords: Kamrupa chicken, Indigenous chicken, carcass, egg quality, hatchability.

AFP-06

Performance studies on Turkey birds under agro-climatic condition of Assam

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Records pertaining to 500 nos of board breasted bronze and board breasted white variety of Turkey reared at farmers' house under on farm trail (OFT) programme and Turkey village adoption programme of KVK, Kamrup and Baksa for 3 years were utilized to carry out the study. A total of 50 nos of farmers reared 10 nos of each under the OFT programme and Turkey village adoption programme. The mean body weights (g) at 1st week of male and female birds were 123.00±2.34 and 98.00 ± 1.23 respectively. The mean adult body weights (Kg) of male and female birds were 8.21±1.24 and 5.86 ±

1.16 respectively. The average early poult mortality % was 2.00 ±0.21. The average marketable weight at 7 month of Tom was 9.32 ± 2.57 Kg and average dressing percentage was 78.00±2.43. The average age and body weight at first egg were 101.00 ±2.56 days and 5.95±0.87 Kg. The average annual egg production was 92.00±3.78 nos and average egg weight 68.65±0.54 g. The average hatchability % was 80.00±0.98 and the average feed conversion ratio (FCR) was 1.27±0.32. The average cost benefit ratio (B:C Ratio) of turkey birds reared for meat purpose under field condition was 6.07±0.360, thus it indicated rearing of turkey birds is a profitable venture.

Keywords: Turkey, body weight, Age at first egg, egg weight, hatchability, mortality, FCR

AFP-07

Reproductive and productive performances of Japanese quails (C*oturnix japonica*) under agro-climatic condition of Assam

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Records pertaining to 900 nos of Japanese Quails reared at farmers' house under on farm trail (OFT) programme of KVK, Baksa, Nalbari and Kamrup of Assam Agricultural University for 3 years were utilized to carry out the study. A total of 18 nos of farmers selected and each farmer reared 50 nos of quails under the OFT programme. The mean body weights (g) at day old, 1st week, 2nd week, 3rd week, 4th week, 5th week, 6th week, 7th week, 8th week, 9th week and 10th week were 8.561±0.071, 25.882 ± 0.224, 64.412±0.450, 112.647 ± 0.655, 176.150 ± 1.175, 221.214 ± 1.239, 248.123 ± 1.339, 260.861 ± 1.428, 281.155 ± 1.489, 309.706 ± 1.696 and 317.412 ± 1.798 respectively. The average daily body weight gain (g) during day old to 10th week of age was 4.412± 0.011. The average age at first egg was 43.910 ± 0.200 days. The average egg weight was 13.676 ± 0.109 g. The average mortality percentage from day old to 6th week of period was found to be 4.667 ± 0.435. The average feed conversion ratio (FCR) from day old to 6th week of period was found to be 2.56. The average hen day egg production and hen housed egg production during 6th week to 16th week were 57.809±1.120 and 42.785±0.551 respectively. The cost benefit ratio (B:C ratio) for meat production for period of 42 days and egg production for a period of 1.5 years was 1.7 and 1.3 respectively.

Keywords: Japanese quail, body weight, Age at first egg, egg weight, mortality, FCR, B:C ratio

AFP-08

Effect of feeding of peppermint and eucalyptus essential oils on the performance of Japanese quails *(Coturnix japonica)*

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Researchers are challenged with the task of identification of possible feed additives as a performance enhancer to replace use of antibiotics in poultry diets. The present work was aimed at determining effects of feeding peppermint and eucalyptus essential oils on the performance and carcass traits in Japanese quails for five weeks. A completely randomized design including 5 treatment groups each having 3 replications with12 birds was applied. The experimental treatment groups were: T0 control (basal diet), T1 (basal diet + 0.2% of peppermint essential oil), T2 (basal diet + 0.2% of

eucalyptus essential oil), T3 (basal diet + 0.1% of peppermint essential oil + 0.1% of eucalyptus essential oil) and T4 (basal diet + 0.05% of peppermint essential oil + 0.05% of eucalyptus essential oil). Growth parameters were studied at weekly intervals as well as during different period's *viz.* starter (1-2 weeks), finisher (3-5 weeks), and overall period (1-5 weeks). The results showed that the inclusion of peppermint and eucalyptus essential oils significantly (P<0.05) reduced feed intake, increased body weight gains, and improved feed conversion ratio with the best performance during all the periods found in the T3 group. The essential oils improved dressed yield without and with giblets. Yield of cut-up parts in terms of weights of thighs, breasts and drumsticks, and necks were significantly (P<0.05) improved in peppermint and eucalyptus essential oils supplemented groups with maximum thigh, neck, and breast weight observed in T3, while the highest drumstick weight was noted in T2 group of quails. Peppermint and eucalyptus essential oils are, therefore, suggested to be used as feed additives in quails' ration for higher profitability.

Keywords: Carcass traits, eucalyptus, peppermint, performance, quails

AFP-09

Comparative production performance of Kuzi duck of Odisha and its crosses with Khaki Campbell and White Pekin

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Duck is an important species of poultry having many advantages than chicken. Due to this duck as backyard poultry species is being reared in our country from centuries. They are known for their dark meat and larger size eggs production. Mostly indigenous duck are being kept by the farmers in the country. Kuzi duck which is native to Odisha having very good egg production potential. However, to see the cross performance of Kuzi (D) duck were cross with Khaki Campbell (K) and White Pekin (P) and produced four crosses viz. DK, KD, DP and PD. Along with the crosses three purebreds duckling were also hatched for comparison of different genetic groups for egg production parameters. Egg production data were recorded upto 40 weeks of age in all the seven genetic groups along with egg weight at 20, 30 and 40 weeks of age. Egg production per duck from 16-20 weeks of age varies from 2.67 egg in P to 41.47 eggs in KD and the number differ significantly (p<0.05) between the genetic groups. The egg production from 20 to 40 weeks of age varies from 59.22 eggs in W to 80.80 in DK and significant difference were observed between the genetic groups. The per day egg production up to 40 weeks of age in D, K, P, DK, KD, DP, PD were 102, 94, 59, 113, 117, 84 and 83 eggs, respectively. The egg production results revealed that the egg production improved in DK and KD crosses and Kuzi produced more number of eggs than Khaki. The heterosis% was positive for egg production in DK and KD and low in DP and PD crosses. The egg weight at 20 week varies from as low as 47.34 g in Khaki to 59.33 g in Pekin at 20 weeks of age in different genetic groups and at 30 weeks the egg weight was lowest in Khaki with 62.37 g and 69.22 g in White Pekin. The egg weight at 40 weeks of age in D, K, P, DK, KD, DP, PD were 69.00, 64.60, 73.38, 66.58, 68.21, 71.01, 70.44 g, respectively. The egg weights recorded at different weeks were also differing significantly between the genetic groups. The results revealed that Kuzi is performing better in respect to egg production among the three purebreds and better egg weight than Khaki and among the crosses DK and KD are producing well indicating these two crosses may be used for duck farming with higher egg production potential. However, before large scale supply of the crosses the production potential needs to be studied in a large population both at farm and field.

Keywords: crosses, egg production, egg weight, heterosis, Kuzi duck

AFP-10

Determination of optimum level of protein requirement for White Pekin ducks during grower stage.

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An experiment was conducted to determine the optimum level of crude protein requirements of White Pekin ducks during grower stage. From the earlier experiment it was observed that 2600 k cal ME/ kg diet was sufficient for growth and nutrient utilization. So keeping this ME level, three experimental diets containing CP-14%, CP-16% and CP-18% were formulated. For this experiment, 180 grower ducks of combined sex were randomly divided into three groups having six replicates in each group with 10 birds in each replicate. Care was taken to distribute equal number males and females in each replicate. The birds were reared in deep litter system with paddy husk as litter materials the three experimental diets were provided to three groups, respectively. The birds were reared from 9th week to 16th week. Clean drinking water was made available round the clock. The feed was offered *ad libitum* twice daily. Daily feed offered and residue left, weekly body weights were recorded up to 16th week. After 16th week, a metabolism trial was conducted to determine the metabolizability of different nutrients. The initial body weights of the ducks were 2141.11±23.11g, 2159.92±23.11g and 2152.58±23.16g, whereas the final body weight was 2553.71±24.45g, 2531.39±25.62g and 2522.33±23.99g in CP-14, CP-16 and CP-18 groups, respectively. No significant differences between the groups were observed. The average daily feed intake was 217.92±2.93g, 220.03±0.29g and 218.81±0.27g, in CP-14, CP-16 and CP-18 groups, respectively without any statistically significant difference between the groups. The total feed intake from 9th to 16th week was 15.25±0.20 kg, 15.40±0.02 and 15.32±0.02 kg in CP-14, CP-16 and CP-18 groups, respectively. The FCR in CP-14, CP-16 and CP-18 groups were 23.66±1.13, 25.70±1.06 and 25.19±1.04, respectively. No significant difference between the groups with respect to FCR was observed. From the perusal of nutrient metabolizability data it was observed that the metabolizability of DM, OM and CP was significantly lower in CP-14 group than other two groups fed with higher levels of protein in the diet. However, significantly ($p<0.01$) higher CF metabolizability was observed in lowest CP fed groups, i.e. CP-14 group than CP-16 and CP-18 groups. No significant difference with respect to EE metabolizability between the groups was observed.

Keywords: White Pekin ducks, protein, metabolizability, FCR

AFP-11

Assessment of performances of different poultry birds under backyard production system in Howrah district

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Backyard poultry production is one of the important livelihood options for rural women in terms of nutritional security as well as financial support which lead to women empowerment. The State ARD Department promotes this backyard system of poultry rearing by providing poultry birds at free of cost. Generally, Rhode Island Red (RIR) chicks are provided by them as it is one of the best dual purpose poultry birds available in the country. But rural women face a social problem as RIR chicks are very active foragers and often destroy the neighbouring fields and cause conflicts. Keeping this in mind Howrah KVK has designed one OFT to introduce two dual purpose poultry chicks *i.e.* Vanraja and Kadaknath to assess the performances of them over RIR in 2020-21 to 2022-23. Hundred farm women who are rearing RIR were chosen from four Blocks through SRS method for the study. Ten birds of Vanraja and Kadaknath were provided to them. Data on live weight were collected at 15th, 30th and 52nd week. Information on production of eggs was collected at 52nd week. The result shows that the performance of Vanraja is better than RIR in terms of production and farmers get more price as the egg colour is light brown like *deshi* hens. Though the performance of Kadaknath is also good and the meat is more nutritious but the breed is not accepted by some villagers due to black colour meat. Both the

breeds can solve the problem faced by the farmers as they do not damage the neighbouring filed which was one of the major concerns of the villagers.

Keywords: Backyard poultry, Vanraja, Kadaknath, RIR chicken, egg production, meat production

AFP-12

Evaluation of laying performance of four lines of Japanese quail

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The laying performance of four different lines (L1, L2, L3 and L4) of Japanese quail were estimated by rearing ninety females from each line, which were randomly selected at the end of fifth week and reared up to 16 weeks of age. The highly significant differences (P<0.01) were observed in body weight. The age at first egg of different lines did not differ significantly. The age at first egg laid was 47.90 (L4), 51.00 (L3), 51.70 (L3) and 52.50 (L4) days, respectively. The age at 50 per cent egg production showed significant difference (P<0.05) among them. The age at 90 per cent egg production did not differ significantly. The hen-housed and hen-day egg production of four different lines showed a non-significant and highly significant difference (P<0.01) highly significant difference (P<0.01) was observed in mean egg weight (g). The mean feed consumption (g) per day per bird differed significantly (P<0.01) from 6th to 16th weeks of age. The feed efficiency per dozen of eggs was highest in L4 (0.45) followed by L3 (0.50), L2 (0.54) and L2 (0.57).

