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A systemic review of studies investigating *Moringa oleifera* leaf meal as a feed for livestock

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Moringa oleifera is a multipurpose tree species that originated from Himalaya and has spread worldwide. Its leaves and green fresh pods are used as vegetables by humans and are rich in carotene and ascorbic acid with a good profile of amino acids. *Moringa oleifera* leaves can be used as livestock feed as it has appreciable high crude protein levels, vitamins and minerals and contain negligible amount of anti-nutritional factor indicating its higher nutritional quality than other leafy vegetables or fodders. There is increasing number of scientific reports documenting the nutritional benefits of *Moringa oleifera* leaf meal (MOLM) and current published literatures were systematically reviewed to study the nutritional potential and benefits of *Moringa oleifera* as a potential fodder for livestock. Databases such as ProQuest, Scopus, TEEAL and EBSCO host were searched for reports on any studies investigating the nutritive potential of MOLM as feed resources for food animals. Search terms included: *Moringa oleifera* leaf meal, anti-nutritional factors and livestock. Inclusion criteria were papers that studied nutrient profiling of MOLM and its effect on sheep, goat dairy cow, rabbit and poultry. A total of 43 scientific studies were retrieved from the search and 36 articles met the selection criteria. After screening the title and abstracts, 13 articles reported studies on poultry, 5 articles studied its effect on goat, 1 article on pig, 2 papers on sheep, 6 papers on dairy cattle, 3 papers on general ruminants, 1 paper on rabbit and 5 papers reported nutritive profiling of MOLM. It was found that MOLM could substitute oil seed meals in the diets of non-ruminant and ruminants and improve their growth performance and carcass characteristics. Inclusion of MOLM as a protein supplement to low quality diets improved dry matter intake, digestibility and milk production but did not affect milk composition of dairy cows. MOLM can be digested and utilized by monogastric animals because of high pepsin and total soluble protein in MOLM than other parts of the plant. However, documented information on its dietary use of MOLM for pigs is scanty. Further studies are needed to investigate its functional, bioactive compounds and phytochemicals.

Biography

Bukola Babatunde has completed her PhD degree in Poultry Nutrition in 1999 from University of Ibadan, Nigeria and another PhD in Animal Nutrition and Immunity in 2009 from La Trobe University Australia. She has worked at Institute of Agricultural Research & Training, Obafemi Awolowo University, Moor Plantation as Research Fellow in Pig improvement programs and as a Senior Lecturer in Animal Science at Federal College of Animal Health and Production Technology, Institute of Agricultural Research & Training. She is currently an Associate Professor and Head of Department of Animal Husbandry at Fiji National University. She has published more than 40 papers in reputed journals and is a Member of Editorial Board and Review Board of reputable international journal.

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Other Genetic parameters for androstenone, skatole, indole of boar taint and their relationship with performance and reproductive traits

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The purpose of this study was to evaluate degree of taint compounds i.e., androstenone, skatole and indole of boars and their relationship of traits so that to find possibility to breed low level taint compounds boars. Genetic parameters of Boar taint compounds were estimated for 310 boars constitute of three breeds and one crossbred, include their genetic correlation with performance and reproductive traits. The chemical analysis of three boar taint compounds were assessed by GC/MS/MS facilities using 3~5 g of fat tissue collected by biopsies. The average of three compounds, androstenone (1.193±1.114 μg/g), skatole (0.092±0.096 μg/g) and indole (0.062±0.082 μg/g) were obtained. Duroc showed the highest level of androstenone as 1.684±1.334 μg/g and those of native breed was 1.287±0.673 μg/g, crossbred (Duroc X native bred) was 1.286±0.673 μg/g, Landrace was 0.086±1.077 μg/g and Yorkshire was 0.823±0.763 μg/g. Native breed showed the highest level of skatole as 0.118±0.171 μg/g and Landrace showed the lowest level of skatole 0.086±0.071 μg/g. Native breed also showed the highest level of indole of 0.237±0.023 μg/g and Yorkshire showed the lowest as 0.041±0.043 μg/g. The heritabilities of androstenone was 0.40, skatole was 0.17 and indole was 0.001. The genetic correlations of boar taint compounds and performance traits were not significant ($p>0.05$). The genetic correlations of boar taint compounds and the dam of boars reproductive traits were also not significant ($p>0.05$). It is concluded that it is possible to breed the low taint boars, since the heritabilities of major taint compounds were moderate and their correlation with economic traits were not significant.

Biography

DooWan Kim has been working in National Institute of Animal Science for 6 years now. He received MS in Animal Science from Chonbuk National University, Chonbuk, Korea in 2016.

