

Effect of induced hypothyroidism on the fertility of male goats

Reddy, IJ and Varshney, VP and Sanwal, PC and Agarwal, N and Pande, JK

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.11, I. No.1, P.55-59, FEB, 1998

To study the effect of induced hypothyroidism on fertility status of male Black Bengal goats, 10 adult healthy mature males were divided into control and treated groups. Hypothyroidism was induced successfully by injecting thiourea subcutaneously initially for 15 days at the rate of 100 mg/kg body weight, followed by 66.7 mg/kg body weight for the subsequent 15 days. This resulted in a decrease ($p < 0.01$) in plasma tri-iodothyronine, thyroxine and testosterone levels, with increasing duration of thiourea treatment. It also adversely affected semen quality, ejaculate volume, sperm concentration, motility and viability. Live percentage declined to 75% for treated and control remained at 90%. Artificial insemination of female goats with semen of thiourea-treated goats, resulted in failure of conception. However, females inseminated with semen of male goats of control group showed 100% conception. These observations indicate that, thyroid hormones play a key role in maintaining the normal r e p r o d u c t i v e p r o c e e s s o f m a l e g o a t s .

Study on the utilization of neem kernel meal as a protein supplement for growing rabbits

Gowda, SK and Sastry, VRB and Katiyar, RC

INDIAN VETERINARY JOURNAL, Vol.75, I. No.3,P.281-282, MAR, 1998

Neem kernel meal (NKM) that had been subjected to urea ammoniation and alkali (NaOH) treatment was included at various levels in the diets of 5 groups of 6 rabbits. In terms of digestibility, feed intake, energy density and daily weight gain it was concluded that the processed NKM was a satisfactory substitute for the conventional deoiled groundnut meal used for feeding rabbits. Energy enrichment was required, however, to avoid higher feed intake.

Comparative evaluation of gas production and dry matter digestibility of straw substrates in vitro

Srinivas, B and Singh, KK

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.68, I. No.5,P.484-486, MAY, 1998

Rumen fistulated cattle (12) were allocated into 3 groups and offered wheat straw alone (D1); supplemented with concentrate mixture (D2); and urea-molasses-mineral block (UMMB) lick (D3). Strained rumen liquor of respective animals was used as inoculum and untreated or 4% urea-treated wheat or paddy straw as substrates. In vitro gas production (IVGP) was measured at 2 hr interval for the first 12 hr (phase I) and 4 hr of interval for the later up to 48 hr (phase 2) of inoculation. Cumulative gas production curve was sigmoidal in shape. Total gas production (TGP) increased linearly with time after 3-5 hr in D1 and 0.5-3 hr in D2 and D3. It was significantly high on diets D2 and D3 compared to D1. TGP was greater on treated straw substrates than that of untreated. The TGP showed that CO₂ proportion was reduced by 3-4% in treated substrates. Methane proportion was higher on diet D1 than that of other 2 diets. The gas production pattern showed that the specific environmental conditions have an effect on the fermentability of the straw. Fermentation pattern of substrates observed through IVGP was confirmative with IVDMD as was also indicated by a positive correlation of 0.74. Regression equations were developed for IVGP and IVDMD. The study indicated that the method of IVGP in evaluating low quality roughages was compatible with IVDMD method.

Carcass traits and meat quality in rabbits fed neem kernel and mustard-meal supplemented diets

Gowda, SK and Sastry, VRB and KAtiyar, RC

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.68, I. No.7, P.696-698, JUL, 1998

Forty-two New Zealand White rabbits, 6 weeks old, were assigned to 7 groups and fed for 18 weeks on 7 isonitrogenous diets formulated with deoiled groundnut meal (DGNM) and respectively, replaced at 50 or 100% with urea-ammoniated neem seed kernel meal (UANKM) and alkali-treated NKM or with 100% deoiled mustard meal (DMM) and urea-ammoniated DMM. Feed intake, growth, carcass traits and yield of edible cuts were not affected by dietary treatments. The results suggest that feeding processed NKM or DMM to broiler rabbits does not affect meat quality or carcass characteristics.

Neem (*Azadirachta indica*) kernel meal in the diet of White Leghorn layers

Gowda, SK and Verma, SVS and Elangovan, AV and Singh, SD

BRITISH POULTRY SCIENCE, Vol.39, I. No.5, P.648-652, DEC, 1998

1. Neem kernel meal (NKM) was incorporated into a standard layer diet at 0, 100, 150 and 200 g/kg, replacing parts of the soyabean meal and deoiled rice bran. Each diet was offered to 18 White Leghorn layers (25 weeks, 50% egg production) in individual cages for a period of 12 weeks. 2. Results indicated significantly lower food intakes ($P < 0.01$), rates of egg production and egg weights in birds fed on the diets with NKM at 150 and 200 g/kg. Fertility and hatchability were also adversely affected by the higher inclusion rates of NKM. 3. Except for lower egg shell weight and shell thickness ($P < 0.05$) in hens fed NKM at 150 and 200 g/kg, the internal egg quality characteristics were comparable in all groups. 4. Feeding NKM beyond 100 g/kg to laying hens significantly ($P < 0.01$) reduced the content of haemoglobin, erythrocyte count, packed cell volume, serum calcium and uric acid concentrations. However, the leucocyte count, plasma glucose concentration and serum glutamate oxaloacetate transaminase activity were unaltered. Serum glutamate pyruvate transaminase activity was significantly ($P < 0.05$) reduced in birds fed NKM at 200 g/kg. 5. Thus NKM at 100 g/kg in a layer diet would appear to be safe and cost-effective.

Effect of hypothyroidism on libido and reaction time in Black Bengal bucks

Gupta, PSP and Sanwal, PC and Varshney, VP

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.68, I. No.12, P.1236-1238, DEC, 1998

Hypothyroidism was induced using thiourea in 4 2-year-old, male Black Bengal goats to study its effect on libido and reaction time. Plasma triiodothyronine (T-3), thyroxine (T-4) and testosterone (T) levels were determined by radioimmunoassay (RIA). Hypothyroidism was induced in the animals by fourth day of treatment itself and the treatment was extended for further 26 days. Plasma testosterone levels were significantly lower than the pretreatment (normal/control) levels. The libido was decreased and the reaction time was increased (nonsignificantly) during the hypothyroid state.

Effect of hypothyroidism on the growth of Black Bengal goats

Gupta, PSP and Sanwal, PC and Varshney, VP

*ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.12, I. No.3,P.354-357,
MAY,1999*

Hypothyroidism was induced in three age groups (8 months, 1 year and 2 years) of Black Bengal goats by administering thiourea subcutaneously for 30 days. From fourth day onwards the animal were observed to be in hypothyroid state. For 8 months age group, a control group of similar age was taken. For the 1 year and 2 years age groups there was no control group but the values obtained on the pre-treatment day were considered as control values. For confirming the establishment of hypothyroidism, peripheral. plasma triiodothyronine (T-3) and thyroxine (T-4) were estimated in all the animals before and during the treatment period by radioimmunoassay. In the thiourea treated 8 months age group the T-3 and T-4 levels were significantly ($p<0.001$) lower than those in the control group during the treatment period. In all the thiourea treated groups the T-3 and T-4 levels observed during the treatment period were significantly ($p<0.01$) lower than the pre-treatment levels. A nonsignificant loss in the body weight was observed in all the thiourea treated groups whereas there was a significant growth in the control group of animals. The study indicates that hypothyroidism has a negative effect on growth in goats .

Processed neem kernel meal as a substitute for peanut meal protein in growing goat diets

Anandan, S and Sastry, VRB and Katiyar, RC and Agrawal, DK

SMALL RUMINANT RESEARCH, Vol.32, I. No.2, P.125-128, APR, 1999

Twenty-four local goats (12 male and 12 female), 7-10 months of age with mean body weight 10.3 +/- 0.48 kg were assigned at random to two dietary treatments and were offered diets consisting of isonitrogenous concentrate mixtures based on ground maize and containing either deoiled peanut meal (DPNM) or urea-ammoniated neem kernel meal (UANKM), along with ad Libitum green sorghum fodder for a 70-day period. The dietary treatment did not significantly influence the intake of dry matter, digestibility of various nutrients, average daily weight gain or feed efficiency. However, the digestibility of crude protein was depressed ($p < 0.05$) in goats fed UANKM diet. Use of UANKM diet reduced ($p < 0.01$) feed cost per unit liveweight gain by 20% compared with DPNM. Since UANKM supported a similar level of animal performance as compared to DPNM it can alleviate the shortage of vegetable protein in (growing countries). (C) 1999 Elsevier Science B.V. All rights reserved.

Plasma T3 and T4 profile during estrous cycle in Black Bengal female goats

Reddy, IJ and Varshney, VP and Sanwal, PC

INDIAN VETERINARY JOURNAL, Vol.76, I. No.6, P.565, JUN, 1999

Pattern of rumen movements in intact and fistulated buffaloes maintained on green oat and maize fodder

Roy, KS and Upadhyay, RC

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.69, I. No.5,P.326-327, MAY, 1999

Pattern of rumen movement was studied in intact and fistulated buffaloes maintained on green oat and maize fodder by using Volume Transducer and Physiograph. It was recorded that number of primary contractions in intact buffaloes were 3 to 4, and secondary contractions were 2 to 3 per 5 min with mean ratio of P: S was 1:0.60. But the average duration of primary and secondary contraction in different animals varied from 14.22 sec and 10.33 sec in intact buffaloes and 10.0sec to 7.33sec in fistulated buffaloes respectively. No specific trend was observed in their pattern and appearance of contraction. The primary contractions often had lower magnitude than secondary contraction and spreaded over entire body of the rumen. However secondary contractions were of higher magnitude and caused sharp peak(s) of short duration. But in fistulated buffalo, the numbers of primary contractions were 4 to 5 and secondary contraction were 3 to 4 per 5 min with a mean ratio of 1 : 0.64. It has been postulated that the secondary contractions were associated with the eructation reflex in buffalo like cattle. And lower frequency of rumen movements in buffaloes allowed the feed to remain undisturbed in a position for greater microbial activity and help in better utilization of feed material.

Neem (*Azadirachta indica*) seed cake in animal feeding-scope and limitations - Review

Gowda, SK and Sastry, VRB

*ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.13, I. No.5,P.720-728,
MAY,2000*

The different products of neem (*Azadirachta indica*) are utilized for variety of purposes in industry, health and animal agriculture in the Indian subcontinent. The cake from seeds after oil extraction is a good source of nutrients (CP: 35-38%; EE: 4.5-5.5%; CF: 12-15%; Ca: 0.75%; P: 0.45% on DM), and in particular, the one out of its kernel is proteinaceous and is relatively balanced in its amino acid and mineral profile. But the cake is toxic and bitter to taste owing to triterpenoids (nimbin, salannin, azadirachtin), which restricts its safe inclusion in livestock diet. Several feeding trials with raw cake have revealed poor palatability and adverse performance among different categories of livestock and poultry. Internal organ changes included histological alteration in intestine, liver, kidney and disruption of spermatogenesis and ovarian activity. Ruminants appears to tolerate reasonably higher levels of the cake and to a limited low levels of dietary inclusion also proved to be tolerable in monogastric farm animals. Debitterization through solvent (hexane, ether) extraction, water washing, alkali (NaOH, 1.5, 2.5 or 3%, wt/wt) soaking and urea (1.5 or 3%, wt/wt) - ammoniation have been tried with appreciable success in improving the palatability and nutritive value of the cake. For enhanced utilization, decortication of neem seeds is to be done effectively at industrial level with maximum oil recovery. The resultant proteinaceous kernel by-product could be a cheaper unconventional protein supplement after suitable processing.

Effect of neem (*Azadirachta indica*) kernel-meal feeding on internal organs of layers

Gowda, SK and Singh, SD and Elangovan, AV and Verma, SVS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.70, I. No.2,P.191-193, FEB,2000

Neem -kernel-meal (NKM) was incorporated into a standard layer die at 0, 100, 150 and 200 g / kg levels replacing a part of soybean-meal and deoiled rice bran and offered ad lib. to 72 White Leghorn layers (25 weeks, 50% egg production) allotted uniformly to 4 dietary treatments. Inclusion of NKM at higher levels significantly ($P<0.01$) reduced the feed intake and egg production. Blood haemoglobin content, plasma calcium and alanine amino transferase activity were also significantly ($P<0.01$; $P<0.05$) reduced due to NKM feeding at higher levels. Microscopic examination of internal organs after 12 weeks of experimental feeding indicated moderate congestion in intestine, liver, kidneys and spleen of hens fed NKM at 150 and 200 g / kg levels. Varying degree of degenerative changes in hepatic parenchyma with cloudy swelling and fatty infiltration was observed in hens fed 200 g / kg NKM. In ovary and oviduct of laying hens fed NKM at 200 g / kg level, height of glandular epithelial lining was reduced with loss of cilia and atrophy of follicles with devoid of ova. The results indicated the untoward effects of feeding NKM at levels beyond 100 g / kg in the diet of laying hens.

**Quantity and quality of oocytes aspirated from buffalo ovaries:
Effect of presence of a corpus luteum**

Nandi, S and Chauhan, MS and Palta, P

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.70, I. No.5,P.486-487, MAY,2000

Ovaries were collected from buffaloes in a slaughterhouse and divided into 2 groups (with corpus luteum (CL) and without CL). Acceptable quality oocytes (grade A+ and grade B) and overall recovered oocytes (0.26 - 0.34 oocytes/ovary) were recovered significantly more often ($P<0.05$) from ovaries without CL than from those with CL.

Effect of a corpus luteum on the recovery and developmental potential of buffalo oocytes

Nandi, S and Chauhan, MS and Palta, P

VETERINARY RECORD, Vol.147, I. No.20,P.580-581, 11-Nov,2000

The low superovulatory response and poor recovery rate of oocytes are major impediments to the application of in vitro fertilization and embryo transfer technology in buffaloes. The present study aimed to evaluate the comparative efficacy of oocyte collection methods, season (low and peak breeding season), and ovarian status (presence or absence of corpus luteum) on the recovery rate and quality of recovered buffalo follicular oocytes. For this purpose riverine buffalo ovaries were collected from buffaloes slaughtered at Faisalabad Municipal Corporation Slaughter House. To study the efficiency of 3 different recovery methods the ovaries were dissected (n = 291), punctured (n = 301), or aspirated (n = 298). In all, 675 oocytes were recovered by dissection, 441 by puncture, and 363 by aspiration. The results of the present study revealed that a significantly higher ($P < 0.05$) oocyte recovery rate was obtained from the ovaries collected during the peak-breeding season and from those in which the corpus luteum was absent. Of the 3 oocyte recovery methods used, dissection yielded the highest percentage (36.74%) of type I oocytes, followed by puncture (32.87%), and a s p i r a t i o n (1 9 . 8 3 %)

Effect of environmental temperature on quality and developmental competence in vitro of buffalo oocytes

Nandi, S and Chauhan, MS and Palta, P

VETERINARY RECORD, Vol.148, I. No.9,P.278-279, 3-Mar,2001

Ovaries were collected from mature buffaloes of unknown reproductive status from an abattoir in New Delhi, India, in December 1996 to January 1997, the cool period (temperature 1 to 10 degrees C) (n=311) of the year, and in April to May 1997, the hot period (temperature >30 degrees C) (n=280) of the year. Oocytes were aspirated and graded as good (grade A), fair (B) or poor (C). Grade A and B oocytes were used for in vitro maturation studies. High environmental temperature had a detrimental effect on the yield per ovary and the quality of oocytes and developmental competence. If, however, the aspirated oocytes successfully completed maturation, then external environmental conditions did not affect the fertilization, cleavage and rate of embryo production of matured oocytes.

Effect of buffalo follicular fluid alone and in combination with PMSG and M199 on in vitro buffalo oocyte maturation

Gupta, PSP and Nandi, S and Ravindranatha, BM and Sarma, PV

*ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.14, I. No.5,P.693-696,
MAY,2001*

The effect of replacement of in vitro maturation medium completely with the buffalo follicular fluid (buFF) on in vitro oocyte maturation of buffalo oocytes was studied. 5 to 8 buffalo cumulus oocyte complexes were cultured in a single drop with each of the eight media studied i.e., M199+steer serum (10% v/v), M199+steer serum (10% v/v)+PMSG, M199+buFF (10% v/v), M199+buFF (10% v/v)+PMSG, M199+buFF (50% v/v), M199+buFF (50% v/v)+PMSG, buFF (100%) and buFF+PMSG at 39 degreesC and 5% CO₂ in air for 24 h. Supplementation of M199 with Steer serum alone resulted in IVM rate of 35% only. When the above medium was supplemented with PMSG, the maturation rate rallied to 82%. Significant increase in the maturation rates were observed when M199 was supplemented with increasing levels of buFF. A further increase in the maturation rate was also obtained when PMSG was incorporated into the medium of M199 supplemented with buFF. The rate of maturation was to the tune of 91% when oocytes were matured in buFF alone which was increased non significantly on the addition of PMSG. Highest maturation rate (97%) obtained with M199+buFF (50%v/v)+PMSG did not differ significantly from that obtained by either M199+buFF (10%v/v)+PMSG or buFF +PMSG. It is suggested that buFF alone without any supplementation can form the effective in vitro maturation medium for buffalo oocytes.

Micronutrient profile in soil, feed, fodders and blood samples of animals in eastern and southern dry zones of Karnataka

Gowda, SK and Prasad, CS and Ramana, JV and Ramachandra, KS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.71, I. No.2,P.150-154, FEB,2001

The micronutrient (calcium, phosphorus, magnesium, copper, zinc and iron) status of soil, water, feeds, fodder and blood samples of animals was studied in eastern and southern dry zones of Karnataka. Micronutrient content of soil in both the zones was above the critical level except for phosphorus (15.7 ppm) which was well below the critical level of 45-130 ppm in southern dry zone. Ca and Mg were present in higher amounts (19-23 ppm) in water in both the zones, as compared to other micronutrients which were present in trace amounts. Straw the major source of roughage in these zones was low in most of the micronutrients screened but contained high levels of silica. Legumes contained higher levels of Ca (1.44-2.73%), Zn (25-165 ppm), Cu (8-25 ppm) and Fe (334-5664 ppm) compared to cultivated green fodders. Local grasses and weeds showed higher values of zinc and iron. Tree leaves/top feeds were good sources of Ca (1.38-2.02%), Zn (35-226 ppm) and Fe (792-981 ppm). Amongst the concentrate supplements oil-cakes, brans and lice polish were rich in phosphorus (0.84-3.95%). Most of the feed ingredients were good sources of magnesium. Majority of animals screened in eastern dry zone showed lower blood plasma Ca values as compared to other micronutrients. In southern dry zone about 65-70% of the animals screened showed low phosphorus and zinc content in blood plasma. It was evident that calcium in eastern dry zone and phosphorus and zinc in southern dry zone were the most limiting micronutrients. Strategic supplementation through legumes, tree leaves, oil-cakes and brans would alleviate the deficiency of micronutrients in these

z o n e s .

Isolation of preantral follicles from buffalo ovaries

Gupta, PSP and Nandi, S and Ravindranatha, BM and Sarma, PV

VETERINARY RECORD, Vol.148, I. No.17,P.543-544, 28-Apr,2001

A total of 145 buffalo ovaries were collected from various abattoirs. Preantral follicles were isolated by two methods, a mechanical method and an enzymatic method. In the mechanical method, extraction involves washing of the samples with various media, pipetting and filtration prior to microscopic examination. The enzymatic method was similar to the mechanical method except for the use of either trypsin and hyaluronidase. The enzymatic method yielded more than five times the number of preantral follicles in comparison to the mechanical method and the recovery rate differed significantly between the two methods ($P < 0.001$). However, there was no significant difference between the fresh ovaries and stored ovaries in terms of recovery rate and no significant difference between the trypsin and hyaluronidase treatments. In conclusion, both mechanical and enzymatic recovery methods can be used in buffaloes for the isolation of preantral follicles. However, the recovery rate of preantral follicles was found to be significantly higher using the enzymatic method than the mechanical method.

Testosterone profile in experimental hypothyroid Black Bengal goats.

Reddy, IJ and Varshney, VP and Sanwal, PC

INDIAN VETERINARY JOURNAL, Vol.78, I. No.7,P.651-652, JUL,2001

Two developmental abnormalities namely, polycornulia and hermaphroditism in sheep are reported in Andhra Pradesh, India. A ram from the Munipalle, Guntur district was found to have 4 horns (2 normal and 2 additional about 3 cm below). The extra horns were smaller, shorter and directed obliquely downwards and backwards. Hermaphroditism was observed in a sheep with 2 well developed horns and a scrotum with a well developed epididymis but had no penis. There was also a vulva with 2 well developed lips and vagina, and the animal was urinating like a normal female. There were no explained causes of these abnormalities in the described cases.

**Influence of different levels of steer serum on production of
fertilisable buffalo oocytes in vitro**

Nandi, S and Gupta, PSP and Ravindranatha, BM and Sarma, PV

VETERINARY RECORD, Vol.149, I. No.4,P.124-125, 28-Jul,2001

Two developmental abnormalities namely, polycornulia and hermaphroditism in sheep are reported in Andhra Pradesh, India. A ram from the Munipalle, Guntur district was found to have 4 horns (2 normal and 2 additional about 3 cm below). The extra horns were smaller, shorter and directed obliquely downwards and backwards. Hermaphroditism was observed in a sheep with 2 well developed horns and a scrotum with a well developed epididymis but had no penis. There was also a vulva with 2 well developed lips and vagina, and the animal was urinating like a normal female. There were no explained causes of these abnormalities in the described cases.

Comparison of three different media on maturation of buffalo oocytes in vitro

Ravindranatha, BM and Nandi, S and Gupta, PSP and Sarma, PV

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.71, I. No.9,P.841-843, SEP,2001

This study was conducted to determine the effect of 3 basic culture media (TCM-199, Minimum Essential Medium (MEM) and Waymouth) on the in vitro maturation of buffalo oocytes. Cumulus-oocyte complexes (COCs) collected from slaughtered buffalo ovaries were graded into Good, Fair and Poor, washed twice in prepared steer serum and transferred into 50 ml droplets of (1) TCM-199+10% steer serum + 40 IU/ml pregnant mare serum gonadotropin (PMSG), (2) MEM + 10% steer serum + 40 IU/ml PMSG and (3) Waymouth + 10% steer serum + 40 IU/ml PMSG. Droplets were covered in 38-39 degrees C mineral oil and matured in a CO₂ incubator for 24 h. The experiment was repeated 10 times. No significant differences in COC maturation rates were observed in all culture media. An 85% maturation rate was observed in TCM-199-cultured COCs though it was not significantly higher in MEM or Waymouth-cultured COCs. Second degree cumulus (full expansion) was significantly higher in the TCM-199 than in MEM or Waymouth and first degree cumulus (moderate expansion) was significantly higher in TCM-199 than MEM COCs. No significant difference in first degree cumulus expansion was seen between TCM-199 or Waymouth media. In conclusion, TCM-199 and TCM-199 + 10% steer serum + 40 IU/ml PMSG may be considered as the ideal basic culture and in vitro maturation media for buffalo oocytes, r e s p e c t i v e l y .

Effect of somatic cells monolayer on maturation of buffalo oocytes in vitro

Nandi, S and Ravindranatha, BM and Gupta, PSP and Sarma, PV

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.71, I. No.10,P.936-937, OCT,2001

This study was conducted to determine the effect of 3 basic culture media (TCM-199, Minimum Essential Medium (MEM) and Waymouth) on the in vitro maturation of buffalo oocytes. Cumulus-oocyte complexes (COCs) collected from slaughtered buffalo ovaries were graded into Good, Fair and Poor, washed twice in prepared steer serum and transferred into 50 ml droplets of (1) TCM-199+10% steer serum + 40 IU/ml pregnant mare serum gonadotropin (PMSG), (2) MEM + 10% steer serum + 40 IU/ml PMSG and (3) Waymouth + 10% steer serum + 40 IU/ml PMSG. Droplets were covered in 38-39 degrees C mineral oil and matured in a CO₂ incubator for 24 h. The experiment was repeated 10 times. No significant differences in COC maturation rates were observed in all culture media. An 85% maturation rate was observed in TCM-199-cultured COCs though it was not significantly higher in MEM or Waymouth-cultured COCs. Second degree cumulus (full expansion) was significantly higher in the TCM-199 than in MEM or Waymouth and first degree cumulus (moderate expansion) was significantly higher in TCM-199 than MEM COCs. No significant difference in first degree cumulus expansion was seen between TCM-199 or Waymouth media. In conclusion, TCM-199 and TCM-199 + 10% steer serum + 40 IU/ml PMSG may be considered as the ideal basic culture and in vitro maturation media for buffalo oocytes, r e s p e c t i v e l y .

Impact of three categories of supplements on In Sacco ruminal degradation of urea-treated and untreated straw substrates

Srinivas, B and Krishnamoorthy, U and Jash, S

*ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.15, I. No.2,P.195-204,
FEB,2002*

The objective of this study was to examine the impact of three categories of supplements on intake and diet induced difference on degradation of straw substrates. Sixteen crossbred cattle fitted with rumen cannula were randomly divided into 4 equal groups. Animals were fed on wheat straw ad libitum without any supplement except mineral mixture (control; T-1) or supplemented with concentrate mixture (CS; T-2) or green Lucerne (GLS; T-3) or urea-molasses block lick (ULS; T-4). Total dry matter intake in T-2, T-3 and T-4 was increased by 70, 54 and 49%, respectively compared to T-1 which was only 1.55 kg/100 kg B.Wt. Other than control animals, straw intake was less on T-3 than T-2 or T-4. In Sacco degradation of untreated and urea treated wheat or paddy straw in different treatments indicated that the supplements had a significant ($p < 0.01$) impact on rapidly soluble (A) and insoluble but potentially degradable (B) fractions of straw. Urea treatment increased fraction-A but, provision of supplement improved fraction-B also. Effective degradation (ED) of OM was better on T-2. Rate of degradation (C) of OM and CWC was dependent on diet and type of straw but hemicellulose and cellulose were related to latter factor only. ED of cell wall carbohydrates (CWC) was similar in T-2 and T-4 but higher than T-3. CS was more effective in improving the degradation of both untreated and urea treated straw while ULS was effective on the former only. CS had more impact on superior quality straw while contrary was true with ULS. Although GLS improved intake and degradability of untreated and urea treated straws, its bulkiness affected the straw intake compared to other supplements.

Modulation of prolactin hormone and intersequence pause days in domestic chickens

Reddy, IJ and David, CG and Sarma, PV and Singh, K

VETERINARY RECORD, Vol.149, I. No. 19, P.590-592, 10-Nov,2001

This study was carried out to investigate the basic mechanism involved in taking pauses between the sequences of egg laying in domestic hen and also to extend the sequence length, egg production and to decrease the intersequence pause days by modulating the prolactin levels in birds. White Leghorn healthy female birds (50) were administered with anti prolactin agent subcutaneously @ 100 µg/kg body weight at weekly intervals from 17th to 36th week of age. Another group of 50 birds as controls was given placebo in place of the modulating agent. The level of prolactin remained lower in the treated birds than that in the control birds throughout the production cycle up to 72 weeks of age. The level of prolactin even in the control group decreased during the peak production period. The number of total pause days in full production period up to the age of 72 weeks decreased significantly in treated group in comparison to the control group. The reduction in pause days in treated group resulted in 4.11% increase in egg production over that in control group. The increase in egg laying days and the total egg production were significant. The average percentage of egg production from 21 to 72 weeks period was 87.67 in treated group as compared to 83.56 in control group. These results indicated that modulation of prolactin levels using bromocryptine enhances egg production in domestic hen.

Effect of commercially available PMSG on maturation, fertilization and embryo development of buffalo oocytes in vitro

Gupta, PSP and Nandi, S and Ravindranatha, BM and Sarma, RV

REPRODUCTION FERTILITY AND DEVELOPMENT, Vol.13, I. No.6-May,P.355-360, ,2001

In vitro fertilization (IVF) technology provides an opportunity to produce embryos for genetic manipulation, embryo transfer and basic research in developmental physiology, and can be exploited for emerging biotechnologies such as transgenesis and cloning. In the present study, the effects of different concentrations of commercially available pregnant mare serum gonadotrophin (PMSG) (Folligon; Intervet, International B.V, Boxmeer, Holland) in oocyte culture media, on maturation, fertilization and embryonic development of buffalo oocytes in vitro were investigated. Oocytes aspirated from abattoir-derived ovaries were cultured in media containing TCM-199 + PMSG at 0, 2.5, 20, 30, 40 and 50 IU mL⁻¹ in presence or absence of steer serum (10%) for 24 h in a CO₂ incubator. The maturation rate was assessed on the basis of degree of expansion of cumulus cells. The matured oocytes were inseminated with 9-10 x 10⁶ spermatozoa mL⁻¹ in Brackett and Oliphant medium and the cleavage rate was recorded 40-42 h after insemination. Uncleaved oocytes were stained with aceto-orcein for evaluation of fertilization rates. The cleaved embryos were further cultured in TCM-199 + 10% steer serum on buffalo oviducal cell monolayer for 7 days. Maturation, fertilization, cleavage and embryonic development were significantly higher (P <0.05) in oocytes cultured in TCM-199 + 10% steer serum supplemented with 40 and 50 IU PMSG mL⁻¹. It is concluded that commercially available PMSG can effectively be used in place of pure follicle-stimulating hormone for in vitro maturation of buffalo oocytes, making it cost effective for IVF studies.

In vitro maturation of buffalo oocytes with epidermal growth factor and fibroblast growth factor

Gupta, PSP and Ravindranatha, BM and Nandi, S and Sarma, PV

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.72, I. No.1,P.23-26, JAN,2002

The present study was conducted to investigate the optimum concentration of epidermal growth factor (EGF) and fibroblast growth factor (FGF) for in vitro maturation of buffalo oocytes and to examine the effect of these growth factors when used alone or along with pregnant mare serum gonadotrophin (PMSG) on the same. In experiment 1, aspirated oocytes were cultured in TCM-199 supplemented with EGF (10, 20, 30 ng/ml) or FGF (10, 20, 30 ng/ml) in a CO₂ incubator at 38.5°C for 24 hr. Maturation was assessed by examining the expansion of cumulus cell mass and metaphase II stage after staining in aceto-orcein, 20 ng/ml was the optimum concentration of both EGF and FGF for buffalo oocyte maturation. Hence, in experiment 2, oocytes were cultured in TCM-199 supplemented with PMSG (40 IU/ml) and EGF (20 ng/ml), FGF (20 ng/ml) or both. TCM-199+EGF (20 ng/ml)+PMSG (40 IU/ml) were an ideal chemically defined medium for buffalo oocyte maturation.

Effect of antibiotics on buffalo oocytes matured and fertilized in vitro

Ravindranatha, BM and Nandi, S and Reddy, SM

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.72, I. No.1, P.64-65, JAN,2002

This study was conducted to test the efficacy of 2 different antibiotics (penicillin and streptomycin, and gentamicin) on the maturation and fertilization of buffalo oocytes in vitro. Oocytes from the ovaries of buffalo with more than 3 layers of cumulus cells and homogeneous ooplasm were chosen for maturation process. The oocytes (10-15 in a group) were cultured in TCM199 + fetal calf serum (10%) + FSH-P (10 mg/ml) supplemented with 2 different antibiotics, (i) penicillin (100 IU/ml) and streptomycin (50 mg/ml), and (ii) gentamicin (50 mg/ml). No significant differences in the maturation rate were observed in oocytes cultured in media supplemented with penicillin and streptomycin, and gentamicin. The cleavage rate (38 vs. 27%) and embryo development (20 vs. 10%) were significantly higher in oocytes cultured in media supplemented with gentamicin. It is concluded that gentamicin is a better antibiotic than penicillin and streptomycin in oocyte and embryo culture.

Influence of GnRH and eCG on oestrus response and progesterone profile in norgestomet primed postpartum

Selvaraju, S and Rajasundaram, RC

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.71, I. No.3,P.241-244, MAR,2001

24 postpartum anoestrus cows were divided into 3 groups to examine the pattern of oestrus behaviour at induced oestrus and the progesterone changes before, during and after oestrus induction treatment. The norgestomet+eCG (nor+eCG) combination treatment results in earlier onset, longer duration and intense manifestation of oestrus than norgestomet (nor) and GnRH combination (nor+GnRH). Progesterone concentrations on the day of oestrus were significantly higher in nor+GnRH, but nonsignificant among the groups on day 10 post-oestrus. Progesterone levels were significantly lower in fertile than in non-fertile oestrus. It is concluded that eCG at implant removal has more significant effect on oestrus response, whereas, GnRH significantly affect progesterone levels at oestrus.

In situ protein degradability of certain feedstuffs in the rumen of cattle

Chandrasekharaiah, M and Sampath, KT and Thulasi, A and Anandan, S

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.71, I. No.3,P.261-264, MAR,2001

In situ crude protein (CP) disappearance of soybean extraction, sunflower extraction, rapeseed extraction, maize gluten meal-60 (60% CP), maize gluten meal-40 (40% CP), copra-cake extraction, safflower-cake, broken rice, jowar grain, ragi grain, rice polish and maize bran in the rumen at different incubation periods were determined by nylon bag technique using 3 adult fistulated steers. The residual CP values were transformed to natural logarithms and then subjected to linear regression to arrive at degradation constants. The effective degradability was calculated for an assumed out flow rate of 5%/hr. The effective CP degradability of soybean extraction, sunflower extraction, rapeseed extraction, maize gluten meal-60, maize gluten meal-40, copra-cake extraction, safflower-cake, broken rice, jowar grain, ragi grain, rice polish and maize bran was 54, 54, 69, 21, 37, 33, 63, 32, 15, 32,47 and 37% respectively. Maize gluten meal-60, maize gluten meal-40, soybean extraction and copra-cake extractions provided high amounts of UDP (490, 252, 2 10 and 150g) per kg dry matter as compared to other protein supplements. The energy supplements (ragi grain, jowar grain, broken rice, maize bran and rice polish), although in small quantities, contribute more undegradable protein than rumen degradable protein at an outflow rate of 5%/hr.