Keywords: Japanese quail, feed consumption, feed efficiency, egg production, egg weight.

AFP-13

Effect of *Moringa oleifera* leaf meal on the performance of layer Japanese quails

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The study was aimed to note the response of *M. oleifera* leaf meal on performance and cost economics of Japanese quails. A total of 300 day-old Japanese quail chicks in trial 1, and 360 adult Japanese quails (270 females + 90 males) in trial 2 were procured for 1-6 weeks and 7-22 weeks, respectively, and randomly distributed in five treatments (T0, T0.5, T1, T1.5 and T2) of three replicates each, based on five different inclusions (0, 0.5, 1, 1.5 and 2%) of *Moringaoleifera*leaf meal. The results revealed adequate amounts of crude protein (30.21%) and fibre (8.12%) in *M. oleifera* leaf meal. Besides, significant (P≤0.05) improvements were recorded in growth traits, nutrients utilization, and production traits in T0.5, T1, T1.5, and T2 than T0. Significant (P≤0.05) improvements were also noted in fertility and hatchability of eggs, and serum biochemistry of quails in T0.5, T1, T1.5, and T2 than T0. As well as, the dressed yield improved insignificantly (P≥0.05) in trial 1 and significantly (P≤0.05) in trial 2 in T0.5, T1, T1.5, and T2 than T0. Furthermore, the average cooking loss in meat reduced significantly (P≤0.05) in T0.5, T1, T1.5, and T2 than T0. The meat was of good quality and eggs were slightly desirable to desirable in T0.5, T1, T1.5, and T2 than T0. At last, reduction in feed cost per kg live weight gain (` 9.8-45.84) and egg mass production (` 20.91-56.17) was noted in all the inclusion levels of *M. oleifera* leaf meal than T0. It can be concluded that dietary inclusion of *M. oleifera* leaf meal in Japanese quails at 2% inclusion level was best in terms of improved growth traits, nutrients utilization, production traits, serum biochemistry, carcass traits, and reduced cost of feed, and hence, can be recommended in diets of broiler and layer Japanese quails. Besides, a 1% level of inclusion was best in terms of improved reproductive and meat traits, and organoleptic properties of meat and eggs.

Keywords: Moringa oleifera, Performance, Japanese Quails

AFP-14

Effect of cage *vs* floor housing on egg production, egg quality and feed efficiency in Japanese quail layers

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The study was aimed to note and suggest the suitable system of rearing of quails under floor and cage systems on egg production, egg quality and feed efficiency so as to reduce housing cost and to achieve efficiency. A total of 180 birds of 6 weeks of age birds were equally divided in two different housing systems of rearing, 90 birds were kept in floor housing system and rest 90 birds were in cage housing system, maintaining the sex ratio of 3:1 female and male, *i.e.*(67 females +23 males) in floor housing and(67 females+23 males) in cage housing system. The result revealed that weekly feed intake in floor system of rearing overall mean value was 18.726±0.78kg and in cage system 18.406±0.84kg found to be non-significant (p≥0.05). The results suggested that there was an improvement in FCR at progressively higher age groups. However FCR was found to be non-significant(P≥0.05).Further the system of housing had revealed that weekly body weight and weekly body weight gain were found to be statistically non-significant (P≥0.05) in both systems of rearing. But the average daily weight gain and total body weight gain had significant effect of housing system (p≤0.05) and floor system of rearing had higher value as compare to cage system of rearing. System of housing did not affect the egg weight, egg length, egg width, egg shape index but specific gravity and shell thickness of egg had higher value in cage system of rearing as compare to floor system of rearing. Internal quality traits of egg in both housing systems found that shell weight, yolk weight, yolk height and yolk ratio had no significant effect on housing system of rearing. But yolk weight and yolk index showed that there were significant difference in both housing systems and floor housing system had higher value than cage system of housing.

Keywords: Cage and floor housing, egg production, egg quality, feed efficiency, Japanese quail layers

AFP-15

Evaluation of layer Japanese quail for egg production and egg quality traits under low-cost cages and deep litter housing systems

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The study was aimed to evaluate layer Japanese quail for egg production and egg quality traits under low-cost bamboo cages and deep litter housing systems. A biological trial of 144 adult (108 females+36males) eight-week-old Japanese quails for 6 weeks was conducted. The birds were randomly allocated in three treatments (T_1, T_2 and T_3) of 3 replicates each, based on deep litter, single tier and double tier cages. The study revealed that most of the traits (egg production, egg quality, egg fertility %, hatchability %, H:L ratio, feed cost per bird) are found insignificant (P>0.05) effect on housing systems. The significant effects are found in feed intake per bird, feed conversion ratio, egg length, egg albumin weight, egg albumen % and mortality rate. The weekly egg production per bird, HDEP and HHEP were insignificantly (P>0.05) higher in double tier cages than the single tier and deep litter reared quail egg productions. The heavier size eggs produced by deep litter birds than cages and also in deep litter birds feed intake, FCR significantly higher than cage birds. The egg quality traits egg length, egg albumen weight(g), egg albumen height(g), egg albumen (%) were more than the cage eggs. The egg fertility rate and hatchability TESB (%) was found better in double tier and single tier cages than deep litter. The H:L ratio insignificantly (P>0.05) more in deep litter reared quails. The feed cost and housing cost was found

more in deep litter rearing of Japanese quails, however, double tier cage feed cost and housing cost lower than the single tier cage and deep litter housings. In this study, housing Japanese quails at the different housing system associated with significant differences in the most of egg quality and increased the most of the traits in cage system. The double tier cage housing was more economical than the single tier cage and deep litter. No significant effect was seen in our study between deep litter and low-cost bamboo cage system of housing.

AFP-16

Adaptive morphometry of Kuttanad ducks of Kerala in their flood-hit breeding tract

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A study was conducted to assess the body measurements of Kuttanad ducks of Kerala to know their adaptive biometricsin the flood-prone breeding tract. Data were collected on body measurements at 16 weeks of age from 125 Kuttanad ducks. The mean body measurements (cm) at 16 weeks of age were found to be 43.23 ±0.21, 20.12 ±0.17, 12.27 ±0.07, 31.73 ±0.17, 25.16 ±0.17and 7.76 ±0.04 for length of trunk to neck (LTN), neck length (LN), length of breast bone (LBB), chest girth (CG), length of trunk (LT) and length of shank (LS) respectively. The effect of sex and ecotypes revealed significant differences among males and females as well as Chara and Chembally varieties with respect to the body measurements. Sexual dimorphism was observed in LTN, LN, LBB, LT, CG and LS measurements with males possessing larger biometry than females. Chara variety has longer trunks, breast bones and chest girth indicating a better meat type biometry when compared to the Chembally variety. However, Chembally had longer necks and shanks suggestive of their better adaptiveness for swimming and feeding in the flood-hit home tract. The mean LTN, LN, LBB, CG and LS measurements of Kuttanad ducks were found to be higher than most of the Indian ducks while they were lower than those of exotic ducks. The shank length showed significant increase ever since its first report 40 years back and could be an indication of the increased adaptiveness of Kuttanad ducks to swimming in turbulent flood waters.
Keywords: Adaptive morphometry, Kuttanad ducks, Kerala

AFP-17

Effect of phytogenic feed additives on performance of indigenous ducks and rural birds through molecular docking and network analysis

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Phytogenic feed additives are considered as alternative to antibiotics which stimulates the growth performance, gut health, immunity without any adverse residual effect on poultry birds. The aim of this study was to assess the phytogenic constituents andtheir nutritive value and to elucidate their effect on various production performances in combinations in indigenous Kuttanad ducks. Selected phytogenic feed additives such as the leaves of tulsi (*Ocimum sanctum*), Chekurmanis (*Sauropus androgynus*), drumstick (*Moringa oleifera*) and Kalmegh (*Andrographis Panniculata*) were harvested, cleaned, oven dried and pulverised to fine powder. These powdered leaves were subjected to FTIR analysis (Perkin Elmer, UTAR TWO; 4000–450 $cm^{-1)}$, UV-Visible Spectrophotometer (Perkin Elmer, lambda 365; 190-1100nm) and GC-MS (Perkin Elmer, Clarus 590) followed by network analysis and docking of resulting phytocompounds. FTIR peak positions in tulsi, drumstick, chekurmanis and kalmegh showed the presence of phenols, alkanes, hydroxyl, organosulfur, carbonyl, and aromatic groups. The UV-Vis analysis indicated the presence of flavonoids as peak positions in between 230-

285nm and 300-350nm. GCMS analysis showed presence of 2-nonen-1-ol, (z)-, 3-ethylheptanoic acid-, 4-aminocyclohexanone, n-acetyl-in tulsi, acetic acid n-octadecyl ester, hexacosyl acetate and 1-docosanol, acetate in moringa,1-hepten-4-ol, 4-propyl-, cyclohexanol, 3,5-dimethyl–in hekurmanisand thymol in Kalmegh having anti-inflammatory, antioxidant, antimicrobial, antifungal, antipyretic, and hepatoprotective effects. The protein % in kalmegh, shyama tulsi, chekurmanis and moringa were 7.72, 10.72,19.39 and 28.29 respectively on dry matter basis. Feeding of these phytogenicfeed additives each at 1% and 2% in 36 number of Kuttanad ducks and 150 number of Gramapriya chicks for 6 weeks interval showed no significant difference in water: feed intake and mortality during experimental period. The growth rate of ducks and Gramapriya birds in treatment group varies significantly ($P<0.05$) from control group at 6 weeks. No significant differences observed in body core temperature and respiration rate. Sophyto constituents present in these leave possess desired pharmacological properties that make them effective as effective herbal growth promoters.

Keywords: Feed additives, Indigenous, Molecular docking, Network analysis, Phytogens

AFP-18

Comparison of economic traits of Uttara and Kadaknath chicken under organized and backyard farms in U.S. Nagar district of Uttarakhand"

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The data for the present study were collected from total of 600 birds of Uttara and Kadaknath (300 each) and were further divided in 4 different groups of 150 birds and were reared under two different rearing system namely organized and backyard *viz.* Uttaraorganize (UO), Uttara backyard (UB), Kadaknath organized (KO) and Kadaknath backyard (KB) at Instructional Poultry Farm (I.P.F.) of University and Gadarpur Block of U.S. Nagar District of Uttarakhand. For study of growth traits body weight was measured from day old to 24 weeks of age at every 4 weeks interval. The average body weight observed in UO, UB, KO and KB at dayoldand24 weekswere30.50±0.17, 30.39±0.16, 29.96±0.15, 29.91 ±0.12g and 1382.26±9.42, 1251.76±3.05, 1239.88±5.12, 1139.59±4.10g, respectively. The higher body weight and conformation traits were observed in UO than other groups. There was no significant difference observed in dressing percent which is because of higher processing loss in Uttara. The giblet yield and cut-up parts percent do not vary significantly. The proximate analysis of meat sample in the present study indicates that UO and KO had the highest value of crude protein in both breast and thigh muscle. The physico-chemical properties showed higher value of WHC in KO and KB and the value of pH do not vary significantly. Texture profile analysis showed highest hardness in KB and highest cohesiveness, springiness and chewiness in UO.TBARS and FFA value were observed lower in KO and KB representing higher antioxidant capacity of meat. The aminoacid profile showed that higher concentration of essential and non-essential amino acids was found in KO and KB. Higher haemoglobin and TLC were found in KO ad KB.