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Apparent digestibility of cull chickpeas and peanut meal in growing pigs

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To determine the effect of the substitution of soybean meal and *Sorghum* for cull chickpeas and peanut meal on apparent digestibility of nutrients in growing diets for pigs; six crossbred pigs (BW=39.1±1.7) were used in a replicated Latin Square Design. Pigs were assigned to consume one of three diets: Diet with 17.78% CP and 3.27 Mcal ME/kg, containing *Sorghum* 69.5%, soybean meal 28% and premix 2.5% (CONT); Diet with 17.73% CP and 3.28 Mcal ME/kg with *Sorghum* 42.5 %, cull chickpeas 40%, soybean meal 12.0%, vegetable oil 3% and premix 2.5% (CHP); and Diet with 17.9% CP and 3.26 Mcal ME/kg with *Sorghum* 51.4%, cull chickpeas 30%, peanut meal 14%, vegetable oil 2% and premix 2.5% (CHPN). Pigs were individually placed in metabolic crates (0.6×1.2 m). The adaptation period was 6 days and sample collection period was 4 days. From each diet and period, one kg of diet was taken as a sample and the total fecal production was collected. Feed intake (2.19, 2.24 and 2.26 kg/day) was not affected by treatments (P>0.05) for CONT, CHP and CHPN, respectively. Apparent digestibility of DM (82.05, 82.91 and 83.9%) was similar (P>0.05) across treatments. Apparent digestibility of crude protein was not altered (P>0.05) by CHP and CHPN inclusion (78.35, 78.47 and 79.23%). It is concluded that cull chickpeas and cull chickpeas-peanut meal can be used in growing pig diets without affecting nutrient digestibility.

Biography

Juan Manuel Uriarte Lopez has completed his Master of Science degree from Univeridad Autonoma of Sinaloa in Mexico. He has published more than 25 articles in leading journals and he is working as a Teacher of Animal Nutrition for 27 years at the School of Veterinary Medicine UAS in Culiacan, Mexico.

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Effect of cellooligosaccharide feeding on growth performance of weaned grazing Japanese black calves

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Calves at weaning can digest easily fermentable carbohydrates such as starch, but they may not be able to obtain sufficient energy from forage because of inefficient fiber digestion. Improving energy acquisition in weaned calves on pasture by implementing a measure to the conventional grazing system is crucial for successful rearing. Non-digestible oligosaccharides have been used in calf diets to improve health and cellooligosaccharides (CE), which are derived from enzymatic digestion of plant cellulose, may be a good supplement for stocker calves. Here, we evaluated the effect of CE supplementation on weaned grazing calves. Eight castrated calves weaned at 3 months were allocated to either a control (CON) or an CE group based on body weight (BW) and age. All calves were provided a commercial concentrate feed (TDN 72.5%, CP 15.5%) from 4 weeks before weaning at a daily maximum of 2000 g. The experimental groups were fed CE (NPC Cello-Oligo®, containing 95-97% D-cellobiose, Nippon Paper Chemicals Co., Ltd, Tokyo, Japan) at a rate of 10 g/day mixed with the concentrate feed from the starting time of experiment. Neither BW nor average daily gain differed significantly between the groups, but there was a tendency for BW gain to be greater in CE than in CON at 7 weeks (CE, 33.8±3.2 kg; CON, 26.8±2.1 kg; $P<0.05$). We assume that CE may be more advantageous for grazing calves if it is provided from an earlier timing (i.e., pre-weaning period), or at a larger amount than 10 g.

Biography

S Kushibiki has completed his PhD from Tohoku University and Post doctoral studies from National Institute of Livestock and Grassland Science (NILGS). He is the Associate Director of Ruminant Metabolism Unit of NILGS. He has published more than 30 papers in reputed journals and is serving as a Professor of Tsukuba University.

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Paenibacillus sp. nov., isolated from animal complete feed

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A Gram-reaction-positive, aerobic, rod-shaped, spore-forming bacterium, SK3146T, was isolated from complete feed in South Korea and characterized in order to determine its taxonomic position. On the basis of 16S rRNA gene sequence similarity, strain SK3146T was shown to belong to the family *Paenibacillaceae*, being related to *Paenibacillus vulneris* CCUG 53270T (98.1%) and *Paenibacillus chinjuensis* WN9T (96.9 %). The phylogenetic distances from other described species with validly published names within the genus *Paenibacillus* were greater than 3.3%. The G+C content of genomic DNA is 48.1±0.2 mol%. Phenotypic and chemotaxonomic data (major menaquinone, MK-7; fatty acid profile, anteiso-C15:0 and iso-C16:0) supported the affiliation of strain SK3146T to the genus *Paenibacillus*. The results of DNA-DNA hybridization test and physiological and biochemical tests allowed strain SK3146T to be distinguished genotypically and phenotypically from *Paenibacillus* species with validly published names. Strain SK3146T, therefore, represents a novel species of the genus *Paenibacillus* for which the name *Paenibacillus* konkukensis sp. nov., is proposed. Some biological activities of this strain should be characterized in future works, expecting for beneficial probiotics applicable to animal feed additive.

Biography

Soo-Ki Kim has completed his PhD in Osaka University and Postdoctoral studies in Department of Biology of Purdue University. He is a Professor in Department of Animal Science and Technology. He has published research papers on the fields of basic microbiology and development of animal feed additives. He has also served as a President of Korean Agricultural Microbiology Research Association from 2013 to 2015.

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Correlation between blood composition and meat quality in Hanwoo steers

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A hundred twenty six Hanwoo steers (8-9 month of age) were used to know the correlation between blood composition and carcass traits. Steers fed the formula feed and rice straw (30 heads) or total mixed rations (96 heads) and were slaughtered at 30 month of age. Blood samples were corrected from jugular vein at the growing (8-12 mo), early fattening (13-23 mo) and late fattening (24-30 mo) phases. Blood metabolites and hormones were analyzed and determined the correlation coefficients and regression equations with carcass traits. Average concentrations of retinol, insulin and leptin were 1.10 IU, 30.34 ng and 235.35 ng per ml of blood plasma, respectively and blood retinol has negative correlations significantly ($P<0.01$) with insulin and leptin. With the age of steers, blood insulin and total protein decreased but blood retinol, AST, glucose, cholesterol and triglyceride were increased. At the late fattening phase, significant ($P<0.01$) negative correlations occurred between blood retinol concentration and marbling score and also blood total protein and longissimus muscle area of 13th rib and obtained the regression equations as follows; Marbling score (1-9)=-0.009×Retinol (IU/100 ml)+9.125 (R2=0.643); Ribeye muscle area (cm2)=-0.250×AST (U/L)+112.498 (R2=0.450). From the results obtained in the current study, it might be possible to make a high marbled beef by controlling the blood retinol content during the fattening phase in steers.