Follicle size and oocyte diameter in relation to developmental competence of buffalo oocytes in vitro

Raghu, HM and Nandi, S and Reddy, SM

REPRODUCTION FERTILITY AND DEVELOPMENT, Vol.14, I. No.1, P.55-61, ,2002

Follicular size, oocyte morphology and diameter were investigated for their possible relationship with in vitro developmental competence of buffalo oocytes. Cumulus oocytes complexes (COCs), aspirated from small (<3 mm), medium (3-8 mm) and large (>8 mm) follicles of normal ovaries and cystic ovarian follicles of abattoir-derived ovaries, were graded for their morphological appearance and were cultured to assess their developmental competence. The influence of cystic follicles on maturational competence of COCs recovered from co-existing follicles of cystic ovaries was studied. The mean diameter of oocytes from follicles of different size were examined, and the influence of oocyte diameter-(i)<126 μm ; (ii) 127-144 μm ; (iii) 145-162 μm ; and (iv)>163 μm -on in vitro maturation, cleavage and embryo yield was studied. Results suggested that increased fertilization, cleavage and embryo development were significantly ($P<0.05$) higher in COCs aspirated from large follicles, followed by medium and small-sized normal follicles, and the presence of cystic follicles had no significant ($P<0.05$) effect on the maturation competence of the COCs recovered from co-existing follicles. The mean diameter of the buffalo oocyte obtained from normal ovaries was found to be 146.4 μm and the rate of blastocyst production in vitro was significantly higher ($P<0.05$) in oocytes with diameters greater than 145 μm . In conclusion, the larger the size of the follicles and oocytes, the greater the developmental competence in vitro of buffalo oocytes.

Timing of sequential changes in cumulus cells and first polar body extrusion during in vitro maturation of buffalo oocytes

Nandi, S and Ravindranatha, BM and Gupta, PSP and Sarma, PV

THERIOGENOLOGY, Vol.57, I. No.3,P.1151-1159, FEB,2002

Studies were conducted to investigate the degree of the cumulus cell expansion and expulsion of the first polar body in relation to time of incubation in three different culture media during in vitro maturation of buffalo oocytes and to suggest a suitable practical method for assessment of in vitro maturation rate of buffalo oocytes. Buffalo oocytes were aspirated from ovaries collected from a local slaughterhouse. Only oocytes with more than two layers of cumulus cells and homogenous ooplasm were cultured into 50 µl droplets of three different culture systems: (1) TCM-199 + steer serum (10%); (2) TCM-199 + steer serum (10%) + PMSG (40 IU/ml), and (3) TCM-199 + steer serum (10%) + PMSG (40 IU/ml) + estradiol 17β H (1 µg/ml) in a 35 mm, Petri dish. The droplets were covered with warm (39 degreesC) mineral oil and incubated in a CO₂ incubator (39 degreesC, 5% CO₂ in air, 90-95% relative humidity) for 16-18, 20, 22, and 24 h. The maturation rate was assessed by evaluation of degree of cumulus cells expansion and identifying first polar body extrusion into the perivitelline space under stereo zoom microscope. Matured oocytes were inseminated in vitro with 9-10 million sperm/ml of Brackett and Oliphant (BO) medium. Cleaved embryos were cultured in TCM-199 supplemented with steer serum (10%) for 8 days. Cumulus expansion and extrusion of first polar body commenced at 16 and 17 h, respectively, of buffalo oocyte culture. These events mainly exhibited during 22-24 h of culture. Oocytes with Degrees 1 and 2 cumulus cells expansion and extruded first polar body in degree 0 oocytes may be considered as matured and can be used in IVF studies. (C) 2002 Elsevier Science Inc. All rights reserved.

**Production of buffalo (*Bubalus bubalis*) embryos in vitro:
Premises and promises**

Nandi, S and Raghu, HM and Ravindranatha, BM and Chauhan, MS

REPRODUCTION IN DOMESTIC ANIMALS, Vol.37, I. No.2, P.65-74, APR, 2002

Techniques for in vitro production (IVP) of buffalo embryos adopting the procedures developed in cattle have received increasing interest in the recent times. A high oocyte maturation, fertilization and cleavage rate and a low rate of blastocyst yield and calving following transfer of in vitro produced buffalo embryos have been obtained. The efficiency of IVP in buffalo is much lower than that in cattle. Several problems need to be resolved before IVP technology can be used regularly in buffalo breeding. This review attempts to present an overview of the different techniques used in buffalo to produce transferable embryos in vitro, namely in vitro maturation and fertilization of immature oocytes and in vitro development of the resulting cleaved embryos to the blastocyst stage before transfer. The problems associated with IVP the possible solutions and the new biotechniques linked to IVP are discussed.

Mustard cake as a source of dietary protein for growing lambs

Kumar, GKA and Panwar, VS and Yadav, KR and Sihag, S

SMALL RUMINANT RESEARCH, Vol.44, I. No.1,P.47-51, APR,2002

Mustard seeds contain about 30-35% oil and 34-39% protein and India produces about 5.7 million metric tons every year. Mustard cake (MOC) has a good balance of essential amino acids and relatively high methionine content. Cheaper than peanut cake and soybean meal, it is used in the feeding of cattle and buffaloes, but information is scanty on its feeding in sheep and, goats. Therefore, a study was planned to replace peanut cake with mustard cake to evaluate its effect on the growth performance of growing lambs. Eighteen crossbred male lambs of 6-7 months were randomly divided into three groups of six each on the basis of body weights. The dietary treatments for the three groups consisted of iso-nitrogenous and iso-caloric concentrate mixtures. The peanut meal (in control) was replaced at 50 and 100% levels by mustard cake on protein basis. The lambs were fed the dietary treatments for 120 days. Gram (*Cicer arietinum*) straw was fed ad lib. A metabolism trial of 7 days duration was conducted before termination of the experiment. The total dry matter intake did not differ among the groups. The values of total body weight gain were 11.30, 14.50 and 11.43 kg in groups I (control), 2 (50% MOC) and 3 (100% MOC), respectively. The average daily gain values were 94.16, 120.83 and 95.26 g per day in the groups. Though no significant differences were observed in daily gain, the animals in group 2 gained more as compared to groups I and 3. The higher gain may be due to combining two oil cakes. The animals were in positive nitrogen and mineral balance. These data indicate peanut cake may completely be replaced with mustard cake without affecting feed intake, feed efficiency, nitrogen balance, mineral balance and growth performance of growing lambs. (C) 2002 Published by Elsevier Science B.V.

In vitro culture of buffalo (*Bubalus bubalis*) preantral follicles

Gupta, PSP and Nandi, S and Ravindranatha, BM and Sarma, PV

THERIOGENOLOGY, Vol.57, I. No.7, P.1839-1854, 15-Apr,2002

Growth of buffalo preantral follicles in culture was studied to investigate the effect of size of preantral follicles. individual or group culture, long-term culture of preantral follicles for (40 days). addition of human follicle stimulating hormone (FSH), insulin-transferrin-selenium (ITS). growth factors (epidermal growth factor (EGF), fibroblast growth factor (FGF), vaso active intestinal polypeptide (VIP) in culture media, and substitution of pregnant mare serum gonadotrophin (PMSG) for FSH as gonadotrophin source in culture media. Preantral follicles were isolated mechanically from ovaries of matured, nonpregnant slaughtered buffaloes and cultured in droplets of culture media under mineral oil in a 35 mm petri dish in a CO₂ incubator (38-39 degreesC. 5% CO₂ in air. 90-95% relative humidity) for 15 days. Preantral follicle isolation and washing medium consisted of Minimum Essential Medium (MEM) supplemented with steer serum (10%), glutamine (2 mM), sodium pyruvate (0.23 mM). hypoxanthine (2 mM) and gentamycin (50 mug/ml). respectively. In Experiment 1. we placed isolated preantral follicles individually or in groups of 2-4 preantral follicles in 30 or 50 mul droplets. respectively. using two culture media: washing media and washing media + ITS (1%) + FSH (0.05 IU/ml), respectively. In Experiment 2. we grouped isolated preantral follicles were grouped into six different size classes: less than or equal to 36, 37-54, 55-72, 73-90, 90-108 and greater than or equal to 109 mum. We cultured groups of 2-4 preantral follicles in washing media + ITS (1%) + FSH (0.05 IU/ml) in a CO₂ incubator for 15 days. In Experiment 3, we allocated groups of 2-4 preantral follicles to 10 treatments: (1) only washing media. (2) washing media + FSH (0.05 IU/ml), (3) washing media + ITS (1%), (4) washing media + ITS (1%) + FSH (50 IU/ml), (5) washing media + ITS (1%) + EGF (50 ng/ml), (6) washing media + ITS (1%) + FSH (0.05 IU/ml) + EGF (50 ng/ml), (7) washing media + ITS (1%) + FGF (50 ng/ml), (8) washing media + ITS (1%) + FSH (0.05 IU/ml) + FGF (50 ng/ml), (9) washing media + ITS (1%) + VIP (50 ng/ml), and (10) washing media + ITS (1%) + FSH (0.05 IU/ml) + VIP (50 ng/ml). In Experiment 4. based on the results of Experiment 3. we incubated preantral follicles from those treatments showing significantly ($P < 0.05$) higher growth up to 40 days, In Experiment 5. we allocated groups of 2-4 preantral follicles to two treatments: (1) washing media + PMSG (50

Influence of 2-bromo-alpha-ergocryptine on plasma prolactin, oestradiol-17 beta and progesterone levels in domestic hen

Reddy, IJ and David, CG and Singh, K

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.15, I. No.8,P.1103-1109, AUG,2002

This study investigated the effect of 2-bromo-alpha-ergocryptine (anti prolactin agent) on plasma levels of prolactin, oestradiol-17beta and progesterone in domestic hen during the active period of lay. Fifty healthy female White Leghorn birds were administered with anti prolactin agent (2-bromo-alpha-ergocryptine, Sigma-USA., methane sulphonate salt, C₃₂H₄₀BrN₅O₅.CH₄SO₃) subcutaneously at 100 mug/kg body weight at weekly intervals from 17th to 36th week of age. Another group of fifty birds as controls were given placebo in place of bromocriptine. The level of prolactin remained lower in treated birds than in the control birds from 19 to 36 weeks of age. Level of prolactin even in the control group was found to decrease during the peak production period. Oestradiol-17beta and progesterone concentration in treated birds were significantly ($p<0.01$) higher than the controls during the treatment. Egg production, is positively correlated with oestradiol-17beta ($r=0.02$; $r=0.67$) and progesterone ($r=0.49$; $r=0.90$) in control and treated groups respectively where as prolactin level is positively correlated with egg production in the control birds ($r=0.07$). Prolactin levels were negatively correlated with egg production ($r=0.55$) in treated birds; and oestradiol-17beta ($r=-0.71$; $r=-0.53$) and progesterone ($r=-0.22$; $r=-0.27$) respectively in control and treated groups. The total number of pause days during the treatment period decreased significantly ($p<0.01$) in the treated group compared to the control group. The reduction in pause days in treated group resulted in 1.76% increase in egg production over that in control group. The increase in egg laying days and the total egg production were found to be significant ($p<0.01$). These results indicate that a lower level of prolactin in circulatory blood enhances egg production in domestic hen.

Peripheral plasma inhibin concentrations in relation to overt and silent estrus in Sahiwal cows and Murrah buffaloes.

Mondal, S and Palta, P and Prakash, BS

BIOLOGY OF REPRODUCTION, Vol.66, I. No.1,P.403, ,2002

Scope for utilization of sunflower heads as animal feed in Karnataka state

Anandan, S and Kumar, GKA and Rudraswamy, MS and Ramana, JV and
Ramachandra, KS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.72, I. No.6,P.469-471, JUN,2002

A survey was carried out to assess the utilization pattern of sunflower heads (SFH) in the districts of Bellary, Raichur and Chitradurga, which are the major sunflower growing areas of the Karnataka state. The survey revealed that currently sunflower heads are not being fed to any class of livestock, and are mainly used for composting or burnt or dumped on way side. Even though sunflower heads are not being fed, the survey revealed that animals consumed SFH in a limited way. Small ruminants have a greater liking for SFH than the large ruminants. The major reason ascribed for not feeding SFH is lack of tradition and availability of other feeds in sufficient quantities. The chemical composition and in vitro studies revealed that SFH is nutritionally better than many of the commonly used roughages. Proper extension and demonstration of utilization of SFH is required for popularizing the use of SFH as livestock feed.

Assessment of mineral status in hilly and central dry zones of Karnataka and ways to supplement them

Gowda, NKS and Prasad, CS and Ramana, JV and Shivaramaiah, MT

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.72, I. No.2,P.165-170, FEB,2002

A study was undertaken to assess the mineral status of calcium (Ca), phosphorus (P), magnesium (Mg), copper (Cu), zinc (Zn) and iron (Fe) of soil, feeds/fodders and blood samples of animals in hilly and central dry zone of Karnataka. The extractable minerals from soil were within the critical range in central dry zone, whereas, in hilly zone soil Ca (0.03%) and P (9 ppm) levels were below the critical levels. Paddy and ragi straw contained higher silica and were also lower in Ca, P, Cu and Zn than the critical levels. Cultivated green fodders and mixed local grasses in both the zones were moderate to good sources of Ca, Mg, Cu and were rich in Fe (206-2090 ppm). Legume fodders available in these zones contained good amount of Ca (1.8-2.4%), Cu (35-63 ppm), Zn (44-284 ppm) and Fe (652-2752 ppm). Fodder tree leaves like Erthrina, glyricidia, mulberry, and subabul contained higher levels of Ca (0.8-2.5%) followed by Cu, Zn and Fe. Cereal grains had lower ash content and were low in Mg (0.18%). Oilcakes and brans were good sources of P (1-2.96%). Certain unconventional feeds like gram husk, horse gram and groundnut haulms being fed to animals in these zones contained moderate to high levels of Zn (31-213 ppm), Fe (702-2901 ppm) and Ca (1.1-1.9%) but their bioavailability to the animals is yet to be seen. There existed some variation in the mineral content of feeds / fodders between the zones. Animals in hilly zone had significantly ($P<0.01$) lower P, Cu and Zn values in blood plasma and animals in central dry zone showed significantly ($P<0.01$) low Ca, Cu and Zn. Iron levels in animals of both the zones were within the normal range. Supplementation of green fodders, legumes, tree leaves along with concentrate ingredients like cakes and brans or alternatively providing region specific mineral supplements could overcome the deficiency of minerals and could be a cost effective approach.

Effect of replacing groundnut-cake with mustard-cake on feed intake and digestibility of nutrients in growing lambs

Kumar, GKA and Panwar, VS and Yadav, KR and Punia, JS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.72, I. No.3,P.269-271, MAR,2002

Groundnut-cake was replaced with mustard-cake at 50 and 100% levels on a protein basis in the diet of growing lambs to find its effect on feed intake, nutrient utilization and digestibility of nutrients. It was concluded that GNC can be replaced completely with MOC without affecting the feed intake, nutrient utilization and digestibility of the nutrients in growing lambs .

The possible role of prolactin in laying performance and steroid hormone secretion in domestic hen (*Gallus domesticus*)

Reddy, IJ and David, CG and Sarma, PV and Singh, K

GENERAL AND COMPARATIVE ENDOCRINOLOGY, Vol.127, I. No.3,P.249-255, JUL,2002

The aim of this study was to investigate the basic physiological mechanism involved in taking pauses between the sequences of egg laying in domestic hen to improve egg production by extending the sequence length and decreasing the intersequence pause days by modulating the prolactin concentration in birds. Fifty healthy female white leghorn birds were administered anti-prolactin agent (2-bromo-alpha-ergocriptine, Sigma, USA) subcutaneously at 100 mug/kg body weight at weekly intervals from 17th to 36th week of age. Another group of fifty birds was given placebo in place of the modulating agent. The level of prolactin remained lower in the treated birds than in the control birds throughout the production cycle up to 72 weeks of age. The level of prolactin in the control group was found to decrease during the peak production period. The average percentage of egg production from 19 to 72 week period was 87.67 in the treatment group as compared to 83.56 in the control group. Oestradiol-17beta and progesterone concentrations in the treated birds were significantly ($P < 0.01$) higher than those in control birds, during and after withdrawal of the treatment. Prolactin level was negatively correlated with egg production ($r = -0.02$; $r = -0.12$) and with oestradiol-17β ($r = -0.75$; $r = -0.38$) and progesterone ($r = -0.20$; $r = -0.83$), respectively, in control and treatment groups. The total number of pause days during the production period decreased significantly ($P < 0.01$) in the treatment group, resulting in a 4.11 % increase in egg production. It is concluded that there is a consistent relationship between plasma prolactin in the physiological range and laying performance in domestic hen. (C) 2002 Elsevier Science (USA). All rights reserved.

Recovery rate and developmental potential in vitro of buffalo oocytes depend on age of the animal

Raghu, HM and Nandi, S and Ravindranatha, BM and Reddy, SM

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.72, I. No.7,P.586-587, JUL,2002

Fertility responses and hormonal profiles in repeat breeding cows treated with insulin

Selvaraju, S and Agarwal, SK and Karche, SD and Srivastava, SK and Majumdar, AC and Shanker, U

ANIMAL REPRODUCTION SCIENCE, Vol.73, I. No.4-Mar,P.141-149, 16-Oct,2002

The influence of insulin treatment on conception rate and endocrine profile was studied on 21 repeat breeding cows divided randomly into two groups, i.e. insulin treatment (n = 11) and control (n = 10). Cows of the insulin treatment group were injected subcutaneously with a long acting purified form of bovine insulin at 0.2 IU/kg body weight/day on days 8, 9 and 10, and then with 0.75 mg tiaproston (PGF(2)alpha) intramuscularly on day 12 of the oestrous cycle (oestrus = day 0). The cows of the control group only received 0.75 mg tiaproston was injected intramuscularly on day 12. There was no difference ($P > 0.05$) in the interval to the onset of oestrus and subsequent cycle length between the treatment (84.5 +/- 6.6h and 21.2 +/- 0.6 days, respectively) and the control (72.3 +/- 5.9 h and 19.7 +/- 0.4 days, respectively) groups. First service conception rate and overall pregnancy rate did not differ ($P > 0.05$) between the insulin treatment group (45.4 and 63.6%) and the control group (33.3 and 40.0%). Progesterone concentration following administration of insulin increased ($P < 0.05$) in the insulin treated cows (2.2 +/- 0.4 ng/ml versus 2.9 +/- 0.4 ng/ml) but the concentration of oestradiol-17beta did not differ. The insulin concentration was higher on day 10 of the oestrous cycle ($P < 0.05$) in the treatment group (71.0 +/- 12.5 muU/ml versus 38.1 +/- 4.5 muU/ml). The insulin and glucose concentrations were higher ($P > 0.05$) in animals, which subsequently became pregnant than in non-pregnant animals. The results may indicate that there is beneficial effect of insulin on fertility in repeat breeder cattle. (C) 2002 Elsevier Science B.V. All rights reserved.

Relationship between peripheral plasma inhibin and progesterone concentrations in Sahiwal cattle (*Bos indicus*) and Murrah

Mondal, S and Prakash, BS and Palta, P

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.16, I. No.1,P.10-Jun, JAN,2003

The present study investigated peripheral plasma immunoreactive inhibin (ir-inhibin) concentrations in relation to the stage of oestrous cycle and progesterone concentrations in cycling Sahiwal cattle (*Bos indicus*) and Murrah buffaloes (*Bubalus bubalis*). Blood samples were collected once daily for thirty-two consecutive days from cattle and buffaloes (5 each) during winter months of January and February. Mean (\pm S.E.M.) plasma ir-inhibin concentrations ranged from 0.40 \pm 0.01 to 0.59 \pm 0.03 ng/ml in cattle and from 0.29 \pm 0.03 to 0.52 \pm 0.05 ng/ml in buffaloes. In cattle, ir-inhibin concentrations increased from 0.47 \pm 0.07 ng/ml on day -4 (day 0 = day of oestrus) to reach a maximum value of 0.59 \pm 0.03 ng/ml on day -2. Thereafter, ir-inhibin concentrations showed a decline to reach a low of 0.40 \pm 0.01 ng/ml on day I of the oestrous cycle. In buffaloes, ir-inhibin concentrations increased from 0.38 \pm 0.04 ng/ml on day -4 to reach a maximum concentration of 0.52 \pm 0.05 ng/ml on day -2. Ir-inhibin concentrations then declined to reach a low of 0.29 \pm 0.03 ng/ml on day 9 of the cycle. In both cattle and buffaloes, ir-inhibin concentrations which were lowest (0.43 \pm 0.02 and 0.34 \pm 0.02 ng/ml, respectively) during the mid-luteal phase of the oestrous cycle increased ($p < 0.05$) to 0.52 \pm 0.03 and 0.44 \pm 0.04 ng/ml, respectively, during the late luteal phase, and then further to the highest value of 0.53 \pm 0.02 and 0.49 \pm 0.04 ng/ml, respectively, during the perioestrus phase, following which these declined to 0.50 \pm 0.02 and 0.39 \pm 0.03 ng/ml, respectively, during the early luteal phase. The variations in peripheral plasma ir-inhibin profile in both the species appear to be related to the changes in characteristics of follicular populations during the oestrous cycle. Peripheral plasma ir-inhibin concentrations were negatively correlated with progesterone concentrations in cattle ($r = -0.51$, $p < 0.01$) and buffaloes ($r = -0.30$, $p < 0.01$) indicating that the corpus luteum is not a source of peripheral ir-inhibin in these species.

In vitro maturation and fertilization of buffalo oocytes: Effects of storage of ovaries, IVM temperatures, storage of processed

Ravindranatha, BM and Nandi, S and Raghu, HM and Reddy, SM

REPRODUCTION IN DOMESTIC ANIMALS, Vol.38, I. No.1, P.21-26, FEB,2003

Studies were conducted to examine the possibility of preserving slaughterhouse-derived buffalo ovaries at 4degreesC for 0 (control), 12 and 24 h to maintain the developmental competence of the oocytes (experiment 1), to assess the effect of incubation temperature during oocyte maturation on rates of in vitro maturation (IVM) and in vitro fertilization (IVF) of buffalo oocytes and embryo development (experiment 2), and to examine the effect of storage at 25degreesC for 0 (control), 4 and 8 h of frozen-thawed buffalo sperm and BO and H-TALP as sperm processing and fertilization media on cleavage and embryo development in vitro of buffalo oocytes (experiment 3) in order to optimize the IVF technology in buffalo. Results suggested that storage of ovaries at 4degreesC for 12 or 24 h significantly ($p < 0.05$) reduced the developmental potential of oocytes. Incubation temperatures during the IVM influenced the fertilization rate but had no significant effect on maturation and subsequent embryo development. The incubation temperature of 38.5degreesC during IVM was found to be optimum for embryo production in vitro . Storage of frozen-thawed sperm at 25degreesC for 8 h significantly ($p < 0.05$) decreased its ability to cleave the oocytes. Sperm processed in BO medium had significantly ($p < 0.05$) higher ability to cleave the oocytes than the H-TALP medium.

Ovarian response, embryo production and hormonal profile in superovulated goats treated with insulin

Selvaraju, S and Agarwal, SK and Karche, SD and Majumdar, AC

THERIOGENOLOGY, Vol.59, I. No.6-May, P.1459-1468, MAR,2003

The influence of insulin on ovarian response and embryo production was investigated in 30 mixed breed goats, divided randomly into three equal (n = 10) groups. Goats in Group 1 (control) were superovulated using 20 IU FSH i.m. in six divided descending doses, i.e. 4/4, 3/3 and 3/3 IU at 12 h interval for three consecutive days and were not given insulin treatment. Goats in Group 2 (insulin pretreatment) were pretreated with long acting purified bovine insulin 0.2 IU/ kg body weight per day s.c. on Days 7, 8 and 9 of the estrous cycle prior to initiation of superovulatory treatment as in Group 1. Animals in Group 3 (insulin cotreatment) were treated as in Group 1, but in addition received long acting purified bovine insulin 0.2 IU/kg body weight per day s.c. as a cotreatment along with the first, third and fifth FSH treatments on three consecutive days. Total ovarian response (corpus luteum and unovulated large follicle (UOLF)) was significantly ($P < 0.05$) higher in insulin pretreatment (17.90 +/- 3.08) than in the cotreatment (11.50 +/- 2.34) and control (11.90 +/- 1.87) groups. The number of UOLF was significantly higher ($P < 0.05$) in the insulin pretreatment (10.2 +/- 1.67) than the cotreatment (4.9 +/- 1.14) and control (3.6 +/- 1.09) groups. The mean transferable quality of embryos did not differ significantly among treatments. Progesterone concentration on the day of PGF(2)alpha treatment was not different ($P > 0.05$) between the insulin treatment groups (5.28 +/- 0.79; 5.30 +/- 0.66 ng/ml). Estradiol-17beta concentration was significantly ($P < 0.05$) higher on the day of PGF(2)alpha treatment in both the insulin treatment groups (36.67 +/- 6.40; 34.33 +/- 4.33 pg/ml) as compared to the control group (20.00 +/- 2.73 pg/ml). There is ample evidence to indicate beneficial effect of insulin on folliculogenesis and steroidogenesis in superovulated goats. (C) 2002 Elsevier Science Inc. All rights reserved.

Seasonal variation in the yield of oocytes from buffalo ovaries

Gupta, PSP and Sarma, PV

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.72, I. No.12,P.1117-1118, DEC,2002

This study was undertaken to assess the recovery of oocytes from buffalo ovaries collected from the local abattoir in Bangalore, Karnataka, India during breeding (April to September) and non-breeding (October to March) seasons. 22 buffalo ovaries were collected from April 1997 to March 1998. The ovarian weight, number of follicles, and number of corpora lutea were recorded. Oocytes were retrieved from the ovaries by aspiration and slicing. No significant differences ($P>0.05$) in the ovarian weight, number of follicles, number of corpora lutea, and number of oocytes recovered were observed between the two seasons. Results obtained may be due to the uniform reproductive activity throughout the year because less variation in the environmental temperature between different seasons in this region.

Assessment of animal feed resource availability in Southern Karnataka region

Raju, SS and Anandan, S and Angadi, UB and Ananthram, K and Prasad, CS and Ramachandra, KS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.72, I. No.12,P.1137-1140, DEC,2002

Animal feed resource availability was assessed based on secondary data in Southern Karnataka region comprising 7 districts. Distribution and composition of livestock revealed that the region accounted for 49 and 48% of total state sheep and poultry population. respectively High percentage of crossbred cattle (26, 10%) among adult females with high crossbred population in the districts of Bangalore urban (64.69%), Kolar (45.71%) and Bangalore rural (30.30%) indicated that the animal husbandry activities are practiced more on commercial lines in the region. The region had a total DM availability of 10.31 m tonnes from different feed resources. Crop residues contributed for more than 70% of total DM available in the region. Major portion (58%) of the green DM forage availability is contributed from the gross cropped area in all the districts of the region. The contribution from the forest area was minimal within the region as a whole. The DM availability, RLU/day for the region is 8.05 kg with the values ranging from 3.92 kg in Bangalore urban district to 12.33 kg in Chitradurga district. The study indicated that the existing situation ranges from low feed resource availability-high productivity to high feed resource availability-low productivity. Developing suitable strategies for efficient utilization of existing feed resources would help in further increasing the animal productivity in the region.

**Peripheral plasma inhibin concentrations in relation to,
expression of estrus in Murrah buffaloes (*Bubalus bubalis*)**

Mondal, S and Prakash, BS and Palta, P

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.73, I. No.4, P.405-407, APR,2003

This study investigated the changes in peripheral plasma inhibin levels in relation to expression of oestrus in Murrah buffaloes (India). Out of total 7 oestrus, two were accompanied by overt signs, whereas rest were silent oestrus. Inhibin concentrations were lowest during midluteal phase and increased through late luteal phase in buffaloes that exhibited overt signs and silent oestrus respectively. Inhibin levels were significantly higher ($P<0.01$) in buffaloes that exhibited silent oestrus and might be responsible for poor expression of oestrus.

In vitro culture of buffalo oocytes and embryos: Comparison between individual and group culture

Ravindranatha, BM and Nandi, S and Reddy, SM

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.73, I. No.7,P.769-770, JUL,2003

Buffalo ovaries were collected from a local abattoir and transported to the laboratory in 0.9% normal saline at 32-35 degrees C within 1 h of slaughter. The oocytes, either individual or in groups of 8-9, were cultured in TCM199 + FCS (10%) + FSH-P (10 ng/ml) supplemented with gentamicin. Maturation was assessed on the basis of cumulus cell expansion after 24 h of incubation. Maturation rate was significantly faster ($P<0.05$) in group culture than in individual culture. Cleavage rate and the morulae yield was also significantly faster ($P<0.05$) in oocytes cultured in groups. 40 IU/ml eCG concentration was most effective for the maturation of buffalo oocytes in

v i t r o .

Effect of a commercial preparation of eCG on the in vitro maturation rate of buffalo oocytes

Ravindranatha, BM and Nandi, S and Gupta, PSP and Sarma, PV

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.73, I. No.7,P.771-772, JUL,2003

The study examined the effect of commercially available equine chorionic gonadotropin (eCG) on in vitro maturation of buffalo oocytes and assessed the optimum level of eCG inclusion in oocyte maturation media. Only grade A and grade B oocytes were chosen from cumulus oocyte complexes aspirated from buffalo ovaries collected from a slaughter house. The experiment was repeated 7 times. With the increment of inclusion of eCG from 2.5 IU/ml to 20 and 30 IU/ml in the maturation media, there was a significant increment in the maturation rates. However, no significant differences in maturation rates were observed between oocytes matured in media supplemented with 20 and 30 IU/ml eCG. A significantly higher (>86%) maturation rate of oocytes was observed when eCG concentration was increased to 40 IU/ml of media. It may be concluded that commercially available eCG at the level of 40 IU/ml can effectively be used for in vitro maturation of buffalo oocytes in place of pure follicle stimulating hormone, which will also be cost effective for IVM studies.

Oviposition patterns associated with prolactin concentration in domestic chicken (*Gallus domesticus*)

David, CG and Reddy, IJ and Singh, K

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.16, I. No.11, P.1565-1571, NOV,2003

Physiological mechanisms, involved in unusual ovulatory sequences in domestic hen are remaining undefined. One hundred individually caged white leghorn birds were divided into two equal groups viz. control and treatment, and 2-bromo-alpha-ergocryptine, was administered to birds in the treatment group to modulate prolactin (PRL) secretion from anterior pituitary gland. The effect of modulation of PRL concentrations on egg production, sequence length and intersequence pause length were studied by analysis of oviposition records of the birds from 24 to 72 weeks of age. The surviving 48 birds in the control and treatment groups averaged 34.58 +/- 1.7 and 25.67 +/- 1.15 sequences of oviposition, with a mean sequence length of 9.92 +/- 0.63 and 14.04 +/- 1.12 days respectively. Most of the birds had a single characteristically long sequence during the entire reproductive cycle, which averaged 46.04 +/- 3.09 days in the control birds and 59.33 +/- 4.44 days in the treated birds. 2-bromo-alpha-ergocryptine treatments had significantly decreased (p less than or equal to 0.01) the circulating concentrations of PRL compared to the birds of the control group. This resulted in a significant increase (p less than or equal to 0.01) in the number of laying days in birds of the treatment group with a concomitant decrease in the intersequence pause length. The decreased PRL levels during prime sequences in birds of the both groups, reveals the negative role of the circulating PRL levels on egg production with concomitant shorter intersequence pause length. Hence, modulation of PRL with dopamine agonist may enhance the reproductive efficiency of hens later in

l i f e .

Developmental competence and post-thaw survivability of buffalo embryos produced in vitro: effect of growth factors in oocyte

Nandi, S and Ravindranatha, BM and Gupta, PSP and Raghu, HM and Sarma, PV

THERIOGENOLOGY, Vol.60, I. No.9,P.1621-1631, DEC,2003

The present study was conducted to examine the effects of supplementation to IVM medium of epidermal growth factor (EGF), fibroblast growth factor (FGF) and vasoactive intestinal peptide (VIP) along with pregnant mare serum gonadotrophin (PMSG) on oocyte maturation and cleavage of buffalo embryos (experiment 1). The developmental competence of cleaved embryos cultured in either a complex co-culture system (TCM-199 + 10% serum + oviduct cell monolayer) or defined media (a modified form of synthetic oviductal fluid (mSOF) was evaluated (experiment 2). The post-thaw morphology and survivability of frozen blastocysts developed from embryos cultured either in complex or defined medium was compared (experiment 3). Aspirated oocytes were cultured in maturation medium (TCM-199 + PMSG (40 IU/ml-control)) supplemented with EGF (20 ng/ml), FGF (20 ng/ml) and VIP (20 ng/ml), either alone or in combination, in a CO₂ incubator at 38.5 degreesC for 24 h. Maturation rate was assessed and oocytes were inseminated in vitro with frozen-thawed sperm processed in Brackett and Oliphant (BO) medium. The cleaved embryos were cultured either in complex co-culture system or mSOF. Results suggested that EGF had more beneficial effect on buffalo oocyte maturation, and embryo cleavage than FGF. Addition of VIP to the oocyte maturation medium did not improve the results. Blastocyst yields from buffalo oocytes were significantly higher in a complex co-culture system than in defined media (mSOF) when oocytes were matured in presence of EGF either alone or in combination with FGF and VIP. The mean percent of morphologically normal blastocysts after thawing and their survivability were significantly higher in blastocysts obtained from embryos cultured in mSOF than those cultured in complex co-culture system. (C) 2003 Published by Elsevier Inc.