Keywords: Uttara, Kadaknath chicken, organized, backyard farms

AFP-19

Effect of dietary protein and energy on meat quality, cholesterol, haematology and serum biochemical parameters in native ducks (Arani) of Tamilnadu (India)

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A study was undertaken in 224-day old unsexed Arani ducklings to study the effects of dietary protein and energy levels on meat quality, cholesterol, haematology and serum biochemical parameters. Arani ducks are native of Tamil Nadu, a southern state of India. A total of 224 day old, unsexed Arani ducklings received from Post Graduate Research Institute in Animal Sciences, Kattupakkam, Tamil Nadu Veterinary and Animal Sciences University were used for the present study. The ducklings were randomly divided into 7 treatments each having four replicates, in each replicate 8 ducklings were allotted by simple random sampling method. The ducklings were reared under intensive system. The experimental period was divided into two phases, namely starter (0-3weeks) and finisher (4-12weeks). The feed given was in mash form. At the end of 12 weeks, 8 ducks (4 from each sex, 2 / replicate) from each treatment were randomly selected for further evaluation. Proximate composition (%) like moisture, crude protein, total ash and ether extract of Arani duck meat had non-significant ($P > 0.05$) difference among treatment groups. Cholesterol levels in duck meat had significant ($P < 0.01$) difference among the treatment groups. Highest cholesterol content was observed in T3 (84.3 ± 0.4mg) and lowest was observed in the control group (60.3 ± 1.2 mg). Effect of treatment diets on hematology and serum biochemical parameters were not influenced by any treatment group. However, treatment diets had significantly ($P < 0.01$) affected the uric acid level in serum. Arani duck meat had lesser score for tenderness (4.43 to 4.57) and higher score for juiciness (5.29 to 5.71).It may be concluded that dietary crude protein and energy levels had no significant effect on the meat quality composition except the cholesterol level and there was no significant effect on haematology and serum biochemical parameters.

Keywords: Dietary protein, meat quality, cholesterol, haematology, serum biochemical parameters, native ducks

AFP-20

Effect of supplementation of peppermint and eucalyptus essential oils on the hematological parameters of Japanese quails

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Since several decades antibioticsare used as a feed supplement in the ration of farm animals because of their metaphylactic, prophylactic and growth promotion action which eventually has resulted in anti-microbial resistance (AMR) in livestock and humans. With an intention of resolving this issue, some potential replacements have been studied. Essential oils belong to those categories of supplements which haveantimicrobial, anti-inflammatory, and antioxidant properties. Keeping these facts in view, this study was undertaken to investigate the effects of dietary inclusion of peppermint (PEO) and eucalyptus essential oils (EEO) on hematological parameters of the Japanese quails. For this, 180 Japanese quail chicks of 6-days old were randomly grouped into 5 treatments (3 replicates having 12 chicks each). The experimental treatments were T0 (control), T1 (0.2% PEO), T2 (0.2% EEO), T3 (0.1% each of PEO+EEO) and T4 (0.05% each of PEO+EEO). By the end of the5th week, blood samples of 2 birds from each replicate were collected and their hematological parameters were determined. The study revealed that the values of TEC, TLC, PCV, hemoglobin, MCHC, basophil + eosinophil and lymphocyteswere improved in all the essential oil supplemented groups especially T3. MCV, heterophils and H:L ratio was significantly ($P<0.05$) decreased in the group T3(0.1% of PEO+EEO).Thus, it can be concluded that the supplementation of 0.1% of PEO and EEO in combination improved the physiological and health status of Japanese quails preventing the occurrence of pathological conditions.

Keywords: Eucalyptus essential oil, hematological parameters, Japanese quails, peppermint essential oil

AFP-21

Growth performance and carcass characteristics of Desi, Rhode Island Red and Vanaraja fowl under three systems of rearing under coastal saline region of West Bengal

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A study was conducted at different blocks in coastal saline zone of West Bengal. One hundred (100) day old chicks each of RIR, Vanaraja & Desi non-descript type were used under three systems of rearing i. e. intensive deep litter rearing, semi-intensive/ semi-scavenging & improved free-range system. Feeding and management practices were followed as per different system of rearing. The study was undertaken to find out growth performance & carcass characteristics at 24 weeks of age. Evaluation of FCR was done in the birds reared under intensive deep litter. At 6th week of brooding the body wt of male birds of Vanaraja was highest (629.62±0.31g) (P<0.05) than RIR (496.82±0.32g) & Desi (232.28±0.33g), at 24weeks the weight of Vanaraja was 2235.55±0.52g (P<0.05) whereas RIR & Desi were 2128.54±0.53g & 1376.45±0.54g respectively. Again at 6th week brooding the body weight of female birds of Vanaraja was the highest (482.33±0.04 g) (P<0.05) than RIR (381.99±0.4 g) & Desi (193.99±0.39 g). At 24th weeks the wt. of Vanaraja female was 1779.97±0.67 g (P<0.05) whereas RIR & Desi non-descript females were 1631.86±0.67 g & 1086.65±0.66 g respectively. The body weight (g) under intensive, semi-intensive & improved free-range birds (P<0.05) were 386.2±0.39, 366.07±0.4 & 306.04±0.41 respectively at 6 week of brooding; whereas body weight at 24th weeks (P<0.05) it was 1630.48±0.66, 1670.26±0.67 & 1197.13±0.68 g respectively. It was found that RIR birds showed the lowest FCR (P<0.05) (3.95±0.07) followed by Desi (4.73±0.05) & Vanaraja (4.79±0.07) respectively. Among carcass characteristics the dressing percentage of Desi birds was less than that of Vanaraja & RIR which was 62.36±0.16, 67.50±0.52 & 70.73±0.60 percent respectively. The back & breast cuts were the greatest contributors to the dressed carcass wt followed by drumstick & thigh cuts.

Keywords: Desi, Rhode Island Red, Vanaraja, Semi-intensive system, Free-range system.

AFP-22

A study on annual profit analysis of meat type quail farming in Northern Kerala

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A study on meat type quail farmers was carried out to assess the annual expenditure and income from quail rearing under field condition. Altogether, hundred and twenty layer quail farmers from three districts namely, Wayanad, Kozhikode and Malappuram were selected for the study using multistage random sampling. A well-structured, pre- tested interview schedule was prepared for collection of primary data. The study was conducted in five different categories of farmers based on the flock size as very small (500-1000 birds), small (1000-5000 birds), medium (5001-10000 birds), large (10001 and above). The study revealed that more than half (51.33%) of the meat type quail farmers under the study were had a flock size ranging from 5001 to 10000 birds which was found to be the same flock size range which got highest net return per bird per annum. Various socio-economic parameters followed by gross and net income from the meat type quail farming were analyzed and tabulated.

Keywords: Quail farming, Expenditure, Income, Net profit, Kerala

AFP-23

Perceived empowerment of the poultry farming through Vanaraja poultry based backyard poultry farming

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Present study was conducted to understand the empowerment level developed among the resource poor poultry farmers through Vanaraja poultry based Backyard Poultry Farming. For the study all the four agro climatic zones of the Bihar was considered. Two districts from each zone were randomly selected. From each district 20 poultry farmers engaged in Vanaraja poultry based backyard poultry farming were randomly selected as respondent. In this way a total of 160 respondents were considered for the study. For the measurement of perceived empowerment level of the poultry farmers economic, psychological and social empowerment indicators were used. It was found that majority of the farmers i.e. 68.13 per cent were in medium level of economic empowerment, most of the respondents i.e. 84.38 per cent were in medium to high level of psychological empowerment and slight more than half of the respondents i.e. 52.50 per cent were perceived that they have medium level of social empowerment. The overall perceived empowerment were found for majority of the poultry farmers (67.50%) in medium level followed by 21.88 per cent of the poultry farmers who were in high level of overall empowerment. Therefore, it can be concluded that Vanaraja based Backyard poultry farming can be replicated to other areas for poverty alleviation and employment generation, which ultimately lead to overall empowerment of the rural community.

Keyword: Empowerment, Vanaraja poultry, Backyard poultry farming, Agro climatic zones of Bihar

AFP-24

Effect of replacing fish meal by soybean meal on the performance of Khaki Campbell laying Ducks

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An experiment was conducted to study the effect of replacing fish meal by soybean meal on the performance, nutrient utilisation and egg quality of Khaki Campbell laying ducks. Seventy two number of Khaki Campbell laying ducks (36 weeks) were divided into three groups (each group had 3 replicates with eight laying ducks per replicate) and were randomly fed three experimental diets (isonitrogenous and isocaloric) (T_1-Control diet with fish meal, T_2-fish meal totally replaced by soybean meal, T_3-T2+ supplementation of amino acids i.e. Lysine and Methionine for a period of 20 weeks. The egg production (nos and dozen), DDEP percent and feed intake were significantly ($P<0.05$) higher whereas FCR and cost of feed per dozen egg were significantly ($P<0.05$) better for ducks reared on T_1 compared to other groups. The dry matter, organic matter, ether extract and crude fibre digestibilities were significantly ($P<0.05$) lower for ducks kept on T_3.The egg quality parameters like shape index, haugh unit, albumen, yolk and shell % were significantly higher for T_3 group. It is concluded that the performance of Khaki Campbell laying ducks fed diet without fish meal was deteriorated but the egg quality was improved with addition of essential amino acids.

Key words: Fish meal, egg production, egg quality, essential amino acids, soybean meal, Khaki Campbell ducks

AFP-25

Performance of Kadaknath chicken under intensive system among tribal farmwomen of Baksa district of Assam

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A total of 500 unsexed Kadaknath day old chicks were distributed among 20 tribal farm women, each with 25 chicks in Baksa district of Assam. The chicks were reared up to 5 months of age under intensive system of management in uniform environment condition. The average daily feed consumption, body weight, body weight gain and feed conversion ratio (FCR) were recorded weekly up to 8 week of age and thereafter at monthly interval up to 5 months of age. The average weight of day old chicks was 28.55 ± 0.50 g. The overall mean weekly body weight gains during 1st, 4th and 8th week were 7.54±0.10, 42.42±3.23 and 86.34±5.65g, respectively. The mean weekly feed consumption recorded at 1st, 4th, and8thweek were 21.29±0.11,104.38±2.09, and 244.52 ± 2.62 g, respectively. Similarly, the corresponding values of FCR were 2.82±0.35, 2.46±0.05, and 2.84±0.12. The weekly body weight gain linearly increased up to eight weeks of age. The overall mean weight gain recorded at 3rd, 4th, and 5th month of age was 260.52 ±7.49, 174.58±7.50 and 131.41±18.84 g, respectively. The mean monthly feed consumption during 3rd, 4th and 5th month was 1682.09±38.59, 1739.05±11.84 and 1622.83±7.14 g, respectively. The corresponding values for FCR were 6.46±0.06, 9.97± 0.37 and 12.56 ± 1.98, respectively. The average age at first egg was 171.81 ± 1.33 days and the average egg weight was 41.67±0.40 g. The average annual egg production was 118.48±1.34. The dressing percentage, giblet yield, breast muscle, thigh muscle, abdominal fat and weight of organs (spleen, thymus and bursa) were 70.43 ± 1.79, 5.35 ± 0.02, 19.41 ± 0.13, 14.91 ± 0.25, 1.59 and 0.88 ± 0.04 per cent, respectively of live weight at 5 months of age. An overall mortality of 25.2 % was recorded during entire period of experiment with a maximum of 11.40% during first week. It may be concluded that, rearing of Kadaknath chicken up to 5 months of age under intensive results in higher cost of production and hence cannot be recommended for intensive system and could be reared in backyard system.
Keywords: Performance, Kadaknath chicken, intensive system tribal farm women

AFP-26

Performance of *Kamrua* and Indigenous chicken under semi-intensive system at North-eastern Himalayan foothills of Assam

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A study was conducted to assess the productive and reproductive performances of *Kamrupa* (improved backyard dual type chicken) and indigenous chicken under semi-intensive system at North-eastern Himalayan foothills of Assam. A total of 200 unsexed *Kamrupa* and indigenous day-old chicks, 100 of each variety were procured and were reared separately under deep litter system up to 8 weeks of age at Instructional Poultry Farm under Krishi Vigyan Kendra, Kokrajhar, AAU, Telipara. At 9th week, each group of birds were divided in to 4 replicates, each of 25 birds and were managed under semi-intensive system up 72 weeks of age. The birds were given daily 50% of their total feed requirement in the morning and evening and were let loose for at least 8 hours outside in search of feed. The results indicated that the body weights recorded during 8th, 20th, 52nd and 72nd weeks of age were significantly (P≤0.05) higher in *Kamrupa* chicken than in indigenous chicken. However, the age at first egg in *Kamrupa* (176.00±1.03 days) was significantly(P ≤0.05) lower than the indigenous chicken (232.00±2.14 days). The annual egg production and egg weight were recorded as 115.30±1.01 numbers and 41.00±0.97g in *Kamrupa* chicken respectively, which were significantly higher than the

corresponding values in indigenous chicken under semi-intensive system of management. The survivability rate in *Kamrupa* and indigenous chicken were found to be similar. It might be concluded that rearing of *Kamrupa* chicken was more profitable than indigenous chicken under semi-intensive system of management.