Biography

Y H Moon has completed his PhD in Ruminant Nutrition from GNU in Korea and working in the university as a Professor since 20 years. He has published more than 100 papers in reputed journals and has been serving as an Editorial Board Member of repute.

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Feeding system in Aberdeen Angus calves

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The feeding system in animal production, achieves efficiency of production parameters as birth weight and weaning weight. Birth weight is related to the survival of the calf, while weaning weight is a productive indicator. The present study was undertaken in order to improve the feeding system used in Aberdeen Angus calves, located in a region of semi-dry climate. The birth weight (BW), weaning weight (PD), daily weight gain (GDP) and total weight gain (GTP) were measured. 24 records calves born in 2015, (8 females and 16 males), with date of birth and birth weight (PN) were obtained and weight adjustment 180 and 205 days held. During the period of lactation (0-60 days), calves remained with their mother in the pasture, later in the pre-weaning (61 to 150 days), calves were separated from their mother in the mornings, housing them individually in pens where they were offered them twice a day, 12 kg alfalfa, 13 kg corn stover and 1 kg concentrate. In the afternoon they returned to the pasture with their mothers, where they ate native grass until 5 months of age. For a month left permanently calves in the pen (151 to 180 days), feeding them twice a day with 26 kg stubble, 24 kg alfalfa, 90 kg corn silage and 3 kg concentrate, evenings calves suckled his mother. Minerals were provided once a week and water ad libitum. Weaning was performed at 6 months. The results showed a weight lightly minor than the reported for this race (34.5 kg versus 35 kg), the PD 205 days were 240 kg, the GDP was 1 kg and 213 kg was GTP. We concluded that in this feeding system the productive parameters were improved.

Biography

Eduardo Posadas Manzano has completed his Master's degree from UNAM University, Mexico. He is the Secretary of Animal and Production Department at Faculty of Veterinary Medicine and Bovine Clinic, Milk Production in Tropic Professor at FMVZ-UNAM. He has published more than 200 papers in national and international congresses and journals. He is author of 3 books in Veterinary Medicine and bovine production. He has received the National Animal Health Award by SAGARPA Mexico.

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Silvia Denise Peña Betancourt, J Fisheries Livest Prod 2016, 4:2 (Suppl)
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Supplementation bagasse brewery in the diet of sheep in a family system in the state of Hidalgo, Mexico

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Industrial wastes pose a threat of environmental pollution worldwide. The beer industrial process produces huge amounts of semiliquid waste, which can be reused in animal feed. In Mexico the family sheep production systems are based on forages that miss in dry times, so the lack of quality food causes high and low weight gains in animals. The aim of this study was to use bagasse brewery to supplement the ration of crossbred sheep meat during development and test weight gain. The study was conducted in the municipality of Cuautlalpan, state of Mexico under a system of household production with 9 sheep landrace (7 females and 2 males) with an initial weight of 35 kg. The 9 sheep were selected randomly and grouped into two treatments. The control group (T0) with 2 animals, T1 with 3 and T2 with 4, using a statistical model completely randomized with a factorial arrangement 2×3 (two treatments per 3 animals) and a comparison of means with Tukey's test. The results of the statistical analysis showed a positive effect of supplementation with bagasse brewery in the diet of sheep in the development stage significantly on the daily weight gain ($P \leq 0.05$). It is concluded that supplementation with brewer bagasse in a 10% of dry basis ration, helps improve weight gain of crossbred sheep in regions close to breweries.

Biography

Silvia Denise Peña Betancourt is a Veterinarian, completed her Master of Science from UNAM-FMVZ, Toxicology Specialist Clinic at Faculty Medicine Alexis Carrel and Doctor of Pharmaceutical Science at Faculty of Claude Bernard University. She currently works as a Research Professor at UAM-X, since 1991 to date and as Toxicology Laboratory Responsible at Department of Agricultural and Animal Production in UAM-X. She has written more than 30 research papers in national and international journals and is a Member of National Council of Animal Health and published books and books chapter in toxicology

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Neutrophilic toll-like receptor 4, Fas gene expression and level of some plasma parameters: Causative factor for repeat breeding