Limiting amino acids in the bypass protein fraction of some commonly used feedstuffs

Sampath, KT and Chandrasekharaiah, M and Thulasi, A

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.73, I. No.10,P.1155-1158, OCT,2003

Studies were conducted to determine the availability of limiting amino acids (lysine and methionine) in the bypass protein fraction of some commonly used feedstuffs. The feedstuffs, viz. groundnut-cake, cottonseed-cake, maize gluten meal (40%CP), silkworm pupae, bajra grain, broken rice, rice polish and navanae (*Setaria italica*) contained 0.85 and 0.25; 1.65 and 0.34; 1.33 and 0.88; 1.71 and 1.08; 1.48 and 0.11, 0.70 and 0.10, 0.95 and 0.17 and 1.48 and 0.14% lysine and methionine respectively. The above feedstuffs were incubated in nylon bags in the rumen of three fistulated-crossbred steers for 24 hr. The lysine and methionine disappearance from these feedstuffs during 24 hr incubation in the rumen were 76.25 and 65.43; 47.86 and 57.84; 81.92 and 52.65; 26.39 and 26.19; 83.48 and 74.69, 88.48 and 96.98, 71.99 and 78.01 and 76.99 and 74.98% in groundnut-cake, cottonseed-cake, maize gluten-meal (40%CP), silkworm pupae, pearl millet grain, broken rice, rice polish and navanae (*Setaria italica*) respectively. The bypass protein fractions of cottonseed-cake and silkworm pupae were good source of lysine and the bypass proteins fractions of maize gluten-meal (40%CP) and silkworm pupae were good sources of methionine.

Improving the digestibility of finger millet straw by strategic supplementation through locally available concentrate

Chandrasekharaiah, M and Sampath, KT and Praveen, US and Prakash, C

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.73, I. No.10,P.1184-1186, OCT,2003

Groundnut-cake was replaced with mustard-cake at 50 and 100% levels on a protein basis in the diet of growing lambs to find its effect on feed intake, nutrient utilization and digestibility of nutrients. It was concluded that GNC can be replaced completely with MOC without affecting the feed intake, nutrient utilization and digestibility of the nutrients in growing lambs.

Utilization of dietary nutrients, retention and plasma level of certain minerals in crossbred dairy cows as influenced by source

Gowda, NKS and Prasad, CS and Ashok, LB and Ramana, JV

*ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.17, I. No.2,P.221-227,
FEB,2004*

Nutrient utilization and plasma level of minerals were studied in lactating crossbred cows fed diet supplemented from different source of minerals. Twelve crossbred cows of first to third lactation during their mid stage of lactation were distributed equally under two groups and were fed concentrate mixture, green fodder (para grass) and finger millet straw as per requirement. Cows in group I were fed concentrate mixture supplemented with 1% mineral mixture whereas cows in group II were not supplemented with mineral mixture in the concentrate mixture but were offered additional quantity of green fodder (1 kg DM/cow/day) to compensate for the requirement of minerals. Balance study conducted towards the end of 120 days of feeding experiment indicated that the total dry matter intake in both the groups did not differ significantly. The cows in group II offered additional quantity of green fodder consumed significantly ($p < 0.05$) more of green fodder (5.11 vs. 4.51 kg /animal/day) and the cows in group I consumed significantly ($p < 0.01$) more of finger millet straw (1.71 vs. 0.92 kg/animal/day). The digestibility of major nutrients did not differ between the groups except for ether extract which was significantly ($p < 0.05$) lower in cows fed additional green fodder. The total daily intake of P, Cu, Fe and Co did not differ significantly in both the groups whereas significantly higher intakes of Ca, Mg, Zn and Mn were observed in cows supplemented with inorganic source of minerals. However, supplementation through both the sources could meet the mineral requirement in group I and group II. The gut absorption (%) of all the minerals was comparable between the groups except for Mg which was significantly ($p < 0.05$) higher in cows supplemented mineral mixture. The net retention of all the minerals was significantly more in the group supplemented with inorganic source of minerals. Except for P, Mg and Co the retention as percentage of total intake was comparable for all minerals in both the groups. Irrespective of source of mineral supplementation the average monthly blood plasma mineral levels (Ca, P, Mg, Cu, Zn, Fe) were within the normal range and comparable between the groups. Lower level of Cu observed at the start of the experimental feeding in both the groups increased with the advancement of supplemental feeding. The plasma Zn and Fe content in cows of both the groups did not vary. The blood plasma level of some minerals (Ca, P, Mg and Cu)

Micronutrient content of certain tropical conventional and unconventional feed resources of Southern India

Gowda, NKS and Ramana, JV and Prasad, CS and Singh, K

TROPICAL ANIMAL HEALTH AND PRODUCTION, Vol.36, I. No.1, P.77-94, JAN,2004

The ash, silica and certain important micronutrients were estimated in conventional and unconventional feed and fodder resources available in Southern India. Commonly used dry roughages, such as paddy straw, ragi straw, maize kadbi/stalk, jowar kadbi/stalk, bajra stalk and wheat straw, were high in ash (9.9% +/- 0.77%) and silica (6.4% +/- 0.65%) and low in most of the other micronutrients, except iron, with paddy straw containing most silica (>9%). Cultivated non-leguminous (maize, jowar) and improved green crops (hybrid napier, guinea, green panic, NB-21, CO-1) were also high in ash (10.5% +/- 0.60% and 12.5% +/- 0.51%) but were moderate sources of P, Mg and Cu and good sources of Zn (98 +/- 3.8 ppm and 55 +/- 6.7 ppm). Leguminous green fodders (stylosanthes, lucerne, cow pea, soyabean) were excellent sources of Ca (1.9% +/- 0.16%), Mg (0.40% +/- 0.05%), Cu (30 +/- 5.2 ppm), Zn (121 +/- 14.7 ppm) and Fe (1234 +/- 166 ppm) and moderate sources of P. Mixed local grasses and weeds were high in silica (6.9% +/- 1.00%) but were good sources of Cu, Zn and Fe. Cereal grains (maize, wheat, rice, ragi) were low in ash (2.9% +/- 0.33%) and were relatively poor sources of Ca (0.22% +/- 0.03%), Mg (0.19% +/- 0.03%) and Cu (13 +/- 3.1 ppm). Pulses were low to medium sources of most minerals and good sources of Fe (1230 +/- 293 ppm). Oil seed cake/extractions (groundnut cake, cotton seed cake, soyabean meal, sunflower cake, safflower cake) and cereal by-products (rice polish, rice bran, wheat bran) were excellent sources of P (1.1% +/- 0.47% and 2.3% +/- 0.19%) and good sources of Zn (65 +/- 3.9 ppm and 66 +/- 10.7 ppm) and Fe (938 +/- 130 ppm and 662 +/- 126 ppm). Among the unconventional feeds screened, orange peel, sunflower heads, meat meal, rubber seed cake, spirulina algae and sea weeds contained plentiful Ca, Zn and Fe: tree leaves/top feeds (mulberry, erythrina, glyricidia, banana, subabul, groundnut haulms) were excellent sources of Ca (1.5% +/- 0.13%), Zn (120 +/- 22.9 ppm) and Fe (1033 +/- 133 ppm) but relatively poor sources of P. Soyabean husk, cocoa seed husk, rubber seed cake and meat meal were moderate to good sources of P (1.0% and 0.33%). The high Zn and Fe values of most feeds/fodders were probably due to soil contamination. This account of the micronutrient content of feed/fodder resources should help in strategic supplementation intended to alleviate local

d e f i c i e n c i e s .

In vitro development of buffalo oocytes in media-containing fluids from different size class follicles

Nandi, S and Raghu, HM and Ravindranatha, BM and Gupta, PSP and Sarma, PV

REPRODUCTION IN DOMESTIC ANIMALS, Vol.39, I. No.1, P.33-38, FEB,2004

Studies were conducted to investigate the effect of supplementation of fluid from different sized class [small (SFF, <3 mm), medium (MFF, 3-8 mm) and large (LFF, >8 mm)] of normal and cystic (CFF) ovarian follicles in oocyte culture media on oocyte maturation rate and embryo development in vitro and to test the efficacy of follicular fluid (FF) from different size classes as a whole oocyte maturation medium. Results suggested that FF were capable of developing buffalo oocytes to embryonic stage in vitro although its efficacy was lower than that of serum. Regardless of high maturation rates after in vitro maturation (IVM) in media containing FF or IVM in whole FF, low blastocyst rates were obtained after in vitro fertilization (IVF) and culture of embryos. Follicular fluid from small follicles had significantly ($p < 0.05$) higher potential of developing buffalo oocytes to embryonic stage in vitro than that from medium and large follicles. Cystic FF was not capable of supporting development of buffalo oocytes in vitro.

Growth rate and biometrical measurements in mithun calves under semi-intensive system

Mondal, SK and Pal, DT and Bujarbaruah, KM

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.74, I. No.1,P.66-68, JAN,2004

Growth pattern and body measurements of growing mithun calves of either sex were studied under semi-intensive system for 5 months from birth in India. The average growth rate was 480.0 g/day in male calves and 379.3 g/day in female calves. The fortnightly changes in body measurement parameters like head length, head breadth, ear length, body length, height at withers, heart girth, abdominal girth and pouch girth were determined. There was a steady increase in all the body conformation traits in both male and female calves.

In vitro embryo production in cattle and buffalo: present status, challenges and outlook

Nandi, S and Raghu, HM and Ravindranatha, BM and Chauhan, MS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.74, I. No.2,P.151-155, FEB,2004

The success rate and the practical application of IVP embryos in bovine have not largely increased because of their low efficiency. The production of bovine embryos in vitro is characterized by high rate of maturation (cattle: 85-90%, buffalo: 70-90%), fertilization (cattle: 70-90%, buffalo 60-70%) and cleavage (cattle: 50-80%, buffalo: 40-50%) and moderate to low rate of blastocyst formation (cattle: 30-60%, buffalo: 15-30%) and calf production following transfer (cattle: 10-15%, buffalo: 10.5%).

Peripheral plasma progesterone concentration in relation to estrus expression in Murrah buffalo (*Bubalus bubalis*)

Mondal, S and Prakash, BS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.73, I. No.3,P.292-293, MAR,2003

This study investigated the changes in peripheral plasma progesterone levels in relation to expression of oestrus in Murrah buffaloes (India). Out of 7 oestrus, 2 were accompanied by overt signs, whereas 5 were silent oestrus. Mean plasma progesterone concentrations was lowest on the day of oestrus and rose to a peak level on days 8 and 9, which then declined gradually to the basal level on the day of next oestrus in buffaloes that exhibited overt signs and silent oestrus, respectively. The overall plasma progesterone levels in buffaloes that exhibited silent oestrus was lower ($P<0.05$) compared to those in overt oestrus.

Essential amino acid content of commonly used feedstuffs

Chandrasekharaiah, M and Sampath, KT and Thulasi, A

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.73, I. No.3,P.305-307, MAR,2003

Studies were conducted to determine the essential amino acids (EAAs) content in commonly used feed ingredients such as soybean extraction, broken rice, rapeseed extraction, sunflower extraction, rice polish, pearl millet grain, silkworm pupae, maize gluten-meal (40% CP and 60% CP), safflower-cake and copra-cake. The EAA content in these feedstuffs were determined in a high pressure liquid chromatography (HPLC) using pre-column derivatisation with phenyl isothiocyanate (PITC). The EAA content of feedstuffs ranged from 0.03 to 9.12% on dry matter basis. Highest level of EAA was observed in soybean extraction followed by maize gluten-meal (60% CP and 40% CP), silkworm pupae, rapeseed extraction, safflower-cake, sunflower extraction, copra-cake, rice polish, broken rice and pearl millet grain.

Effect of supplementation containing polyethylene glycol (PEG)-6000 on intake, rumen fermentation pattern and growth in kids fed

Bhatta, R and Shinde, AK and Verma, DL and Sankhyan, SK and Vaithyanathan, S

SMALL RUMINANT RESEARCH, Vol.52, I. No.2-Jan,P.45-52, APR,2004

A study was designed to assess the effect of replacing groundnut cake (GNC) in a compounded feed mixture (CFM) with 50 g kg⁻¹ DM of polyethylene glycol-6000 (PEG-6000) on performance of kids fed tannin-containing foliage of *Prosopis cineraria*. Thirty Kutchi weaner kids of similar body weight (10.31 ± 0.11 kg) and age (90 days) were divided into three homogeneous groups (HP, LP and LP-PEG). They were supplemented with 100 (first month), 150 (second month) and 200 g per day (third month) of CFM before being allocated to the range. Kids in HP received a standard CFM with groundnut cake; LP received CFM in which GNC was replaced with cereal grains and LP-PEG received CFM in which the cake was substituted with 50 g kg⁻¹ DM of PEG-6000. All the kids were grazed as a flock from 08:00 to 17:00 h on a 35 ha plot of native range of India. From April to June they were fed freshly cut leaves of *P. cineraria* in the range. On DM basis *P. cineraria* leaves contained 159.2 g kg⁻¹ crude protein (CP), 567.2 g kg⁻¹ neutral detergent fibre (NDF), 360.0 g kg⁻¹ acid detergent fibre (ADF) and 188.6 g kg⁻¹ acid detergent lignin (ADL). CP digestibility was higher ($P = 0.004$) in HP (0.541) and LP-PEG (0.530) compared to LP (0.444). Digestible crude protein (DCP) (g per day) and metabolisable energy intakes (MJ per day) in HP, LP and LP-PEG were 84.4, 61.06 and 85.56; 12.76, 12.55 and 14.89, respectively ($P = 0.004$ and 0.025). Blood haemoglobin (Hb) level (g dl⁻¹) was higher ($P = 0.001$) in LP-PEG (12.3) compared to HP (9.12) and LP (8.96). A similar trend was found in blood urea nitrogen (BUN; $P = 0.008$). Rumen ammonia N (mg dl⁻¹) and total volatile fatty acid (mg dl⁻¹) concentrations were higher ($P < 0.05$) in LP-PEG (7.34; 8.26) compared to HP (4.95; 7.12) and LP (4.27; 6.49). After 3 months of experimental period, body weight gain in HP and LP-PEG was similar (7.69kg) and higher ($P < 0.05$) compared to LP (6.57kg). These results indicate the possibility of substituting conventional high protein CFM with low protein CFM containing PEG-6000 in kids fed tannin rich foliage of *P. cineraria*. (C) 2003 P u b l i s h e d b y E l s e v i e r B . V .

Relative functionality attributes of right and left ovaries in buffaloes (*Bubalus bubalis*)

Gupta, PSP and Nandi, S and Sarma, PV

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.74, I. No.5,P.477-479, MAY,2004

Proper implementation of reproductive technologies in buffalo, a species of high dairy merits, necessitates in depth studies on its ovarian functions. Present study aimed to elucidate the relative functionality attributes of right and left buffalo ovaries of slaughtered mature riverine buffaloes. Weight of the ovary (2.53 and 2.65 g), follicular fluid volume per ovary (0.19 and 0.24), the number of follicles (4.97 and 5.12), oocytes (3.14 and 3.23), corpora lutea (0.37 and 0.41) and corpora albicans (0.31 and 0.20) present in the right and their left ovaries, respectively, were not significantly different. These results suggest equal participation of the right and the left ovary in r e p r o d u c t i v e f u n c t i o n s o f b u f f a l o .

**Effect of heparin, caffeine and calcium ionophore on in vitro
capacitation of buffalo spermatozoa**

Srivastava, R and Nandi, S

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.74, I. No.5,P.511-513, MAY,2004

The efficacy of various capacitation agents, viz. heparin, caffeine and calcium ionophore on in vitro capacitation of buffalo spermatozoa was examined. Heparin, caffeine and calcium ionophore had significant effect on individual motility, viability, head to head agglutination and sperm-oocyte attachment. The combination of heparin and caffeine or calcium ionophore resulted in maximum head to head agglutination and sperm - oocyte attachment .

Effect of some chemical and herbal compounds on growth of *Aspergillus parasiticus* and aflatoxin production

Gowda, NKS and Malathi, V and Suganthi, RU

ANIMAL FEED SCIENCE AND TECHNOLOGY, Vol.116, I. No.4-Mar,P.281-291, 15-Oct,2004

The anti-fungal properties of a series of chemical and herbal compounds at different levels was tested on potato dextrose agar. Among the chemical compounds, propionic acid at 0.1-0.5%, ammonia at 0.5%, copper sulphate at 0.08-0.5% and benzoic acid at 0.1-0.5% completely inhibited *Aspergillus parasiticus* growth. Urea, citric acid and sodium propionate had moderate anti-fungal properties (36-64% reduction). Among the herbal compounds, clove oil at 0.5% completely inhibited fungal growth. Compounds which inhibited fungal growth by at least 20% were selected to test their efficacy to inhibit fungal growth and aflatoxin production in feeds. All the selected chemical and herbal compounds reduced ($P < 0.01$) fungal growth (i.e. fungal spore count) and aflatoxin production. Propionic acid at 0.05-0.5%, sodium propionate at 0.1-0.5%, benzoic acid at 0.2% and ammonia at 0.5% completely inhibited aflatoxin production. Reduction in aflatoxin production was high with 0.5-1% citric acid (91-94%), 0.1-0.5% urea (93-96%) and 0.08% copper sulphate (85%). Clove oil at 0.5-1% inhibited aflatoxin production completely. Moderate reduction in toxin production occurred with 0.2-1% turmeric (63-84%), 0.1-1% onion (64-76%) and 0.2-1% garlic (71-84%). Among the chemical compounds tested in feeds, propionic acid, sodium propionate, benzoic acid and ammonia were the best anti-fungal compounds, followed by urea and citric acid. Among the herbal compounds, clove oil was the best followed by turmeric, garlic and onion. (C) 2004 Elsevier B.V. All rights reserved.

Macro- and micro-nutrient utilization and milk production in crossbred dairy cows fed finger millet (*Eleusine coracana*) and

Gowda, NKS and Prasad, CS

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.18, I. No.1, P.48-53, JAN,2005

Finger millet straw and rice straw are the major source of dry roughage in southern India. They distinctly vary in their morphological and nutritional characters. Hence an effort was made to study the nutrient utilization, milk yield and composition in crossbred dairy cows fed either finger millet (group 1) or rice straw (group 2) as a source of dry roughage. The cows in both the groups were fed as per requirement with concentrate, green fodder and straw in the ratio of 30:45:25 parts (DM). At the end of 50 days of preliminary feeding a digestibility trial was conducted for 7 days and pooled samples of feed, fodder, feces, urine and milk were analysed for macro and micro nutrient content. Finger millet straw contained more CP, Ca, P, Mg, Cu, Zn and Co than rice straw and rice straw contained higher ADF, ash and silica. The intake of DM, CP, EE, NDF, ADF and most micronutrients (Ca, P, Mg, Cu, Zn, Fe, Mn and Cc) was significantly higher in cows fed finger millet straw. The digestibility of DM, CP, NDF and ADF was significantly higher in cows fed finger millet straw and the gut absorption of Ca, Cu, Mn and Co was significantly higher in cows fed finger millet straw. The dietary requirement of all micronutrients in both the group of cows could be met irrespective of the type of roughage fed except that of Ca, which was low (0.61 and 0.40%) in rice straw fed cows. The average daily milk yield (L/cow) was also higher (7.0 L) in cows fed finger millet straw as compared to cows fed rice straw (6.3 L). The average milk composition also did not differ except that of milk fat which was significantly (4.7 and 4.5%) low in cows fed rice straw. The overall results of this study have indicated that finger millet straw is a better source of dry fodder than rice straw and while feeding rice straw as the sole roughage to dairy cows there is need to supplement additional calcium as this could be one of the limiting nutrients for milk

p r o d u c t i o n .

Effect of 30 KDa and above buffalo follicular fluid protein treatment and immunization on ovarian functions in goats (Capra

Ghosh, J and Yadav, MC and Maity, SK and Meur, SK

THERIOGENOLOGY, Vol.63, I. No.1, P.179-189, 1-Jan,2005

Information on the use of buffalo follicular fluid (buFF) in modulation of ovarian functions in farm animals is scanty compared to other species. This is an attempt to investigate the effect of direct administration and active immunization of 30 kDa and above buFF proteins on ovarian functions in goats. Treatment of goats (n = 6) with steroid free 30 kDa and above buFF protein fraction during late-luteal phase for 4 days (days 12 or 13 to days 15 or 16) of the natural cycle, delayed the onset of estrus by 24 h compared to control although the mean duration of estrus was unaffected. A 71% increase (P = 0.06) in mean ovulation number was also observed following treatment. However, the population of large (≥ 5 mm diameter) follicle was not affected. The ovarian activity calculated as total of ovulation and large follicles increased (1.6 times) significantly (P = 0.02) in treated animals. Active immunization of goats (n = 5) against these proteins did not affect the onset and duration of estrus. Similarly, the ovulation rate, number of large follicles and the ovarian activity did not differ significantly between immunized and control groups. The study revealed that 30 kDa and above buffalo follicular fluid contains some factor(s) that cause delay in the onset of estrus in goats and increase the ovulation rate. Active immunization against these proteins in goat did not show any effect either on onset, duration of estrus or ovulation rate and large follicle population. Detailed study on these buffalo follicular fluid proteins may help to use them further for modulation of ovarian function in farm animals. (c) 2004 Elsevier Inc. All rights reserved.

Relationship between intersequence pauses, laying persistency and concentration of prolactin during the productive period in

Reddy, IJ and David, CG and Singh, K

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.18, I. No.5,P.686-691, MAY,2005

Prolactin is considered to influence the taking of pauses in between ovulatory sequences in White Leghorn hens. Therefore modulating concentrations of prolactin using bromocriptine - a dopamine agonist during early life (17 to 36 weeks of age) could overcome the inhibitory effects of high concentration of prolactin on ovarian activity. The effect of modulation of prolactin concentration on egg production, sequence length and inter sequence pauses were studied by analyzing the oviposition records from 19 to 72 weeks were studied and compared with untreated controls. Bromocriptine administered subcutaneously ($100 \mu\text{g kg}^{-1}$ body weight) or orally through feed ($640 \mu\text{g day}^{-1} \text{bird}^{-1}$) resulted in a steady and sustained decrease in prolactin levels ($p < 0.01$) during and after the withdrawal of treatment up to one reproductive cycle (72 weeks of age). The treated birds had comparatively longer sequences ($p < 0.01$) and fewer pauses ($p < 0.01$). Egg production increased ($p < 0.01$) by fourteen per cent through subcutaneous administration and eleven per cent through oral feeding, over the control birds. It is concluded that the physiological pauses that occur during ovulatory sequences can be disrupted effectively using bromocriptine. Prolactin levels are modulated which may interfere with the follicular recruitment and subsequent oviposition thereby improve egg laying potential of the bird.

Importance of trace minerals and relevance of their supplementation in tropical animal feeding system: A review

Prasad, CS and Gowda, NKS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.75, I. No.1,P.92-100, JAN,2005

Trace minerals are required by animals in smaller quantity and based on the established functions atleast 9 trace minerals are essential (Fe, Cu, Zn, Mn, I, Co, Se, Mo, Cr). Trace minerals activate several enzymes responsible for various biochemical functions and some are integral part of enzymes/hormones/vitamins. Trace mineral deficiency impaires productivity in livestock. Body trace mineral status, immunity and reproductive functions have direct relationship Cu, Co, I, Se, Zn and Mn are likely to influence these functions. The trace mineral content in plants is governed by geochemical nature of soil and species of plants besides agro-climatic conditions. The requirement of trace minerals in livestock is dependent on level of production, physiological status and feeding system. Legume fodders, cultivated green fodders and tree leaves are good sources of Fe, Zn, Cu, Co and Mn, and oil-cakes and bran are good sources of Zn, Mn and Cu. Chemical form of inorganic source and anti-nutritional factors (silica, tannins, phytate) greatly influence the bioavailability. Chelated or organic forms of minerals (Cu-lysine, Zn-methionine) have better bioavailable and improved immunity and reproduction. In tropical regions, mostly Cu and Zn are deficient in most fodders, whereas the level of Mn, Co and Fe is either adequate or high. Low reproductive efficiency of livestock in most regions is generally attributed to the deficiency of Cu, Zn and Mn. Supplementation of the most deficient minerals as area-specific mineral mixture improved production and reproduction of animals. Chromium is an essential element because of its role in glucose utilization, reducing muscle fat content and increasing the leanness of meat. Boron, lithium, silicon, nickel and vanadium though may not be dietary essential but on supplementation in controlled conditions have shown beneficial effects.

Effect of supplementation of micronutrients through different sources on the production performance in crossbred dairy cows

Gowda, NKS and Prasad, CS and Ramana, JV

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.74, I. No.6,P.653-657, JUN,2004

Study was conducted to know the lactation performance in 12 crossbred cows fed diets with inorganic and organic source of micronutrient supplementation under each of the dietary treatment. Cows in group 1 were fed concentrate mixture supplemented with 1% commercial mineral mixture, whereas cows in group 2 were fed with additional green fodder as a strategic supplement in place of 1% inorganic mineral mixture to meet the mineral needs for 120 days. There was no significant difference in the total dry matter intake in both the groups (10.75 and 10.41 kg). The average daily intake of Ca (55.23 and 41.96 g), Cu (173.19 and 137.10 mg), Zn (800.70 and 625.39 mg) and Mn (1147.49 and 924.11 mg) was significantly ($P < 0.05$) higher in group 1 fed diet supplemented with mineral mixture than in group 2. However, the average daily intake of P (103.45 and 89.97 g), Mg (32.69 and 27.71 g), Fe (7025 and 6860 mg) and Co (19.73 and 16.53 mg) did not differ significantly amongst the 2 groups indicating that the cows in group 2 fed no mineral mixture could derive these micronutrients through the consumption of additional quantity of green fodder provided to them. The net percentage of P in the dry matter consumed by the cows in both the groups was higher (0.86-0.96%) than that of Ca (0.424.51 %) due to the inclusion of wheat bran and groundnut-cake in the concentrate mixture which are rich sources of P. The unit dietary level of Cu (13-16 ppm), Zn (60-75 ppm), Fe (653-659 ppm), Mn (88-106 ppm) and Co (1.58-1.83 ppm) in the dry matter consumed by the cows in both the groups was higher than the recommended levels as the concentrate ingredients and green fodder consumed were good sources of these micronutrients. The cows in group 2 fed additional green fodder recorded a non-significant reduction in the average milk yield (4% FCM), 7.69 L / day as compared to 8.08 L per day in group I during the 120 days of feeding experiment. Milk composition also did not show significant variation between the groups except the milk ash which was significantly less in group 2. It can be concluded from this study that strategic supplementation of micronutrients through local para grass for crossbred cows producing upto 10 L of milk could meet the trace mineral requirement but the major minerals like Ca and Mg could not be met and r e q u i r e d t o b e s u p p l e m e n t e d .

Relative percentage of protein partitioned into various protein fractions prepared by ammonium sulphate precipitation of

Gupta, PSP and Ravindra, JP and Reddy, GR

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.75, I. No.2,P.182-184, FEB,2005

Follicular fluid consists of many proteins that influence oocyte maturation. Fractionation of ovarian follicular fluid into different protein fractions is the first step in the isolation of peptides/proteins. In this study, bubaline ovarian follicular fluid collected from different size categories of follicles (small, medium and large) was fractionated with ammonium sulphate precipitation at different saturation levels in to different protein fractions (A to G). The amount of protein in each fraction and relative percentage of total protein partitioned into different protein fractions was estimated. The amount of protein partitioned in to different fractions of follicular fluid varied significantly in any particular category of follicles. There was significant difference among different categories of follicles with respect to the peptide level/relative percentage of protein partitioned into a particular fraction. By 95% of ammonium sulphate saturation, 81 and 78% of the protein quantity in he follicular fluid of small and large follicles, respectively, got precipitated but in the medium size follicles, only 45% of the protein quantity got precipitated. It may be because of the variation in the type of proteins or quantity of specific protein present in different size categories of follicles. The data presented may give an idea about the quantum of protein that can be obtained from different protein fractions of the fluid that facilitates effective planning of the strategies for the isolation and purification of specific peptides of ovarian
f o l l i c u l a r f l u i d i n b u f f a l o e s .

Effect of different physical and chemical treatments on detoxification of ricin in castor cake

Anandan, S and Kumar, GKA and Ghosh, J and Ramachandra, KS

ANIMAL FEED SCIENCE AND TECHNOLOGY, Vol.120, I. No.2-Jan,P.159-168, 9-May,2005

In spite of its high protein content, castor cake is not used as livestock feed due to the presence of toxic factors-ricin, ricinine and allergen. Of the three, ricin is the most detrimental to the animals. In order to detoxify the cake, a number of physical and chemical methods were employed. Soaking (3, 6 and 12 h), steaming (30 and 60 min), boiling (30 and 60 min), autoclaving (15 psi, 30 min; 15 psi, 60 min) and heating (100&DEG; C 30 min; 120&DEG; C 25 min) were the physical methods employed, while the chemical methods consisted of ammonia (7.5, 12.5 ml/kg of castor cake), formaldehyde (5, 10 g/kg), lime (10, 20 and 40 g/kg), sodium chloride (5, 10 and 20 g/kg), tannic acid (5, 10 g/kg) and sodium hydroxide (2.5, 5 and 10 g/kg). The efficacy of the treatments was assessed, based on the qualitative and quantitative changes in ricin content. Of all the methods employed, autoclaving (15 psi., 60 min) and lime treatment (40 g/kg) completely destroyed the toxin. © 2004 Published by
E l s e v i e r B . V .

Influence of diet induced changes in rumen microbial characteristics on gas production kinetics of straw substrates in

Srinivas, B and Krishnamoorthy, U

*ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.18, I. No.7,P.990-996,
JUL,2005*

The effect of diets varying in level and source of nitrogen (N) and fermentable organic matter on dynamic characteristics of microbial populations in rumen liquor and their impact on substrate fermentation in vitro was studied. The diets tested were straw alone, straw+concentrate mixture and straw+urea molasses mineral block (UMMB) lick. The same diets were taken as substrates and tested on each inoculum collected from the diets. Diet had no effect on the amino acid (AA) composition of either bacteria or protozoa. Differences among the diets in intake, source of N and OM affected bacterial and protozoal characteristics in the rumen. Upper asymptote of gas production (Y_{α}) had a higher correlation with bacterial pool size and production rate than with protozoal pool size and production rate. Among the parameters of the gas production model, Y_{α} and lag time in total gas has showed significant ($p < 0.01$) correlation with bacterial characteristics. Though the rate constant of gas production significantly differed ($p < 0.01$) between diet and type of straw, it was least influenced by the microbial characteristics. The regression coefficient of diet and type of straw for Y_{α} indicated that the effect of diet on Y_{α} was threefold higher than that of the straw. As microbial characteristics showed higher correlation with Y_{α} , and diet had more influence on the microbial characteristics, gas production on a straw diet could be used effectively to understand the microbial characteristics.

Effect of housing on physiological responses and energy expenditure of sheep in a semi-arid region of India

Bhatta, R and Swain, N and Verma, DL and Singh, NP

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.18, I. No.8,P.1188-1193, AUG,2005

An investigation was carried out to study the effect of two housing systems on physiological responses and energy expenditure of sheep in a semi-arid region of India. Two types of housing management were adopted. First was a shed- 6x3 m(2) structure with all the four sides of 1.8 m chain link fencing with a central height of 3 in. The roof was covered with asbestos sheets and with mud floorings. Second was an open corral- 6x3 m(2) open space with all the four sides covered with 1.8 in chain link fencing. Thirty-four (32 ewes and 2 rams) sheep of native Malpura breed-aged about 18 months (body weight 28 kg ewes;. 35 kg rams) were grazed together on a 35 ha plot of native range. All the sheep were grazed as a flock from 08.00 to 17.00 h during a yearlong study. The flock was divided into two groups (16 ewes+1 ram) in the evening and housed as per the systems (Shed and Open Corral). Dry and wet temperatures were recorded at 06.00 h and 21.00 h using a wet and dry bulb-thermometer both inside the shed and in the open corral and temperature humidity index (THI) was calculated. There was significant ($p < 0.05$) difference in the THI between shed and open corral in all the seasons, indicating that shed was always warmer compared to open corral. Rectal temperature (RT) of both the groups of sheep was similar during morning as well as evening throughout the seasons. There were significant ($p < 0.05$) differences in the skin temperature (ST) and respiration rate (RR) between the two groups at both the measurements in all the seasons. Highest energy expenditure (EE) was recorded inside the shed at 21.00 h (224 kJ/h) during monsoon and lowest at 6.00 h during winter (119 kJ/h). There was a significant ($p < 0.05$) difference between the EE inside the shed and that in the open corral. It was concluded that housing had significant effects on the physiological responses and EE of sheep. Provision of housing at night was stressful during monsoon (with less rainfall) and summer, whereas it was protecting the sheep from acute cold during winter in a semi-arid region of India.