Keywords: *Kamrupa*, indigenous chicken, body weight, age at first egg, survivability

AFP-27

Livelihood security through Vanaraja poultry based Backyard poultry farming among the Tharu tribe of Bihar

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Present study was purposively conducted in West Champaran district of Bihar at *Tharuhat* i.e. native area of Tharu tribe which belongs to this district only. For the study 100 Tharu people were selected randomly as respondent with condition that having at least 30 Vanaraja poultry birds and rearing experience of more than five years obtained from PSP, BASU, Patna. Livelihood security among the Tharu people through poultry rearing was measured with indicators of economic security, food security, health security, education security and social empowerment. Livelihood security operationalized as weighted mean of above mentioned dimensions. It was found that majority of the respondents i.e. 82 per cent, 78 per cent and 73 per cent were in medium to high level of economic security, education security and health security, respectively. It was also found that majority of the respondents i.e. 57 per cent and slight less than half of the respondents i.e. 51 per cent of the respondents were found in medium level of food security and social empowerment. It was also found that overall livelihood security from rearing of Vanaraja based backyard poultry farming from majority of the farmers i.e. 62 per cent were in medium level category. It was found that the promotion of Vanaraja poultry based backyard farming would help in socioeconomic upliftment of tribal people. The impact of the study can be replicated to other area for poverty alleviation and employment generation, which ultimately lead to rural livelihood security.

Keyword: Livelihood security, Vanaraja poultry, Backyard poultry farming, Tharu tribe

AFP-28

Acquisition of thermotolerance in slow-growing backyard poultry through sequential mechanism of thermal conditioning in changing climatic scenario

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This study was undertaken to elucidate the ultimate and proximate effect of embryonic thermal conditioning (ETC) in combination with early post-hatch heat stress (PHHS) on acquired thermotolerance in slow-growing CARI-Debendra chicken. Embryonic thermal manipulation (ETM) was conducted from embryonic days 11-16, subjecting the embryos to a temperature of 39.5°C with a relative humidity of 60-70% for 5 hours per day. A control group was incubated under standard conditions. After hatching, chicks were randomly assigned to different groups, including a non-manipulated control group and an early post-hatch thermal conditioning group. The post-hatch conditioning involved maintaining a brooding temperature of 37±1°C for the first five weeks. The study assessed various parameters to evaluate the effects of thermal conditioning. Hatchability did not

significantly differ between the ETM and control groups. However, hatch weight and pipping time showed significant variation. At hatch, the ETM group exhibited higher rectal and surface temperatures compared to the control group, which diminished with age. Heat conditioninggroup showed 1% increase in body weight than control at 6weeks of age.Stress parameters in serum such as thyroid hormones T4, concentration of potassium and activity of creatinine kinase enzyme were more in ETM group than the control group while H/L ratio and concentration of T3 were less in ETM group indicating acquisition of thermotolerance. Expression of the HSP70 gene significantly differed in liver (P≤0.06) and intestine tissues (P ≤0.09) of ETM group. Upregulation of GRP78 gene in intestinal tissue in ETM group in 12-week-oldchickens revealed the tissue specificity of expression of this gene. In conclusion, embryonic and early post-hatch thermal conditioning positively influenced body weight, immune response, and the expression of molecular chaperones, thereby enhancing welfare and productivity in CARI Debendra chickens. These findings underscore the potential benefits of thermal conditioning in improving thermotolerance in poultry, particularly in the context of climate change.

Key words: Climate change, Embryonic thermal conditioning, Slow-growing backyard poultry, Thermotolerance

AFP-29

Kashmir Anz geese breed: first and the only registered domestic geese breed of India

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The study was undertaken to characterize the domestic geese reared in the Valley of Kashmir. The study area comprised of geese rearing districts of Kashmir Valley. Characterization of the germplasm of local geese of Kashmir was carried out on an extensive scale and included studies on their morphology, morphometry, performance and physiology. Geese rearing in the Valley dates back to ancient times. They are reared for meat, eggs, and as a hobby in areas located around the water bodies. The geese under study were found to be of cinnamon, white, and a mixture of cinnamon and white colour. The colour of their beak varied from black to yellow through all intermediate patterns. Shanks were orange coloured in all adult geese. The eyes were either grey or brown in colour. Peculiarities like knob, dewlap and paunch were also present in some of these geese. Sexual dimorphism on the basis of plumage and eye colour was found to be absent. Average adult body weight of the gander was 3.82 kg and that of the goose 3.34 kg. The acceptability of its meat was good and significant proportion of consumers rated it better than chicken meat as well as mutton in terms of appearance, texture, taste and overall acceptability. This indigenous goose has now been registered as a breed with the name 'Kashmir Anz', making it the first and the only registered domestic geese breed in India as of now.

Keywords: Breed, Characterization, Domestic, Geese

AFP-30

Backyard poultry farming with Rajasri: A potential tool for livelihood and nutritional security in jagtial district of telangana state

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Backyard poultry farming with "Rajasri" variety birds is a potential tool to up lift the socio economic status of underprivileged people of rural areas as they provide subsidiary income besides providing balanced food (egg & chicken meat) by utilizing the natural food base available in the rural. A total number of 2200day old chicks (Rajasri) are reared in deep litter system up to 6 weeks of age under standard managemental conditions. Later at 7 weeks of age 2000 growers were distributed to 100

beneficiaries at rate of 20 birds per each beneficiary covering 5 villages in Medipally, Korutla and Raikal Mandals in Jagtial District of Telangana State. At beneficiary level the birds were reared with nominal supplementary feeding only. Up to 52 weeks age, the average egg production of 120no(s) was recorded from each bird with an average egg weight of 45-50 grams. The cost of chick, expenditure of standard (from 0-6 wks) & supplementary feed (from 7-52 weeks), vaccination and medicines in total Rs.142 was spent on each bird. The eggs were sold at Rs.5.at per egg. The culled birds were sold at Rs.150 & Rs.200/kg per female and male bird. Rearing of 20 Rajasri backyard birds generated an income of about Rs.13,920/- per year. The Rajasri backyard poultry units provided supplementary income to the under rural privileged people. As it is "low input and high output technology" it helps rural under privilege peoples improve their nutritional status as well as income to meet petty expenses at household level. Therefore the present study indicates the importance of encouragement of the backyard poultry farming especially to weaker sections of society.

Keywords: Backyard farming, livelihood, nutritional security, Rajasri bird, rural area

AFP-31

Qualitative traits of desi chickens in bidar district of karnataka

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A study was undertaken to evaluate the indigenous chicken in the Bidar district of Karnataka state for their morphometric characteristics under farm conditions. The sample size constituted two fifty desi chickens of Bidar district. The qualitative characteristics like skin colour, earlobe colour, comb colour, comb type, wattle presence or absence, plumage colour shank colour and eye colour, these characteristics are quite distinct than the other native chickens. The 80% of the birds had yellow skin and 20% had white skin. Red (52%) earlobes were most common, followed by white (20%) and a combination of red and white (32%). The comb type of indigenous chicken from Bidar district of Karnataka was predominantly single. The highest plumage colour birds were multi-coloured, brown, black and white, of these, 18% were black, 26% were brown, 16% were white and 40% were multicoloured. The most prominent shank colour was yellow, followed by black, green and white, in which yellow was 62%, black was 10%, green was 8% and white was 20%. The desi chicken of Bidar district had shown 100% yellow colour eye. This study will help to identify the desi chickens by observing their distinct phenotypic characteristics. The desi chickens showed significant variations in every phase of the comparison, which indicates the genetic variations among the desi chickens in the study area that have to be exploited through improved feeding and breeding strategies.

Keywords: Qualitative, Desi Chicken, Plumage, Shank and Combs

AFP-32

Nutrient requirements of Kadaknath hens to optimize egg production during late laying phase (50-72 weeks)

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The present experiment was conducted to find the nutrient requirement of Kadaknath hen to optimize egg production during late laying phase 50-72 weeks of age. The study was conducted on a total of 96 Kadaknath birds of 50 weeks of age. The Kadaknath hens were divided into 4 groups of 24 hens. Each group was further divided into 3 replicates of 8 birds. The feed was prepared by using main

soya and maize ingredient & mineral mixture. Group T1 received control diet containing CP-16%,ME-2600kcal/kg,Methionine-0.85%,Lysine-0.31%,Calcium-3,Phosphorus 0.30% as per data available in the book (Nutrient requirement of poultry) published by Indian Council of Agriculture Research, New Delhi. Group T2 was fed with CP-15%, ME-2550kcal/kg, Methionine-0.80%, Lysine-0.28%, Calcium-3%, Phosphorus-0.30%. Group T3 was fed withCP-17%, ME-2650 kcal/kg, Methionine-0.90%, Lysine-0.35%, Calcium-3.25%, Phosphorus-0.35% and group T4 was fed with CP-18%, ME-2700kcal/kg, Methionine-0.95%, Lysine-0.40%, Calcium-3.50%, Phosphorus-0.40%.The effect of various nutrient levels in diets on average live body weight, feed consumption, feed conversion ratio and hen day egg production in Kadaknath layers were found to be statistically non-significant (P>0.05) with each other during 50 to 72 weeks. Mortality percentages in treatment T1 were 20.83%, in T2-16.67%, T3-8.33% and in T4 were 8.33%. From the results, it is concluded that the dietary regime given by ICAR i.e. diet containing CP-16%, ME-2600 kcal/kg, Methionine-0.85%, Lysine-0.31%, Calcium-3, Phosphorus-0.30% can be effectively utilized for improving the overall performance of Kadaknath hens during late laying phase(50-72week).

Keywords: Crude protein, hens, kadakanath, late laying phase, egg production.

AFP-33

Siruvidai chicken: A lesser known indigenous ecotype of Tamil Nadu

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Siruvidai chicken, an indigenous ecotype of Tamil Nadu is prevalent in Ariyalur district of Tamil Nadu. The phenotypic characters of Siruvidai roosters exhibit golden-yellow hackles, while their breast, abdomen, tail feathers, and wing primaries are black. Their body is adorned with red feathers. Whereas, in females, the neck is covered with lustrous brown feathers intricately laced with golden-yellow colour. The breast and abdomen display vibrant brown feathers; while the back is adorned with dark brown feathers. The tail feathers exudes an ebony tone. Siruvidai chickens possess a single comb that is typically red in color. The comb of the hen is mostly upright, although floppy in some cases. The eye color, is typically yellow in Siruvidai chickens; although, orange eyes may be observed rarely. Siruvidai chickens have white-colored ear lobes. The beaks are yellow or brownish-yellow in colour and the wattles are red in colour. Siruvidai chickens typically have yellow legs and white skin. The Red Jungle fowl is widely acknowledged as the ancestor of all chicken breeds worldwide. The phenotypic characters of Siruvidai chicken resembles to that of Red Jungle fowl. However, more molecular characterization studies are needed to establish the precise relationship between the Siruvidai chicken and the red jungle fowl.