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Insulin like growth factor-1 (IGF-1) plays an important role in reproduction because it has anabolic and positive effect on cell proliferation, transformation and differentiation. IGF-1 also plays a prominent role in the regulation of immunity and inflammation. Plasma lactoferrin (LF) and haptoglobin (Hp) reflect the immune status of the animal. Higher level of plasma Hp indicates sub-clinical or clinical infections. The present study was conducted in order to investigate whether the TLR-4 and Fas gene expression in neutrophils and plasma level of IGF 1, LF and Hp varied between repeat breeding (RB) and regular breeding (RgB) cross bred cattle. For the study, recently calved Karan Fries cattle of 2nd-3rd parity with body weight ranging from 400-460 kg reared under farm and field conditions and free from clinical reproductive tract infections and mastitic conditions were selected. Cows were monitored up to three consecutive services. Animals which conceived by maximum three number of services (23 weeks post partum) were considered as regular breeders and those that did not conceive, as repeat breeders. Relative expression of TLR-4 and Fas genes in neutrophils were significantly ($P<0.05$) higher in RgB group when compared with RB group. On *in vitro* supplementation of IGF-1, the relative expression of TLR-4 and Fas gene in neutrophils of RgB group increased but was not significant. Concentration of plasma IGF-1 and LF were significantly ($P<0.001$) greater in RgB group while plasma Hp was significantly ($P<0.001$) less in RgB group when compared with RB group. Within RgB group the concentration of IGF-1 significantly increased post 9th week but such an increase was not observed in RB group. The concentration of plasma Hp at the beginning, at the end of 23 weeks of experiment and also at weekly interval was significantly greater in RB group when compared with RgB group. The concentration of LF increased significantly in RgB group from 12th week postpartum and was significantly higher in RB group. IGF-1 and LF parameters were positively correlated with each other and both of them were negatively correlated with Hp. From the present study, it can be concluded that the immune status of RgB group animals was better when compared with RB group animals. Poor immune status and some type of inflammation may be the causative factor for repeat breeding problem to persist in one of the group of cows.

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Evaluation of a short-horn grasshopper *Spathosternum praciniferum* as an alternative protein source for livestock feed

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Despite being a capable alternative protein source in livestock diets, grasshoppers received fewer attentions regarding mass scale cultivation. Probable annual biomass of two short-horn grasshoppers of the genus Oxya has been estimated so far but both the works used an environmental chamber, the cost of which is a definite encumbrance for local livestock farmers. Hence it is essential to estimate the annual biomass in natural condition. In this context the present work explores whether the short-horn grasshopper *Spathosternum praciniferum* could be a suitable alternative protein supplement. Firstly, the proximate composition along with fatty acids, amino acids, vitamins, minerals and anti-nutritional factors were estimated. Then they were reared in the laboratory with the host plant *Sorghum halepense* and nymphal mortality was calculated followed by estimation of sex ratio. Number of egg pods laid by each female and number of eggs hatched were also determined. Results revealed that the insects are highly nutritious with more than 65% protein and are affluent in essential amino acids. Total six fatty acids and five vitamins were detected. Anti-nutrients were also present in extremely low titer. The results have instated these insects as a rich nutrient resource; moreover, the projected annual biomass was found to be about 3.5 kg of dry weight obtained from a single pair. This is certainly lower than the earlier biomass estimations, but one should note that environmental chamber was not used in the present work. Hence the present findings strongly established the candidature of short-horned grasshoppers as an alternative protein source for livestock.

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Effects of a direct-fed microbial to Bali steers fed oil palm trunk fermented as base diet

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This research aims to determine effect of a direct-fed microbial (DFM) on digestibility (dry matter (DM) , organic matter (OM) and crude protein (CP)) and growth performances such as feed intake, body weight gain and feed efficiency of Bali steer fed oil palm trunk fermented as base diet with the addition of (DFM) of *Saccharomyces cerevicea* and *Pediococcus* sp. The experimental design used was a randomized block design consisted of 4 treatments and 4 replicates using 16 Bali steers with an average weight between 120-150 kg per head. Feed treatment applied as follows: A: 70% concentrate+30% fermented oil palm trunk; B: Ration A+1% *Saccharomyces cerevicea*; C: Ration A+1% *Pediococcus* sp; D: Ration A+0.5% *Saccharomyces cerevicea*+0.5% *Pedicococus* sp. The results showed that the treatment provides highly significant effect ($P<0.01$) on the digestibility of DM, OM CP, feed intake and body weight gain, whereas a significantly effects ($P<0.05$) to feed efficiency. It can be concluded that the best treatment was the used of ration D with digestibility DM, OM and CP were 70.42%; 73.04% and 69.27% respectively. The ration D also showed that the body weight gain: 1.0 kg/day with feed intake: 4.31 kg and 23.13% feed efficiency.

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The functional ecology and mechanical properties of biological hooks in nature

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The selection of biological hooks in nature is wide so how do we endeavor to narrow the field into a manageable set that can be analyzed and commercialized such that they all have a natural product that is reproducible and of value to the human population? We turn to the ancient evolutionary theory of cladistics which makes use of a simple measure to differentiate between organisms, the visual structures that differentiate and also consolidate them into sets. Nachtigal supplies us with a textbook of classes of attachment mechanisms which yield a number on instances where the connectors resemble those of man-made devices, from ratchets to hinges, but always in two structures and never with an intervening third which is separate from the two such as the rod of a hinge on a door. It is important to consider the use of available technology, to look at these examples with new eyes as are made available by new microscopy techniques, computer integration and new layered manufacture techniques such as SEM (Scanning electro-deposition Electron Microscopy) and bio-printing. The end result has been the simplest of all attachment devices seen to be possible and inevitably the first option when looking at commercial applications. Advances in biomaterials too mean that we can look at more options with greater versatility from fusing bone with attachment devices treated with hydroxyapatite to anchorage devices for the sensitive walls of the gut and/or the abdomen as well as brain implants for sensing magnetic fields. It is hoped that the reader will enjoy this work as much as I have with the great promise that it will hold forth the right of way for the advance of technology and the sustenance of the age which is about to come.