Stimulation of in vitro ovine oocyte maturation with a novel peptide isolated from follicular fluid of the buffalo (Bubalus

Gupta, PSP and Ravindra, JP and Kumar, VG and Raghu, HM and Nandi, S

SMALL RUMINANT RESEARCH, Vol.59, I. No.1,P.33-40, JUL,2005

In vitro oocyte maturation is an important step in the laboratory production of embryos. The technique of in vitro maturation (IVM) has generally been standardized in sheep, but now the efforts are aimed at reducing the cost of the technology by replacing expensive inputs of the IVM medium with less expensive and chemically defined inputs. In this study, a novel peptide (Mr 26.6 kDa) isolated and partially purified from buffalo ovarian follicular fluid was incorporated at various dose levels to study its effect on the IVM of ovine oocytes. Oocytes were retrieved from sheep ovaries via a slicing technique. The basic culture medium (control) was comprised of the tissue culture medium (TCM-199)+BSA (3 mg ml⁻¹) with gentamicin (50ngml⁻¹). The isolated peptide was added to the basic culture medium at dose levels of 10, 15, 20, 25, 50, 100, 1000, 2000, 5000 ng ml⁻¹ of culture medium. An additional treatment group was incorporated comprised of 2000 ng peptide per milliliter plus epidermal growth factor (EGF: 20 ng ml⁻¹). A positive control group comprising of basic culture medium along with steer serum (20%, v/v) and EGF (20ng ml⁻¹) was also tested. The oocytes in the culture medium were placed in Petri dishes with overlaying mineral oil and incubated for 24 h at 38.5 degrees C, 95% relative humidity and 5% CO₂/air. The biological effect of the isolated peptide was evaluated by a cumulus expansion score and the in vitro maturation rates, which were calculated based on the cumulus expansion and extrusion of first polar body. There was a dose-dependent increment in the cumulus expansion as well as in vitro maturation rates of oocytes when the basic medium was supplemented with the isolated peptide. The in vitro maturation rates obtained with different doses of the peptide, i.e. 0, 10, 15, 20, 25, 50, 100, 1000, 2000, 5000, 2000 ng + EGF and positive control group were 18.9, 37.5, 50.7, 63.0, 64.5, 67.0, 76.5, 78.2, 81.5, 83.1, 90.4 and 88.1 %, respectively. Even at a low dose level of 20 ng ml⁻¹, the isolated peptide could stimulate the IVM rate and at 100 ng ml⁻¹ dose, it yielded a high maturation rate (> 75%). In view of the observations made in this study, the novel peptide can be incorporated at 100 ng dose in IVM medium of ovine oocytes for augmenting the efficiency of in vitro embryo production technology (IVEP) in sheep. (c) 2004 Elsevier B.V All rights reserved.

Ovarian hormones and their role in oestrous cycle in animals: A review

Dhanda, P and Ravindra, JP

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.75, I. No.7,P.885-892, JUL,2005

Ovarian hormones play a central role in successful reproduction in the female animal and they principally act by their feedback effects in the hypothalamo-hypophyseal-ovarian axis to coordinate various events in reproduction. The ovary produces both steroid and nonsteroid hormones and other substances. The steroid hormones have important role in expression of estrus, feedback control of gonadotrophin secretion, follicular development and ovulation. Estrogen mainly has positive feedback during follicular phase and in causing preovulatory gonadotrophin surge and progesterone mainly a negative feedback on LH secretion during the luteal phase. The peptide hormones, especially the inhibins, along with estrogens play a significant role in control of follicular development through regulation of FSH secretion. An understanding of their role and mechanism of action, types and expression of their receptors in various target organs has facilitated use of these hormones, their analogues, antagonists in control and manipulation of events during oestrous cycle-the estrus, follicular development, gonadotrophin secretion and ovulation.

Effect of feeding complete feed block containing *Prosopis cineraria* leaves and polyethylene glycol (PEG)-6000 on nutrient

Bhatta, R and Vaithiyanathan, S and Shinde, AK and Jakhmola, RC

JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE, Vol.85, I. No.11, P. 1788-1794,
30-Aug, 2005

A study was carried out to determine the effect of replacing the cake portion of concentrate mixture with 5 parts polyethylene glycol (PEG)-6000 in a complete feed block (CFB) containing *Prosopis cineraria* leaves on the performance, rumen fermentation pattern and rumen enzyme profile of kids under an intensive system of rearing. Eighteen weaners of Sirohi goat of similar body weight (16.0 +/- 0.5 kg) and age (90 5 days) were divided into three equal groups. They were housed in individual cages in a side open asbestos roof shed with mud floor. All the kids received CFBs containing 50 parts P *cineraria* leaves and 50 parts concentrate mixture. CFB offered to the first group had high protein (183.8 g kg⁻¹); HP), that offered to the second group had low protein (131.3 g kg⁻¹); LP) and that offered to the third group had low protein (124.7 g kg⁻¹) but contained PEG-6000 (LP-PEG). The concentrate mixtures in LP and LP-PEG were without groundnut cake, whereas in LP-PEG, groundnut cake was replaced by barley and 5 parts PEG-6000 were incorporated. CFBs were similar in their nutritive value except for crude protein (CP). *Prosopis* leaves utilized in the CFB contained (g kg⁻¹ dry matter) 129.1 CP, 535.5 neutral detergent fibre, 395.8 acid detergent fibre and 222.8 acid detergent lignin. There were significant differences in dry matter intake (g day⁻¹) between HP (1102), LP (1108) and LP-PEG (1194); the trend in Metabolizable energy intake was similar. During the growth trial, LP kids consumed maximum amount of feed (76.91 kg) followed by HP (75.73 kg) and LP-PEG (73.12 kg). However, maximum feed efficiency (feed consumed kg⁻¹ live weight gain) was recorded in LP-PEG kids (9.59) followed by HP (10.64) and LP (11.60). These differences were statistically significant ($p < 0.05$). Although there was no significant difference in the digestibility of dry matter among the groups, there was significant difference in the digestibility of CP, neutral detergent fibre and acid detergent fibre. The digestibility of CP was 0.591, 0.484 and 0.645, that of neutral detergent fibre was 0.397, 0.308 and 0.494) and that of acid detergent fibre was 0.168, 0.154 and 0.282 in HP, LP and LP-PEG, respectively. Rumen metabolites studied 6 h after feeding revealed that there were significant ($p < 0.05$) differences in the concentrations of ammonia N, tri-chloro, acetic acid precipitable N and total volatile fatty acids among the three groups, but not pH. The rumen enzyme concentrations

Isolation of an oocyte stimulatory peptide from the ovarian follicular fluid of water buffalo (*Bubalus bubalis*)

Gupta, PSP and Ravindra, JP and Nandi, S and Raghu, HM and Ramesha, KP

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.18, I. No.11,P.1557-1563, NOV,2005

Ovarian follicular fluid contains both stimulatory and inhibitory agents that influence the growth and maturation of oocyte. In the present study, an attempt was made to isolate and study the biological properties of ovarian follicular fluid peptide(s) in buffaloes. Bubaline ovarian follicular was made steroid- and cell-free. A protein fraction was obtained by saturation (30-35% level) of the follicular fluid with ammonium sulfate. The protein fraction was purified with Sephadex-G 50 gel filtration chromatography and a single peak was obtained in the eluant volume, which was lyophilized. SDS-PAGE of the lyophilized fraction revealed a single band and the molecular weight of the peptide was 26.6 kDa. The peptide stimulated the cumulus cell expansion and in vitro maturation rate of oocytes in buffaloes in a dose dependent manner when it was incorporated at different dose levels (0, 10, 25, 50, 100 and 1,000 ng ml⁻¹ of maturation medium). The basic culture medium consisted of TCM 199 with Bovine serum albumin (0.3%). The in vitro maturation rates were comparable to those obtained with a positive control medium (TCM 199+20 ng EGF ml⁻¹+steer serum (20%)). Further purification and biological assays may throw more light on the nature and functions of this peptide.

Database on availability and requirement of animal feed resources in the country

Angadi, UB and Raju, SS and Anandan, S and Ramachandra, KS

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.75, I. No.9,P.1083-1086, SEP,2005

A computer based information system for assessing availability and requirement of animal feeds in the country was designed and developed. The information system has been developed using user friendly graphical user interface system with MS ACCESS 2000 as back-end and VISUAL BASIC as front-end tool for data entry, data maintenance and retrieval. The system provides information on the quantitative and qualitative availability of different feed resources for individual states and the requirement in terms of dry matter, DCP and TDN for standard ruminant livestock unit. The information can be retrieved through user-defined queries in tabular and graphical form. The computer based information system developed would be an important tool and aid for short term and long term planning by policy makers, researchers etc. in improving the livestock productivity in the country.

Effect of feeding tree leaves as supplements on the nutrient digestion and rumen fermentation pattern in sheep grazing on

Bhatta, R and Vaithiyanathan, S and Singh, NP and Shinde, AK and Verma, DL

SMALL RUMINANT RESEARCH, Vol.60, I. No.3,P.273-280, NOV,2005

A study was carried out to determine the effect of feeding different tree leaves as Supplements oil nutrient digestion, rumen fermentation and blood parameters of sheep grazing oil a semi-arid rangeland. Thirty adult Malpura rains of uniform body weight (39.0 +/- 0.75) were divided into five groups Of six each. They were grazed as a single flock from 08.00 to 17.00 h oil a semi-arid rangeland. After the end of the grazing period, the first group (G 1), which was not provided with my supplementation, served as the control. The second group (G2) Was Supplemented with 200 g of a concentrate mixture per head per day, whereas the third, fourth and fifth groups (G3-G5) were provided with approximately 200 g DM d(-1) of freshly Cut foliage from *Prosopis cineraria*, *Acacia nilotica* and *Albezia lebbek*. The foliage from P cineraria contained 133.4 g kg(-1) DM condensed tannin (CT) with protein precipitating capacity (PPC) of 66 g kg(-1) DM, whereas A. nilotica contained 18.9 g kg(-1) DM hydrolysable tannin (HT) with PPC of 11.5 g kg(-1) DM. However, A. lebbek did not contain any tannin. The protein contents were H 9, 139 and 194 g kg-1 DM, respectively. The DMI (g d(-1)) was 688, 916, 1024, 1003, 999 in G1, G2, G3, G4 and G5, respectively. Digestible crude protein (DCP) and metabolizable energy (ME) intakes ill Supplemented groups G2-G5 were higher (P < 0.05) than ill the control (G 1). Supplementation improved the DM digestibility in all groups, whereas CP digestibility was lower (P < 0.05) in G3 compared to G2, G4 and G5. Rumen fermentation Study conducted 6 h after Supplementation revealed that total N, ammonia N, and total VFA levels were lower (P < 0.05) in G3 compared to the other Supplemented groups. Although the haernoglobin (Hb) levels were similar among groups, blood urea N (BUN) was lowest in G3 compared to the other groups. The initial body weights were similar among groups (mean 39 kg). After 60 days of experimental feeding, all groups maintained their body weight, except the control group (GI), which lost body weight. It was observed, that Supplementation with tree leaves containing CT like P cineraria helps in better rumen fermentation pattern by preventing excessive loss of nitrogen. It was Concluded that maximum nutritional benefits of tree leaves could be harvested, if used as supplement rather than as a sole feed. (c) 2005 Elsevier B.V. All rights reserved.

Livestock feed and fodder resources of India and strategies for their judicious utilization: A review

Sampath, KT and Ramachandra, KS and Anandan, S

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.75, I. No.12,P.1438-1443, DEC,2005

Livestock production has been an integral part of Indian agriculture and this scenario is not likely to change in the near future. For sustenance and growth of the livestock sector in the country it is essential that the feed resources be utilized efficiently since the feed cost accounts to almost 60-70% of the total cost of rearing of the animals. Livestock in India are mostly dependent on the crop residues as their staple diet and any interventions for bringing about changes in the feeding systems has to essentially look in to this aspect, The present potential availability of dry roughages, greens and concentrates in the country is to the extent of 393.38, 462.05 and 35.32 million tonnes respectively. Contrary to the expectations. adequate feed resources are available in the country, at least in terms of quantitative availability. However. a wide gap still exists in terms of qualitative parameters. For drawing out an short-term or long-term plans/strategies for enhancing the productivity of Indian livestock. it is imperative that an inventory of the available feed resources has to be drawn out meticulously and such information has to be updated periodically. Several improved feeding strategies are being adopted looking in to the production parameters of the livestock and the feed resources available, Subtle changes in the feeding systems, which are cost effective and region specific have to be brought in for enhancing the production performance of our livestock.

Changes in uterine protein secretion during luteal and follicular phases and detection of phosphatases during luteal phase of

Roy, SC and Suganthi, RU and Ghosh, J

THERIOGENOLOGY, Vol.65, I. No.7,P.1292-1301, 15-Apr,2006

Changes in uterine proteins during different reproductive states and their functional significance though known in other species have not been established in buffaloes. An attempt has been made to unravel the changes in composition of buffalo uterine secretion with growth and regression of corpora-lutea during early, mid and late luteal and follicular phase of estrous cycle using gel filtration and electrophoresis techniques. Also the phosphatases activities in luteal phase uterine secretions have been studied. Gel filtration chromatography analysis revealed a protein peak in void volume of the column, the intensity of which was more in all the luteal phase samples than follicular phase samples. Alkaline phosphatase was also found eluted in the void volume. The other three uterus-specific peaks (Peaks V-VII) were detected below 13.7 kd molecular weight. There were at least five peaks of acid phosphatases activity in chromatogram. Silver staining of SDS-PAGE gel detected as many as 40 protein bands in the uterine fluid of which nine proteins were glycoproteins. Molecular weight (MW) comparison revealed the major protein band at 66 kd which could be serum albumin. Comparison of uterine proteins with serum protein bands revealed a 93.5 kd glycoprotein in buffalo serum that did not appear in uterine fluid and at least 11 uterus-specific protein bands (506, 470, 241, 114, 49, 38, 33, 26, 19.2, 16, and 14.3 kd). The 38 and 19.2 kd bands were luteal-stage specific. Intense periodic acid Schiff's (PAS) stained bands in uterine proteins compared to serum indicated glycosylation process in endometrial epithelial cells. The study suggested that buffalo uterine secretion contained mainly serum and several uterus-specific proteins of which few were luteal phase specific. Further study on characterizing the unique or most abundant proteins and defining their role in uterine functions would help to address the cause of low r e p r o d u c t i o n r a t e i n b u f f a l o e s .

Enhancement of in vitro maturation rate of oocytes in buffalo with a protein fraction obtained from the ovarian follicular fluid of

Gupta, PSP and Ravindra, JP and Raghu, HM and Nandi, S

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.76, I. No.3,P.208-213, MAR,2006

Ovarian follicular fluid is commonly being used as an input in the in vitro maturation (IVM) medium of oocytes. This study was conducted to find the oocyte stimulatory protein fractions of bubaline ovarian follicular fluid (buff). In this study the bubaline oocytes were studied. A protein fraction in IVM medium of bubaline oocytes was studied. A protein fraction precipitated from cell and steroid free buFF with ammonium sulphate at 0-25% saturation level was purified through sephadex-G 25 gel filtration column. There was no protein in the elution volume, but the void volume fraction consisted of 4 Proteins of Mr 30, 52, 65 and 205 kDa. Bubaline oocytes were matured in vitro with a basic culture medium consisting of TCM 199 + bovine serum albumin (0.3%) + gentamycin (50 mg/ml) at 38.5 degrees C, 95% relative humidity and 5% CO₂ in air. When the protein fraction of buFF was incorporated in the basic IVM medium at different dose levels of 0, 5, 10 and 15 ng/ml of maturation medium, it stimulated the in vitro maturation rate of bubaline oocytes in a dose dependent manner. Hence, it was concluded that the stimulatory protein fraction of the bubaline ovarian follicular fluid can be supplemented in the IVM medium of bubaline oocytes at 20 ng / ml dose .

Electrophoretic pattern of various protein fractions precipitated from the fluid of different size categories of ovarian follicles in

Gupta, PSP and Ravindra, JP and Reddy, GR

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.76, I. No.3,P.214-218, MAR,2006

Proteins of ovarian follicular fluid influence the oocyte maturation and follicular development. Isolation and studying their biological activity is essential for understanding the ovarian follicular dynamics. Electrophoretic analysis of different fractions of any biological fluid is the preliminary step in the identification of a protein/peptide for further isolation and purification of the same. In this study, bubaline ovarian follicular fluid collected from different size categories of follicles was fractionated with ammonium sulphate precipitation into various protein fractions (fraction A:0-25%, B:25-35%, C:35-55%, D:55-65%, E:65-75%, F:75-85%, G: 85-95%). Peptides/proteins present in all the fractions were identified by SDS-PAGE in 12.5% gel under reducing conditions. Molecular weights of all the peptides were determined. The total number of protein bands that could be resolved on 12% SDS-PAGE gel when the ammonium sulfate precipitated fractions (from A fraction to G fraction) were applied to the gel were 32 +/- 0.5, 28 +/- 0.6 and 35 +/- 0.0 in small, medium and large follicles, respectively. There was a significant difference among the different categories of follicles with respect to the number of peptide bands obtained in the SDS-PAGE profile of follicular fluid collected from them. Variations were observed in the SDS-PAGE profile of follicular fluid collected from them. Variations were observed in the type of bands (with respect to their molecular weight) in the electrophorogram of follicular fluid collected from different categories of follicles. This study indicated the presence of different number and type of peptide bands among different size categories of ovarian follicles in buffaloes. This study would also provide preliminary information for the researchers attempting to isolate peptides from the bubaline ovarian follicular fluid.

Nucleic acids and protein content in relation to growth and regression of buffalo (*Bubalus bubalis*) corpora lutea

Ghosh, J and Mondal, S

ANIMAL REPRODUCTION SCIENCE, Vol.93, I. No.4-Mar,P.316-327, JUL,2006

Information on nucleic acids and protein content of buffalo corpus luteum (CL) in relation to growth, development and regression is not available. An experiment was thus conducted to investigate the variation and relationship between nucleic acids and protein content in CL during different developmental stages and to determine the qualitative differences in protein constituents in any of these stages. Buffalo corpora lutea of different developmental stages viz., developing (day 5-10, n = 16), developed (day 11-17, n = 12) and regressed (day 18-21, n = 10) stages were collected from non-pregnant and -pathological genitalia (n = 38). The DNA, RNA and protein content in tissue extracts were determined and the proteins in pooled samples were analyzed by polyacrylamide gel electrophoresis. Developing stage CL had more total and per gram tissue level of DNA and RNA with significant positive relationship with total and per gram RNA and protein contents. Although there was no significant difference in total weight, a significant decrease in total DNA as well as per gram level of DNA and RNA was observed in developed stage compared to developing stage CL. The total protein content in developed stage CL was compared to developing and regressed stage CL. Non-denaturing PAGE analysis of CL proteins of different stages showed five protein bands of 210, 190, 82, 68 and 66 kDa and one that migrated with the dye front in all the stages however, not shown any differences in banding pattern. Denaturing PAGE showed 15 bands viz., 205, 66, 53, 42, 35, 27, 24, 22, 20, 18, 17, 14, 9, 7.5 and 6.5 kDa. Out of these 66 and 53 kDa bands appeared with maximum intensity in all the three stages of CL. Comparison of bands between the three stages revealed five 57, 31, 27, 19 and 16 kDa stage-specific bands in regressed stage CL. The present study indicated that the DNA, RNA and protein content of buffalo CL varied with the stages of development and regressed stage CL contained some unique protein bands which were not observed either in developed or developing stage CL. (c)
2 0 0 5 E l s e v i e r B . V . A l l r i g h t s r e s e r v e d .

**Effect of ovine follicular fluid fraction and peptide on in vitro
maturation of buffalo oocytes**

Nandi, S. and Kumar, V. Girish and Gupta, P. S. P.

REPRODUCTION IN DOMESTIC ANIMALS, Vol.41, I. No.4,P.331, AUG,2006

**Recovery of large preantral follicles in buffalo: Effect of presence
of a corpus luteum**

Gupta, P. S. P. and Ramesh, H. S. and Manjunatha, B. M. and Nandi, S. and
Ravindra, J. P.

REPRODUCTION IN DOMESTIC ANIMALS, Vol.41, I. No.4,P.344, AUG,2006

Energy expenditure in crossbred cattle fed paddy straw of different form

Bhatta, Raghavendra and Kumar, Vijay and Sridhar, Manpal and Singh, Khub

ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.19, 1. No.12,P.1755-1760, DEC,2006

Studies were carried out at the National Institute of Animal Nutrition and Physiology, India to determine the effect of feeding chopped paddy straw (*Oryza sativa*) on the energy expenditure in crossbred cattle. Four crossbred cattle male aged 5-6 years and weighing about 450 kg were used for this study. Three experimental trials, one each for the feeding of un-chopped paddy straw offered ad libitum (UCA), chopped paddy straw fed at restricted level (CR) and chopped paddy straw offered ad libitum (CA) were conducted. The quantity of un-chopped paddy straw consumed during UCA was assumed as the voluntary intake by the cattle and the same quantity was offered after chopping during CR. Each trial comprised of 21 d preliminary feeding period and 5 d of observation recording period. Expired gas was collected in Douglas bags using a face-mask and three-way valve at 6 hourly intervals i.e., at 09.30, 15.30, 21.30, and 03.30 h throughout the observation period. Expired gas and ambient air inspired by the animals were analyzed for the oxygen content through paramagnetic oxygen analyzer. Energy expenditure (EE) by the animals was calculated by determining the volume of oxygen consumed per minute (STP) and multiplying by 4.825. Paddy straw used in all the three trials contained (g/kg DM) 90.0 CP, 786 OM, 700 NDF, 489 ADF, 357 Cellulose and 60.0 ADL. Metabolizable energy (ME) was 6.9 MJ/kgDM. Dry matter intake (DMI) both in UCA and CR was about 6.8 kg, except that it was chopped in CR. Chopping has resulted in 32% improvement (9 kg) in DMI of CA as compared to that of UCA. Although ME intake was similar in UCA and CR (47.2 MJ/day), energy expenditure (EE) was higher in UCA (23.3 MJ) when compared to that of CR (19.5 MJ). The ME intake (63.3 MJ) as well as EE (27.1 MJ) was highest in CA. Energy expenditure when expressed as MJ/kg DMI was 3.48, 2.90 and 3.12; whereas as per cent of ME intake it was 50, 41 and 44 in UCA, CR and CA respectively. Our study has unequivocally confirmed that chopping of poor quality roughages like paddy straw has definite advantages not only in terms of improving the intake by decreasing the time taken for ingestion but also in reducing the energy cost of eating.

Biochemical composition of ovine follicular fluid in relation to follicle size

Nandi, S. and Kumar, V. Girish and Manjunatha, B. M. and Gupta, P. S. P.

DEVELOPMENT GROWTH DIFFERENTIATION, Vol.49, I. No.1,P.61-66, JAN,2007

The aim of this study was to biochemically characterize ovine follicular fluid and to relate possible changes in composition to follicular size. Ovaries were collected from adult and cycling non-pregnant slaughtered sheep (*Ovis aries*) during breeding season. A total of 104 pairs of ovaries were investigated and these data were then compared. Follicular fluid was aspirated from small (< 2 mm), medium (2-4 mm) and large (> 4 mm) nonatretic ovarian follicles. The follicular fluid was centrifuged at 4 degrees C and 5000 g for 30 min to remove any cells and stored at -80 degrees C prior to assay. Follicular fluid samples were analyzed for glucose, total protein, cholesterol, triglycerides, lactate, urea, creatinine, sodium, potassium, chloride, calcium, phosphorus, magnesium, acid phosphatase, alkaline phosphatase, and lactate dehydrogenase. Data were analyzed by the linear regression model. As follicles became larger, the concentrations of glucose and cholesterol significantly ($P < 0.05$) increased while those of triglycerides, lactate, alkaline phosphatase and lactate dehydrogenase significantly ($P < 0.05$) decreased.

Development and validation of a simple, sensitive enzyme immunoassay (EIA) for quantification of prolactin in buffalo

Roy, K. S. and Prakash, B. S.

THERIOGENOLOGY, Vol.67, I. No.3,P.572-579, FEB,2007

A simple and highly sensitive enzyme immunoassay (EIA) was developed and validated for prolactin quantification in buffalo plasma (on a microtitreplate) using the biotin-streptavidin-peroxidase amplification and immobilized antiserum in a competitive assay. Prolactin standards (range: 5-5000 pg/(well 50 μ L) were prepared in hormone-free plasma collected from minimal stress non-lactating buffalo heifers in temperate weather. The sensitivity of the EIA procedure was 5 pg/(well 50 μ L) (corresponds to 0.1 ng/mL plasma); the 50% relative binding sensitivity occurred at 160 ng/(well 50 μ L). Plasma volumes for the EIA, viz. 12.5, 25, and 50 μ L, did not influence the shape of standard curve. A parallelism test was carried out to compare the endogenous buffalo plasma prolactin with bovine prolactin standard. To validate the assay biologically, 11 Murrah buffaloes were given a third-generation antiprolactin (Norprolac; 10 mg/animal, i.m.). Blood samples were collected 1 d prior to the start of Norprolac administration and continued up to seventh day in an Ovsynch treatment program. In all animals, there were abrupt declines in prolactin concentrations following Nor-prolac treatments, which confirmed the biological validation of the EIA. After development and validation of EIA procedure, the concentration of plasma prolactin was determined efficiently in samples collected during both summer and winter samples. (c) 2006 Elsevier Inc. All rights reserved.

Efficacy of heat treatment and sun drying of aflatoxin-contaminated feed for reducing the harmful biological effects in

Gowda, N. K. S. and Suganthi, R. U. and Malathi, V. and Raghavendra, A.

ANIMAL FEED SCIENCE AND TECHNOLOGY, Vol.133, I. No.2-Jan,P.167-175, 1-Feb,2007

Drying causes degradation of aflatoxins in animal feed. The effect of drying aflatoxin contaminated feed in hot air oven or in sunlight on aflatoxin reduction was studied and was confirmed through a nutritional study in sheep. Four experimental diets were prepared using crushed maize, wheat bran and peanut meal. Diet I served as control and diets II, III and IV were treated with the required quantity of aflatoxin material to provide 350 ppb of aflatoxin B-1 (AF B-1). Diet II was not subjected to any physical treatment. Diet III was spread as thin layer in aluminium trays and dried in a hot air oven at 80 degrees C for 6 h and diet IV was dried in sunlight for 14 h (2 d, 25-37 degrees C ambient temperature). Twenty-four sheep of 12-16 months of age were distributed based on their body weight to four groups of six animals each in a completely randomized design. Each group was fed on one of the four diets as per requirement for maintenance and growth of 50 g/d. Feeding was continued for 150 d and daily feed intake and bi-weekly body weights were recorded. Blood was collected from each animal at 0, 100 and 150 d of feeding for estimation of biochemical parameters (haemoglobin, total protein, albumin, globulin, urea, triglycerides) and minerals (Ca, P, Mg, Cu, Zn). Analysis of aflatoxin showed that the control diet contained an average of 15 AF B-1, whereas the aflatoxin-contaminated diet (II) contained 326 ppb AF B-1. Hot air oven drying of the diet resulted in an average reduction of 57.6% in aflatoxin content, whereas sun drying reduced the aflatoxin content by 83.7%. Average feed intake did not differ significantly amongst the groups. Average daily weight gain was lower and feed conversion ratio was higher ($P < 0.01$) in sheep fed the diet without drying. None of the blood biochemical parameters studied varied significantly between groups. However the Ca and P contents in plasma of sheep fed the aflatoxin-contaminated diet without drying for 150 d of feeding reduced significantly ($P < 0.05$; < 0.01). The levels of other minerals (Mg, Cu, Zn) however were not different among the four groups. It can be concluded that drying of feed either in hot air oven (80 degrees C, 6 h) or in sunlight (14 h) is effective in reducing the aflatoxin level and the harmful effects in sheep; the latter method of treatment is more effective and practical, and is less expensive. (c) 2006 Elsevier B.V. All rights reserved.

r e s e r v e d .

Isolation and characterization of butyrivibrio fibrisolvens from the rumen of crossbred steers

Thulasi, A. and Chandrasekharaiah, M. and Sampath, K. T.

INDIAN VETERINARY JOURNAL, Vol.84, I. No.1,P.41-44, JAN,2007

A report on the isolation and characterization of Butyrivibrio fibrisolvens a probiotic organism in the rumen known to produce conjugated linoleic acid, bacteriocins and several enzymes which aids in effective forage digestion of crossbred steers was
d i s c u s s e d .

Effect of feeding graded levels of aflatoxin on performance of sheep

Gowda, N. K. S. and Suganthi, R. U. and Malathi, V. and Raghavendra, A.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.77, I. No.3,P.262-268, MAR,2007

An experiment was conducted to study the nutritional, biochemical and toxicological response in sheep fed graded levels of aflatoxin B-1 (AFB(1)). Sheep (28) of uniform body weight of 5-6 months of age were distributed equally under 4 groups and fed on 0, 250, 500 and 1000 ppb of AFB(1) in their diet for 105 days. Feeding of AFB(1) at 500 and 1000 ppb significantly reduced the feed intake. The body weight(.)gain was lower in all the aflatoxin fed groups and was more pronounced in 1000 ppb AFB(1) fed group. Total plasma protein and albumin levels were significantly reduced at 100 days of feeding. Calcium and phosphorus contents were also significantly lower in groups fed higher levels of AFB(1). Histopathological study. showed pronounced tissue alterations in liver, kidney, spleen and lungs characterised by degenerative changes in sheep fed 500 and 1000 ppb of AFB(1) and the changes were mild in group fed 250 ppb of AFB(1). It is concluded that the performance of sheep fed 500 and 1000 ppb of AFB(1) was severely depressed and such effects were mild to moderate in sheep fed 250 ppb AFB(1). It could be suggested that the tolerance limit of AFB(1) in s h e e p i s m u c h b e l o w 2 5 0 p p b .

Utilization of dietary minerals and blood biochemical values in lambs fed hydrated sodium calcium alumino silicate sorbent

Gowda, N. K. S. and Suganthi, R. U. and Malathi, V. and Raghavendra, A.

SMALL RUMINANT RESEARCH, Vol.69, I. No.3-Jan,P. 17-22, MAY,2007

An investigation was made in lambs to study the utilization of dry matter (DM), dietary minerals and changes in certain blood biochemical values due to the inclusion of hydrated sodium calcium alumino silicate (HSCAS) as a sorbent material in the concentrate mixture. Fourteen lambs of uniform age and body weights were allotted to two dietary groups, control (T-1) and experimental group supplemented with 5 g kg⁻¹ of HSCAS (T-2). The feeding was continued for 105 days and the results indicated no variation in the intake of concentrate, hay and also the fortnightly body weight changes between the groups. Digestibility trial conducted showed that the dry matter (DM) consumption varied between 3.21 and 3.28% of their body weight and the ratio of concentrate and hay consumption was 37:63 (T-1) and 36:64 (T-2), respectively. The digestibility coefficient of DM between the groups varied non-significantly (T-1: 0.541 +/- 0.018; T-2: 0.576 +/- 0.023). Though the intake of minerals studied was similar in both the groups, the apparent gut absorption coefficients of copper (Cu: 0.239 +/- 0.028 and 0.107 +/- 0.010), Zinc (Zn: 0.279 +/- 0.024 and 0.213 +/- 0.019), Iron (Fe: 0.175 +/- 0.015 and 0.128 +/- 0.055) and Manganese (Mn: 0.423 +/- 0.028 and 0.356 +/- 0.015) were significantly ($P < 0.01$; 0.05) lower in lambs fed HSCAS. However the utilization of Calcium (Ca), Phosphorus (P) and Magnesium (Mg) did not differ. Analysis of blood plasma at 0, 50 and 100 days of feeding period for total protein, albumin, globulin and urea did not show any significant variation due to HSCAS feeding. It is concluded that inclusion of HSCAS at 5 g kg⁻¹ concentrate mixture resulted in lower absorption of certain trace minerals (Cu, Zn, Fe, Mn) and thus it is required to additionally supplement these minerals in diet when such sorbent material is used. (c) 2005 Elsevier B.V. All rights reserved.

Seasonal variation and circadian rhythmicity of the prolactin profile during the summer months in repeat-breeding Murrah

Roy, Kajal S. and Prakash, Bukkaraya S.

REPRODUCTION FERTILITY AND DEVELOPMENT, Vol. 19, I. No.4, P.569-575, ,2007

The present study was undertaken to determine a detailed endocrine profile for prolactin and progesterone during the oestrous cycle in repeat-breeding Murrah buffalo heifers during summer and winter. Hormone concentrations were quantified in blood plasma samples collected over the oestrous cycle in both winter and summer, as well as in samples collected during the summer months to observe circadian rhythmicity. The mean plasma prolactin concentration during the winter months ranged from 3.10 +/- 0.48 to 9.17 +/- 1.39 ng mL(-1); during the summer months, plasma prolactin concentrations ranged from 248.50 +/- 16.03 to 369.63 +/- 25.13 ng mL(-1). During the winter months, the mean plasma progesterone concentration ranged from 0.20 +/- 0.00 to 3.04 +/- 0.34 ng mL(-1), which was significantly higher ($P < 0.01$) than the prolactin concentrations recorded in the summer months (range 0.20 +/- 0.00 to 1.48 +/- 0.13 ng mL(-1)). Plasma prolactin and progesterone concentrations were negatively correlated ($r = -0.24$) during the summer oestrous cycle, which indicates prolactin-induced suppression of progesterone secretion through poor luteal development. During the summer, a circadian rhythmicity was observed in buffaloes and the results indicate that high prolactin secretion contributes to poor fertility by lowering gonadal hormone (progesterone) secretion. It was concluded from the present study that prolactin and progesterone profiles during the summer and winter months are directly correlated with the reproductive performance of buffaloes. The finding also validates the hypothesis that hyperprolactinaemia may cause acyclicity/infertility in buffaloes during the summer months due to severe heat stress.

Measurement of methane production from ruminants

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*ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.20, I. No.8,P.1305-1318,
AUG,2007*

On a global scale agriculture and in particular enteric fermentation in ruminants is reported to produce about one fourth (21 to 25%) of the total anthropogenic emissions of methane (CH₄). Methane is produced during the anaerobic fermentation of hydrolyzed dietary carbohydrates in the rumen and represents an energy loss to the host besides contributing to emissions of greenhouse gases into the environment. However, there appears to be uncertainty in the CH₄ estimation from livestock due to the limited availability of data to document the variability at the farm level and also due to the significant impact of diet on the enteric CH₄ production. The methane mitigation strategies require robust prediction of emissions from rumen. There are many methods available which would be suitable for measuring CH₄ produced from the various stages of animal production. However, several factors need to be considered in order to select the most appropriate technique like the cost, level of accuracy required and the scale and design of the experiments to be undertaken. Selection of any technique depends on the accuracy as each one has its advantages and disadvantages. Screening of mitigation strategies may be evaluated using individual animal before large-scale trials on groups of animals are carried out. In this review various methods for the estimation of methane production from ruminants as well as for the determination of methane production potential of ruminant feeds are discussed. The advantages and disadvantages of the methods starting from respiration chamber, ventilated hood, facemask, sulphur hexafluoride (SF₆) tracer technique, prediction equations and meteorological methods to in vitro methods are detailed.