Keywords: Indigenous chicken, Siruvidai, Tamil Nadu, morphological characters

AFP-34

Morphometric characteristics of indigenous Siruvidai chicken of Tamil Nadu

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The morphometric characters of indigenous Siruvidai chicken were recorded from 20 adult females and 20 males in Ariyalur district of Tamil Nadu. The average comb length in Siruvidai cocks and hens was110and 32 millimeters respectively, while the respective values of wattle lengthwere41 and 21 millimeters. Siruvidai cocks had 32 millimeters long beak, while it was 30 millimeters in hens. The shank length was 91and 74 millimeters in the respective sexes. The diameter of the legs, was 15

millimeters in roosters and 7 millimeters in hens, while the circumference of shank was 42 and 38 millimeters respectively.Only roosters of Siruvidai develop spurs on their legs, with an average length of 21 millimeters in adult males. Hens, on the other hand, do not grow spurs on their feet. The length of breast bone averages 102and 86 millimeters in cocks and hens respectively, while the breast angle in respective sexes was 50 and 42 degrees. The breast circumference was 302 millimeters in cocks and 279 millimeters in hens. The wing span was497 millimeters in adult males and 403 millimeters in adult females. The body length was 418 and 379 millimeters in the respective sexes. The back-length averages 198 and 194 in males and females. The height was about 395 millimeters in cocks and 360 millimeters in hens, whereas, the back height of the respective sexes were 281 and 252 millimeters. The Siruvidai cocks weigh from 1.40 to 1.60 kilograms, and the body weight of adult hens range from 1.10 to 1.30 kilograms. The annual egg production was around 70 to 90 eggs per year. They typically lay about 10 to 14 eggs in a clutch before going broody and incubating the eggs naturally.

Keywords: Indigenous chicken, Siruvidai, Tamil Nadu, morphometric characters

AFP-35

Haematological and biochemical parameters of different types of native chicken

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This present study aims at the evaluation of haematological and serum-biochemical parameters of native chicken (Aseel, Kadknath and Nicobari), non-descriptive chicken (*Siruvidai* and *Peruvidai*), synthetic strain (TANUVAS star chicken) and Forsgate strain of White Leghorn reared at the Poultry Research Station, Tamil Nadu Veterinary and Animal Sciences University, Chennai, India. Data were collected for haematological and biochemical parameters analysis. The haematological parameter includes Red Blood Cells (RBC), White Blood Cells (WBC), Packed Cell Volume (PCV), Haemoglobin (Hb) and Differential Leukocyte Count (DLC) includes heterophils, lymphocytes, monocytes, eosinophils and basophils. The biochemical parameters include glucose, triglycerides, total cholesterol, HDL (High density lipoprotein), LDL (Low density lipoprotein), uric acid, total protein, albumin and globulin. RBC, WBC, PCV and haemoglobin values showed significant ($P<0.01$) difference among various type of chicken. RBC (2.9 to 4.4 (10^6 /µl), WBC (12.02 to 29.12 10^3 /µl), PCV (22.1 to 36.39 %) and Hb (7.4 to 8.4 g / dl) were recorded and highest value recorded in White Leghorn. Similarly, Differential Leucocyte Count (%) showed significant ($P<0.01$) difference among various type of chicken. The values for Heterophils (%) were ranges from 48.72 ± 2.31, eosinophils (%) were ranges from 1.00 to 4.12 ± 0.07, basophils (%) were ranges from 2.1 ± 0.58 to 6.2 ± 0.35, monocytes (%) were ranges from 1.0 ± 0.01 to 4.2 ± 0.12 and lymphocytes (%) were ranges from 20.02 ± 0.87 to 40.11 ± 1.15 for various types of chicken. Glucose, triglycerides, cholesterol, HDL and LDL recorded significant ($P<0.01$) difference among various type of chicken. The values for glucose (mg/dl) were ranges from 198.74 ±1.15 to 234.45 ± 2.89, triglycerides (mg/dl) were ranges from 100.12 ±7.54 to 242.84 ± 3.46, cholesterol (mg/dl) were ranges from 113.91 ± 5.77 to 170.35 ± 2.61, HDL were ranges from 46.7 ± 1.15 to 69.7 ± 2.31 and LDL were ranges from 28.1 ± 0.58 to 46.2 ± 1.73 for various types of chicken. Total protein (g/dl) and uric acid (mg/dl) had shown significant ($P<0.01$) difference, whereas albumin and globulin (g/dl) did not show significant difference among various type of chicken. The values for total protein (g/dl) were ranges from 4.6 ± 0.17 to 5.3 ± 0.23 and uric acid (mg/dl) were ranges from 4.39 ± 0.02 to 7.36 ± 0.06. Haematological and biochemical parameter of birds are essential to analyze the health status and stress condition of the birds due to environment, nutrition and management. The results of the present study provide information about the immune status of the birds.

Keywords: Haematological, biochemical parameters, native chicken

AFP-36

Comparative evaluation of production performance of seven generations of Tellichery, the native chicken breed of Kerala

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AICRP on Poultry for eggs, Mannuthy centre is rearing the native chicken breed of Kerala, Tellichery, with an objective of conservation, improvement, characterization, and application of local native germplasm. Seven generations were evaluated for various egg production traits from 17-40 weeks of age. A total of six hundred pullets were housed in individual laying cages after completion of the 16th week of age in each generation. The estimated average age at sexual maturity for the seven-generation was 157.5, 156.7, 154.2, 142.6, 155.9, 155.1 and 141.7days respectively. Individual egg production was recorded from 16th to 40 weeks of age. Corresponding estimates for egg weight in grams at 28th week of age was 40.90±0.15, 39.64±0.16, 39.30±0.14, 39.68±0.19, 38.25± 0.16, 39.15±0.15 and 40.10±0.84 respectively, and at 40th week of age, egg weight was 41.77±0.20, 42.47±0.23, 43.37±0.20, 43.04±0.18, 44.08±0.18, 43.95±0.18 and 44.01±0.18 respectively. Egg production up to 40th week of age on hen housed basis, hen day basis, and on survivor basis, the estimates were 69.83, 71.35 and 71.35 for S0 generation, 72.08, 74.65 and 76.67 for S1 generation, 75.96, 77.9, and 79.19 for S2 generation, 79.20, 82.33and 84.90 for S3 generation, 78.95, 82.30 and 83.10 for S4 generation, 78.95, 80.22 and 80.40for S5 generation, 78.75, 80.61 and 80.73 for S6 generation and 78.90, 80.75 and 81.20 for S7 generation respectively. The results revealed a significant improvement in production performance over subsequent generations accomplished by scientific selection and management.

Key words: Tellichery, native chicken, production performance

AFP-37

Performance and carcass traits of guinea fowl fed on dietary *Neem* leaf powder as a growth booster

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The present study was designed to compare the efficacy of different levels of NLP as a growth booster on growth performance and carcass characteristics of guinea fowl over a period of 12 weeks. Day old guinea fowl keets (n=120) were randomly assigned to four treatment groups, each with 3 replicates. The first treatment was designated as control (T_0) in which no supplement was added to the feed, while in treatments T_1, T_2 and T_3, NLP was provided as 1, 2 and 3 g per kg of feed, respectively. The results revealed a significant increase in body weight at 12 weeks; 1229.7 for T_1, 1249.8 for T_2, and 1266.2 g T_3 compared to 1220.0 g for the control group ($P<0.05$). The results also showed that the supplementation of NLP significantly increased feed intake ($P\leq0.05$) which might be due to the hypoglycaemic activity of Neem. A significant increase was also found in the feed conversion ratio (FCR) of the treated groups over the control, showing that feeding NLP to the treated groups has lowered their residual feed efficiency. The results of the study demonstrate the beneficial effects of supplementing NLP on body weight gain and dressed yield in the treated groups in guinea fowl. NLP is, therefore, suggested to be used as a feed supplement in guinea fowl for higher profitability.

Keywords: Guinea fowl, Growth traits, Neem leaf powder

AFP-37

Performance Evaluation of Indigenous Chicken of Belagaum Division of Karnataka State, India

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A study was undertaken to evaluate the indigenous chicken of Belagaum division of Karnataka State, India for the performance and morphological characters pertaining to three districts namely; Bijapur, Belagaum and Dharwad, both under field conditions and under farm conditions. Survey was conducted in three districts and the data was recorded as per NBAGR proforma. The evaluation of the birds under farm conditions revealed that, the body weight of birds belonging to Bijapur and Belagaum were significantly higher at all age groups compared to Dharwad district. Significant differences were noticed in hen housed egg production and in survivor's egg production up to 52 weeks of age. The birds of Bijapur district showed good survivability compared to other two districts. The birds of all the three districts under study showed very good ELISA titers against New Castle disease at all the stages of life.
Keywords: Characterization, Indigenous chicken, Morphological characters, ELISA

AFP-37

Optimization of energy and protein requirements in Rajasri growers

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Three hundred and sixty Rajasri female birds at the age of 9 weeks were randomly allotted to 9 treatments with 8 replicates in each treatment and 5 birds in each replicate. The birds were raised in cage system in an open sided poultry house under uniform management from 9 to 18 weeks of age. Nine experimental diets constituted three levels of energy (2500 kcal, 2600 kcal, 2700 kcal/kg ME) each with three levels of protein (15%,16%,17% CP). During the overall period (from 9 to 18 weeks of age) body weight was significantly ($P<0.05$) influenced by supplementation of ME 2700 kcal/kg with 17% CP shown highest body weights. The mean feed intake of Rajasri grower birds fed with diet containing 2500 kcal/kg ME and 15%CP recorded significantly ($p<0.05$) highest feed consumption. The significantly ($p<0.05$) highest dressing percentage, weight of liver, heart and gizzard observed in high energy diet ME 2700 kcal/kg with 17% CP diet. Based on the overall results, it was concluded that supplementation of 2700 kcal/kg ME with 15% CP diet is optimum for growth performance of Rajasri grower birds
Key words: Backyard poultry, Energy, Protein, Requirements

AFP-38

First case report on Ultra-Sonographic Diagnosis of Free Fluid (Ascites) in Budgerigar (Melopsittacus undulatus) and its Therapeutic Management

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A seven month old female Budgerigar (Melopsittacus undulatus), was brought to the Veterinary Clinical Complex (VCC), FVSc & AH, Shuhama, with the history of anorexia, abdominal swelling, uncoordinated gait, lethargy, dehydration and poor feather condition. Abdominal ultrasonography revealed free fluid in abdomen with enlarged liver and rounding of borders. The bird was treated non-specifically for liver disease since the owner did not consent for blood collection, abdomenocentesis nor biopsy of liver. Oral enrofloxacin @ 50 mg/kg b.wt. for 5 days, oral spironolactone @ 1 mg/kg b.wt. OD

for 7 days, oral multivitamins @ dose rate of 0.2 ml BID was advised for one month. The bird showed

SESSION VII

YOUNG SCIENTIST AND DR. P. KOTHANDARAMAN MEMORIAL AWARDS

AVITECH & IPSA YOUNG SCIENTIST AWARDS -2023

YS-01

Utilization of broiler litter for biogas production employing pretreatment and conditioning techniques

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Biogas production from broiler litter can serve the problem of handling poultry waste and additionally generates income for the enterprise. Pretreatment and conditioning techniques can help in overcoming these limiting factors. The present study was conducted at ICAR-Central Avian Research Institute (CARI) Izatnagar, India. Three biogas digesters were used, each with different pretreatment methods for broiler litter. The first digester served as a control (B_0) with no pretreatment, the second digester (B_1) had pretreatment with alkali @ 0.1 mol/L, and the third digester (B_2) had pretreatment with the same alkali @ 0.2 mol/L. The pretreatment was given for 15 days, after which the digesters were filled following conditioning techniques to create optimal conditions for biogas production. During experimental duration various parameters related to biogas production were monitored and the results revealed that the highest biogas production and the shortest Hydraulic Retention Time (HRT) of 28 days were observed in B_1 treatment compared other treatments. The highest average yield of biogas production was measured as 0.0373m^3/kg of broiler litter in B_1, with methane content ranging between 42.73-61.27%. It was concluded that by employing optimal conditioning techniques and pretreatment, broiler litter has significant potential to produce biogas at the farm level. This approach not only addresses the environmental concerns associated with poultry waste but also presents an economically viable solution for the broiler industry's waste management.