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Influence of SNPs in myostatin promoter gene to growth and muscling traits in Bali cattle

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Improvement of genetic qualities in Bali cattle can be done by selection based on genetic marker. MSTN (Myostatin) gene is known as an inhibitor or negative regulator of muscles development in embryogenesis and myogenesis. Mutation of this gene caused double muscling characteristic in cattle and it was identified has significant associated with some growth traits in cattle, sheep, pigs and mice. A total 48 Bali cattle from Bali cattle breeding centre was screened to identified genetic polymorphisms in MSTN promoter region by using direct-sequencing method (GenBank: AF348479.1). The weights and bodies measurement of Bali cattle were collected at 12 months. The muscling traits were evaluated by using ultrasound veterinary scanner at frequency 6.5 Hz and 130 mm of deep. The polymorphic SNPs in this region were 23 SNPs (g.-8495C>T, g.-8455A>C, g.-8444G>A, g.-8428A>G, g.8361G>A, g.-8350A>G, g.-8313A>G, g.-8254T>G, g.-8223C>T, g.-8313A>G, g.-8.184C>A, g.-8173A>G, g.-8161C>T, g.-8158C>A, g.-8144T>C, g.-8141G>C, g.-8124T>C, g.-8098C>T, g.-8087C>G, g.-8086C>T. Based on statistical analyses, SNPs g.-8444G>A, g.-8428A>G, g.8361G>A, g.-8313A>G and g.-8313A>G were significantly associated with ultrasound back fat thickness. SNP g.-8.184C>A and g.-8087C>G was significantly associated with ultrasound rump thickness and ultrasound longissimus dorsi thickness ($P \leq 0.05$) respectively. This result showed that SNPs in MSTN gene could be suggested as good marker for muscling traits in Bali cattle.

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A next generation delivery system of bioactive nutrients to dairy cattle for the production and optimization of new, value added, medicinal, milk products

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This project takes aim at developing a novel and natural nutrient delivery system that incorporates an active ingredient (holy basil, HB) into molecular gels. These gels or emulsions are fed to dairy cows alongside their regular diets and are efficiently transferred to the mammary gland, while resisting degradation during digestion. Gel creation is preformed via emulsification of a stable wax polymer and a sodium alginate (NaAlg) solution followed by a two-tier gelation process initiated by calcium salts. The wax complex makes up 25% of the gel and is comprised of rice bran wax (2% w/v) and canola oil. It was selected based on its stability (<10% degradation) during 48 hours artificial rumen incubation. The NaAlg solution (75% of the gel) is added to the wax solution to be homogenized and emulsified, creating a low viscosity emulsification. A 9:1 solution ($CaCO_3$:$CaCl_2$) is then added to our emulsification at the same time as the HB. The calcium salts induce encapsulation of the HB through immediate and long-term gelation. The insoluble calcium ($CaCl_2$) activates instantaneously, causing rapid gelation, while the insoluble calcium ($CaCO_3$) activated by a drop in pH is triggered once the gel reaches the cow's acidic digestive system. The $CaCO_3$ activation creates sustained gelation; this helps ensure the encapsulated HB survives rumination while on its way to the mammary gland for deposition. This target-specific delivery system will enhance the functional food properties of milk and can be applied to attain marketable, medicinal milk products, unique to the industry in their therapeutic qualities.

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Growth performance of broilers raised under mango plantation fed different levels of crude protein

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The study was conducted to determine the growth performance and carcass quality of broilers raised under mango plantation fed different levels of crude protein. One hundred fifty two-week old commercial broilers white strain (Cobb 500) were used and distributed equally to the following treatments: T1-21% CP, T2-20% CP, T3-19% CP, T4-18% CP (Control) and T5-17% CP. These were laid out in completely randomized design with three replications. The birds were fed in restriction for a period of five weeks. Feeds were withdrawn from the birds daily when they are in range, 3 hours in the morning and 3 hours in the afternoon. Results showed that T3 significantly differed with T4 and T5 but not with T1 and T2 with a feed conversion ratio of 2.0. T1 obtained the lowest percentage abdominal fat deposition with 0.74. In terms of profitability, T3 had the best return above feed cost with P178.01 income per chicken. This study revealed that feeding the ranged broilers with 19% CP resulted in better feed efficiency and income, while 21% CP obtained the least fat deposition.

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Ileal amino acid digestibility of full-fat rice bran fed to post weaned piglets with or without multi-carbohydrase and phytase supplementation

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The ileal-cannulated pig model for amino acids (AA) determination in pigs uses animals older than six weeks due to difficulties related to implanting the T-cannula in distal ileum of younger pigs and complications during the post-surgical recovery. However, to properly formulate the diet of weaned pigs, the nutritive value of feed ingredients should be determined with younger pigs. Thus, twenty five post weaned piglets were used to determine the apparent (AID) and standardized (SID) ileal AA digestibilities of full-fat rice bran (FFRB) with or without multi-carbohydrase (MC) and phytase (Phy) supplementation. Piglets were weaned at 23 days of age and individually housed in digestibility cages until 42 days of age. A completely randomized experimental design with a 2×2 (with or without MC and Phy) factorial treatment arrangement was used to determine the effects of enzymes. Reference diets (RD: 5% casein) was replaced by 30% of FFRB with or without MC, Phy or MC+Phy. A RD was used to quantify endogenous AA losses. Ileal digesta was collected at slaughter (about 6 weeks of age). The AID and SID of the indispensable amino acids without enzymes were on average 18% and 6%, respectively, lower than the values described in the literature (NRC, 2012). The MC increased the AID and SID of all AA in FFRB, whereas Phy increased only the proline digestibility ($P<0.05$). The MC is an alternative to improve the AA digestibility in FFRB, whereas the Phy does not change the most part of AA digestibility.