**Peripheral plasma progesterone concentration during
periparturient period in Black Bengal goats.**

Mondal, S. and Pathak, M. C. and Singh, D. N. and Varshney, V. P.

BIOLOGY OF REPRODUCTION, Vol., 1. No.51,P.173, ,2007

Effect of suppression of plasma prolactin on luteinizing hormone concentration, intersequence pause days and egg production in

Reddy, I. J. and David, C. G. and Raju, S. S.

DOMESTIC ANIMAL ENDOCRINOLOGY, Vol.33, I. No.2,P.167-175, AUG,2007

The aim of this study was to investigate the effects of suppression of plasma prolactin (PRL) concentration on circulating concentrations of luteinizing hormone (LH), progesterone (P-4), estradiol (E-2) beta pause days and egg production in birds later in the reproductive period. Twenty-four White Leghorn birds of same age group were divided into two groups of 12 in each. Birds of each group were administered s/c either with placebo (control group) or equal volumes of anti PRL agent (2-bromo-alpha-ergocriptine) solution containing at 100 mu g/kg body weight/hen/week (treated group) from 72 to 82 weeks of age. Egg production and inter sequence pauses were recorded daily from both the groups. Plasma PRL, LH, E-2 beta and P4 concentrations were estimated in blood samples collected at weekly intervals. At 77th weeks of age, blood samples from treated and control birds were obtained every 3 h for 36 h to study the surges of LH. It was found that plasma PRL concentration was lower ($p < 0.01$) in bromocriptine treated birds with high concentrations of LH, its 3h LH surges, E-2 beta and P4 in plasma. Higher egg production, less pause days in treated birds may be the result of low PRL concentration, associated with positively correlated responses of high concentrations of LH (with regular interval and duration of LH surges), E-2 beta and P4 concentration required for completion of egg formation and oviposition. In conclusion, bromocriptine administration decreased ($p < 0.01$) PRL concentration increased ($p < 0.01$) steroid hormones and LH surges, for egg formation and oviposition and enabled the birds to lay more eggs even later in the productive period with the available resources under normal husbandry practices. (C) 2006 Elsevier Inc. All rights reserved.

Effect of supplementing sodium bentonite or activated charcoal on mineral balances in growing male goats receiving diets with or

Rao, S. B. Nageswara and Chopra, R. C.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.77, I. No.7,P.617-620, JUL,2007

Use of nutritionally inert sorbents like sodium bentonite (NaB), activated charcoal (AC) offers a promising approach to tackle the aflatoxin problem. The adsorbents sequester the aflatoxins in the GI tract and reduce the absorption into the body system. Growing male kids (24) weighing 11.91 +/- 0.36 kg were divided on the basis of body weight into 6 treatment groups, i.e., T-1 (green maize + concentrate mixture), T-2 (green maize + concentrate mixture supplemented with sodium bentonite (NaB) @ 2 kg/ 100 kg), T-3 (green maize + concentrate mixture supplemented with activated charcoal (AC) @ 2 kg per 100 kg), T-4 (T-1 + AFB(1) @ 300 ppb), T-5 (T-2 + AFB(1) @ 300 ppb), T-6 (T-3 + AFB(1) @ 300 ppb). At the end of 70 days of growth study, a metabolism trial of 6-day duration was conducted on 18 animals. Absorption and retention (% intake) of Ca was nonsignificantly lower in aflatoxin fed group (T-4) which was further reduced by the addition of AC. AFB(1) and adsorbents used in this study did not affect the P and Mg absorption and retention in kids. AC supplementation in control (T-3) as well as aflatoxin (T-6) groups resulted in low absorption and retention (% intake) of Fe than control (T-1). Lower absorption and retention of Mn observed in aflatoxin (T-4) and charcoal fed groups (T-3 and T-6) in comparison to control (T-1). P and Mg retention was not affected in statistical terms by AFB(1) or adsorbents. However, Ca, Fe, Zn and Mn retention reduced by either AFB(1) or AC or both. Hence, long term effect of using adsorbents on mineral utilization needs to be considered

Recovery of large preantral follicles from buffalo ovary: Effect of season and corpus luteum

Gupta, P. S. P. and Ramesh, H. S. and Nandi, S. and Ravindra, J. P.

ANIMAL REPRODUCTION SCIENCE, Vol. 101, I. No.2-Jan,P.145-152, SEP,2007

Preantral follicle can be considered as an alternative source of oocyte for in vitro production of embryos. The objective of the present study was to standardize a procedure for the isolation of large preantral follicles (> 150-500 μ m) from buffalo ovaries and to determine the effect of season and the presence of corpus luteum on the recovery rate of the large preantral follicles. A combined enzymatic cum mechanical approach was adopted to recover the large preantral follicles. In the first experiment, the ovarian cortical pieces were suspended in trypsin (1000-1500 BAEE units for milligrams of solid) and incubated at various temperatures for different periods, i.e. (1) trypsin (1%), 37 degrees C for 10 min; (2) trypsin (1%), 37 degrees C for 10 min + 4 degrees C for 3 h; (3) trypsin (0.5%), 37 degrees C for 20 min; (4) trypsin (0.25%), 37 degrees C for 20 min. Although there was no significant difference ($P > 0.05$) among the different protocols, the first protocol yielded more follicles (3.2, 2.6, 1.8 and 1.5 per ovary, respectively). Hence, the first protocol was selected and used in the second and third experiments. In the second experiment, the effect of season, i.e. peak breeding season (October-March) versus low breeding season (April-September) was evaluated on the recovery rate of the large preantral follicles. The recovery rate of large preantral follicles from the ovaries during the peak breeding season was significantly ($P < 0.05$) greater (9.92 \pm 0.85 per ovary) than that of the low breeding season (4.95 \pm 0.27 per ovary). In the third experiment, effect of the presence of corpus luteum on the recovery rate of large preantral follicles was studied. There was a significantly ($P < 0.05$) higher yield of large preantral follicles from the ovaries with corpus luteum (8.05 \pm 0.88 per ovary) than for the ovaries without corpus luteum (4.57 \pm 0.43 per ovary). This study confirms that the large preantral follicles can be isolated from buffalo ovaries using a combination of enzymatic cum mechanical methods and that more large preantral follicles can be recovered during the peak breeding season and from the ovaries having corpus luteum. (C) 2006 Elsevier B.V.

A l l r i g h t s r e s e r v e d .

Occurrence and prevalence of Cyllamyces genus - A putative anaerobic gut fungus in Indian cattle and buffaloes

Sridhar, Manpal and Kumar, Deepak and Anandan, S. and Prasad, C. S. and Sampath, K. T.

CURRENT SCIENCE, Vol.92, I. No.10,P.1356-1358, 25-May,2007

The presence of the sixth genera of anaerobic gut fungi-Cyllamyces was recorded in cattle and buffaloes for the first time in India and more likely from entire Asia. The existence of Cyllamyces genera in buffaloes is recorded for the first time in the Indian sub continent and probably this is the first report of occurrence of this genus in buffaloes globally. Till now only the five major aforementioned genera had been reported from the faeces of cattle and buffaloes in India. This fungus has been isolated from the faeces of both cattle and buffaloes from a number of states of Southern and Western India. The characteristic features of this genera is the presence of free swimming mono and biflagellate zoospores ,formation of bulbous holdfasts without rhizoids and several branched sporangiophores

Electrophoretic analysis of ovine ovarian follicular fluid

Nandi, S. and Kumar, V. Girish

INDIAN VETERINARY JOURNAL, Vol.84, I. No.5, P.468-470, MAY, 2007

This study was conducted to determine the pattern and molecular weight of peptides present in the follicular fluid of sheep. Follicular fluid was aspirated from sheep ovaries (n=664) and subjected to SDS-PAGE. The total number of peptide bands observed in the follicular fluid was 22. A similar electrophoretic pattern was observed among the follicles of different sizes. The 75.15, 46.47, 43.02, 37.0 and 25.57 kDa peptides might be of oocyte origin. Peptides with molecular weights of 46.47, 43.02, 27.22, 30.47 and 32.87 kDa might be IGFBPs. The peptide with a molecular weight of 46.47 might be of granulosa and cumulus cell origin. The 117.37, 67.17 and 54.82 peptides might be globulin, albumin and prealbumin, respectively. The 43.02, 37.0 and 38.42 kDa peptides might be forms of inhibin and follistatin. The 27.3 or 25.57 kDa peptides might be similar to the oocyte maturation stimulatory factor of 26.6 kDa or activin. The 25.57, 22.37, 18.42, 14.22 kDa peptides were probably the subunits of inhibin. Moreover, the 8.22 and 6.32 kDa peptides were probably insulin-like growth factor (IGF) and epidermal growth factor (EGF), respectively. The 4.02 kDa peptide might be granulosa cell inhibitory factor.

Biometry of ovine oocytes in relation to follicle size

Nandi, S. and Kumar, V. Girish

INDIAN VETERINARY JOURNAL, Vol.84, I. No.5,P.534-535, MAY,2007

A total of 664 ovaries obtained from Bangalore slaughterhouse were processed for oocytes aspiration and collection. The collected oocytes from preantral follicles were measured. Results revealed that there was a significant increased in the oocyte diameter as the follicle mature its sized. The mean diameter of oocytes observed from small, medium and large antral follicles were 100.42 ± 2.39 , 112.07 ± 2.61 and 132.7 ± 1.88 micro m, respectively. On the other hand, the mean oocyte diameter in small and large preantral follicles were 68.42 ± 1.17 and 81.03 ± 2.23 micro m, respectively. It is suggested that the measured ovine oocyte diameters are smaller than the published values and is associated with faulty or incomplete in vivo maturation of

o o c y t e s .

Phosphorus, protein and DNA contents of buffalo oocytes before and after in vitro maturation: effects of IGF-I

Nandi, S. and Gupta, P. S. P. and Ravindra, J. P.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.77, I. No.9,P.818-820, SEP,2007

Studies were undertaken to determine the phosphorus, protein and DNA contents of viable buffalo oocytes before and after in vitro maturation with supplementation of different concentrations of IGF-I (0, 25, 100, 200 ng/ml) in culture medium. Oocytes were aspirated from abattoir derived buffalo ovaries. The oocytes with homogenous ooplasm and compact cumulus cell layers were preliminarily selected and stained with trypan blue to test their vitality. The concentration of 200 ng/ml of IGF-I in the maturation medium was optimum for in vitro maturation of buffalo oocytes. IGF-I stimulated in vitro oocyte maturation in a dose-dependent manner. The phosphorus, protein and DNA were significantly higher in oocytes after culture compared to those before culture in all treatments.

Effect of individual or group culture on in-vitro development of buffalo preantral follicles

Ramesh, H. S. and Ravindra, J. P. and Gupta, P. S. P. and Kumar, V. Girish

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.77, I. No.10,P.953-955, OCT,2007

A study was made to investigate the effect of individual (single) and group culture on in-vitro development of large preantral follicles in buffaloes. Large preantral follicles of 150 to 500 μ m size isolated from slaughterhouse derived ovaries by microdissection method. They were placed individually or in groups in minimum essential medium supplemented with steer serum (10%), follicle-stimulating hormone (FSH-0.05 IU/ml), sodium pyruvate (0.23 Mm), glutamine (2 Mm), hypoxanthine (2 Mm), insulin-transferrin-selenium (ITS-6.25 mg insulin, 6.25 mg transferrin, 6.25 ng sodium selenite), mercaptoethanol (10 mM/ml), gentamicin (50 mg/ml) and cultured in a CO₂ incubator up to 100 days. There was no significant difference in the size of follicles between the 2 groups. However, the preantral follicles in-group culture showed a significantly higher growth, growth rate and survivability compared to those individually cultured. Thus culturing of preantral follicles in groups was beneficial for their development during in-vitro condition.

Tyrosine phosphorylation of a 38-kDa capacitation-associated buffalo (*Bubalus bubalis*) sperm protein is induced by L-arginine

Roy, S. C. and Atreja, S. K.

INTERNATIONAL JOURNAL OF ANDROLOGY, Vol.31, I. No.1,P.24-Dec, FEB,2008

The aim of the present study was to determine the effect of L-arginine on nitric oxide (NO center dot) synthesis, capacitation and protein tyrosine phosphorylation in buffalo spermatozoa. Ejaculated buffalo spermatozoa were capacitated in the absence or presence of heparin, or L-arginine or N-omega-nitro-L-arginine methyl ester (L-NAME), an inhibitor of nitric oxide synthase (NOS) for 6 h. Capacitating spermatozoa generated NO center dot both spontaneously and following stimulation with L-arginine and L-NAME quenched such L-arginine-induced NO center dot production. Immunolocalization of NOS suggested for existence of constitutive NOS in buffalo spermatozoa. L-Arginine (10 mM) was found to be a potent capacitating agent and addition of L-NAME to the incubation media attenuated both L-arginine and heparin-induced capacitation and suggested that NO center dot is involved in the capacitation of buffalo spermatozoa. Two sperm proteins of M-r 38 000 (p38) and 20 000 (p20) were tyrosine phosphorylated extensively by both heparin and L-arginine. Of these, the tyrosine phosphorylation of p38 was insensitive to both induction by cAMP agonists as well as inhibition by a protein kinase A (PKA) inhibitor. Further, most of these L-arginine-induced tyrosine phosphorylated proteins were localized to the midpiece and principal piece regions of flagellum of capacitated spermatozoa and suggested that sperm flagellum takes active part during capacitation. These results indicated that L-arginine induces capacitation of buffalo spermatozoa through NO center dot synthesis and tyrosine phosphorylation of specific sperm proteins involving a pathway independent of cAMP / PKA .

Follicular fluid concentrations of glucose, lactate and pyruvate in buffalo and sheep, and their effects on cultured oocytes,

Nandi, S. and Kumar, V. Girish and Manjunatha, B. M. and Ramesh, H. S.
and Gupta, P. S. P.

THERIOGENOLOGY, Vol.69, I. No.2,P.186-196, 15-Jan,2008

The objective was to determine ovarian follicular fluid concentrations of glucose, lactate, and pyruvate in relation to follicle size in buffalo and sheep. The effect of varying concentrations of these substances on in vitro oocyte maturation, oocyte protein content, and granulosa and cumulus cell growth was also investigated. Follicular fluid was aspirated from various sizes of follicles (from ovaries without a dominant follicle) collected from adult, cycling nonpregnant buffalo (*Bubalus bubalis*) and sheep (*Ovis aries*) during the breeding season. Overall, mean (+/- S.E.M.) concentrations (mM) were glucose 2.42 +/- 0.31 and 1.40 +/- 0.22, lactate 7.56 +/- 2.61 and 10.42 +/- 1.64, and pyruvate 0.02 +/- 0.01 and 0.002 +/- 0.00, in buffalo and sheep, respectively. In both species, as follicles became larger, concentrations of glucose significantly increased, lactate significantly decreased, but pyruvate was not affected. Oocyte maturation was higher ($P < 0.05$) in medium containing supra-physiological concentrations of either glucose (5 mM), or pyruvate (10 mM) alone, or physiological concentrations of glucose, lactate and pyruvate in combination, compared to supra-physiological concentrations of lactate (15 mM) alone, or sub- or supra-physiological concentrations of glucose, lactate and pyruvate in combination (both species). The protein content of oocytes was not significantly affected by the concentration of glucose, lactate, and pyruvate in the maturation medium. However, growth of granulosa and cumulus cells was higher ($P < 0.05$) in medium containing supra-physiological concentrations of glucose (5 mM) alone, or pyruvate (10 mM) alone, or physiological, or supra-physiological concentrations of glucose, lactate and pyruvate in combination, compared to supra-physiological concentrations of lactate (15 mM) alone, or sub-physiological concentrations of glucose, lactate and pyruvate in combination (both species). In conclusion, concentrations of glucose, pyruvate and lactate in the medium had cell type-specific effects on oocyte maturation, and on growth of granulosa and cumulus cells. Furthermore, glucose and pyruvate were the principal energy sources for oocytes and follicular somatic cells in buffalo and sheep.

(c) 2 0 0 8 E l s e v i e r I n c . A l l f i g h t s r e s e r v e d .

Production of superoxide anion and hydrogen peroxide by capacitating buffalo (*Bubalus bubalis*) spermatozoa

Roy, S. C. and Atreja, S. K.

ANIMAL REPRODUCTION SCIENCE, Vol.103, I. No.4-Mar,P.260-270, 30-Jan,2008

In the present study attempts were made to detect and quantify the generation of superoxide anion ($O_2^{\cdot-}$) and hydrogen peroxide (H_2O_2) by capacitating buffalo spermatozoa. Ejaculated buffalo spermatozoa were suspended in sp-TALP medium at 50×10^6 mL⁻¹ and incubated at 38.5 degrees C with 5% CO₂ in air in the absence or presence of heparin (a capacitation inducer) or reduced nicotinamide adenine dinucleotide phosphate (NADPH) or diphenylpicrylhydrazyl (DPI, a flavoprotein inhibitor) for 6 h. Production rate of $O_2^{\cdot-}$ and H_2O_2 by spermatozoa at different hours of capacitation were measured by cytochrome c reduction and phenol red oxidation assays, respectively. Spermatozoa generated both $O_2^{\cdot-}$ and H_2O_2 spontaneously and following stimulation with heparin and a significant increase of $O_2^{\cdot-}$ production was observed in the presence of NADPH. However, DPI inhibited this NADPH-induced $O_2^{\cdot-}$ production and suggested for existence of putative NADPH-oxidase that constitute a specific $O_2^{\cdot-}$ generating systems in buffalo spermatozoa. Results of our study indicated that buffalo spermatozoa generate $O_2^{\cdot-}$ and H_2O_2 and production of these free radicals is induced during capacitation. (c) 2007 Elsevier B.V. All rights reserved.

Production of buffalo embryos using oocytes from in vitro grown preantral follicles

Gupta, P. S. P. and Ramesh, H. S. and Manjunatha, B. M. and Nandi, S. and Ravindra, J. P.

ZYGOTE, Vol.16, I. No.1,P.57-63, FEB,2008

The present study examines the use of buffalo preantral follicles as a source of oocytes for in vitro embryo production. Preantral follicles were isolated from abattoir-derived buffalo ovaries and were grown for 100 days in five different culture systems: (1) minimum essential medium (MEM); (2) coconut water; (3) MEM + ovarian mesenchymal cell (OMC) co-culture; (4) MEM + granulosa cell (GC) co-culture; or (5) MEM + cumulus cell (CC) co-culture. Low growth rates for the preantral follicles were observed when follicles were cultured in MEM or coconut water medium. Moderate growth rates were seen for OMC and GC co-cultures, and high rates of growth were observed when follicles were grown in CC co-culture. The survival of preantral follicles was low in the MEM culture (<25%), but was over 75% in the other culture systems. Oocytes were not recovered from the MEM group, while an oocyte recovery rate of 80-100% was observed when the follicles were cultured with coconut water/somatic cells. Transferable embryos could be produced only with the oocytes obtained from preantral follicles grown in the OMC and CC co-culture systems. This study demonstrates, for the first time, that it is possible to produce buffalo embryos by in vitro fertilization of oocytes derived from in vitro grown preantral follicles.

Effect of complete feed block on dry matter intake and milk yield in murrah buffaloes

Samanta, A. K. and Singh, K. K. and Das, M. M.

INDIAN VETERINARY JOURNAL, Vol.84, I. No.12,P.1320-1322, DEC,2007

The roughages based complete feed block (CFB) has already been proved to enhance the dry matter intake in crossbred heifers (Verma, et al., 1996; Samanta, et al., 2004) by virtue of proportionate intake of roughage and concentrate and steady state of rumen fermentation. In this study on farm experiment was conducted to see the effect of CFB on dry matter intake and milk yield in Murrah buffaloes.

Use of antioxidants in amelioration of mycotoxin toxicity: A review

Gowda, N. K. S. and Ledoux, D. R.

ANIMAL NUTRITION AND FEED TECHNOLOGY, Vol.8, I. No.1,P.11-Jan, JAN,2008

Mycotoxins are toxic metabolites of different species of fungi naturally occurring in various feed stuff. Two mycotoxins of major significance to livestock production are aflatoxin B-1 (AFB(1)) and ochratoxin A (OTA). They cause pathological lesions in liver and kidney through cell damage, release of free radicals, and lipid peroxidation. Several synthetic and natural antioxidants have been used to ameliorate the toxic effects of these mycotoxins. Vitamins (A, E, Q and provitamins ((a) over cap - carotene, carotenoids), phenolic compounds, curcuminoids, and sulfur containing compounds (glutathione, methionine) are known to exhibit antioxidant action against AFB(1) and OTA. Some of these compounds are also effective in preventing carcinogenesis during mycotoxicosis. There is a need to evaluate the antioxidant potential of these compounds with emphasis on their stability, effective level of inclusion and effect on other biochemical or tissue functions. Ascertaining and confirming the antioxidant properties of cultivable medicinal/aromatic plants would add value to these products and contribute to their commercial viability.

Improving production performance of dairy animals in the villages by strategic supplementation - On farm trial

Sampath, K. T. and Chandrasekharaiah, M. and Praveen, U. S.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.78, 1. No.5,P.522-526, MAY,2008

Two on-farm lactation trials of 8 months duration each were conducted in villages, Anagalpura and Menesi, respectively of Doddaballapura taluk of Bangalore district in Karnataka state to study the effect of strategic supplementation on the basal diet in lactating crossbred cows. On-farm trials in each village were divided into 2 phases based on the availability of basal roughage (phase 1: local green grass + finger millet straw; phase 2: local green grass alone). Phase 1 lasted for 5 months followed by phase 2 continuously for 3 months duration. Crossbred cows (22) yielding 8 to 10 litres of milk/day, were divided into 2 groups (control and experimental) of 11 each in Anagalpura village and 16 crossbred cows (8 to 10 litres milk/day) were divided into 8 each in Menesi village based on lactation number, milk yield and days after calving. In both the villages, the cows in control group were fed with supplements of groundnut cake and wheat bran as practised by the farmers in phase 1 and 2. Animals in experimental group (in both the phases) were fed supplements, viz. groundnut cake, wheat bran and maize grain by replacing part of wheat bran in this group. The animals in both the groups were fed the basal roughage as mentioned in phase 2 and 1. The average milk yield/day in experimental group was significantly higher than those in control group in Anagalpura and Menesi villages. Milk fat, total solids and SNF were significantly higher in experimental group than that in control group irrespective of the phases in both the villages. The farmers income increased by Rs 15.73 and Rs 11.59/cow/day respectively, in phase 1 and 2 in Anagalpura and Rs 8.95 and Rs. 16.98/cow/day respectively, in phase 1 and 2 in Menesi villages by improved method of feeding. The study indicated that strategic supplementation of limiting nutrients i.e. energy through maize grain to the local available basal diets increased milk yield and had a positive effect on milk composition. Hence it was demonstrated that with minimum alternation in the existing feeding practices by scientific intervention, the farmers income can be increased through enhanced milk production.

Effect of feeding bypass protein on milk production performance in crossbred cows

Chandrasekharaiah, M. and Sampath, K. T. and Praveen, U. S.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.78, I. No.5,P.527-530, MAY,2008

On-farm lactation trial of 4 months duration was conducted in Anagalpura and Menesi village of Doddaballapura taluk, Bangalore district in Karnataka state to study the effect of feeding bypass protein (UDP) on the milk production performance of crossbred cows. Crossbred cows (24) yielding 8 to 10 litres of milk/day were divided into 2 comparable groups (control and experimental) of 12 each based on lactation number, milk yield and days after calving. Cows in control group were fed a concentrate mixture (CMC) which contained 37% of CP as UDP (bypass protein), while those in experimental group were fed a concentrate mixture (CME) containing 50% CP as UDR. The animals in both the groups were fed ad lib. local mixed grass as the major source of roughage. The average milk yield per day in experimental group was significantly higher than those in control group. The milk fat, SNF and total solids were significantly higher in experimental animals than in control group animals. The milk yield was increased by 1.07 litres, feed cost was reduced by Rs 2.20 and the overall income of the farmers was increased by Rs 12.40/cow/day in experimental group. The study indicated that feeding of bypass protein increased quantity and quality of milk in cows producing 8-10 litres milk/day on local mixed grass based diets.

Efficacy of turmeric (*Curcuma longa*), containing a known level of curcumin, and a hydrated sodium calcium aluminosilicate to

Gowda, N. K. S. and Ledoux, D. R. and Rottinghaus, G. E. and Bermudez, A. J. and Chen, Y. C.

POULTRY SCIENCE, Vol.87, I. No.6, P.1125-1130, JUN,2008

A 3-wk feeding study was conducted to evaluate the efficacy of turmeric (*Curcuma longa*) powder (TMP), containing a known level of curcumin, and a hydrated sodium calcium aluminosilicate (HSCAS; Improved Milbond-TX, IMTX, an adsorbent, Milwhite Inc., Houston, TX) to ameliorate the adverse effects of aflatoxin B-1 (AFB(1)) in broiler chicks. Four pen replicates of 5 chicks each were assigned to each of 7 dietary treatments, which included the basal diet not containing TMP, HSCAS, or AFB(1) (control); basal diet supplemented with 0.5% food grade TMP that contained 1.48% total curcuminoids (74 mg/kg); basal diet supplemented with 0.5% HSCAS; basal diet supplemented with 1.0 mg/kg AFB(1); basal diet supplemented with 0.5% TMP and 1.0 mg/kg AFB(1); basal diet supplemented with 0.5% HSCAS and 1.0 mg/kg AFB(1); and basal diet supplemented with 0.5% TMP, 0.5% HSCAS, and 1.0 mg/kg AFB(1). The addition of TMP to the AFB(1) diet significantly ($P < 0.05$) improved the weight gain of chicks, and the addition of HSCAS to the AFB(1) diet significantly ($P < 0.05$) improved feed intake and weight gain, and reduced relative liver weight. The addition of TMP or HSCAS and TMP with HSCAS ameliorated the adverse effects of AFB(1) on some of the serum chemistry parameters (total protein, albumin, cholesterol, calcium). Further, decreased antioxidant functions in terms of level of peroxides, superoxide dismutase activity, and total antioxidant concentration in liver homogenate due to AFB(1) were also alleviated by the inclusion of TMP, HSCAS, or both. The reduction in the severity of hepatic microscopic lesions due to supplementation of the AFB(1) diet with TMP and HSCAS demonstrated the protective action of the antioxidant and adsorbent used in the present study.

Evaluation of sperm functional attributes in relation to in vitro sperm-zona pellucida binding ability and cleavage rate in

Selvaraju, S. and Ravindra, J. P. and Ghosh, J. and Gupta, P. S. P. and Suresh, K. P.

ANIMAL REPRODUCTION SCIENCE, Vol.106, I. No.4-Mar,P.311-321, JUL,2008

The objective of this study was to evaluate sperm functional attributes in relation to in vitro spermzona binding ability and cleavage rate in assessing frozen thawed buffalo (*Bubalus bubalis*) semen quality. Frozen-thawed forty-eight ejaculates from eight Surti buffalo bulls (six ejaculates/bull) obtained by artificial vagina were used. Frozen semen from each bull was thawed, pooled, and subjected for sperm functional (six replicates) and in vitro fertilization (four replicates) tests. The progressive forward motility, plasmalemma functional integrity assessed by fluorogenic [6-carboxyfluorescein diacetate (CFDA), and propidium iodide (PI)], hypoosmotic swelling (HOS), and hypoosmotic swelling-Giemsa (HOS-G) test, mitochondrial membrane potential, sperm nuclear morphology, the number of sperm bound to zona and cleavage rate differed significantly ($P<0.05$) between bulls. When the animals were grouped based on cleavage rate (group I, $>40\%$ cleavage rate, $n = 5$, and group II, $<40\%$ cleavage rate, $n = 3$), in vitro fertility parameters and all the sperm functional attributes except sperm nuclear morphology differed significantly ($P < 0.05$). The proportions of sperm with functional plasmalemma in the tail and intact acrosome assessed by HOS-G test (25.33, range: 17.48-40.27) were significantly ($P<0.001$) lower than the functional plasmalemma in the tail assessed by HOS test (39.80, range: 27.85-54.67). The number of sperm bound to zona had significant correlations with the mitochondrial membrane potential ($r=0.90$, $P<0.01$) and plasmalemma integrity (fluorogenic, $r=0.74$ and HOS, $r=0.79$, $P<0.05$) and HOS-G, $r=0.87$, $P<0.01$). The cleavage rate had significant ($P<0.05$) correlations with the mitochondrial membrane potential ($r=0.70$) and plasmalemma integrity measured by HOS-G test ($r=0.68$). The present study indicates that these attributes could represent important determinants of buffalo sperm quality influencing cleavage rate. (C) 2007 Elsevier B.V. All rights

r e s e r v e d .

Cloning of cellulose gene from R-albus in E-coli and cellulase activity in the periplasmic protein fraction

Thulasi, A. and Chandrasekharaiah, M. and Sampath, K. T.

INDIAN VETERINARY JOURNAL, Vol.85, I. No.4,P.19-20, APR,2008

The present study was undertaken to clone the cellulase gene from Ruminococcus albus in Escherichia coli and to estimate the enzyme activity in the intracellular, extracellular and the periplasmic protein fractions in recombinant E coli.

Sperm nuclear morphology in relation to sperm functional tests in assessing buffalo semen

Selvaraju, S. and Ghosh, J. and David, C. G. and Reddy, I. J. and Ravindra, J. P.

INDIAN VETERINARY JOURNAL, Vol.85, I. No.5, P.505-507, MAY, 2008

Subtle sperm abnormalities that are unrecognized by conventional semen analysis may explain reduced fertility in bulls being used for AI. Sperm with defects such as abnormal nuclear morphology has been associated with improper zygotic, embryonic and or foetal development (Ostermeier et al., 2000). Qualitative and quantitative changes in nuclear material give rise to sperm with morphological abnormalities (Saacke et al., 1998). Perusal of literature revealed paucity of information on this aspect in buffalo semen analysis. The aim of the present work was to study sperm nuclear morphology in relation to sperm functional tests in assessing buffalo semen quality.

Relationship between peripheral plasma inhibin and FSH concentrations in Sahiwal cows (*Bos indicus*) and Murrah

Mondal, S. and Prakash, B. S. and Palta, P.

TROPICAL ANIMAL HEALTH AND PRODUCTION, Vol.40, I. No.6,P.403-406, AUG,2008

The present investigation was undertaken to study the relationship between circulating inhibin and FSH concentrations during the estrous cycle in buffaloes and Sahiwal cattle. The pattern of inhibin concentrations was similar, with peak concentrations on Day -2 (Day 0=day of estrus) and minimum concentrations on Days 12 and 11 in buffaloes and cattle, respectively. Circulating FSH concentrations were the highest on Day 0 and lowest on Days 8 and 13 in buffaloes and cattle, respectively. Peripheral plasma inhibin concentrations were negatively correlated to FSH concentrations in buffaloes ($r = -0.27$, $P < 0.01$) and cattle ($r = -0.35$, $P < 0.01$) indicating that inhibin is involved in negative feedback regulation of FSH in both these species.

**Effect of co-culture with dominant follicle on growth of preantral
and antral follicles in sheep and buffalo**

Nandi, S. and Ramesh, H. S. and Kumar, V. Girish

INDIAN VETERINARY JOURNAL, Vol.85, I. No.6,P.41-42, JUN,2008

Plasma luteinizing hormone profiles during ovsynch treatment in Murrah buffalo heifers

Roy, K. S. and Prakash, B. S.

INDIAN VETERINARY JOURNAL, Vol.85, I. No.6,P.108-109, JUN,2008

Eleven repeat breeding Murrah buffalo heifers were subjected to Ovsynch treatment which involved administration of 10 micro g GnRH analogue (Receptal VET) at any stage of the oestrous cycle, followed by 25 mg of PGF2 alpha (Lutalyse) on day 7 and a second GnRH treatment 48 h after PGF2 alpha administration. Blood samples were collected prior, during and after treatment for LH determination using direct ELISA. Results showed that the duration of LH surge varied from 6 to 10 h with a mean of 6.90 ± 0.41 h in Ovsynch treated buffaloes. The peak concentrations ranged from 8.24 to 26.20 ng/ml with a mean of 16.21 ± 1.48 ng/ml. All the animals exhibited onset of LH peak within 2 h after the second GnRH treatment. Furthermore, five heifers became pregnant following fixed time AI and achieved a conception rate of 45.5% during peak summer months. The study showed that Ovsynch treatment can be used to induce oestrus in repeat breeding buffaloes during summer.

Isolation and preservation of buffalo and ovine preantral follicles

Nandi, S. and Ramesh, H. S. and Kumar, V. Girish

INDIAN VETERINARY JOURNAL, Vol.85, I. No.6,P.119-120, JUN,2008

Preantral follicles from slaughtered buffaloes (n=84) and sheep (n=126) were preserved at 4 degrees C for 24 h in three different media: (i) phosphate buffer saline (PBS)+10% fetal bovine serum+ beta -mercaptoethanol (10 mM)+gentamicin (50 micro g/ml) (control); (ii) tissue culture medium 199 (TCM 199)=fetal bovine serum (10%)+ beta -mercaptoethanol (10 mM)+gentamicin (50 micro g/ml) and (iii) minimum essential medium (MEM)+fetal bovine serum (10%)+ beta -mercaptoethanol (10 mM)+gentamicin (50 micro g/ml). Results showed that the viability of buffalo and ovine preantral follicles after 24 h of preservation in PBS were 74 and 80%, which were comparable to those preserved in TCM-199 (78 and 83%) and MEM (80 and 84%). Although more follicles survived in TCM-199 and MEM media than PBS during storage, there was no significant difference in the percentage of live follicles among the three groups. It is concluded that preantral follicles can be preserved for the duration studied without compromising its viability.