Keywords: Biogas, Broiler litter, Methane, Poultry

YS-02

Expression profiling and association studies of *CRBP IV* and *cGH* gene with egg production in Kadaknath

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Kadaknath is one of the most famous native chicken breeds of India with annual production of 80 eggs only. Production related genes differ in their expression in different genotypes/ birds. The egg production up to 40 wk were recorded in 120 pedigreed Kadaknath birds kept at Desi fowl unit of ICAR-CARI, Izatnagar, Bareilly. Based on the egg production the birds were categorized as high and low egg producing birds. Three different tissues viz., kidney, liver and oviduct were collected from eight birds belonging to the two different egg production groups viz., four each from high and low egg producing groups. RNA was isolated using trizol method followed by cDNA synthesis for qPCR studies. It was found that the mRNA expression of *CRBP IV* gene differ significantly among the two egg production groups in liver ($P<0.01$). The mRNA expression of *cGH* gene differ significantly in all the three tissues i.e. kidney ($P<0.2$), liver ($P<0.001$) and oviduct ($P<0.01$) in case of high and low egg producing groups. The level of expression of *CRBP IV* gene in liver ($P<0.0001$) and kidney ($P<0.15$) had significant effect on egg production up to 40 wk. Similarly, the level of expression of *cGH* gene in liver and oviduct ($P<0.001$) had significant effect on egg production up to 40 wk. The birds with higher expression of the two genes in these three tissues had significantly higher egg production. CRBP IV gene was expressed 1.14, 6.91 and 1.03 folds more in kidney, liver and oviduct of high egg producing group compared to that of low egg

producing group. cGH gene was expressed 1.90, 31.61 and 4.72 folds more in kidney, liver and oviduct of high egg production group compared to that of low egg production group. The study revealed that full sib selection for improvement in egg production up to 40 wk can be done on the basis of level of expression of CRBP IV and cGH gene in liver and/ or oviduct in Kadaknath native chicken.

Keywords: Kadaknath, *cGH*, *CRBPIV*, qRT-PCR, egg production traits

YS-03

Evaluation of adaptability and acquisition of thermotolerance in slow growing birds reared in tropical climate

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A study was undertaken to evaluate thermotolerance of CARI-Debendra under different temperature-humidity indices in hot-humid climate, to identify polymorphism pattern in thermotolerant genes and their association with expression profile and production traits, and to improve thermotolerance of those birds by suitable technological interventions. In first experiment, 240 CARI-Debendra birds were reared under different temp-humidity indices such as THI>80, THI<75 and seasonal control (THI=78) till 12 wk. Restriction fragment length polymorphism was studied in 200 birds of CARI-Debendra chicken for candidate genes HSP70 and GRP78 to identify possible thermotolerance markers. Embryonic thermal conditioning (ETM) was done only from E11-16 at 39.5°C with RH 60-70% for 5hrs/day and early post-hatch thermal conditioning for first five wk with brooding temperature of 37±1°C.Early post-hatch herbal supplementation was superimposed in feed at 1% level in control and ETM group. Birds reared in THI>80 showed higher (P<0.01) body surface temperature and rectal temperature than THI<75 group birds. However, THI>80 group birds recorded 115.6gm lower (P<0.01) 12-week body weight, increase water consumption (+16.33) and increased FCR than seasonal control and THI<75 group birds. Relative intestinal weight was found to be lowest in THI>80 (5.43%) followed by THI <75(7.22%) on 6th week only. Decrease in chloride concentration (100.03 vs 141.83) and decrease in T3 (133.83vs250.67) were observed in THI>80 group in comparison to control group. PCR-RFLP of HSP70, GRP78 genes as well as their sequencing with *Taq*I and *Hae*III respectively did not show any polymorphism at promoter, exon 1 and 5'UTR region of genes. HSP70 gene was expressed 139, 10.04 and 10.45 folds more (P<0.01) in liver, intestine and breast muscle, respectively in THI>80 group in comparison to other two groups. Hatchability did not differ significantly between ETM (63.23%) and control (63.53%) but hatch weight (35.05 vs 33.39) showed significant variation. Rectal temperature and surface temperature in ETM group were +1.04 and +4.76% higher than the control at hatch. Herbal supplementation group showed 7.5% increase in body weight than control at 6wk, while heat conditioning group increased only 1%. Stress parameters in serum such as thyroid hormones T4, concentration of potassium and activity of creatinine kinase enzyme was more in ETM group than control while H/L ratio and concentration of T3 was less in ETM group indicating acquisition of thermotolerance. Embryonic thermal manipulation and post-hatch herbal supplemented group positively influenced the body weight, immune response and haematological parameters with overall welfare and productivity in CARIDEBENDRA birds

Keywords: Adaptability, Embryonic thermal conditioning, Slow growing, Thermotolerance, THI

YS-04

Association of diversity in microsatellite genotypes and expression of CRBP IV gene with layer economic traits in Rhode Island Red chicken

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An investigation was carried out to analyse polymorphisms in egg-production associated microsatellite markers and CRBP IV gene in sampled population of selected strain of Rhode Island Red (RIR) chicken and to determine association between polymorphic genotypes and layer traits. Data (N=112) on body weight at 20 wk of age (BW20) and layer traits (age at sexual maturity (ASM), egg weight at 28 and 40 wk of age (EW28, EW40) and egg production up to 40wk of age (EP40)) were analysed by least-squares analysis of variance taking sire as random and hatch as fixed effects. Alleles were separated on 3.4% MetaPhorTM Agarose gel electrophoresis and their sizes were estimated by GelDoc using Quantity One software. Allelic data were analyzed by POPGENE for estimation of population genetic parameters. Tissues of kidney, liver and oviduct were collected from 12 birds at 40wk of age from four different egg production-body weight groups, viz., high egg production-high body weight, high egg production-low body weight, low egg production-high body weight and low egg production-low body weight. Relative mRNA expression studied using qRT-PCR. Expression data analyzed by LS-ANOVA using SAS. LS-means of ASM, BW20, EW28, EW40 and EP40 were 135.19±1.15days, 1347.13±15.28g, 42.49±0.27g, 48.19±0.42g and 124.55±1.94 eggs, respectively. BW20 2 revealed low, but positive genetic as well as phenotypic correlations with EP40. Population was under H-W disequilibrium which suggested that selection for 40week part-period egg production might have been associated with studied MS loci. Microsatellite analysis revealed 2-7 alleles having sizes ranging from 100bp at MCW0110 to 300bp at MCW0103 with varied frequencies. Total 37 alleles were observed with average no. of alleles per locus as 3.70 ± 0.47. Out of all the polymorphic loci, five loci viz., ADL0023, ADL0176, MCW0044, MCW0069 and MCW0110 revealed high degree of polymorphism. Genotypes at ADL0023 and ADL0273 demonstrated significant effects on layer traits. Basal mRNA expression of CRBPIV gene differed significantly among different groups only in kidney ($P \leq 0.05$), but non-significant ($P > 0.05$) in liver and oviduct. Expression of CRBPIV gene also differed significantly ($P \leq 0.0001$) among tissues and highest expression was observed in oviduct. Genotypes of MCW0110 were found to have significant ($P \leq 0.05$) effect on CRBPIV expression in kidney and MCW0069 was found to have significant ($P \leq 0.01$) effect on CRBPIV expression in oviduct. Body weight at 20 wk of age revealed low, but positive genetic as well as phenotypic correlations with egg production up to 40 wk thereby suggesting its usefulness as selection criterion for genetic improvement of egg production.

Keywords: Association, Chicken, Expression, Layer traits, Microsatellites

YS-05

Unravelling selection signatures related to immune response in Guinea fowl through whole-genome sequencing

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The present study was aimed at detecting selection signatures related to immune response in CARI-KADAMBARI Guinea fowl (*Numida meleagris*) through whole-genome sequencing. Blood samples from six adult guinea fowl were collected and isolation of genomic DNA was done. Whole-genome sequencing was performed using next-generation sequence (WGS) technology on Illumina platform and the data was generated. The high informative SNP analysis was undertaken throughout the genome. The average genome mapping percentage and transition and transversion (Ti/Tv) ratio of detected single

nucleotide polymorphisms (SNPs) were calculated. To detect the genomic foot prints, pooled heterozygosity (H*p*) statistical parameter has been employed. Functional annotation of candidate genes related to immune response was carried out based on gene ontology (GO) enrichment analysis. The average genome mapping percentage against the reference genome was 74.27% and the Ti/Tv ratio was more than 2 indicative of good quality SNP calling. The genomic regions that fall under the threshold Fst value were considered as strong selection signatures. The genome wide score of *Z*(H*p*) ≤4.0 was taken as the threshold after examining at the *Z*(H*p*) values. Selection signature analysis revealed the putative genes involved in host cellular defence mechanism and immune response. These putatively selected genes were significantly enriched for 46 biological pathways and three molecular functions which are potentially involved in the activation of lymphocyte and leukocyte cells. Several genes were found to be potential candidates for host cellular immune response. Our strategic findings could facilitate future genome-wide association studies as well as genomic targets aimed at understanding the mechanism of tolerance and disease resistance in Guinea fowls. Also, the genomic regions under selection contain numerous SNPs that could be useful for developing an SNP chip specific to Guinea fowl.

Keywords: DNA, WGS, Illumina, SNP, Lymphocyte

YS-06

Comparative evaluation of *Curcuma longa* and combination of *C. longa* and *Kaempferia galanga* on antimicrobial activity and growth performance of broiler chicken infected with multidrug-resistant, non-typhoidal *Salmonella* spp.