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Apparent digestibility of canola meal nutrients using exogenous enzymes in broiler chickens

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Canola meal (CM) is an important ingredient in the feeding poultry. However, CM has anti-nutritional factors that induce reduction on nutrient digestibility. Exogenous enzymes in poultry diets could improve the nutritional value of some vegetable feedstuffs. The objective of this study was to evaluate the apparent total tract digestibility (ATTD) of dry matter (DM), crude protein (CP), apparent metabolizable energy (AME), ash, calcium (Ca), phosphorus (P) and neutral detergent fiber (NDF) in CM with or without multicarbohydrase (MC) and phytase (Phy) supplementation using broiler chickens. Day-old male broilers (245) were allocated to five treatments in a randomized complete design. Each treatment had seven replicate cages with seven broilers per replicate. Reference corn diet was replaced by 30% of CM on ATTD determination. A completely randomized experimental design with a 2×2 (with or without MC and Phy) factorial treatment arrangement was used to determine the effects of enzymes. Data were submitted to variance analysis using SAS 9.2. The ATTD of DM and AME improved ($P<0.05$) with isolate enzymes addition. Interaction ($P<0.05$) was observed between enzymes on ATTD ash, CP, Ca and P and a trend ($P=0.06$) for NDF digestibility. For all nutrients and AME, the treatments with enzymes showed higher digestibility coefficients than the control diet. The results confirmed that MC and Phy combination in CM produces greater benefit for broiler chick compared to isolated enzymes.

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Effects of sulfur on the nutrition value of DDGS for beef cattle

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To investigate the effects of sulfur on the nutrition value of DDGS for beef cattle, *in vitro* cultivation was conducted for 72 hours with the rumen fluid collected from steers, setting different sulfur levels (0.346%, 0.692% and 1.038%) and various sulfur sources (Na_2SO_4, Na_2SO_3, $Na_2S_2O_3$ and Na_2S), monitoring the fermentation parameters (dry matter digestibility, gas production and its rate) and model predicted indicators (organic matter digestibility, metabolizable energy, net energy, microbial protein, partitioning factor and gas yield). The results showed that, high sulfur level (0.692% and 1.038%) only decreased ($P<0.05$) asymptotic gas production (b), while different sulfur sources resulted in various parameters, more specifically, sulfur from Na_2SO_4 and Na_2S produced more gas ($P<0.05$) with faster rate ($P<0.01$) of gas production than those of Na_2SO_3 and $Na_2S_2O_3$, while Na_2SO_3 had the highest b and inverse for Na_2SO_4 ($P<0.01$), which tended ($P=0.09$) to produced lower total volatile fatty acids than the others; sulfur from Na_2SO_4 and Na_2S also had a lower ($P<0.01$) DMD in 24 hours, MCP, PF24 and a higher ($P<0.01$) OMD, ME, NEm, NEg, GY24 than those of Na_2SO_3 and $Na_2S_2O_3$. These results suggest that DDGS with different sulfur content ranging from 0.346% to 1.038% have a similar feed value and dietary sulfur source exerts a great effect on its nutrition value for beef cattle.

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Growth performance and oxidative stress of Malaysian prawn *Macrobrachium rosenbergii* by partial replacement of dietary fishmeal with palm kernel meal

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Effect of partial replacement of fish meal with palm kernel meal on growth performance and oxidative stress of Malaysian prawn, *Macrobrachium rosenbergii* was evaluated. A closed aquaculture system with 21 fiberglass tanks with the capacity of 150 liter was set up for the experiment. Five test diets were formulated by replacing 0, 10, 20, 30 and 40% fishmeal with palm kernel meal and labeled as PKM0, PKM10, PKM20, PKM30 and PKM40, respectively. Another two diets were prepared by the supplementation of 2% shrimp meal and 2% squid meal in PKM30 and PKM40 diets which designated as PKM30+ and PKM40+, respectively. All the test diets were iso-nitrogenous (30% crude protein), iso-lipidic (12% crude lipid) and iso-energetic (19 KJ/g DM gross energy). Triplicate groups of 30 post-larvae (0.041±0.001 g) were stocked in previously prepared tanks and fed the test diets at the rate of 20-30% of their body weight, twice a day for 60 days. The results showed that there was no significant differences (P>0.05) in final weight (g), percent weight gain (%) and specific growth rate (% per day) of prawn fed PKM0, PKM10, PKM20 and PKM30 diets. However, all these growth parameters were significantly decreased in prawn fed PKM40 diet compared to fishmeal based control diet (PKM0). Supplementation of crude attractants such as shrimp meal and squid meal recovered the depleted growth performances. It was found that the above growth parameters were significantly improved in PKM30+ and PKM40+ diets compared to all other PKM diets. No significant differences were also found between these groups of prawn and the control group. The feed conversion efficiency and protein efficiency ratio also followed the similar trends where PKM40 showed significantly lowest values compared to the control. The feed utilization parameters were significantly improved in PKM30+ and PKM40+ groups. The survival (%) was not significantly affected by any of the dietary treatments. On the other hand, superoxide dismutase activity was similar in all the dietary treatments except in PKM30. It is concluded that 30% fishmeal can be replaced with PKM in the diets of prawn without any detrimental effects on growth performance and feed utilization. Supplementation of small amount of crude attractants such as squid meal, shrimp meal etc could replace 40% or more fishmeal from the diet of Malaysian prawn.