Effect of supplemental palm oil on nutrient utilization, feeding economics and carcass characteristics in post-weaned

Dutta, T. K. and Agnihotri, M. K. and Rao, S. B. N.

SMALL RUMINANT RESEARCH, Vol.78, I. No.3-Jan,P.66-73, AUG,2008

Thirty male post-weaned Muzafarnagari lambs, of about 3 months of age and similar body weight (18.47 +/- 1.31 kg), were divided into 5 similar groups in order to observe the effect of graded levels of palm oil supplementation on growth, nutrient utilization, cost of feeding, carcass characteristics and meat quality under feedlot regimen. Lambs in different treatment groups were fed with concentrate mash supplemented with 0% (T-1), 2.5% (T-2), 5.0% (T-3), 7.5% (T-4) and 10% (T-5) palm oil and gram straw (*Cicer arietinum*) ad libitum. The growth trial was continued for 12 weeks. A metabolism trial of 6 days collection was conducted after 60 days of experimental feeding. After 90 days of feeding, randomly selected three animals from each group were slaughtered according to standard procedure for assessment of carcass traits and meat duality. Separated thoracic portion of Longissimus thoracis muscle from each carcass was collected for analysis of moisture, protein and fat. Accelerated growth in lambs under T-3 ($P < 0.05$) was observed as compared to other treatments with similar DNA intake. Similarly, DM intake (kg)/kg gain was found most efficient ($P < 0.01$) in T-3 and least efficient in 10% palm oil supplemented T-5. Due to this, feed cost (rupees)/kg weight gain was calculated less (44.23) in T-3 than other palm oil supplemented treatments. DM, CP, Ca and P intakes were similar in all treatment groups during metabolism trial. Intake ratio of Ca and P was recorded 3.68:1.00, 3.42:1.00, 3.37:1.00, 3.69:1.00 and 3.44:1.00 in T-1 to T-5 treatments, respectively. Water intake and water intake/kg DM intake was also similar in different treatment groups. OM digestibility was significantly higher ($P < 0.01$) in 2.5% palm oil supplemented T, ration as compared to other treatments. DM, CP, EE, CF, NFE and P digestibilities were found similar among different treatment groups. TDN percentage in the feed increased from 60.16 (T-1) to 66.17 (T-5), which was mainly due gradual increase of palm oil in the diet, although the difference was non-significant. Whereas, DCP percentage in feed (gradually depressed ($P < 0.05$) due to higher level of palm oil supplementation. Nitrogen retention (%) as percentage of N-absorbed was significantly higher ($P < 0.05$) in palm oil supplemented (groups than control T-1 being highest in T-3 and T-4. This could be the reason for higher body weight gain in T-3 and T-4. Dressing and meat percentages (empty weight basis) ranged from 52.00 (T-4)

Role of male effect to advance breeding season and induce estrus in Mandya ewes

Gorti, Ravikiran and David, C. G. and Reddy, I. J.

INDIAN VETERINARY JOURNAL, Vol.85, I. No.7,P.739-741, JUL,2008

In sheep the ram acts as an exteroceptive stimulus to initiate ovarian activity in ewes during transition from non breeding to breeding season and seems to constitute a major factor in the control of reproductive events (Cushwa et al., 1992). When the ewes are isolated from the rams for more than 1 month they react to the introduction of a ram resulting in activation of LH secretion, synchronization of ovulation. In this study, we explored the possibly of using male effect to induce and synchronize estrus during the non breeding season in Mandya breed of ewes.

Feeding practices and nutrient status of dairy cows under field conditions

Gowda, N. K. S. and Prasad, C. S. and Selvaraju, S. and Reddy, I. J. and Ananthram, K. and Sampath, K. T.

INDIAN VETERINARY JOURNAL, Vol.85, I. No.7, P.745-748, JUL, 2008

Adequate nutrition plays an important role in dairy cattle productivity, and it accounts for more than 70% of the input cost. Feeding pattern in unorganized dairy farming mainly comprises of crop residues and other locally available roughages and crop residues and crop by-products. Such a feeding practice often does not meet the nutrient requirement and could affect the productive (Prasad et al., 2005) and reproductive performance in dairy animals (Anon, 2005-06). Hence, this study was undertaken as a part of Institute-Village-Linkage-Programme (IVLP) to assess the nutrient availability in dairy cattle through feeds / fodders and also to record the level of certain minerals, so as to suggest a suitable feeding strategy to improve productivity.

Molecular characterization of follicle stimulating hormone receptor (FSHR) gene in the Indian river buffalo (*Bubalus bubalis*)

Minj, Archana and Mondal, S. and Tiwari, A. K. and Sharma, B. and Varshney, V. P.

GENERAL AND COMPARATIVE ENDOCRINOLOGY, Vol.158, I. No.2,P.147-153, SEP,2008

Follicle stimulating hormone (FSH) plays a central role in regulation of ovarian function in mammals. The actions of follicle stimulating hormone are mediated through receptors present on the granulosa cells of the ovary. In the present study we have cloned and characterized the FSHR gene of buffalo. Sequence analysis indicated that the buffalo FSHR cDNA sequence comprised of an open reading frame of 2085 bp encoding a 695 amino acid protein. Its nucleotide sequence showed more than 80% similarity to the homologous genes of mammalian species. At amino acid level buffalo FSHR exhibited a high percentage (84-96.7%) of identity with the corresponding mammalian homologs. This is the first isolation and characterization of FSHR cDNA from buffalo ovary. (C) 2008 Elsevier Inc. All rights reserved.

Co-culture of buffalo preantral follicles with different somatic cells

Ramesh, H. S. and Gupta, P. S. P. and Nandi, S. and Manjunatha, B. M. and Kumar, V. Girish and Ravindra, J. P.

REPRODUCTION IN DOMESTIC ANIMALS, Vol.43, I. No.5,P.520-524, OCT,2008

The effect of co-culture of buffalo preantral follicles (PFs) with different somatic cells, i.e, cumulus, granulosa, ovarian mesenchymal and oviductal epithelial cells was studied. Large PFs (250-450 μ m) were isolated by microdissecting the trypsin (1%) digested ovarian cortical slices. Cumulus cells were isolated by repeated pipetting of oocytes, granulosa cells were isolated by aspirating from punctured PFs and ovarian mesenchymal cells were isolated from ovarian cortex by scraping the cortical slices and passing through 20 μ m filter. Preantral follicles were cultured in standard culture medium without somatic cells or co-cultured with cumulus cells, granulosa cells, ovarian mesenchymal cells and oviductal epithelial cells for 80 days. The growth rate (μ m/day) of the PFs was monitored by measuring follicular diameter on day 0, 30, 60 and 80 days of culture. The viability of PFs was evaluated by trypan blue staining. The results indicated that PFs co-cultured with cumulus, granulosa and ovarian mesenchymal cells had a better development and survivality compared with control and those co-culture with oviductal epithelial cells. Maximum growth and survivality of PFs were achieved when cultured with cumulus cells. It is concluded that inclusion of somatic cells in PF culture media had beneficial effect on the growth of PFs and cumulus cells supported maximum growth and survivality of PFs in vitro of a l l s o m a t i c c e l l s t e s t e d .

Nutrient utilization and plasma mineral level in sheep fed diets with different calcium and phosphorus ratios with ragi (Eleusine

Gowda, N. K. S. and Pal, D. T. and Prasad, C. S. and Bellur, S. R.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.78, 1. No.9,P.980-986, SEP,2008

Three experimental diets (CP: 20.0%; TDN: 65-67.0%) were formulated using wheat bran, groundnut cake, yellow maize and calcium carbonate to achieve different levels of Ca and P ratios in the concentrate mixture, and fed to 3 groups of sheep of 9 in each group for 150 days period. The diet comprised wheat bran and groundnut cake, which is the normal feeding practice with small holding livestock farmers, diet 2 additionally contained required quantity of calcium carbonate to increase the Ca level, whereas diet 3 contained similar ingredients with part of wheat bran replaced strategically with yellow maize grain to reduce the P level. Weighed quantity of concentrate mixture was offered to each animal to meet 75% of the protein requirement and ragi straw was offered ad lib. as dry roughage source. The intake of concentrate and straw (DM) was in the ratio of 35: 65 in all the 3 groups. The ratio of Ca and P in three concentrate mixtures was 1 : 5.6, 1 : 2 and 1 : 1 for groups 1, 2 and 3, respectively. However, when the total dry matter intake through both concentrate and ragi straw was taken into account, the Ca : P ratios were 1 : 1.01, 1 : 0.76 and 1 : 0.52 for groups 1, 2 and 3, respectively, which was due to higher proportion of P as compared to Ca in concentrate mixtures and more Ca and less P in ragi straw (Ca: P - 1 : 0.05). The DM intake did not differ amongst the groups and the nutrient utilization (DM, CP, EE, NDF) was significantly higher in sheep fed concentrate mixture with Ca : P ratio of 1 : 1 (group 3). Providing excess P with low Ca in concentrate mixture (groups 1 and 2 - Ca : P, 1 5.6, 1 : 2) resulted in significantly more excretion of P, Mg, Cu, Zn and Co through faeces. The plasma mineral level of P was significantly higher after 150 days of feeding in group 3 fed concentrate mixture having Ca : P ratio of 1 : 1 with a net ratio of 1 : 0.52 in the total DM consumed. The values of other minerals (Ca, Mg, Cu, Zn) did not vary significantly among the groups and the interaction between group and period was also not significant. It was concluded that feeding of concentrate mixture having more of wheat bran/groundnut cake as practiced under field conditions contributed to higher P intake, resulting in its higher excretion in dung besides affecting the utilization of other nutrients. Decreasing the P level in the concentrate mixture through the addition of other energy source like maize and corresponding increase in Ca level through inclusion of calcium carbonate was found to be

EFFICACY OF OVSYNCH TREATMENT FOR IMPROVEMENT OF CYCLICITY IN MURRAH BUFFALO HEIFERS DURING SUMMER

Roy, K. S. and Prakash, B. S.

INDIAN VETERINARY JOURNAL, Vol.85, I. No.8,P.833-836, AUG,2008

It is well known fact that during summer season the buffaloes exhibit poor estrous symptoms. The steroid hormones mainly, estradiol - 17 beta, total estrogens and progesterone play important role for expression of oestrous behaviours. Ovsynch is a treatment protocol where a combination of three injection namely, GnRH - PGF(2 alpha) -GnRH administered on day 0, day 7 and day 9, respectively, starting at any day of estrous cycle (Pursley et al., 1995, 1997). The aim of the present investigation was to evaluate the effect ovsynch treatment on plasma estradiol -17 beta and total estrogen concentrations and improvement of cyclicity in Murrah buffalo heifers during summer

s e a s o n .

DESCRIPTION OF GOAT RUMEN ANAEROBIC FUNGI AND THEIR POTENTIALITY AS PROBIOTIC

Samanta, A. K. and Singh, K. K. and Das, M. M. and Pailan, G. H. and Rai, Sonu

INDIAN VETERINARY JOURNAL, Vol.85, I. No.8,P.859-863, AUG,2008

The gastrointestinal tract of goats depend on the anaerobic microbial pool (comprising of bacteria, protozoa and fungi) inhabited in the foregut for extensive degradation and utilization of feed materials either of roughages or concentrate. Administration of a polycentric fungal strain - Orpinomyces (KNGF - 2, isolate of goat) to sheep rumen increased nutrient digestibility and nitrogen retention (Lee et al., 2000). In this line anaerobic fungi may get superiority for their high fiber degrading activity as well as mechanical disrupting ability of fiber fractions. (Samanta and Walli, 1994). The fungal strain found in different species of animals are diverse and their fiber degrading ability also differ especially in the enzyme activities (Samanta, et al. 1999). The present investigation was carried out to study the diversity of goat rumen fungi and their p o t e n t i a l i t y a s p r o b i o t i c .

**EFFECT OF LABORATORY AND OVARIAN FACTORS ON
QUANTITY AND QUALITY OF OVINE OOCYTE**

Nandi, S. and Kumar, V. Girish

INDIAN VETERINARY JOURNAL, Vol.85, I. No.10,P.1045-1047, OCT,2008

In vitro developmental competence of oocytes depends on various laboratory and ovarian factors. The present study was performed to establish the effect of some factors like oocyte collection techniques, presence and absence of corpus luteum in the ovary and follicle size on quantity and quality and in vitro maturation of sheep oocytes.

Effect of direct fed anaerobic fungal culture on rumen fermentation, nutrient utilization and live weight gain in crossbred

Samanta, A. K. and Singh, K. K. and Das, M. M. and Pailan, G. H.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.78, I. No.10, P.1134-1137, OCT, 2008

Attempts were made to evaluate the potential gut anaerobic fungi as probiotic in crossbred heifers. Crossbred heifers (10) were randomly divided into equal group G, and G₂. All the experimental heifers were offered ad lib. wheat straw and concentrate mixture (containing, mustard cake 35, barley 25, wheat bran 38, mineral mixture I and common salt 1 %) @ 1% of body weigh. In addition to that, 2 ml of 4 days old *Pirmyces* sp. (an isolate of goat rumen) was offered to heifers of G₂: 2 ml of same fungal media was given to the heifers of G to neutralize the effect of media. The experiment lasted for 90 days. At the middle of experiment, rumen liquor was collected to monitor the rumen metabolites and microbial population. A digestibility trial was also conducted to see the effect of probiotic oil dry-matter intake and nutrient utilization. The rumen pH, total VFAs ammonia N and total N were not affected by the daily administration of anaerobic fungal probiotic. The population of total viable bacteria was 25.5×10^8 and 26.5×10^8 /ml, fungi was 8.65×10^3 and 9.15×10^3 /ml in G₁ and G₂, respectively. Similarly, the protozoa population was 9.24×10^5 and 10.23×10^5 /ml in G₁ and G₂ respectively, which was also Unaffected by the inclusion of fungal probiotic. The dry-matter intake as % of body weigh was similar in 2 groups. Nutrient digestibility although were numerically higher in probiotic fed heifers still did not differ significantly. The average live weight gain in G₂ was 498 g/head/day, while it was 513 g/head/day in G₁ indicating no positive response of a n a e r o b i c f u n g a l p r o b i o t i c .

Capacitation-associated protein tyrosine phosphorylation starts early in buffalo (*Bubalus bubalis*) spermatozoa as compared to

Roy, S. C. and Atreja, S. K.

ANIMAL REPRODUCTION SCIENCE, Vol.110, I. No.4-Mar,P.319-325, FEB,2009

A comparative study was conducted on protein tyrosine phosphorylation events of capacitating sperm of two ruminant species, cattle and buffalo. Ejaculated cattle and buffalo bull spermatozoa were suspended separately in sp-TALP medium at 50×10^6 mL(-1) and incubated at 38.5 degrees C with 5% CO(2) in air in the absence or presence of heparin for a period of 6 h. The extent of sperm capacitation after various periods of incubations was assessed by lysophosphatidyl choline-induced acrosome reaction followed by a triple-staining technique and capacitation-associated tyrosine-phosphorylated proteins were detected by immunoblotting technique using a monoclonal antiphosphotyrosine antibody. In the same media, over a time-period, a significant increase in capacitation percentage was observed even in control group of buffalo spermatozoa as compared to a non-significant increase in that of cattle sperm. In both cattle and buffalo spermatozoa, at 6h. four proteins of molecular weight 49, 45, 32, and 20kDa (designated as p49, p45, p32, and p20) were tyrosine phosphorylated. However. in buffalo, two additional proteins of 38 and 30 kDa were also tyrosine phosphorylated. In a time-course study. p20 appeared as early as at 0 h in capacitated buffalo spermatozoa as compared to 4 h in cattle. Further, in heparin-treated buffalo spermatozoa, with a time-dependent increase in tyrosine phosphorylation of some proteins, there was time-dependent dephosphorylation of some other proteins that was never seen in heparin-treated cattle sperm. Thus, the present findings revealed that though buffalo sperm takes more time than cattle for capacitation but its associated protein tyrosine phosphorylation event starts very early as compared to cattle. (C)
2 0 0 8 E l s e v i e r B . V . A l l r i g h t s r e s e r v e d .

PERIPHERAL PLASMA FSH CONCENTRATIONS IN RELATION TO EXPRESSION OF OESTRUS IN MURRAH BUFFALOES (BUBALUS

Mondal, S. and Prakash, B. S. and Palta, P.

BUFFALO BULLETIN, Vol.27, I. No.4,P.258-262, DEC,2008

The present study investigated the changes in peripheral plasma FSH concentrations in relation to expression of estrus in Murrah buffaloes. Out of a total of seven oestrus, two were accompanied by overt signs whereas the remaining five were silent oestrus. In buffaloes with overt oestrus, plasma FSH concentrations during perioestrus, early luteal, midluteal and late luteal phase were 2.61 +/- 0.64, 1.73 +/- 0.28, 1.17 +/- 0.16 and 1.16 +/- 0.22 ng/ml, respectively and the corresponding values in buffaloes with silent oestrus were 2.42 +/- 0.69, 0.85 +/- 0.12, 0.99 +/- 0.18 and 1.62 +/- 0.47 ng/ml, respectively. It was concluded that plasma FSH levels were higher ($P < 0.01$) in buffaloes that exhibited overt oestrus compared to silent estrus.

Evaluation of castor (*Ricinus communis*) seed cake in the total mixed ration for sheep

Gowd, N. K. S. and Pal, Dintaran T. and Bellur, Srinivas R. and Bharadwaj, Ujala and Sridhar, Manpal and Satyanarayana, Mayasandra L. and Prasad,

JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE, Vol.89, 1. No.2,P.216-220, 30-Jan,2009

Castor (*Ricinus communis*) seed cake (CSC), a byproduct of the vegetable-oil industry, contains fairly good amounts of protein (crude protein, 290-390 g kg⁻¹) which could be a suitable substitute of conventional oil cakes like soybean meal (SBM) in livestock diets but for the presence of a toxic glycoprotein, ricin. Efforts were, therefore, made to determine the feasibility of feeding CSC as such or after detoxification with lime (41%, wt/wt) by incorporating it into a total mixed ration (TMR) containing 65 and 35 parts ragi (*Eleusine coracana*) straw and concentrate mixture, respectively, with 11 g kg⁻¹ CP and 50 g kg⁻¹ TDN in which the SBM of a control diet was isonitrogenously replaced with either raw or lime-treated CSC in test diets. The control and two test TMRs were fed to 24 sheep, respectively, divided at random into three dietary groups having equal number of animals for 150 days. RESULTS: Although lime treatment had a positive effect in reducing ricin by 58%, no adverse effect could be noticed by feeding raw or lime-treated CSC in terms of body weight changes, macro- and micro-nutrient utilisation, blood biochemical and mineral profile, rumen fermentation pattern, carcass traits, except the level of plasma immunoglobulins which was significantly ($P < 0.05$) higher in sheep fed CSC diets. No pathological lesions could be noticed in the tissues of visceral organs due to feeding the raw or treated CSC. CONCLUSIONS: The findings suggest no adverse effect in the nutritional performance of adult sheep due to feeding the raw or treated CSC when incorporated into TMRs, probably due to a dilution of the ricin concentration or the development of immunity to the glycoprotein ricin, warranting long-term growth-cum-production studies. © 2008 Society of Chemical Industry

Prognostic Value of Various Spermatological Attributes as Predictors of Zona Binding and Zona Penetration of Buffalo

Selvaraju, S. and Ghosh, J. and Ravindra, J. P.

REPRODUCTION IN DOMESTIC ANIMALS, Vol.44, I. No.1, P.11-Jun, FEB,2009

Twenty-four ejaculates from six (four ejaculates each) Surti buffalo bulls aged 4-8 years were used to assess various attributes of spermatozoa influencing the zona-binding and zona-penetration tests. Ejaculates from each bulls were subjected to *in vitro* sperm--zona binding and sperm--zona penetration tests (four replicates per bull) using immature buffalo oocytes. The average number of spermatozoa bound per oocyte was 27.79 +/- 5.90. The average number of spermatozoa penetrated per oocyte was 3.35 +/- 0.64. The average number of zona-bound and -penetrated spermatozoa differed significantly between animals. Significant difference ($p < 0.05$) was observed between the plasmalemma integrity as assessed by eosin--nigrosin stain and hypo-osmotic swelling (HOS) test. Furthermore, the percentage of cells positive for the HOS test, i.e. functional membrane integrity (51.25 +/- 2.32) was significantly ($p < 0.05$) higher than hypo-osmotic swelling-Giemsa (HOS-G) test, i.e. the subpopulation of spermatozoa positive for functional membrane and acrosomal integrities (42.87 +/- 4.56). The HOS test had significant correlations with plasmalemma integrity as measured by the vital stain, eosin--nigrosin ($r = 0.85$, $p < 0.05$). The HOS-G test also had significant correlation with plasmalemma integrity measured by vital stains such as eosin--nigrosin ($r = 0.90$, $p < 0.05$) and fluorogenic stains [carboxyfluorescein diacetate (CFDA) and propidium iodide (PI); $r = 0.92$, $p < 0.01$] and HOS test ($r = 0.93$), acrosomal integrity ($r = 0.86$, $p < 0.05$) and mitochondrial membrane potential ($r = 0.99$, $p < 0.01$). The plasmalemma integrity (fluorogenic stain), functional membrane integrity (HOS test), subpopulation of spermatozoa positive for functional membrane and acrosomal integrities (HOS-G test) and mitochondrial membrane potential had significant ($p < 0.05$) correlation with sperm zona binding and penetration. The present study indicates that these parameters could represent important determinants of sperm quality influencing zona binding and penetration.

Amelioration of reproductive problems in crossbred cattle with high blood urea nitrogen levels by ragi (finger millet)

Gupta, P. S. P. and Selvaraju, S. and Pal, D. T. and Ravikiran, G. and Ravindra, J. P.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.78, I. No.12, P.1397-1399, DEC, 2008

High blood urea nitrogen levels have been considered as one of the important causes of infertility in cattle. A field study was conducted in crossbred cattle with reproductive problems in a Harohalli village, Devanahalli (TK), Bangalore (R) District. In which 21 crossbred cattle having high blood urea nitrogen (> 19 mg%) with reproductive problems were selected. Out of these, 11 were anoestrus (5 heifers and 6 cows) and the rest were repeat breeding animals. They were supplemented with additional energy in the form of 1-2 kg ragi (finger millet) per day for 2-3 months. Blood samples were collected on 0 day and every fifteen days till 3 months of the experiment. They were analyzed for blood urea nitrogen (BUN), glucose, non-esterified fatty acids (NEFA), total protein, cholesterol, calcium, phosphorus, magnesium, copper, zinc and progesterone. All the supplemented animals except one animal that was infested with worms responded positively and showed a significant fall in the BUN levels. But there was no significant difference in the glucose, cholesterol, NEFA, protein and mineral levels between the pretreatment and post treatment period. The plasma progesterone levels improved from below detectable levels at pretreatment period to > 1 ng/ml at post treatment period in anoestrous animals. Following ragi supplementation, all the anoestrous animals started cycling within 15 to 60 days and later conceived. Of the 10 repeat breeding cattle (4 heifers and 6 cows), all animals (except one heifer which was infested with worms) conceived within 3 months and later calved. Results indicated that the energy and protein balance is very important and BUN levels are to be maintained below 19 mg for maintenance of the fertility in cattle,

Visual data mining tool and database for assessing district-wise animal and feed resources in India

Angadi, U. B. and Anandan, S. and Ramachandra, K. S.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.79, I. No.1, P.89-92, JAN,2009

Animal and feed resource management planning must address economic and social sustainability. Integrated database with spatial interactions of animal and feed resources in the country is a key planning process. The impacts of a management plan on animal and feed resources are often hard to anticipate. Combining database management system tool with recent visualization techniques would be workable option. This paper presents a visualization tool to produce dynamic simulation of district-wise animal and feed resources availability and requirement in India over a period of 20 years (1985 to 2005). It describes the overall architecture of the database as well as connection to GIS (Spatial decision support system). The database was developed to store and maintain feed and animal resource data. Programmes were developed for database management, analysis and to convert animal and feed resources data to spatial and graphical form. The visualization tool provides effective information to assess animal and feed resources and impact on livestock at the district

l e v e l .

Augmentation of bubaline sperm metabolism by insulin like growth factor-1

Gupta, P. S. P. and Nandi, S.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.79, I. No.2,P.151-154, FEB,2009

In the present study, IGF-I was tested in vitro at various concentrations (0, 25, 50, 100, 200 ng/ml) on various sperm metabolic parameters i.e. protein, fructose and phosphorous levels in seminal plasma and spermatozoa. The protein concentration in the seminal plasma decreased whereas protein increased in the spermatozoa after 24 h of incubation with different concentrations of IGF-I. There was a significant negative correlation ($r = -0.94$) between the protein content of sperm and seminal plasma after 24 h of incubation along with all increase in the dose of IGF-I. After 24 h of incubation, the fructose level of spermatozoa was below non-detectable levels of the assay (below 50 no/spermatozoon). Fructose level was decreased in the seminal plasma after 24 h of incubation as the dose of IGF-I was increased. IGF could rescue the sperm from protein starvation (probably by stimulating the uptake of amino acids from the seminal plasma into the sperm cell), but could not do so in fructose starvation of the sperm cell. A significant increase in the phosphorus concentration was observed in the seminal plasma but no significant effect was seen in the spermatozoa. There was a negative correlation ($r = -0.77$) between the phosphorus content of sperm and seminal plasma after 24 h of incubation along with an increase in the dose of IGF-I. This Study indicated that IGF-I stimulates fructose and protein uptake by buffalo spermatozoa.

Changes in endocrine profiles during ovsynch and ovsynch plus norprolac treatment in Murrah buffalo heifers at hot summer

Roy, K. S. and Prakash, B. S.

TROPICAL ANIMAL HEALTH AND PRODUCTION, Vol.41, I. No.4, P.677-687, APR,2009

The aim of this study was to compare the changes in hormonal profiles during ovsynch and ovsynch plus norprolac treatment in Murrah buffalo heifers following timed artificial insemination (TAI) at stressful summer months, through intensive endocrine analysis. The norprolac (an anti-prolactin drug) at the dose rate of 10.0 mg/animal /day effectively suppressed the level of prolactin upto 30 hours. The hormones quantified in blood plasma samples collected before, during and after ovsynch and ovsynch plus norprolac treatment were LH, prolactin, progesterone, estradiol-17 beta and total estrogens. The plasma prolactin and progesterone concentrations were negatively correlated ($r = - 0.24$) during summer estrous cycle, which indicated prolactin-induced suppression of progesterone secretion through poor luteal development. The ovsynch treatment reduced the incidence of anestrous from 45% before treatment to only 18% after treatment. The norprolac induced prolactin suppression improved the efficiency of ovsynch treatment upto 100% cyclicity after treatment in comparison to 36% acyclicity before treatment. In both the treatments 45% and 55% of animal became pregnant after TAI, respectively. The high prolactin secretion contributed to poor fertility by lowering gonadal hormones (estradiol-17 beta, total estrogens and progesterone) production in summer months. This finding of endocrine changes suggests that ovsynch protocol for estrus synchronization has potential application for improvement of fertility in repeat breeding buffaloes even during extreme summer months through suppression of prolactin secretion.

The stimulatory effect of the organic sulfur supplement, mercaptopropane sulfonic acid on cellulolytic rumen

McSweeney, C. S. and Denman, S. E. and Conlan, L. L. and Prasad, C. S. and Anandan, S. and Chandrasekharaiah, M. and Sampath, K. T.

ANIMAL, Vol.3, I. No.6, P.802-809, JUN, 2009

Two metabolism trials (experiments 1 and 2) were conducted to examine the effect of the organic S compound, sodium 3-mercapto-1-propane sulfonic acid (MPS) on feed intake, fiber digestibility, rumen fermentation and abundance of cellulolytic rumen microorganisms in cattle fed low S (<0.11%) roughages. Urea was provided in all treatments to compensate for the N deficiency (<0.6%) in the roughages. In experiment 1, steers (333 +/- 9.5 kg liveweight) were fed Angleton grass (*Dicanthium aristatum*) supplemented with S in equivalent amounts as either MPS (6.0 g/day) or sodium sulfate (9.56 g/day). Supplementation of Angleton grass with either sulfate or MPS resulted in an apparent increase in flow of rumen microbial protein from the rumen. Sulfur supplementation did not significantly change whole tract dry matter digestibility or intake, even though sulfate and MPS supplementation was associated with an increase in the relative abundance of the fibrolytic bacteria *Fibrobacter succinogenes* and anaerobic rumen fungi. Ruminal sulfide levels were significantly higher in the sulfate treatment, which indicated that the bioavailability of the two S atoms in the MPS molecule may be low in the rumen. Based on this observation, experiment 2 was conducted in which twice the amount of S was provided in the form of MPS (8.0 g/day) compared with sodium sulfate (6.6 g/day) to heifers (275 +/- 9 kg liveweight) fed rice straw. Supplementation with MPS compared with sulfate in experiment 2 resulted in an increase in concentration of total volatile fatty acids, and ammonia utilization without a change in feed intake or whole tract fiber digestibility even though S and N were above requirement for growing cattle in both these treatment groups. In conclusion, supplementation of an S deficient low-quality roughage diet with either MPS or sodium sulfate, in conjunction with urea N, improved rumen fermentation, which was reflected in an increase in urinary purine excretion. However, MPS appeared to have a greater effect on stimulating short-chain fatty acid production and ammonia utilization when provided at higher concentrations than sulfate. Thus, the metabolism of MPS in the rumen needs to be investigated further in comparison with inorganic forms of S as it may prove to be more effective in stimulating fermentation of roughage diets.

Influence of IGF-I on buffalo (*Bubalus bubalis*) spermatozoa motility, membrane integrity, lipid peroxidation and fructose

Selvaraju, S. and Reddy, I. J. and Nandi, S. and Rao, S. B. N. and Ravindra, J. P.

ANIMAL REPRODUCTION SCIENCE, Vol.113, I. No.4-Jan,P.60-70, JUN,2009

The objective of the present experiment was to examine the influence of mean physiological concentration of insulin-like growth factor-I (IGF-I) on frozen-thawed Surd buffalo (*Bubalus bubalis*) spermatozoa functional parameters, i.e., motility, plasmalemma integrity, acrosomal integrity, functional membrane integrity, lipid peroxidation and fructose uptake in vitro. Frozen-thawed semen samples (n = 6) were washed in tris buffer and divided into two equal parts (control and IGF-I groups). Only in the IGF-I group, IGF-I (rhIGF-I analogue) was added to a final concentration of 100 ng/ml. The samples were incubated at 37 degrees C for 2h and the assessments were made at 0, 30, 60, 90 and 120 min of incubation. The mean concentration of the buffalo seminal plasma (n = 17) IGF-I was 116.83 +/- 28.34 ng/ml (range 41.4-198.95). IGF-I had significant effect on the total motility (P < 0.01), progressive forward motility (P < 0.01), functional membrane integrity (P < 0.05) and lipid peroxidation levels (P < 0.05) during the 120-min study period as assessed by area under curve. Treatment with IGF-I increased (P < 0.01) the total spermatozoa motility at 30, 60 and 90 min as compared to the control. The progressive forward motility was significantly (P < 0.01) higher at 60 and 90 min of incubation. The addition of IGF-I resulted in significant (P < 0.01) increase in straight-line velocity (VSL, μ m/s) as compared to the control at 60 and 90 min of incubation. The linearity (%) was significantly (P < 0.01) higher in IGF-I treated semen as compared to control at 60 min of incubation. Plasmalemma integrity in IGF-I group was significantly (P < 0.05) higher than control at 30 and 60 min of incubation. The functional membrane integrity differed significantly (P < 0.01) between groups (control and IGF-I) at 60 and 90 min of incubation. The percentage of acrosomal intact spermatozoa decreased continuously over a period of time in both the groups. As compared to 0 min of incubation, the significant (P < 0.05) loss of acrosome was observed at 60 and 90 min of incubation in control (63.87 +/- 3.17 vs. 58.52 +/- 2.54) and IGF-I (61.60 +/- 2.26 vs. 56.11 +/- 2.12) groups, respectively. Lipid peroxidation levels were significantly lower in IGF-I group at 90 min (P < 0.05) and 120 min (P < 0.01) of incubation than the control group. Fructose utilization was significantly higher in IGF-I group as compared to control at 30 min (P < 0.05) and 60 min (P < 0.01) of incubation. The present study

Post-thaw development of in vitro produced buffalo embryos cryopreserved by cytoskeletal stabilization and vitrification

Manjunatha, B. M. and Ravindra, J. P. and Gupta, P. S. P. and Devaraj, M. and Honnappa, T. G. and Krishnaswamy, A.

JOURNAL OF VETERINARY SCIENCE, Vol.10, I. No.2,P.153-156, JUN,2009

The present study was conducted to examine post-thaw in vitro developmental competence of buffalo embryos cryopreserved by cytoskeletal stabilization and vitrification. In vitro produced embryos were incubated with a medium containing cytochalasin-b (cyto-b) in a CO₂ incubator for 40 min for microfilament stabilization and were cryopreserved by a two-step vitrification method at 24 degrees C in the presence of cyto-b. Initially, the embryos were exposed to 10% ethylene glycol (EG) and 10% dimethylsulfoxide (DMSO) in a base medium for 4 min. After the initial exposure, the embryos were transferred to a 7 μ l drop of 25% EG and 25% DMSO in base medium and 0.3 M sucrose for 45 sec. After warming, the embryos were cultured in vitro for 72 h. The post-thaw in vitro developmental competence of the cyto-b-treated embryos did not differ significantly from those vitrified without cyto-b treatment. The hatching rates of morulae vitrified without cyto-b treatment was significantly lower than the non-vitrified control. However, the hatching rate of cyto-b-treated vitrified morulae did not differ significantly from the non-vitrified control. This study demonstrates that freezing of buffalo embryos by cytoskeletal stabilization and vitrification is a reliable method for long-term preservation.