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The study was undertaken to compare antimicrobial efficacy and growth promoting effect of *C. longa* and a combination of *C. longa* and *K. galanga* in broiler chickens infected with MDR-NTS spp. Vencobb 430Y chicks (n=150) were equally distributed into 3 treatment groups having five replicates each with 10 birds. The T1 birds were fed with basal diet; T2 and T3 were fed with shade-dried *C. longa* powder at its minimum inhibitory concentration against isolated MDR-NTS and combination of *K. galanga* and *C. longa* at fractional inhibitory concentration along with basal diet respectively. The concentration of herbs was fixed by micro broth dilution technique and checkerboard assay. All birds were orally infected on 7th day with infective dose 50 of isolated MDR-NTS spp, which was found out by conducting an ID_{50} trial. The MIC value obtained for *C. longa* against MDR-NTS was 500 mg/mL and the FIC values were 62.5 µg/mL and 0.38 µg/mL feed respectively for *K. galanga* and *C.longa.* A significant change in body weight was noted at weekly intervals from week 1 to week 6 ($P < 0.01$). Throughout the study, better body weight was exhibited by T2 and T3. When T2 and T3 were compared, higher body weight was observed in T3 during all wk except the fourth and fifth wk. The body weight during the fourth and fifth wk was comparable between T2 and T3.The observed body weights on sixth week were 2222.91 ± 8.28, 2255.56 ± 14.56 and 2356.01 ± 8.29 respectively in T1, T2 and T3 groups. The cumulative feed intake was significantly different among the treatment groups ($P < 0.05$). The cumulative weekly feed conversion ratio was significantly lower ($P < 0.05$) in T3 during the fifth and sixth wk. Better FCR next to T3 was observed in T2 when compared to T1 during fifth week, but during sixth week the FCR values were comparable between T1 and T2. The observed FCR on sixth week for T1, T2 and T3 were 1.99 ± 0.02, 1.98 ± 0.09 and 1.86 ± 0.03 respectively. The caecal counts of MDR-NTS were decreased significantly with the birds tested negative on the fourth week of post-infection in T2 and T3. Also a significant differences were observed in expression of IGF-1 and GHR genes, histomorphometry of duodenum, jejunum and ileum as well as cell mediated immune response. *C. longa* alone at the MIC dose and also in combination with *K. galanga* at FIC dose can be effectively utilized as the antimicrobial agents in broiler chicken infected with non-typhoidal *Salmonella* spp. and this combination can be thus used as a growth promoter.

Keywords: *K. galanga*, *C. longa*, MDR-NTS, Phytobiotics, Herbal growth promoter

YS-07

Effect of feeding variables dietary levels of calcium and available phosphorus on growth, immune response and skeletal health of turkey poults

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The present experiment was planned to study the variable dietary levels of Ca and available P on growth, immunity and skeletal health of turkey poults. Day-old turkey chicks (n=288) were distributed randomly in to 32 groups of 8 chicks each reared in battery pens. Nine dietary treatments with three levels of Ca (1.0/0.8, 1.2/1.0 and 1.4/1.2%) each with three levels of available P (0.5/0.4, 0.6/0.5 and 0.7/0.6%) in a 3×3 factorial experiment was conducted during 0-4/5-8 wks of age. Each of such diet was offered *ad libitum* as mash to four replicated groups of 8 turkey chicks. Cellular and humoral immune response was done on 30th and 35th days of experimental period respectively. At the end of 56 days experimental period, 8 birds from each dietary treatment (9×8=72 birds) were sacrificed and their left tibia bones were removed to study the bone morphometry and mineralization traits. Results indicate that Significantly (P<0.01) higher body weight, gain in body weight, better efficiency of feed utilization and liveability of growing turkey were found in a dietary combination of 1.0/0.8 % calcium with 0.5/0.4% available phosphorus than those recorded in other dietary combinations during 0-4/5-8 wk of age. Significantly (P<0.01) better cellular, humoral immune response and immune organs weight were recorded in a dietary combinations of 1.2/1.0% Ca with 0.6/0.5% available phosphorus than those observed in other dietary combinations. Significantly (P<0.05) higher tibia bone length was observed in a dietary combination1.0/0.8% calcium with 0.5/0.4% available phosphorus than those recorded in other dietary combinations. Significantly (P<0.05) higher tibia mid shaft and distal width were observed at1.0-0.8 % Ca than those recorded at other levels of calcium in the diets. Tibia dry bone weight and total ash weight were observed significantly higher in a dietary combination of 1.0/0.8% Ca with 0.5/0.4% Av.P than those recorded in other dietary combinations. Tibia bone Ca was significantly (P<0.01) increased with increased dietary concentration of Ca. Similarly, tibia bone Ca decreased significantly (P<0.01) with increased dietary concentration of Av.P. Tibia bone phosphorus was significantly (P<0.01) increased with increased concentration of Av.P in the diet. Tibia Copper and Manganese concentration were increased significantly with increasing dietary Ca levels in the diets. Whereas, Tibia Iron concentration was significantly reduced with increasing dietary concentration of Av.P. The present study concluded that a dietary combination of 1.0/0.80% Calcium with 0.50/ 0.40% available phosphorus was found adequate to achieve optimum growth, immune response and skeletal health of turkey poults during 0-4/5-8 wk of age.

Keywords: Calcium, Available phosphorus, turkey poults, growth, immune response, skeletal health.

YS-08

Effect of multi-strain probiotic feed supplement to diets containing fish meal on growth Performance and Carcass Characteristics, serum, immune parameters, histopathology and Escherichia coli count of commercial broiler chicken

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Probiotics are the best feed additives used in poultry to establish beneficial gut microflora by maintaining normal intestinal microflora by competitive exclusion antagonism. Three hundred and fifty

day old commercial broiler chicks randomly allotted to 7 treatments with 10 replicates containing 5 chicks in each replicate and reared for 42 days. The treatments consist of corn soya and fish meal-based control diet, control diet supplemented with antibiotic (Bacitracin methylene disalicylate, @500 g/ ton) and probiotic at 100, 200, 400, 600 & 800 g/ ton diet. Fish meal (4%) was included in the diets as microbial challenge so as to assess the efficacy of the probiotic supplement. The body weight gain and feed conversion ratio were significantly (P<0.05) improved in birds fed on diets supplemented with probiotic at 200 g/ton and higher levels compared with the control. The overall feed consumption was significantly (P<0.05) lower in birds fed on control diet when compared to other treatment groups except the diets supplemented with probiotic 100 g/ton. There were no effects on carcass traits but the percent breast yield (%) was significantly (P<0.05) higher in birds fed diets with probiotics at 400, 600 and 800 g/ton. There was no significant difference in dry matter (DM) and protein retention between the treatments. The total cholesterol concentration (mg/dl) in groups given graded levels of probiotic was significantly (P<0.05) lower in comparison to control and antibiotic groups. The total protein concentration (g/dl) was higher in groups fed diet supplemented (200g/ton, 400g/ton) to control group. The albumin and globulin concentration (g/dl) of antibiotic and probiotic group was significantly (P<0.05) higher respectively. The humoral immune response to ND vaccine, the percent bursal, thymus and spleen weights were statistically similar among the treatments. Escherichia coli count was significantly (P<0.05) reduced in birds fed graded levels of probiotic. Hence, it can be concluded that probiotic at 400 g/ ton may be supplemented as an alternative to antibiotic for improving performance and reducing E. coli counts.

Keywords: Probiotic, cholesterol, globulin, fish meal, intestinal villi

YS-09

Versatile bulk electroporation protocol for chicken cell culture systems: A necessity for *in vitro* nutrition, health and physiological studies in chickens

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Electro-transfection is a bio-physical method of introducing the foreign DNA by employing brief, high-voltage electrical pulse field to breach the cell membranes barrier. Simple and fast reliable delivery with high transfection and survival rate is an absolute necessity of any electro-transfer experiment. Square wave technology is the most studied protocol for transfection studies in mammalian cells and Nucleofector, BTX^{R}, Neon^{TM}, Gene pulser MX cell are the commercial entities that generate this technology. Optimization at every stage of electroporation is important, since improper conditions may yield poor results. In this study, we attempted to generate a stable electrotransfection protocol in chicken primary embryo fibrolbasts and DF-1cell lines for use in CRISPR-Cas 9 experiments. Different buffers were studied at different voltages using Pt2 venus as a reporter gene. Cell viability, cell transfection rate, flow cytometer and Western blotting for analysis of reporter protein were employed at 24 h post electroporation using square wave bulk electroporator. One way ANOVA was employed using SPSS (v. 20.0) and data was log transformed wherever necessary. For validating the CRISPR-Cas 9 based gene editing efficiency of ACVR2B gene, guided RNAs targeting ACVR2B exon was designed and analysed *in silico.* Guides were ligated intopSpCas9 (BB)-2A-Puro (PX459) vector 2.0 and were transfected into chicken cell cultures using optimized conditions. We examined the possibility of co-electroporating DF-1 cells with a reporter construct and multiple short gRNA. Means reflecting electro-transfection scores in cells cultured with different electroporation carriers in 4 mm cuvette with constant pulse conditions of 400 volts and 10 ms pulse length differed significantly (p=0.000). Higher scores of 23.78 and 9.96 were observed in cells polarized with DMEM Advanced as electroporation carrier in DF-1 and primary chicken cells followed by optim-MeM without and with Glutamax and Neon

transfection buffers. Least scores were recorded for DMEM knockout (10.10, 0.44) and DMEM with high glucose (2.88; 1.28) buffers. Cells when double pulsed at 300 and 350 volts for 10 ms witnessed a profound increase of efficiency scores in DF-1 cell lines with 53.84% and 25.53% viability respectively. According to the findings, choosing pulsing conditions and buffer compositions logically essential for the design of electroporation protocols that maximise viability and transfection efficiency. Furthermore, we ascertained efficient CRISPR-mediated gene editing of ACVR2B in chicken cells electroporated using optimized conditions.

Keywords: Electrotransfection, Chicken cells, transfection efficiency, CRISPR

YS-10

Effect of dietary supplementation of thyme and garlic essential oils on the growth performance, carcass characteristics and meat quality in commercial broilers

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In order to improve chicken health, better meat quality and longer storage duration, natural antioxidants such as thyme and garlic essential oils have been used in my experiment. The study assessed production performance and meat quality parameters in broilers. The data was analyzed using the General Linear Model procedure of SPSS 20th version and comparison of means was done using Duncan's multiple range test and significance was considered at P<0.05. At the end of 42 d the results showed that body weight gain (BWG), Overall feed consumption and FCR were significantly (P<0.05) increased in birds supplemented with essential oils. Physicochemical properties in terms of drip loss, cooking yield, cholesterol and shear force and fatty acid profile were significantly (P<0.05) improved by supplementation of essential oils. In fatty acid profile, lower SFA and higher TUFA and PUFA were observed. Meat quality in terms of texture profile analysis, meat colour, TBARS and microbial count were significantly improved in birds fed with essential oils compared to control. In texture profile analysis, hardness of meat was significantly (P<0.05) decreased with incorporation of essential oils. Meat colour, redness (a*) was significantly (P<0.05) improved. Sensory quality (texture and juiciness scores) of broiler meat supplemented with essential oils individually were significantly (P<0.05) improved. The pH and TBARS were significantly (P<0.05) reduced in birds fed with thyme and garlic essential oils. Mean coliform count and psychrophilic bacterial count on broiler meat were significantly (P<0.05) reduced with supplementation of thyme essential oil when compared to other dietary treatments. Diet supplemented with essential oils (TEO and GEO) significantly (P<0.05) reduced yeast and mold count on breast meat of broiler when compared to control and TGEO, whereas birds supplemented with thyme and garlic essential oils individually and their combination did not show any significant (P<0.05) difference in total plate count. Based on the overall results, it is concluded that TEO @ 25 g/100kg or GEO @ 25 g/100kg may be supplemented to broiler diet for improved growth, better meat quality and storage stability. Combination of thyme and garlic essential oils @ 50 g/100kg had no additional advantage on growth parameters and meat quality.

Keywords: Garlic and Thyme essential oil, Meat Quality, Storage studies, Microbiological studies, body weight gain.