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Acridid grasshoppers: An imperative unconventional protein source in poultry diets

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On the quest of alternative protein sources, researchers have found insects to be nutritionally rich and among insects acridid grasshoppers have a good future. In this context the present work concentrated to formulate various protein rich conventional and acridid supplemented diets to feed the Japanese quail *Coturnix japonica*. The experiments were divided into two phases. In the first phase various diets were prepared where fish meal was gradually replaced by acridid meal (i.e., 0%, 25%, 50%, 75%, and 100% replacement). Consumption of the diet having 50% replacement of fish meal with acridid meal resulted higher feed utilization and weight gain of the quails, however egg laying performance and meat quality was slightly better in the birds feeding on the diet having 75% acridid inclusion level than the one having 50% acridid inclusion level. This proved that at least 50% fish meal could be replaced by acridid meal. In the second phase fish meal based, soybean meal based and acridid meal based diets were prepared. All of them had three different inclusion levels of the major ingredients (i.e., 5%, 10%, and 15% of the diet). The growth and egg laying performance of *C. Japonica* was better in most of the cases for 10% acridid meal added diet. This particular diet also gave better results compared to the fish meal based and soybean meal based conventional diets without showing deleterious effect on flesh and egg quality. These encouraging results successfully established acridid grasshoppers as an alternative protein source for poultry birds.

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Changes in metabolic and hormonal profiles with heat shock protein-70 and their association with follicular dynamics in dairy cattle in the subtropical region of Peshawar

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Thermal stress affects the fertility of high producing dairy cattle, badly. This study was conducted to compare Holstein Frisian (HF), cross-bred and indigenous dairy cattle (Sahiwal and Achai) in terms of effects of ambient temperature on HSP-70 expression, serum P4, glucose and cortisol concentrations and follicular number during the dioestrus period of the estrous cycle. Thirty six multiparous lactating dairy cows with normal cyclicity comprising nine cows from each breed of Sahiwal, Achai, cross-bred and HF were selected in two state farms in Peshawar located at 34.0°N, 71.6°E. Blood sampling was conducted at an average ambient temperature of 18°C (thermoneutral) in February, 32°C (thermal transitional) in April and 42°C (thermal stress) in late June. Rectal ovarian ultrasonography was performed to determine follicular dynamics. Thermal stress increased concentrations of glucose ($P<0.05$), cortisol ($P<0.001$), HSP-70 ($P<0.001$) and number of follicles ($P<0.01$), while decreased progesterone ($P<0.01$) in all four breeds beyond 32°C; however, Achai cows resisted elevation of HSP-70 levels with the increasing ambient temperature up to 32°C. As the ambient temperature increased to 32°C and 42 °C, a notable elevation was observed in the first four parameters while progesterone concentrations were decreased. Positive correlation was found between level of glucose, cortisol and HSP-70 with the rise in ambient temperature while progesterone concentrations related negatively with the changing temperature. The number of follicles related positively with ambient temperature, cortisol, HSP-70 and blood glucose and negatively with progesterone concentrations. It is concluded that thermal stress elevated concentration of HSP-70 associated with enhanced concentration of glucose, cortisol and number of follicles. Progesterone concentration provided a good indication of fertility and related negatively with the thermal stress; however, the number of follicles may be considered as a negative indicator of fertility due to lack of a dominant follicle. The indigenous dairy breeds resisted heat stress better than the exotic and crossbred cows indicating that the later are more susceptible to heat stress than the former breeds.

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A study to estimate longevity of thermostable Newcastle disease vaccine (strain I-2) in village chicken of Nepal

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Newcastle disease (ND) is one of the most important poultry diseases because of its widespread distribution and economic impact on poultry. The present study was conducted to estimate the longevity of thermostable ND vaccine (NDV strain I-2) in village chickens of Nepal. A total of 56 (27 days old chicks) were allocated randomly into 2 groups (treatment and control) with 28 birds in each group. On day 28, ND vaccine was administered to the treatment group only. Blood sample was collected from experimental birds at 1 day prior to vaccination and 14, 21, 30, 60, 90 and 105 days post vaccination. The serum obtained was titrated for NDV antibody using hemagglutination inhibition test. The data obtained were log transformed and subjected to the SPSS 16.0. The antibody response of treatment group revealed that the log2HI titers were 5.7, 7.0, 7.2, 6.0, 3.7 and 3.1 for 14, 21, 30, 60, 90 and 105 days after vaccination. The treatment group had higher ($P<0.05$) antibody titer level at 14, 21, 30, 60 and 90 days after vaccination compared to control group however, there was no significant difference in the mean titer level between treatment and control group on 105 days after vaccination suggesting that booster dose is required after 90 days of primary vaccination. Thus, thermostable ND vaccine (strain I-2) produced specific immunity against ND for at least 90 days after vaccination and may be considered suitable in Nepalese condition where cold chain maintenance is a huge challenge especially in rural area.