Supplementation of ragi (*Eleusine coracana*) grain as a locally available energy source for lactating cows: A field study

Gowda, N. K. S. and Pal, D. T. and Chandrappa, T. and Verma, S. and Chauhan, V. and Maya, G. and Sampath, K. T. and Prasad, C. S.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol. 79, I. No.6, P.594-598, JUN, 2009

Energy has been identified as a major limiting nutrient for dairy production in rainfed agri-eco zone of Karnataka. Hence as a nutritional strategy and refinement in the existing feeding schedule using locally available source of energy ingredient like ragi (*Eleusine coracana*) grain was supplemented to dairy cows during their early to mid lactation period in Anagalapura village in Doddaballapur taluk of Bangalore Rural district of Karnataka, under practical feeding conditions for 90 days. Milk yield (Average 1.9 litre/cow/day), fat and solid not fat content (Av. 0.2-0.3%) of milk were increased and milk urea content was reduced due to feeding of ragi grain. This indicated that strategic supplementation of energy feed ingredient along with bran and cake based diet could increase the efficiency of nutrient utilization in lactating cows and thus increased the production. The village has a co-operative milk producers union society with 100 members as share holders, and collects daily about 275 litre of milk. The technology intervention, refinement of existing feeding system and its demonstration has created a greater awareness of its benefits. The increase in milk production as a result of feeding ragi grain as an energy source has resulted in a net increase in income of about Rs 19.00 (Rs ninteen only) per cow per day. Besides, there are other long-term benefits like improvement in the energy status of cow, and hence

r e p r o d u c t i v e e f f i c i e n c y .

Effect of supplementation of area specific mineral mixture in improving reproductive efficiency in crossbred dairy cattle-a field

Selvaraju, S. and Reddy, I. J. and Gowda, N. K. S. and Prasad, C. S. and Ananthram, K. and Sampath, K. T.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.79, I. No.6,P.599-601, JUN,2009

The efficacy of a supplemental mineral mixture (area specific mineral mixture, ASMM) on improving reproductive efficiency in crossbred dairy cattle was assessed in this study. Out of the 110 crossbred dairy cattle examined, 73 were had reproductive problems such as postpartum anestrus and repeat breeding (28% each), followed by delayed puberty (21%), silent heat (10%), infectious endometritis of mild to moderate degree (10%) and cystic ovary (3%). Among the postpartum anestrus animals, 84.21 and 85.71% exhibited estrus and conceived, respectively, within 2 months of ASMM supplementation. Among the repeat breeders, which received the ASMM, 78.6% conceived within 2 inseminations. Onset of estrus occurred in 66.7% of the delayed pubertal animals, which received the ASMM supplementation. Among the silent heat animals, 66.7% conceived within 3 months of the ASMM supplementation. The present study indicated that supplementation of the ASMM improved reproductive performance in crossbred dairy cattle.

Micronutrients utilization, antioxidant enzyme and immunoglobulin level in sheep supplemented inorganic and

Pal, D. T. and Gowda, N. K. S. and Prasad, C. S. and Amarnath, R. and Bellur, S. R. and Sampath, K. T.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol. 79, I. No.6, P.615-619, JUN, 2009

The effect of dietary supplementation of Cu- and Zn-methionine oil macro and micronutrients utilization as well as antioxidant enzyme (Cu/Zn-superoxide dismutase) and total immunoglobulin (TIG) levels were Studied in sheep (Bannur breed) in a 240-day feeding trial. The sheep were supplemented 50% more Cu and Zn either from Cu- and Zu-sulphate (inorganic group) or from methionine-chelated Cu and Zn sources (organic group) oil a corn-soybean meal and para grass-based basal diet. Blood samples were obtained at monthly interval for estimation of macro and micro mineral status, antioxidant enzyme (Cu/Zn-SOD) and total immunoglobulin levels. Plasma Cu and Zn concentration was significantly higher ill sheep that received organic form than in those received inorganic sources of Cu and Zn, Whereas macro minerals (Ca, P and Mg) concentrations ill blood plasma were similar in both the groups. The dietary sources of Cu and Zn did not affect the total immunoglobulin (JIG) level and antioxidant enzyme (Cu/Zn-SOD) in plasma of sheep. Average daily feed intake and daily gain as well as macronutrient (DM, OM and CP) utilization was not affected by the dietary Sources Of Cu and Zn in sheep. However, dry matter intake was 8.1% less for similar body weight, am in sheep fed organic than inorganic source Of Cu and Zn, which resulted in better feed: gain ratio ill this group. Results of higher gut absorption tissue retention and lower excretion of Cu and Zn from organic Source with similar intake of these minerals in the present study revealed that the supplementation of Cu and Zn from organic Sources (Cu- and Zn-methionine) could have beneficial effect on animal and could be used in nutritional programmes for improving the efficiency of animal production and Useful to reduce the negative environmental impact of using inorganic Sources of minerals to animals.

Plasma progesterone, oestradiol-17 beta and total oestrogen profiles in relation to oestrous behaviour during induced

Roy, K. S. and Prakash, B. S.

JOURNAL OF ANIMAL PHYSIOLOGY AND ANIMAL NUTRITION, Vol.93, I. No.4, P.486-495, AUG,2009

P>The objectives of this study were to establish the characteristics of oestrous behaviour in Ovsynch (induction of ovulation through administration of GnRH-PGF(2 alpha)-GnRH in a systemic manner on 0, seventh and ninth day respectively) and Ovsynch plus Norprolac (Quinagolide hydrochloride - an inhibitor of prolactin secretion) treated Murrah buffalo heifers and to determine the relationships between this behaviour and the plasma concentrations of oestradiol-17 beta (E(2)), total oestrogen, and progesterone. Oestrus was detected by visual observations of oestrus signs, per rectal examination of genitalia and bull parading thrice a day during treatment period. Among all the symptoms, it was observed that bull mounting of heifers in oestrus was highest. Examination of genital tracts per rectum revealed that the cervix was relaxed, uterus was turgid and ovaries had palpable follicle in animals with oestrus. The peak concentrations of E(2) (10.81 +/- 0.62 pg/ml) and total oestrogen (17.11 +/- 1.21 pg/ml) occurred at 9.45 +/- 0.85 and 9.64 +/- 0.93 h after second GnRH administration, respectively, in Ovsynch treated animals. However, the peak levels of E(2) (20.02 +/- 2.87 pg/ml) and total oestrogen (32.71 +/- 3.15 pg/ml) occurred at 10.18 +/- 0.50 and 10.36 +/- 0.75 h after second GnRH administration, respectively, in Ovsynch plus Norprolac treated animals. Plasma progesterone concentration was basal (0.20 +/- 0.001 ng/ml) during the peri-oestrus period. The plasma progesterone concentration was the lowest on the day of oestrus and increased to register a peak on day 13 +/- 2 of the cycle. Oestrous behaviour was positively correlated with the peak concentration of E(2) ($p < 0.001$) and total oestrogen ($p < 0.001$) during the peri-oestrus period. Inhibition of prolactin by Norprolac administration significantly increased the concentration of E(2) and total oestrogen during oestrus in buffaloes in comparison to those recorded in animals subjected to Ovsynch protocol alone. In conclusion, our results suggest that the peak concentrations of E(2) and total oestrogen and mean level of E(2) and total oestrogen during the peri-oestrus period are the important factors contributing the behavioural manifestation of o e s t r u s i n b u f f a l o c o w s .

ISOLATION, CULTURE AND CHARACTERIZATION OF ENDOMETRIAL EPITHELIAL CELLS IN BUFFALO (BUBALUS

Mondal, S. and Nandi, S. and Reddy, I. J. and Suresh, K. P.

BUFFALO BULLETIN, Vol.28, I. No.2,P.101-106, JUN,2009

In the present study, the authors isolated and developed the culture of endometrial epithelial cells from buffalo uterus as well as evaluated functional properties of epithelial cells. In primary culture, epithelial cells appeared cuboidal or columnar and showed contact inhibition at the stage of confluence. Protein and DNA concentrations were found to increase with the time in culture. PGF(2 alpha) concentrations declined from 7.25 +/- 2.02 pg/mu g DNA on Day 3 of culture to 6.33 +/- 1.80 pg/mu g DNA on Day 5 of culture and thereafter to 2.98 +/- 1.09 pg/mu g DNA on Day 7 of culture in endometrial epithelial cells. It was concluded that buffalo endometrial epithelial cells could serve as an excellent model for studying the specific role of PGF(2 alpha) in maternal recognition of pregnancy and implantation.

Efficacy of Moringa oleifera and Aloe vera on Aflatoxin B1-induced hepatotoxicity in rats

Suganthi, Umaya R. and Parvatham, R.

RESEARCH JOURNAL OF BIOTECHNOLOGY, Vol.4, I. No.3,P.20-24, AUG,2009

The aim of this work was to evaluate the protective effect of the plant products, Moringa oleifera leaf juice, drumstick pulp powder and Aloe vera gel against aflatoxin B1 induced hepatotoxicity in rats. AFB1 treatment at the dose of 50 µg/kg BW in rats increased the levels of hepatic marker enzymes and lipid peroxidation products and decreased the circulating antioxidants. Supplementation of Moringa oleifera leaf juice at doses 0.5 ml ml/kg BW and 1.0 ml/kg BW, drumstick pulp powder at doses 2g/kg BW and 3g/kg BW and Aloe vera gel at doses 0.5 ml ml/kg BW and 1.0 ml/kg BW along with AFB1 decreased the hepatic marker enzymes and lipid peroxidation products with a concomitant increase in the levels of antioxidants, vitamin C, vitamin E, beta-carotene and reduced glutathione. Furthermore, the hepatic marker enzymes, lipid peroxidation products and antioxidants in rats supplemented with Moringa oleifera leaf juice at the dose of 1.0 ml/kg BW, drumstick pulp powder at the dose of 3g/kg BW and Aloe vera gel at the dose of 1.0 ml/kg BW were oil par with that of controls fed the standard diet. The study shows that Moringa oleifera leaf juice, drumstick pulp powder and Aloe vera gel could provide protection against A F B 1 i n d u c e d h e p a t o t o x i c i t y i n r a t s .

Factors affecting laboratory production of buffalo embryos: A meta-analysis

Suresh, K. P. and Nandi, S. and Mondal, S.

THERIOGENOLOGY, Vol.72, I. No.7,P.978-985, 15-Oct,2009

In vitro fertilization (IVF) provides an excellent and inexpensive source of embryos for carrying out basic research on developmental physiology, farm animal breeding, and for commercial applications. Meta-analysis of the results from different publications rather than a narrative review may provide a current status of this technology in buffalo (*Bubalus bubalis*). In order to gain an idea of the factors affecting the IVF in buffalo, a review of the various studies conducted on buffalo IVF and a meta-analysis of their findings was undertaken. More than 100 articles published from 1991 to 2008 were searched, and results were subjected to meta-analysis to determine the treatment variations without any bias. Thirty factors affecting in vitro embryo production in buffalo were considered. Initially, both fixed- and random-effect models were used. We did not observe any heterogeneity between the studies. Thereafter, all the studies were pooled using the fixed-effect model for analysis. Our analysis suggested that good buffalo oocytes with more than three to five cumulus layers recovered from large-sized follicles in cold seasons when cultured in TCM-199 supplemented with serum, follicle-stimulating hormone, and cysteamine resulted in maximum maturation rate and subsequent embryonic development after insemination. The values obtained in the current study may be considered for a simulation model in establishing a cost-effective suitable method for buffalo IVF in further planned research. (C) 2009 Published by Elsevier Inc.

Level of cottonseed meal but not frequency of feeding regulates whole-body protein synthesis and growth of sheep fed a

Kahn, L. P. and Rao, Somu B. N. and Nolan, J. V.

ANIMAL PRODUCTION SCIENCE, Vol.49, I. No.11, P.1023-1028, ,2009

An incomplete factorial experiment was conducted to determine the effect of level and frequency of feeding of a protein-rich supplement on the growth and whole-body protein metabolism of young sheep fed a medium quality roughage diet. Cottonseed meal (CSM) was used as the protein supplement and provided at 0, 0.2 or 0.4% liveweight per day at a frequency of 1 or 3 times each week and chopped oaten (0.95) and lucerne (0.05) hay was the roughage. Growth rate more than doubled ($P < 0.01$) following provision of CSM but there was no advantage of feeding CSM at the highest level. Frequency of feeding CSM did not alter growth rate. Intake of hay was little affected by CSM and as a consequence the food conversion ratio declined ($P < 0.01$) favourably from 22 : 1 (nil CSM) to 9:1 as a result of supplementation. The rate of whole-body protein synthesis increased ($P < 0.01$) in response to the highest level of CSM with no apparent change in protein degradation, underpinning an increase ($P < 0.01$) in protein retention. These results highlight the role of protein supplements for promoting growth of young sheep on roughage diets and indicate that these supplements need to be provided only once a week.

Effects of turmeric (*Curcuma longa*) on the expression of hepatic genes associated with biotransformation, antioxidant, and

Yarru, L. P. and Settivari, R. S. and Gowda, N. K. S. and Antoniou, E. and Ledoux, D. R. and Rottinghaus, G. E.

POULTRY SCIENCE, Vol.88, I. No.12,P.2620-2627, 1-Dec,2009

The objective of the present study was to evaluate the efficacy of curcumin, an antioxidant found in turmeric (*Curcuma longa*) powder (TMP), to ameliorate changes in gene expression in the livers of broiler chicks fed aflatoxin B(1) (AFB(1)). Four pen replicates of 5 chicks each were assigned to each of 4 dietary treatments, which included the following: A) basal diet containing no AFB(1) or TMP (control), B) basal diet supplemented with TMP (0.5%) that supplied 74 mg/kg of curcumin, C) basal diet supplemented with 1.0 mg of AFB(1)/kg of diet, and D) basal diet supplemented with TMP that supplied 74 mg/kg of curcumin and 1.0 mg of AFB(1)/kg of diet. Aflatoxin reduced ($P < 0.05$) feed intake and BW gain and increased ($P < 0.05$) relative liver weight. Addition of TMP to the AFB(1) diet ameliorated ($P < 0.05$) the negative effects of AFB(1) on growth performance and liver weight. At the end of the 3-wk treatment period, livers were collected (6 per treatment) to evaluate changes in the expression of genes involved in antioxidant function [catalase (CAT), superoxide dismutase (SOD), glutathione peroxidase (GPx), glutathione S-transferase (GST)], biotransformation [epoxide hydrolase (EH), cytochrome P450 1A1 and 2H1 (CYP1A1 and CYP2H1)], and the immune system [interleukins 6 and 2 (IL-6 and IL-2)]. Changes in gene expression were determined using the quantitative real-time PCR technique. There was no statistical difference in gene expression among the 4 treatment groups for CAT and IL-2 genes. Decreased expression of SOD, GST, and EH genes due to AFB(1) was alleviated by inclusion of TMP in the diet. Increased expression of IL-6, CYP1A1 and CYP2H1 genes due to AFB(1) was also alleviated by TMP. The current study demonstrates partial protective effects of TMP on changes in expression of antioxidant, biotransformation, and immune system genes in livers of chicks fed AFB(1). Practical application of the research is supplementation of TMP in diets to prevent or reduce the effects of aflatoxin in chicks fed aflatoxin-contaminated

d i e t s .

Antioxidant efficacy of curcuminoids from turmeric (*Curcuma longa* L.) powder in broiler chickens fed diets containing aflatoxin

Gowda, Nisarani K. S. and Ledoux, David R. and Rottinghaus, Goerge E. and Bermudez, Alex J. and Chen, Yin C.

BRITISH JOURNAL OF NUTRITION, Vol.102, I. No.11, P.1629-1634, 14-Dec,2009

A 3-week-feeding Study (1-21 d post-hatch) was conducted to evaluate the efficacy of total curcuminoids (TCMN), as an antioxidant, to ameliorate the adverse effects of aflatoxin B(1) (AFB(1)) in broiler chickens. Turmeric powder (*Curcuma longa* L.) that contained 2.55% TCMN was used as a source of TCMN. Six cage replicates of five chicks each were assigned to each of six dietary treatments, which included: basal diet; basal diet supplemented with 444 mg/kg TCMN; basal diet supplemented with 1.0 mg/kg AFB(1); basal diet supplemented with 74 mg/kg TCMN and 1.0 mg/kg AFB(1); basal diet supplemented with 222 mg/kg TCMN and 1.0 mg/kg AFB(1); basal diet supplemented with 444 mg/kg TCMN and 1.0 mg/kg AFB(1). The addition of 74 and 222 mg/kg TCMN to the AFB(1) diet significantly ($P<0.05$) improved weight gain and feed efficiency. Increase ($P<0.05$) in relative liver weight in birds fed AFB(1) was significantly reduced ($P<0.05$) with the addition of 74, 222 and 444 mg/kg TCMN to the AFB(1) diet. The inclusion of 222 mg/kg TCMN ameliorated the adverse effects of AFB(1) on serum chemistry in terms of total protein, albumin and gamma-glutamyl transferase activity. The decreased antioxidant functions due to AFB(1) were also alleviated by the inclusion of 222 mg/kg TCMN. It is concluded that the addition of 222 mg/kg TCMN to the 1.0 mg/kg AFB(1) diet demonstrated maximum antioxidant activity against AFB(1).

Endocrine Profiles of Oestrous Cycle in Buffalo: A Meta-analysis

Mondal, S. and Suresh, K. P. and Nandi, S.

*ASIAN-AUSTRALASIAN JOURNAL OF ANIMAL SCIENCES, Vol.23, I. No.2,P.169-174,
FEB,2010*

A meta-analysis was conducted to summarize the results of studies which have described the profiles of hormones during the oestrous cycle in buffalo using a fixed effect model and a random effect model. Plasma progesterone concentrations were lowest (0.30 +/- 0.06 ng/ml) during the peri-oestrous phase and increased ($p = 0.067$) through the early luteal phase to a maximum concentration (1.94 +/- 0.03 ng/ml) during the mid-luteal phase. Circulating plasma inhibin and estradiol concentrations were lowest (0.31 +/- 0.01 and 11.04 +/- 0.13 ng/ml) during the mid-luteal phase, increased through the late luteal phase to maximum concentrations (0.44 +/- 0.02 and 22.48 +/- 0.32 ng/ml) during the peri-oestrous phase. Plasma FSH concentrations were lowest during the early luteal phase and increased through the mid-luteal phase to a maximum concentration during the peri-oestrous phase. Peripheral prolactin concentrations were lowest during the late luteal phase and increased to a maximum concentration during the peri-oestrous phase which then declined ($p = 0.716$) during the early luteal phase. Peripheral plasma cortisol concentrations decreased from 2.68 +/- 0.14 ng/ml during the early luteal phase to 1.43 +/- 0.27 ng/ml during the mid-luteal phase ($p < 0.001$) which then increased to 2.06 +/- 0.17 ng/ml during the late luteal phase. Plasma T(3) concentrations decreased from the late luteal phase to the peri-oestrous phase ($p < 0.001$) which then increased during the early luteal phase. T(4) concentrations increased from the late luteal phase to the peri-oestrous phase which then decreased during the early luteal phase.

Effects of Exposure to Heavy Metals on Viability, Maturation, Fertilization, and Embryonic Development of Buffalo (Bubalus

Nandi, S. and Gupta, P. S. P. and Selvaraju, S. and Roy, S. C. and Ravindra, J. P.

*ARCHIVES OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY, Vol.58, I.
No.1,P.194-204, JAN,2010*

The aim of the present study was to examine the effect of heavy metals, cadmium and lead, on buffalo oocyte viability and in vitro development. Oocytes were aspirated from ovaries of slaughtered buffaloes. Only viable and metabolically active oocytes with more than three layers of cumulus cell layers and homogeneous ooplasm were selected. Effects of nine concentrations (0, 0.005, 0.05, 0.5, 1.0, 1.5, 2.5, 5, and 10 $\mu\text{g/mL}$) of cadmium or lead on buffalo oocyte viability, morphological abnormalities, maturation, and embryonic development in vitro were studied. Oocytes were cultured for 24 h and then checked for viability (0.05% trypan blue staining for 2 min), morphological abnormalities, and reduction assay by MTT test in experiment 1. The doses of cadmium and lead causing 100% oocyte death (1-day culture) were determined (experiment 2). In experiment 3, viable oocytes were matured in vitro in media containing different levels of cadmium or lead and then inseminated in vitro with frozen-thawed spermatozoa, and the resultant cleaved embryos were cultured in a control embryo culture medium for 8 days. In experiment 4, oocytes were cultured in control oocyte maturation medium, then fertilized, and the resultant embryos were cultured in media containing different levels of cadmium or lead for 8 days. The number of cells in the trophectoderm and inner cell mass (ICM) and the total cell counts (TCN) of blastocysts derived by in vitro culture of two- to four-cell-stage embryos (produced in control medium) in media containing 0, 0.005, 0.05, 0.5, and 1.0 $\mu\text{g/mL}$ of cadmium or lead were analyzed by differential staining technique (experiment 5). Cadmium and lead were found to have a dose-dependent effect on viability, morphological abnormalities, maturation, cleavage and morula/blastocyst yield, and blastocyst hatching. A significant decline in viability of oocytes was observed at 1.0 mg/mL cadmium or lead compared to the control group. The doses of cadmium and lead causing 100% oocyte death (1-day culture) were 18 and 32 $\mu\text{g/mL}$, respectively. Cadmium and lead at 1.0 and 2.5 $\mu\text{g/mL}$, respectively, caused a significant reduction of maturation of oocytes compared to the lower concentrations. No cleavage or morulae/blastocysts were produced when the oocytes/embryos were cultured in media containing 2.5 and 5.0 mg/mL of either cadmium or lead, respectively. Similarly, no morulae/blastocysts were produced from cleaved embryos

Production of fibrolytic enzymes in repeat-batch culture using immobilized zoospores of anaerobic rumen fungi

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INDIAN JOURNAL OF BIOTECHNOLOGY, Vol.9, I. No.1, P.87-95, JAN,2010

The zoospores of two isolates of polycentric rumen fungi, *Orpinomyces* NIANP 58 (isolated from the faeces of a buffalo) and *Anaeromyces* NIANP 115 (isolated from the rumen liquor of a cannalulated cow), were immobilized in sodium alginate solution for the production of three fibrolytic enzymes, viz. CMcase, xylanase and beta-glucosidase in repeat-batch culture. Enzyme activity was recorded initially (0 h) and after every 24 h up to 72 h of immobilization. CMCellulase activity of 8.5 +/- 1.205 units at 0 h in *Orpinomyces* showed a very steep increase in the activity (598.00 +/- 26.87), almost 70-fold increase at 48 h of immobilization. This increase was reflected in the specific activity as well, while in case of *Anaeromyces*, an activity of 6.0 +/- 0.851 units at 0 h also showed a very steep increase in activity (322.46 +/- 1.054 units, recording a 50-fold increase at 48 h of immobilization. At 0 h, 28.22 +/- 4.556 units of xylanase activity corresponding to a specific activity of 31.36 +/- 6.225 were obtained in the case of *Orpinomyces*, which increased steeply to 955.11 +/- 54.93 units at 48 h of immobilization. Thereafter, the activity declined to more or less that obtained at 24 h of immobilization though a high specific activity of 791.20 +/- 10.66 was recorded. High xylanase activities were obtained in case of *Anaeromyces* upon immobilization with activity increasing from 56.88 units at 0 h to as high as 1921 units at 72 h. *Anaeromyces* isolate yielded 3.85, 4.246, 8.03 and 23.19 units of beta-glucosidase, whereas *Orpinomyces* isolate yielded 6.09, 14.12, 16.63 and 20.89 units of beta-glucosidase at 0, 24, 48 and 72 h, respectively. The results clearly elucidate the feasibility of using the zoospores of anaerobic rumen fungi for large-scale production of these three enzymes, which have great potential in ruminant nutrition in the breakdown of fibrous feeds and also various industrial applications.

In vitro development of buffalo preantral follicles in co-culture with cumulus or granulosa cells

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VETERINARSKI ARHIV, Vol.80, I. No.1, P.41-50, JAN-FEB,2010

Low reproductive efficiency in buffalo limits the number of offspring produced during lifespan and thus results in under-exploitation of the superior female genetic material. In vitro production of transferable embryos is a method used to overcome Such limitation. Developing a culture system for preantral follicles has important biotechnological implications, due to its potential for producing large number of oocytes for in vitro embryo production. Hence, the effect of the co-culture of buffalo preantral follicles with dispersed somatic cells, like cumulus cells and granulosa cells and their monolayers, was investigated in the present study. Large preantral follicles were isolated from trypsin (1%) digested ovarian cortical Slices. Cumulus and granulosa cell monolayers were prepared by culturing cells until their confluency preantral follicles were co-cultured with dispersed cumulus cells (group 1), the monolayers of cumulus cells (group 2), dispersed granulosa cells (group 3) or the monolayers of granulosa cells (group 4). Large preantral follicles showed significantly higher size, growth rate and survivability when co-cultured with somatic cells dispersed in the medium, as compared to those grown in a monolayer. It was concluded that dispersed somatic cells from buffalo ovarian follicles were more effective in providing support for the growth and survivability of preantral follicles in culture, compared to their monolayers in buffalo.

Relationship between nitric oxide and luteinizing hormone concentration during non-breeding season in Mandya ewes

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INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.80, I. No.1, P.21-23, JAN,2010

This study examined the reproductive activity, synchrony of oestrus and its relationship between nitric oxide (NO) and LH surges during the non-breeding season in sheep. Multiparous female Mandya ewes (12) were divided into control (6 ewes) and treated groups (6 ewes). Ewes in the treated group were exposed to a ram for 3 h in the morning (from 06:00-09:00 h) and 2 h in the evening (16:00-18:00 h) for 30 days during the non-breeding (May-June) season. Controls were exposed to the ram for 15 min in the morning and evening to detect oestrus. Ram introduction advanced the onset of seasonal ovarian activity in the treated ewes compared to controls. Mean occurrence of oestrus in treated ewes was 100% compared to controls, with higher incidences of oestrus during the morning hours than the evening hours after ram introduction. Profiles of NO, LH, P4 and E2 varied between the animals in both the groups. LH surge occurred 8 h after the onset of oestrus with high NO and E2 beta in treated ewes as against the controls with LH surge of 17 h after the onset of oestrus. In conclusion, NO plays a positive role on LH surges thereby shortening the oestrous cycle, improving the occurrence of oestrus for breeding of Mandya ewes in the non-breeding season.

Isolation, culture and characterization of endometrial stromal cells in buffalo

Mondal, S. and Nandi, S. and Reddy, I. J. and Suresh, K. P.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.80, I. No.1, P.24-26, JAN, 2010

The study was conducted to isolate, culture and characterize the primary culture of stromal cells isolated from buffalo uterus. Buffalo uteri were collected from the local abattoir. The uteri in the midoestrous cycle were used in the study. The stromal cells were separated from buffalo endometrium. Endometrial tissues were washed in PBS three-times and digested in RPMI-1640 medium containing 0.1% collagenase at 37 degrees C for 1 h. The number of viable cells that excluded trypan blue was counted using a haemocytometer and were cultured in RPMI-1640 medium with 10% bovine fetal serum. The stromal cells obtained after digestion with collagenase consisted of a mixture of fibroblasts, erythrocytes and epithelial cells. The stromal cells attached to culture dishes within 36-48 h after plating. It was observed that the stromal cells were flat, fibroblastic and spindle shaped, and showed streaming at the confluence stage in primary culture. Stromal cells grew rapidly at first, but slowed down on day 7 as the culture approached confluence. The protein concentrations increased from days 3 to 5 and further on day 7 of culture. It is concluded that endometrial stromal cells from buffalo uterus are isolated, cultured and characterized in this study.

Improvement in buffalo (*Bubalus bubalis*) spermatozoa functional parameters and fertility in vitro: Effect of insulin-like growth

Selvaraju, S. and Nandi, S. and Subramani, T. Siva and Raghavendra, B. S.
and Rao, S. B. N. and Ravindra, J. P.

THERIOGENOLOGY, Vol.73, I. No.1,P.10-Jan, 1-Jan,2010

The aim of the current study was to assess the effect of insulin-like growth factor-I (IGF-I; 100 ng/mL) on buffalo (*Bubalus Bubalis*) sperm functional parameters related to in vitro fertilization. The acrosin activity (the mean diameter of halo formation in micrometers) was significantly higher in the IGF-I group (14.17 +/- 1.51) compared with that in the control group (9.50 +/- 0.36) at 2 h incubation. The mitochondrial membrane potential (per cent) was significantly higher in the IGF-I group compared with that in the control group at 30 min (33.27 +/- 2.62 vs. 26.71 +/- 1.02), 60 min (24.24 +/- 3.45 vs. 18.77 +/- 2.09), and 90 min (22.86 +/- 3.02 vs. 16.92 +/- 1.24) incubation. The percentage of spermatozoa positive for sperm nuclear chromatin decondensation (NCD) differed significantly between the groups at 90 and 120 min incubation. The comet length was significantly lower in the IGF-I group compared with that in the control group at 2 h incubation. The percentage of fragmented DNA in the tail did not differ significantly between the groups at 2 h incubation. The percentage of acrosomal-reacted spermatozoa did not differ significantly between the IGF-I and the control groups at 4 h (41.12 +/- 6.44 vs. 43.53 +/- 5.05) incubation. The cleavage rate (per cent) was significantly higher in the IGF-I treated group (56.73 +/- 3.70) compared with that in the control group (44.85 +/- 2.15). The current study suggests that the addition of IGF-I prevents deterioration of sperm functional parameters and fertility. (C) 2010 Elsevier Inc. All rights reserved.

Effect of copper- and zinc-methionine supplementation on bioavailability, mineral status and tissue concentrations of copper

Pal, D. T. and Gowda, N. K. S. and Prasad, C. S. and Amarnath, R. and Bharadwaj, U. and Babu, G. Suresh and Sampath, K. T.

JOURNAL OF TRACE ELEMENTS IN MEDICINE AND BIOLOGY, Vol.24, I. No.2,P.89-94, ,2010

The effect of feeding Cu- and Zn-methionine to ewes was studied in a 240d feeding trial. The plasma and tissue Cu and Zn concentrations and Cu/Zn-superoxide dismutase (Cu/Zn-SOD) activity were employed to assess the relative bioavailability from Cu- and Zn-methionine. The macro and micronutrient intake, utilization, plasma mineral status, tissue accumulation of Cu and Zn as well as wool concentration of Cu and Zn were studied in ewes (n=12) fed a corn-soybean meal based basal diet with 50% more Cu and Zn supplementation over the basal diet either from Cu- and Zn-sulfate (Cu-Sulf+Zn-Sulf group) or Cu- and Zn-methionine (Cu-Meth+Zn-Meth group). The average daily feed intake and body weight gain of ewes did not differ due to dietary supplementation of Cu- and Zn-methionine. However, dry matter intake was comparatively lower and thus resulted in better feed: gain in Cu- and Zn-methionine group as compared to ewes fed Cu- and Zn-sulfate. Supplementation of Cu and Zn over the basal diet either from methionine-chelated or sulfate sources resulted in increased plasma Cu and Zn as well as Cu/Zn-SOD activity on d-30, which indicated a positive correlation between plasma Cu and Zn and Cu/Zn-SOD activity. The gut absorption, liver concentrations of Cu and Zn, and liver Cu/Zn-SOD activity were significantly ($P<0.01$) higher in ewes supplemented with Cu- and Zn-methionine compared to Cu- and Zn-sulfate. Periodical analysis of wool samples indicated no significant difference in Cu and Zn content between Cu-and Zn-methionine and Cu-and Zn-sulfate groups. Feeding of Cu and Zn from methionine-chelated source resulted in reduced ($P<0.01$) excretion of Cu and Zn in feces indicating their better utilization, and this will have positive implication on environment. The gut absorption values, plasma and liver tissue concentrations of Cu and Zn supported the hypothesis that Cu- and Zn-methionine supplements have better bioavailability compared to Cu- and Zn-sulfate and Cu- and Zn-dependent enzyme (Cu/Zn-SOD) could be used to determine the bioavailability of Cu and Zn. (c) 2009 Elsevier GmbH. All rights reserved.

Changes in luteal cells distribution, apoptotic rate, lipid peroxidation levels and antioxidant enzyme activities in buffalo

Selvaraju, S. and Raghavendra, B. S. and Subramani, T. Siva and Priyadharsini, R. and Reddy, I. J. and Ravindra, J. P.