YS-11

Expression of nutrient transporter genes in response to dietary rice gluten meal and protease enzyme supplementation and the consequent effects on performance, haemato-biochemical profile and gut health in broiler chicken

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Rice gluten meal (RGM), a by-product of wet-milling of rice obtained during starch extraction and syrup preparation, is a highly concentrated protein source, which has a potential to replace costly feedstuff, soybean meal in the diet of broiler chicken. The parameters studied were performance, haemato-biochemical profile, gut health, expression of nutrient transporter genes and cost economics. A total of 320 day old broiler chicks of uniform body weight were distributed randomly into 8 treatments having five replicates each. The first two treatments were fed basal diet containing maize and soybean as major ingredients with and without protease enzyme acting as negative and positive control groups. The rest six treatments contain 15, 17.5 and 20% RGM with and without protease enzyme. Data was analyzed using SPSS software and gene expression by ANOVA using JMP statistical discovery software from SAS 9.1 (SAS Institute, Cary, NC). The performance of birds (weight gain and feed intake) was significantly ($P<0.01$) reduced on supplementation of RGM above 15% level compared to control. No significant differences were observed in gut microbial count and immune parameters on RGM supplementation compared to control. Haemato-biochemical parameters revealed no significant ($P>0.05$) difference between the control and RGM supplemented groups, except in albumin and aspartate aminotransferase (AST), which were significantly ($P<0.01$) lower in 17.5 and 20% RGM supplemented groups compared to control. Histomorphology revealed a significantly ($P<0.01$) lower crypt depth (CD) and higher VH:CD ratio in 17.5% RGM supplemented group in ileum part of small intestine compared to control and other treatments, at 21 days of experiment. Supplementation of enzyme had significantly ($P<0.01$) increased villus height (VH), VH:CD ratio and decreased CD in Jejunum and ileum at 21 and 42 days of experiment. The mRNA expression levels of nutrient transporter genes (PepT1, EAAT3 and Mucin) showed a significant ($P<0.01$) down regulation in PepT1 and Mucin genes in RGM supplemented groups compared to control, at 21 days of experiment. However, at the end of experiment significant ($P<0.01$) down regulation was observed in EAAT3 and Mucin genes in the group supplemented with 20% RGM and enzyme. The cost of production was significantly decreased in RGM supplemented groups. Rice gluten meal can prove to be an economical and safe alternate protein source up to 15% level, replacing 40% of soybean meal without affecting the performance, gut health and expression of growth related genes in broiler chicken.

Keywords: Rice gluten meal, performance, gut health, haemato-biochemical profile, nutrient transporter genes, economics

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KA-01

Effect of dietary supplementation of *Artemisia absinthium* (Wormwood) leaf powder on the blood biochemistry, caecal microbial population and immune response of broilers

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This study explored the use of Artemisia absinthium leaf powder, a natural feed additive, in broiler nutrition. Various treatment groups received different levels of Artemisia absinthium leaf powder with or without enzyme supplementation. Results showed that supplementation with 2% Artemisia absinthium leaf powder along with enzymes significantly improved blood biochemistry by reducing glucose, cholesterol, triglycerides, and LDL levels while increasing HDL levels. Liver and kidney function parameters remained within normal ranges. Additionally, cecal microbial populations were positively influenced by 1.5% and 2% enzyme-treated Artemisia absinthium supplementation. Immune responses, measured by anti-sheep red blood cell antibodies and skin thickness, were significantly enhanced with 1.5% and 2% enzyme-treated Artemisia absinthium supplementation. Overall, supplementation with 1.5% and 2% Artemisia absinthium leaf powder with enzymes improved broiler health and immunity.
Keywords: Broiler, *Artemisia absinthium*, blood biochemistry, immune response, feed additive

KA-02

Utilization of chicken whole blood for preparation of chicken nuggets

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The poultry industry, a rapidly growing sector, generates substantial waste, including blood, often underutilized in developing countries like India. This study explored the incorporation of chicken whole blood in chicken nuggets to assess physico-chemical, microbial, and sensory qualities. Four formulations with varying blood levels were examined. Results indicated increased emulsion stability, pH, water activity, TBA value, moisture, and protein content with higher blood inclusion, while fat content decreased. Sensory evaluation favored formulations with lower blood content. Microbial counts remained within permissible limits. Cost analysis revealed economic benefits with blood incorporation. Overall, chicken nuggets with 11% blood content (T1) were favored in sensory evaluation, while 17% blood content (T3) excelled in physico-chemical parameters and protein content. This study demonstrates that blood protein is a cost-effective alternative for protein enrichment in food products, especially in resource-constrained regions.
Keywords: Blood, Microbiological, Nuggets, Physico-Chemical, Sensory Quality.

KA-03

Using hen's hormonal profile and egg morphometry, pre incubation sex determination of fertile eggs in white leghorn

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This study explores methods for pre-incubation sex determination in the layer industry to reduce the wastage of male chicks. Maternal hormonal profiles and egg morphometry were used as tools for this purpose. The research involved 48 White Leghorn laying hens across two phases. Serum progesterone and estrogen levels were measured, and egg morphometric parameters were analyzed. Results showed that lower progesterone levels were associated with a higher percentage of male chicks.

Estrogen levels were higher in hens producing more female chicks. Phase I had higher hormone concentrations, correlated with increased female embryo percentages and egg production. However, hormone levels didn't significantly vary with age. Egg morphometric parameters like length, width, volume, and weight correlated with chick embryo sex. Eggs with these attributes were more likely to produce female embryos. Birds producing more male eggs had higher production rates and fertility percentages. In conclusion, maternal progesterone levels during ovulation play a crucial role in determining chick embryo sex, offering potential solutions to the male chick wastage issue.

Keywords: Egg morphometry, Sex determination, White leghorn, Progesterone and Estrogen

KA-04

Effect of phytogenic feed additives on growth performance, antioxidant status and immune response in broilers under summer stress

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High ambient temperatures adversely affect broiler performance, impacting growth, immunity, and economic viability. This study investigated the effects of phytogenic feed additives (PFAs) on broilers under summer stress. Performance parameters, immune responses, antioxidant status, and serum biochemical profiles were evaluated. Results at the 6-week mark revealed significant improvements in body weight gain, feed consumption, and feed conversion ratio with PFA supplementation. Humoral and cell-mediated immunity showed no significant differences. Carcass parameters, including dressing weight percentage, were positively influenced by PFAs. Mortality rates remained within acceptable limits. Lipid peroxidation decreased significantly with PFA supplementation, while serum glucose, SGOT, SGPT, and cortisol levels were reduced. Hematological parameters were largely unaffected, but total leucocyte count increased. Intestinal morphology, particularly villus height, improved with PFA supplementation. In conclusion, PFAs enhance broiler performance and mitigate the negative effects of summer stress, offering potential benefits in broiler farming.

Keywords: Body weight, Feed conversion ratio, Immunity, Peroxidation, Serum biochemistry

KA-05

Comparative evaluation of conventional vis à vis herbal antioxidant supplementation on enhancing broiler chicken performance and meat quality

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This study compared conventional antioxidants (Vitamin E and Selenium) with herbal antioxidants (garlic and thyme) in mitigating oxidative stress in broiler chickens. Various parameters including performance, immune response, meat quality, and antioxidant effects were evaluated. While all supplements had no significant impact on body weight, feed intake, and feed efficiency, they did enhance spleen weight and antibody titers against IBDV. Meat quality parameters were largely unaffected, but garlic and thyme supplementation improved water holding capacity and oxidative stability during storage. Additionally, garlic and thyme performed as effectively as Vitamin E and Selenium in enhancing meat quality and immune status in broilers.

Keywords: Antioxidants, Garlic powder, Herbal antioxidants, Meat quality, Thyme powder

KA-06

Efficacy of Kaempferia galanga on growth performance of broiler chickens and its antimicrobial activity against multi-drug-resistance S. Typhimurium

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This study assessed the impact of K. galanga supplementation on broiler chickens challenged with MDR-S. Typhimurium. A total of 31 samples from Wayanad district broiler farms were analyzed for antimicrobial susceptibility and further tested for minimum inhibitory concentration (MIC) and LD50 concentration. Ninety chicks were divided into three treatment groups (T1 to T3) and challenged with MDR–S. Typhimurium. Results indicated 24 samples positive for NTS, with 2 S. Typhimurium and 18 S. Enteritidis isolates. Among them, 18 were MDR-NTS. In vitro MIC of K. galanga against MDR-S. Typhimurium was 25 mg/mL, and LD50 dose was 1×109 CFU/mL. T3 (5% K. galanga) showed significantly higher body weight, pre-slaughter live weight, carcass weight, and dressing percentage compared to T1 (basal diet). Salmonella counts turned negative in T3 and T2 (2.5% K. galanga) but remained positive in T1. Faecal consistency was better in T2 and T3, while T1 exhibited higher scores. Survival rate was higher in T2 and T3, with no Salmonella-related mortality, suggesting that K. galanga could be an effective growth promoter and alternative to antibiotics against MDR-S. Typhimurium.

Keywords: *K. galanga*, Broiler chicken, MDR, *Salmonella,* MIC

KA-07

The GRAS compounds affecting the performance, immunity, gut health, carcass traits and resistance profile of E.coli isolated in turkey birds

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This study investigated the impact of dietary formic acid (FA) and thymol (Th) supplementation on turkey birds, focusing on growth, gut health, immunity, microbial load, carcass traits, and antibiotic resistance in E. coli. CARI VIRAT turkey poults (n=256) were divided into 8 groups with various dietary treatments. Results showed that FA and Th supplementation significantly improved final body weight, cumulative gain, feed conversion ratio (FCR), and immune responses. Gut morphology was enhanced in supplemented groups. Additionally, FA and Th reduced microbial counts and increased Lactobacillus. Improved carcass traits were observed in supplemented groups. Antibiotic resistance profiles varied among treatments, with AGP-treated birds showing the highest resistance. ESBL genes were prevalent, with blaAmpC gene being highest in control groups. In conclusion, FA and Th supplementation can enhance turkey growth, immunity, gut health, and carcass traits while potentially reducing the need for antibiotics.

Keywords: Growth, E.coli, Antibiogram

KA-08

Assessing the impact of storage duration and temperature on the table egg quality

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This study assessed the impact of different storage conditions on egg quality. A total of 120 fresh eggs were divided into three groups: ambient room temperature (T1), 18-20°C (T2), and refrigeration at 4°C (T3). Quality evaluations were conducted at 6-day intervals over 30 days. Results indicated that storage duration and temperature significantly affected internal and some external egg quality parameters. Air cell diameter increased with egg age, being highest in T1. Yolk index, albumen viscosity, albumen height, and Haugh units deteriorated with increased storage time and temperature. pH values increased significantly in eggs stored at ambient temperature. Microbial counts were highest in T1. Organoleptic evaluation revealed that eggs stored at ambient temperature were less preferred after 14 days, while T3 eggs remained preferable for 30 days. In conclusion, eggs stored at 4°C maintain better quality and longer shelf life, emphasizing the importance of cold chain maintenance during transportation to consumers.
Keywords: Egg storage, Egg quality, Storage temperature, Haugh unit, Egg pH.

KA-09

Field evaluation of single cell protein (biomass) in broiler chicken

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This study explored the potential of single-cell protein (SCP) as an alternative protein source in poultry feed. Conducted on 4000 commercial broiler birds over 6 weeks, the research investigated carcass yield, meat quality, CDXA gene expression, microbial analysis of caecal digesta, and intestinal histomorphometry. SCP with over 80% crude protein content was included in dietary treatments (0%, 2.5%, 5%, and 7.5%). Results revealed improved nutrient utilization in SCP-fed groups, along with higher CDXA gene expression with increasing SCP levels. Carcass traits and microbial analysis showed no significant differences. Meat quality parameters also remained unaffected. In conclusion, incorporating SCP up to 5% in poultry feed enhances nutrient absorption without altering carcass yield, meat quality, intestinal morphology, or gut microbial balance.
Keywords: Single-cell protein, field study, alternate protein source, biomass