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Effects of dietary threonine levels on laying performance, offspring traits and its regulation of embryo expressions of pTOR and TDH in Chinese yellow-feathered broiler breeder hens

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The effects of dietary threonine (Thr) level on performance, offspring traits and embryo protein deposition in broiler breeder hens was investigated. A total of 720 Lingnan yellow-feathered broiler breeder hens were randomly divided into 1 of 6 dietary treatments with 6 replicates per treatment (20 birds per replicate). The hens were fed either the basal diet (Thr 0.38%) or the basal diet supplemented with 0.00%, 0.12%, 0.24%, 0.36%, 0.48% and 0.60% Thr from 29 w to 38 w. The results showed that Thr supplementation produced quadratic positive responses in laying rate. Hatchability was higher in breeders fed 0.12% and 0.24% Thr than those of control birds ($P<0.05$). Dietary supplemental Thr had significant effects on expressions of mucin 2 (MUC2) in duodenum, colon and uterus and ZO-1 in duodenum of hens ($P<0.05$). In chick embryo at embryonic age 18, there were significant up-regulations of dietary Thr levels on the transcripts of liver and breast muscle poultry target of Rapamycin, thigh threonine dehydrogenase, duodenum and ileum amino-peptidase ($P<0.05$), but no effects on MUC2 expression of duodenum and ileum ($P>0.05$). Chick livability and serum uric acid nitrogen concentration were increased and liver glutamic-pyruvic transaminase activity was decreased by dietary Thr supplementation ($P<0.05$). It concluded that there were positive effects of adding Thr on laying production of breeder hens and offspring performance and this was associated with the regulations of gene expressions related to amino acid transportation and protein deposition. The optimal dietary Thr supplemental level was 0.298% or 0.388 g/d for broiler breeders.

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The effect of *in vitro* rumen digestion on polyphenol content and free radical scavenging activity of apple pomace

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This project is part of a larger task pursuing the development of naturally produced, health-contributing, polyphenol-enriched milk products that are derived from byproduct plant matter from agricultural sources. Apple pomace (AP), an abundant agricultural byproduct in Canada has high polyophenol content (1000-1415 g Gallic acid equivalent/100 g dry weight). The objective of this study is to evaluate the effects of *in vitro* rumen digestion on the total polyphenol content and free radical scavenging activity of AP. AP will be collected fresh and kept at -20 °C until analysis. Rumen inoculum will be collected from a mature lactating cow and *in vitro* digestion will be performed for 24 and 48 hours of digestion in an ANKOM RF Gas Production System as per manufacturer's instructions. After digestion, the samples will be centrifuged at 26.940 g and filtered through 0.2 um polyethersulfone filters to remove bacterial cells. All samples (treated and untreated) will be freeze-dried and ground, after which polyphenols will be extracted by solvent extraction (80% methanol at 21 °C for 1 hour). Fast Blue BB assay for total polyphenol quantification and 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity assay will be performed on all samples in triplicate with 3 technical replicates to assess the extent of polyphenol degradation in the rumen. The fraction of polyphenols remaining after *in vitro* digestion will be roughly representative of the amount available for absorption into the cow's bloodstream and subsequently the mammary gland.

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Calcium deficiency suppresses follicle growth in laying ducks

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Calcium is very important for maintaining the bone growth and eggshell formation in laying birds. However, some of other biological functions of calcium in laying birds are scarcely known. The purpose of this study was to test the hypothesis that calcium may affect the follicle growth of laying ducks by employing calcium-deficient diet. 450 female ducks (*Anas platyrhynchos*) of 22 weeks were randomly assigned to 3 groups. Ducks were fed one of two calcium-deficient diets (containing 1.8% or 0.38% calcium, respectively) or a calcium-adequate control diet (containing 3.6% calcium) for 67 days (depletion period) and then ducks of the 3 groups were fed a calcium-adequate diet for an additional 67 days (repletion period). As compared with the calcium-adequate control, the hierarchical ovarian follicles number (diameter >1 cm) and total ovary weight of ducks that consumed the diet with 0.38% calcium was significantly decreased ($P<0.05$) during the depletion period, accompanied by reduced egg production. The mRNA expression of ovary gap junction protein, alpha 1 (*GJA1*), gamma 1 (*GJC1*), delta 2 (*GJD2*) were decreased after feeding calcium-deficient diets (1.8% or 0.38% calcium, $P<0.05$). Transcripts of estradiol receptor 2 (ER2), luteinizing hormone receptor (LHR) in ovary were reduced in the ducks fed 0.38% calcium or 1.8% calcium ($P<0.05$). While the mRNA expression of ovary follicle stimulating hormone receptor (FSHR) was decreased in the ducks fed 0.38% calcium but not the 1.8% calcium. The cAMP content in the ovary was increased by calcium depletion (the increase reached 6% for 1.8% calcium and 13% for 0.38% calcium, respectively). Plasma concentrations of estradiol, follicle stimulating hormone (FSH) and calcium was decreased by both of the calcium-deficient diets ($P<0.05$). The down-regulated gene expression of gap junction protein, hormone receptor, increased cAMP content as well as the suppressed follicle growth could be reversed by repletion of dietary calcium. The results of the present study suggest that dietary calcium deficiency negatively affects the follicle growth of laying ducks possibly by down-regulating follicle growth-related genes and hormones.

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