ANIMAL REPRODUCTION SCIENCE, Vol.120, I. No.4-Jan,P.39-46, JUL,2010

Buffalo (*Bubalus bubalis*) is known for its weak/silent estrous behaviour, lower conception rate and longer inter-calving interval as compared to cattle. Understanding the kinetics and functional properties of luteal cells may be helpful to improve reproductive efficiency in the buffalo. Hence the present study was designed to assess the size and distribution of steroidogenic luteal cells along with biochemical properties during different phases of corpus luteum (CL) in the buffalo. The ovaries collected from the local abattoir were classified into three phases, early, mid and late, based on the morphological appearance of the CL as well as the follicles in the ovary. The proportion (%) of the luteal cells (>10 μ m diameter) increased ($P < 0.01$) from early (30.7 \pm 1.3) to mid (36.30 \pm 1.6), and then decreased ($P < 0.01$) in late luteal (31.46 \pm 1.8) phases. Percentage of small luteal cells (10-20 μ m diameter) was higher ($P < 0.05$) in early (58.47 \pm 0.61) and mid (61.29 \pm 0.67) than late luteal (37.18 \pm 1.50) phases of CL. However, the percentage of large luteal cells (20-50 μ m diameter) was higher ($P < 0.05$) only in late (62.82 \pm 1.50) than early (41.53 \pm 0.61) and mid (38.71 \pm 0.67) phases of CL. The average size (μ m) of the large luteal cells increased ($P < 0.05$) from early (25.46 \pm 0.62) to mid (27.15 \pm 0.5) and late (28.86 \pm 0.47) luteal phases. The percentage of luteal cells expressing in situ DNA fragmentation was significantly ($P < 0.05$) higher in the late luteal (41.17 \pm 5.8) than mid-luteal (21.15 \pm 4.9) phase of the CL. In the early stage, half of the steroidogenic luteal cells had significantly ($P < 0.05$) less 3 beta-HSD activity than the other two phases. In the mid stage, the steroidogenic luteal cells had significantly higher ($P < 0.05$) intense 3 beta-HSD activity than the other two phases. Further in the late phase, a significant ($P < 0.05$) reduction in intense 3 beta-HSD activity was observed in the large luteal cells. The lipid peroxidation (μ mol/g of CL) levels were significantly ($P < 0.05$) higher in late luteal (3.46 \pm 0.2) than the mid-luteal (1.43 \pm 0.16) phases. The superoxide dismutase and catalase enzyme levels (U/mg of protein) were also significantly ($P < 0.05$) higher in late luteal (0.9 \pm 0.015 and 3.37 \pm 0.45, respectively) than the mid-luteal (0.1 \pm 0.01 and 2.34 \pm 0.3, respectively) phases. In contrast, the GPx activity (U/mg of protein) decreased significantly ($P < 0.05$) from mid-luteal (1.85 \pm 0.4) to late luteal (1.22 \pm 0.2) phases. The present study suggests

Effect of variable rumen degradable nitrogen levels on microbial protein synthesis estimated with purine derivatives in sheep urine

Chandrasekharaiah, M. and Thulasi, A. and Sampat, K. T.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.80, I. No.7, P.674-678, JUL, 2010

An experiment was conducted to study the effect of varying rumen degradable nitrogen (RDN) levels on microbial protein synthesis in sheep by measuring excretion of purine derivatives in spot urine samples and purine derivatives: creatinine (PDC) index. Sheep (30) were divided into 5 groups of 6 each and the animals in all groups were fed finger-millet straw (FMS) as a basal diet and soybean extraction as a nitrogen source. The animals in group 1 were fed with ad lib. FMS. Animals in group 2, 3, 4 and 5 were offered soybean extraction@ 16.16, 20.65, 24.75 and 26.64 g RDN/kg DOM along with FMS. The experimental feeding was continued for 2 months followed by metabolism trial. The purine derivatives (mmol/litre) excretion and PDC index were 18.74 and 34.37; 17.88 and 40.68; 20.82 and 42.62; 15.92 and 49.36 and 16.92 and 45.62; 15.92 and 49.36 and 16.92 and 45.44, in group 1 through 5, respectively. The microbial purine absorption, the microbial nitrogen (MN) supply (g/d) were comparable among the RDN supplemented groups. Purine nitrogen index (PNI) and nitrogen conversion efficiency (NCE) values were 0.10 and 1.17; 0.10 and 0.78; 0.07 and 0.65 and 0.06 and 0.62, respectively, in G 2 through 5. The result indicated that 16.16 g RDN from soybean extraction may be adequate for optimum microbial protein synthesis in sheep fed on FMS based diet.

Estimation of microbial protein synthesis efficiency in sheep using purine nitrogen index and nitrogen capture efficiency

Chandrasekharaiah, M. and Thulasi, A. and Sampath, K. T.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.80, I. No.8,P.758-763, AUG,2010

An experiment was conducted to evaluate the efficiency of utilization of rumen degradable nitrogen (RDN) for optimum microbial protein synthesis in sheep by the use of possible potential parameters such as purine nitrogen index (PNI) and nitrogen capture efficiency (NCE), which was estimated from purine derivatives excretion in spot urine samples. Sheep (36) were divided into 4 groups of 9 each and the animals in all groups were fed finger millet straw (FMS) as a basal diet and groundnut cake (GNC) as a nitrogen source. The animals in group 1(G1) were fed with ad lib. FMS. Animals in groups 2, 3 and 4 (G2, G3 and G4) were offered GNC@ 14, 18, and 23 g RDN/kg digestible organic matter (DOM) along with FMS. The experimental feeding was continued for 1 month followed by a metabolism trial of 7days. A total of 4 spot urine samples from each sheep were collected at 6 h intervals each day during last week of 1 month feeding period. The total purine derivatives (mmol/litre) excretion and purine derivatives; creatinine (PDC) index recorded were 17.52 and 38.07; 20.53 and 50.09; 24.30 and 51.10 and 18.65 and 39.17, respectively in G1, 2, 3 and 4, respectively. The microbial purine absorption, the calculated microbial nitrogen (MN) supply (g/d) was comparable among the RDN supplemented groups (G2, G3 and G4). PNI and NCE values recorded were 0.19 and 1.40; 0.19 and 1.05 and 0.13 and 0.62, respectively in G2, G3 and G4. The results indicated that 14 g RDN from GNC may be adequate for optimum microbial protein synthesis in sheep fed on FMS based diet. Further, PM and NCE estimated in spot urine of sheep fed ad lib. appeared to be useful
i n e v a l u a t i o n o f r u m i n a n t d i e t s .

Effect of some plant extracts on growth performance, intestinal morphology, microflora composition and activity in broiler

Vidanarachchi, J. K. and Elangovan, A. V. and Mikkelsen, L. L. and Choct, M. and Iji, P. A.

ANIMAL PRODUCTION SCIENCE, Vol.50, I. No.9,P.880-889, ,2010

An experiment was conducted to study the effects of water-soluble carbohydrate extracts from Cabbage tree (*Cordyline australis*), Acacia (*Acacia pycnantha*), and Undaria seaweed (*Undaria pinnatifida*) (at 5 or 10 g/kg diet) on the performance and gut microbiota of broilers. The plant extracts had no negative effect on growth performance, except that a high level of Undaria extract in the diet suppressed the growth of broiler chicks. Ileal digesta viscosity was increased ($P < 0.05$) and apparent ileal digestibility of fat was depressed ($P < 0.05$) in birds fed the higher level of Undaria extract compared with the negative control. The plant extracts increased ($P < 0.05$) the numbers of lactobacilli in the ileum and caeca. The high levels of Acacia extract and Undaria extract significantly ($P < 0.05$) reduced the population of coliform bacteria in the ileum compared with the negative control group. The population of *Clostridium perfringens* in caeca, but not the ileum, was reduced ($P < 0.05$) by the plant extracts. An antibiotic positive control reduced the population of *C. perfringens* in both the ileum and caeca compared with the negative control group. The plant extracts altered microbial fermentation patterns in the ileum and caeca. The higher level of Undaria extract reduced villus height in the ileum while the antibiotic diet resulted in higher ($P < 0.05$) villus height and villus height : crypt depth ratio compared with the negative control group. The results of the study suggest that prebiotic plant extracts had no negative effect on performance of broilers except at a high level (10 g/kg diet) of Undaria extract. The plant extracts beneficially modulated the composition of the microflora in the ileum and caeca by increasing the number of lactobacilli and reducing harmful bacteria, such as potential pathogenic coliforms and *C. perfringens*.

Dynamic In Vivo Changes in the Activities of Gelatinases, Matrix Metalloproteinases (MMPs), and Tissue Inhibitor of

Roy, Sudhir C. and Ghosh, Jyotirmoy

MOLECULAR REPRODUCTION AND DEVELOPMENT, Vol.77, I. No.11,P.944-953, NOV,2010

In ruminants, the phenomenon of endometrial tissue remodeling during the estrous cycle and early pregnancy is not fully understood. In this report, the occurrence of tissue remodeling, if any, in buffalo endometrium was studied by detecting gelatinases, matrix metalloproteinases (MMPs) and tissue inhibitors of metalloproteinases (TIMPs); the key regulators of tissue remodeling, in uterine luminal fluids (ULF) of cycling and early pregnant (approx. 43-65 days) buffaloes. Each stage of the estrous cycle and pregnant ULF demonstrated a unique profile of gelatinase activities compared to serum/follicular fluid, with a major gelatinase band of 60 kDa with highest activity in early-luteal stage. In addition to a 32 kDa uterus-specific gelatinase band detected in both non-pregnant and pregnant ULFs, the pregnant ULF displayed three new gelatinase bands of 86, 78, and 57 kDa. Western blot technique confirmed the presence of MMP-2 (54 kDa), MMP-9 (76/73 kDa), TIMP-1 (32 kDa), TIMP-2(20 kDa), and two molecular weight forms (31 and 22 kDa) of TIMP-3 in buffalo ULF with varying band intensities. Highest MMP-2 and MMP-9 activities were observed in follicular and early-luteal stage ULFs, respectively. Highest TIMP-1 activity was observed in early-luteal ULF. Interestingly, TIMP-2 activity was only detected in mid-luteal, late-luteal, and follicular stage ULFs with significantly increasing intensities. Highest activities of 31 and 22 kDa TIMP-3 were associated with late-luteal and early-luteal stage ULFs, respectively. The varied activities of MMPs and TIMPs in buffalo ULF during the estrous cycle and early pregnancy might be a reflection of dynamic structural remodeling of the endometrium and/or developing conceptus.

Effect of IGF-I on spermatozoa membrane protein profile and correlation between seminal plasma IGF-I and antioxidant

Selvaraju, S. and Subramani, T. Siva and Raghavendra, B. S. and Ravindra, J. P.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.80, I. No.12,P.1171-1174, DEC,2010

The present study assessed the effect of insulin like growth factor I (IGF-I) on spermatozoa membrane protein profile and relationship between IGF-I and antioxidant levels in buffalo (*Bubalus bubalis*) semen. Immediately after semen collection (n = 8), the seminal plasma and spermatozoa cells were separated by centrifugation (5000 g/10 min) and the seminal plasma IGF-I and antioxidant enzymes estimations were carried out. The spermatozoa were diluted (20 million cells/ml) in a tris-egg yolk extender, IGF-I (100 ng/ml of the semen) was added and incubated at 37 C for 2 h. Membrane proteins were extracted with 0.1% Triton X 100 and protein profile was carried out by denaturing gel electrophoresis. No change in membrane protein profile was observed in spermatozoa treated with IGF-I as compared to control. The mean buffalo seminal plasma IGF-I, superoxide dismutase (SOD) and glutathione peroxidase (GPx) concentrations were 139.07 +/- 23.61 ng/ml (range: 51.45 to 267.43), 0.38 +/- 0.03 Unit/mg of protein (range: 0.16 to 0.74) and was 168.15 +/- 35.54 IU/mg of protein (range: 77 to 401), respectively while the total protein concentration (G %) was 2.89 +/- 0.20 (range: 0.88 to 5.27). IGF-I had no significant, correlation with SOD (r = -0.17) and GPx (r = -0.38). The correlation between SOD and GPx was significant and positive (r = 0.77). The present study revealed that IGF-I had no. correlation with SOD and GPx levels and its addition did not influence spermatozoa membrane protein profile in a spermatozoa incubated for 2 h.

Detection of Follicular Apoptosis in Water Buffalo (*Bubalus bubalis*) Ovary by Histology and Nick End Labelling Technique

Sreejalekshmi, P. and Raghavendra, B. S. and Subramani, T. Siva and Murthy, V. Chandrashekhara and Jamuna, K. V. and Prasad, R. V. and

REPRODUCTION IN DOMESTIC ANIMALS, Vol.46, I. No.1, P.59-65, FEB,2011

Contents The objective of this experiment was to assess the features and extent of follicular apoptosis in the water buffalo (*Bubalus bubalis*) ovary using classical histology and nick end labelling technique. Ovaries (n = 40) procured from the slaughterhouse were used for the study. The sections (5 μ m) were used for detection of terminal deoxynucleotidyl transferase-mediated dUTP-biotin nick end labelling (TUNEL) and classical histology (H&E). Those follicles showing $\geq 5\%$ TUNEL positivity (TUNEL assay) and pyknotic nuclei (histology) in granulosa cells were classified as atretic. Based on histology, the atretic primary and secondary follicles (%) were 93.82 and 95.62 respectively. The histology study reveals that the rates (%) of atresia in < 1, 1-3, 3-5 mm and > 5 mm were 36.90, 40.50, 62.84 and 74.5 respectively. Further the atretic tertiary follicles (%) were significantly lower than the primary and secondary classes of follicles. TUNEL assay reveals that the atretic rate (%) of tertiary follicles in < 1, 1-3, 3-5 and ≥ 5 mm class follicles were 50.88, 53.84, 81.81 and 36.36 respectively. The percentage of atresia in > 5 mm diameter follicles were significantly lower in TUNEL than histology. Percentages of granulosa and thecal cells positive for atresia by TUNEL were 30.7 \pm 0.53 and 13.82 \pm 0.18 respectively per follicle. The initial structural changes in atretic follicles were seen primarily in the granulosa cells. In severely atretic follicles TUNEL positive granulosa cells along with theca cells have to be considered in assessing the rate and extent of

a t r e s i a .

Molecular cloning, expression and characterization of a novel feruloyl esterase enzyme from the symbionts of termite

Chandrasekharaiah, Matam and Thulasi, Appoorthy and Bagath, M. and Kumar, Duvvuri Prasanna and Santosh, Sunil Singh and Palanivel,

BMB REPORTS, Vol.44, I. No.1, P.52-57, 31-Jan, 2011

Termites play an important role in the degradation of dead plant materials and have acquired endogenous and symbiotic cellulose digestion capabilities. The feruloyl esterase enzyme (FM) gene amplified from the metagenomic DNA of *Coptotermes formosanus* gut was cloned in the TA cloning vector and subcloned into a pET32a expression vector. The Ft3-7 gene has 84% sequence identity with *Clostridium saccharolyticum* and shows amino acid sequence identity with predicted xylanase/chitin deacetylase and endo-1,4-beta-xylanase. The sequence analysis reveals that probably Ft3-7 could be a new gene and that its molecular mass was 18.5 kDa. The activity of the recombinant enzyme (Ft3-7) produced in *Escherichia coli* (E.coli) was 21.4 U with substrate ethyl ferulate and its specific activity was 24.6 U/mg protein. The optimum pH and temperature for enzyme activity were 7.0 and 37 degrees C, respectively. The substrate utilization preferences and sequence similarity of the Ft3-7 place it in the type-D sub-class of FAE. [BMB reports 2011; 44(1): 52-57]

Temporal changes in circulating levels of plasma interleukin-8 during peripartum period in Murrah buffaloes (*Bubalus bubalis*)

Kumar, Vijay and Kumar, Parveen and Mohan, Krishna and Sarkar, Mihir and Suresh, K. P. and Chauhan, M. S. and Prakash, B. S.

TROPICAL ANIMAL HEALTH AND PRODUCTION, Vol.43, I. No.3,P.669-674, MAR,2011

The objective of this study was to elucidate the changes in circulating levels of plasma interleukin-8 (IL-8) during peripartum period in Murrah buffaloes (*Bubalus bubalis*). IL-8 was estimated in blood plasma of healthy peripartum Murrah buffaloes (n=6) on days +/- 30, +/- 15, +/- 5, +/- 3, +/- 1 and 0 pre- and postpartum with respect to the day of parturition (day 0) in each of the two different seasons (hot-humid and spring). The mean microclimate Temperature-Humidity Index (THI) during spring season was significantly lower ($p < 0.01$) than the corresponding THI in hot-humid season. In both the seasons, plasma IL-8 remained lower in prepartum period ($\leq 46.56 \pm 14.08$ pg/ml during spring and $\leq 73.18 \pm 18.56$ pg/ml during hot-humid season) than in the postpartum period ($\geq 51.41 \pm 13.82$ pg/ml during spring and $\geq 84.13 \pm 16.97$ pg/ml in hot humid season). During spring, the IL-8 levels were significantly higher ($P < 0.05$) on days+5 and +15 postpartum in comparison to the IL-8 levels on days-30, -5, and -3 prepartum. During hot-humid season, IL-8 level was significantly higher ($P < 0.05$) on day+30 as compared to the IL-8 levels on days-30 and -5 prepartum. The correlation between IL-8 and mean microclimate THI was significant ($r=0.25$, $P < 0.01$). From the results, it is concluded that peripartum period in buffaloes is associated with an inflammatory response leading to significantly higher plasma IL-8 during parturition and postpartum period than in the pre-partum period.

Chlorpyrifos and Endosulfan Affect Buffalo Oocyte Maturation, Fertilization, and Embryo Development In Vitro Directly and

Nandi, S. and Gupta, P. S. P. and Roy, S. C. and Selvaraju, S. and Ravindra, J. P.

ENVIRONMENTAL TOXICOLOGY, Vol.26, I. No.1, P.57-67, FEB,2011

This study was undertaken to examine the effect of 10 different levels (0, 0.005, 0.01, 0.02, 0.05, 0.1, 0.5, 1.0, 2.0, and 4.0 $\mu\text{g/mL}$) of two pesticides (chlorpyrifos and endosulfan) on buffalo oocyte viability, maturation, fertilization, and developmental competences in vitro. Studies were conducted to test the development of oocytes cultured with pesticides during maturation, fertilization, and during different embryo development stages. We also conducted experiments to test the hypotheses that the effects of these pesticides are hormones and somatic cells mediated. We observed a dose dependant decline in viability and developmental competence rates of oocytes. Chlorpyrifos and endosulfan had a negative impact on oocytes at 0.02 and 0.1 $\mu\text{g/mL}$ levels, respectively. These pesticides reduced the oocyte nuclear maturation by a direct effect on oocytes, cumulus cell-mediated action, and by blocking the action of hormones. Chlorpyrifos was found to be more ovotoxic and embryotoxic than endosulfan. This study will provide information on dose-response relationship and risk assessment in domestic buffaloes. (C) 2009 Wiley Periodicals, Inc. Environ Toxicol
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Rumen degradable nitrogen requirements for optimum microbial protein synthesis and nutrient utilization in sheep fed on finger

Chandrasekharaiah, M. and Thulasi, A. and Suresh, K. P. and Sampath, K. T.

ANIMAL FEED SCIENCE AND TECHNOLOGY, Vol.163, I. No.4-Feb,P.130-135, 11-Feb,2011

Studies were conducted to determine the rumen degradable nitrogen (RDN) requirement levels for optimum microbial protein synthesis and nutrient utilization in Nellore rams fed on finger millet straw (FMS) based diet. Thirty six Nellore sheep were randomly divided into four groups of nine animals each using the balanced completely randomized design. Animals in all the groups were fed finger millet straw as a basal roughage and groundnut cake (GNC) was offered daily in two equal halves in the morning (8.00 AM) and evening (4.00 PM) as RDN source. The animals in group I (GI) were fed with ad libitum FMS. Animals in group II, III and IV (GII, GIII, and IV) were offered GNC @ 12.4, 16.6, and 21.1 g RDN/kg digestible organic matter (DOM) along with FMS. The daily total dry matter (DM) and organic matter (OM) intakes linearly increased ($P<0.05$) with increasing level of RDN supplementation while there was no difference in total DM and OM intake/kg W(0.75) among different experimental groups. The digestibility coefficients of DM ($P<0.001$), OM ($P<0.001$), crude protein (CP) ($P<0.001$), ether extract (EE) ($P<0.001$), neutral detergent fibre (NDF) ($P<0.01$) and acid detergent fibre (ADF) ($P<0.03$) increased quadratically with increasing level of RDN supplementation from GI to GIV. The purine derivatives (PD) excretion, microbial purine absorption and microbial nitrogen supply (MNS g/day) linearly increased ($P<0.001$) as the level of RDN supplementation increased. There was no difference in nitrogen capture efficiency (NCE) and microbial nitrogen to total urinary nitrogen ratio (MN:UN) among the RDN supplemented groups. This study indicated that 12 g RDN/kg digestible organic matter intake (RDN g/kg DOMI) or 18 g RDN/kg OM apparently digested in the rumen (RDN g/kg DOMR) may be adequate for optimum microbial protein synthesis and digestibility of nutrients, there by improved plane of nutrition in sheep fed on finger millet straw based diet. (C) 2010 Elsevier B.V. All rights reserved.

Effect of Bypass Protein on Milk Yield in Indian Cattle - A Meta-analysis

Suresh, K. P. and Bhatta, Raghavendra and Mondal, S. and Sampath, K. T.

ANIMAL NUTRITION AND FEED TECHNOLOGY, Vol.11, I. No.1,P.19-26, JAN,2011

Suresh, K.P., Bhatta, R., Mondal, S. and Sampath, K.T. 2011. Effect of bypass protein on milk yield in Indian cattle A meta-analysis. *Animal Nutrition and Feed Technology*, 11: 19-26. Twenty Indian studies pertaining to feeding of undegradable dietary protein (UDP) on milk production in lactating cows were selected. Based on inclusion and exclusion criteria to safeguard against the selection bias, only fourteen studies could be considered for conducting a meta-analysis. All the data included in the present study were from experiments conducted under iso-caloric diets and early to mid lactation with medium milk production (around 10 kg). The bypass protein intake was converted to UDP intake g/animal/day as input variable and milk yield was converted to 4% FCM (fat corrected milk) in order to achieve uniformity in study results. The UDP intake (g/animal/day) was categorized into 0-100, 101-200, 201-300, 301-400, 401-500 and 501-600. A database on UDP intake (g/animal/day), milk yield (kg) and fat % were developed based on the studies selected. The data were analysed using the Metacalculator. The results indicated increase in milk yield as the UDP intake was increased. The amount of 4% FCM was 6.62 kg (SD: 0.43) at 0-100 g UDP intake and progressively increased to 10 kg when the UDP intake was >600 g/animal/day. The milk production response was observed to be quadratic i.e. milk production increased with increasing UDP intake and thereafter milk production showed decreasing trend for unit increase in UDP levels. From the meta-analysis of the data, it could be concluded that feeding of UDP is beneficial in increasing milk yield and the optimum level of UDP required for production of 10 kg 4% FCM among Indian cattle is about 571 g / a n i m a l / d a y .

Microbial protein synthesis, nitrogen capture efficiency and nutrient utilisation in sheep fed on finger millet straw (Eleusine

Chandrasekharaiah, Matam and Thulasi, Appoorthy and Sampath, Karatikere T.

JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE, Vol.91, I. No.8,P.1505-1510, JUN,2011

BACKGROUND: Microbial protein synthesised in the rumen is a very important protein source for ruminants. It is essential to provide an adequate amount of rumen-degradable nitrogen (RDN) for optimum microbial protein synthesis in the rumen on straw-based diets. The objective of this study was to determine the RDN requirement for optimum microbial protein synthesis (MPS), nitrogen capture efficiency (NCE) and nutrient utilisation in Nellore rams fed on a finger millet straw (FMS)-based diet. **RESULTS:** Thirty-six Nellore sheep were randomly divided into four groups of nine animals each using a balanced, completely randomised design. The animals in group 1 (RDN0) were fed with ad libitum FMS. Those in groups 2, 3 and 4 (RDN1, RDN2 and RDN3) were supplemented with groundnut cake to provide RDN levels of 14, 18 and 23 g RDN kg⁻¹ digestible organic matter intake (DOMI) or 21, 27 and 35 g RDN kg⁻¹ digestible organic matter apparently digested in the rumen (DOMR) respectively along with FMS. The digestibility coefficients of all nutrients and MPS increased ($P < 0.05$) quadratically with increasing level of RDN supplementation. NCE decreased linearly ($P < 0.05$) as the level of RDN increased. **CONCLUSION:** The results suggest that 12 g RDN kg⁻¹ DOMI or 19 g RDN kg⁻¹ DOMR may be adequate for optimum MPS, NCE and digestibility of nutrients in sheep fed on an FMS-based diet. (C) 2011 Society of Chemical Industry

Chemical composition and anti nutritional factors in karanja (Pongamia pinnata) seed kernels and its in vitro evaluation

Kumar, D. Dinesh and Rao, S. B. N. and Jash, S. and Elangovan, A. V. and Hemalatha, S.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.81, I. No.5,P.478-483, MAY,2011

Karanja (*Pongamia pinnata*) seeds collected from different places of Karnataka were analyzed for morphological measurements, chemical analysis and anti-nutritional factors like karanjin, pongamol, trypsin inhibitors. Variation were observed in seeds size (1.18–1.68 g), CP (14.46–23.09%), fat (30.76–39.99%), and ANF's like karanjin (0.57 to 1.75%), pongamol (0.25 –1.27%) and trypsin inhibitor activity (790–1278 µg / g seed meal). Further, karanja seed meal (KSM) and Karanja defatted meal (KDM) were incorporated in concentrate mixtures at graded levels (25, 50, 75 and 100%) to replace standard soybean meal. To this effect, 9 iso-nitrogenous concentrate mixtures were prepared using (C1 to C9) with 4 levels of replacement (25, 50, 75 and 100% on nitrogen basis) with KSM (C2 to C5) KDM (C6 to C8) and C1 as control. IVDMD, IVOMD (%) followed a decreasing trend when KSM was added to concentrate mixtures whereas complete removal of oil (KDM) resulted in similar trend as that of control. However, both KSM and KDM did not exert any effects on rumen fermentation parameters. Results obtained in the study indicated variation in chemical constituents, ANF's in the seed samples collected across Karnataka and complete removal of oil from karanj seeds caused beneficial effects on nutrient digestibility in

v i t r o .

Effect of Pre-freeze Addition of Cysteine Hydrochloride and Reduced Glutathione in Semen of Crossbred Jersey Bulls on

Perumal, P. and Selvaraju, S. and Selvakumar, S. and Barik, A. K. and Mohanty, D. N. and Das, S. and Das, R. K. and Mishra, P. C.

REPRODUCTION IN DOMESTIC ANIMALS, Vol.46, I. No.4,P.636-641, AUG,2011

This study was aimed to assess the effect of pre-freeze addition of cysteine hydrochloride and glutathione (GSH) on post-thaw sperm functional parameters and field fertility. The experimental bulls (n = 6) aged 4-6 years were used for this study. A total of 36 ejaculates (six ejaculates per bull) were collected and divided into three groups, group I (control), group II (5 mM cysteine hydrochloride) and group III (5 mM GSH). The extended semen samples with and without additives were filled in mini straw using automatic filling and sealing machine and cryopreserved in liquid nitrogen. Post-freeze seminal traits were recorded after thawing at 37 degrees C for 30 s. The curvilinear velocity (VCL) and amplitude of lateral head displacement values were significantly ($p < 0.05$) higher in GSH than the cysteine and control groups. Post-thaw plasmalemma integrity was significantly ($p < 0.01$) higher in GSH group when compared to cysteine and control groups. The loss of acrosomal integrity was significantly ($p < 0.01$) lower in GSH than in cysteine and control groups. Addition of GSH non-significantly ($p = 0.1$) improved mitochondrial membrane potential (MMP) (per cent) than control group. This study indicates that the addition of cysteine and GSH suggestive ($p = 0.08$) of reducing lipid peroxide levels. The conception rate (%) in glutathione group was significantly ($p < 0.05$) higher than that in cysteine (68 vs 58) and control (49) groups. The post-thaw sperm progressive forward motility ($r = 0.4$) had moderate, but no significant correlation with conception rate. However, post-thaw straight-line velocity ($r = 0.7$), loss of acrosomal integrity ($r = -0.8$) and MMP ($r = 0.9$) had significant ($p < 0.05$) correlation with field fertility. This study indicates that the use of glutathione as semen additive may be used for improving post-thaw semen quality and overall augmentation of pregnancy in cows.

Prebiotics in ancient Indian diets

Samanta, A. K. and Kolte, Atul P. and Senani, S. and Sridhar, Manpal and Jayapal, Natasha

CURRENT SCIENCE, Vol.101, I. No.1,P.43-46, 10-Jul,2011

Gut microflora co-evolved with the human evolution, performing health-promoting functions and protection from the enteric pathogens. The long association of the microflora sustained through ages, which in the light of new research, needs specific nutrients that are not required by the humans. The present article revisits the ancient foods and crops, their availability during different prehistoric times and their contribution in maintaining the gut flora and accrual of the beneficial effects. Although the concept of prebiotics is new, the ancient diet components contained the molecules
o r p r e c u r s o r s o f t h e p r e b i o t i c s .

Pulsatile secretion of luteinizing hormone and GnRH and its relation to pause days and egg production in hens exposed to

Reddy, I. J. and David, C. G. and Kiran, G. Ravi and Mondal, S.

INDIAN JOURNAL OF ANIMAL SCIENCES, Vol.81, 1. No.9,P.919-923, SEP,2011

The study aimed to establish the effects of red spectrum of light (650nm; treated n, 12) and normal spectrum of light (450nm control, n=12) on GnRH concentration, amplitude and frequency of luteinizing hormone (LH), estradiol (E2 beta), progesterone (P4), intersequence pause days and egg production from 62 to 72 weeks old laying White Leghorn hens. Weekly interval profiles of plasma GnRH, LH, E2 beta and P4 concentrations were increased in birds exposed to red spectrum of light. At 67th weeks of age blood samples from both the groups were collected at every 3 h for 36 h to study the pulsatile secretion of LH surges. Plasma LH concentration was higher in treated birds with more number of frequencies and amplitude of LH surges in plasma of treated birds. The LH frequencies were more pronounced and advanced during 36 h of sampling at 3 h interval in treated birds. Weekly interval of plasma LH, E2 beta and P4 concentrations increased in treated birds from 62 to 72 weeks of age. GnRH concentration was significantly higher in birds exposed to red spectrum of light compared to controls. It is hypothesized that exposure of birds to red spectrum of light caused enhanced GnRH along with LH, E2 beta and P4 hormones required for egg formation and egg lay. During 77 days (62-72 weeks of age) of experimental period, egg production was enhanced with lower incidence of pause days even during the later stages of productive period in treated group. In conclusion, higher levels of GnRH, LH, and E2 beta and P4 concentration with lower incidence of pause days enabled the birds to lay more eggs even later in the productive period by modulating the wavelengths of light under normal husbandry conditions.

Minerals release kinetics in the rumen from five commonly available dry fodders

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The extent to which the macro and micro minerals present in various fodders released in the rumen were studied in 5 commonly fed dry fodders (paddy straw, ragi straw, wheat straw, maize kadbi and oat hay) in 3 adult cattle fitted with rumen cannula by in sacco nylon bag technique. The dry fodders were incubated in the rumen for different periods i.e. 10 h, 24 h, 48 h and 72 h and minerals release kinetics in the rumen were studied. There were significant differences in element release in the rumen between experimental fodders and the particular minerals. The rate of release of Ca and P was higher from oat hay and maize kadbi than from paddy, ragi and wheat straws. As compared to Ca, the release of P, Mg and K at different periods of incubation in the rumen was higher from various dry fodders. The pattern of Mg release was different from Ca and P. The release of individual elements over all incubation times is very well expressed by cubic polynomials ($R^2 > 0.9$). Overall, across dry fodders, the release of mineral elements ranked as follows: $K > Mg > P > Cu > Mn > Zn > Ca$. Among all minerals, K showed the highest (98 to 100%) and Ca and Zn showed the lowest release in the rumen at different periods of incubation from fodders. It could, therefore, be concluded that the pattern of macro and trace minerals release in the rumen varied from feeds to feeds and the time of incubation influenced the release of minerals from fodders. Calcium and zinc need a longer time for their maximum release in the rumen for making it available for absorption.

Effects of Heavy Metals and Pesticides on Buffalo (*Bubalus bubalis*) Spermatozoa Functions In Vitro

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Industrial toxic metals, pollutants and bio-accumulative pesticides interfere with the male reproductive functions in farm animals. Frozen-thawed semen samples were incubated with heavy metals (cadmium and lead) and pesticides (chlorpyrifos and endosulfan) of different concentrations (0, 0.005, 0.05, 0.02, 0.1, 0.5, 1.0, 2.0 and 4.0 $\mu\text{g/ml}$) for 1 h, and various spermatozoa functional parameters and in vitro fertilization rates were assessed. Any significant effect was assessed by comparing the 1 h data between the control and treatment groups. Progressive forward motility was significantly ($p < 0.05$) reduced in spermatozoa exposed to lower concentrations (0.05-0.5 $\mu\text{g/ml}$) of toxic substances. The straight-line velocity ($\mu\text{m/s}$) and the average path velocity ($\mu\text{m/s}$) were significantly ($p < 0.05$) reduced in spermatozoa exposed to 1.0 and 0.5 $\mu\text{g/ml}$ of cadmium (11.6 \pm 1.9 and 16.3 \pm 1.9) and chlorpyrifos (10.4 \pm 1.5 and 17.1 \pm 1.3), respectively, when compared to control (20.4 \pm 1.4 and 28.1 \pm 1.7). The acrosomal integrity was also significantly ($p < 0.05$) reduced at 0.05 $\mu\text{g/ml}$ of chlorpyrifos (33.3 \pm 1.9), 1.0 $\mu\text{g/ml}$ of cadmium (36.8 \pm 3.7), 1.0 $\mu\text{g/ml}$ of lead (39.4 \pm 2.8) and 0.5 $\mu\text{g/ml}$ of endosulfan (38.3 \pm 3.2), respectively. The spermatozoa chromatin decondensation was significantly ($p < 0.05$) affected at higher concentrations ($>0.5 \mu\text{g/ml}$) of these chemicals. The mitochondrial membrane potential (%) was significantly ($p < 0.05$) reduced at 0.05 $\mu\text{g/ml}$ of cadmium (3.2 \pm 0.2) and chlorpyrifos (4.3 \pm 0.4), 0.1 $\mu\text{g/ml}$ of lead (3.8 \pm 0.3) and 0.5 $\mu\text{g/ml}$ of endosulfan (3.2 \pm 0.3) when compared to control (6.7 \pm 1.0). The in vitro fertilization capabilities (cleavage percentage) of spermatozoa were significantly reduced at 1.0 $\mu\text{g/ml}$ of cadmium (28.3 \pm 2.4) and 2.0 $\mu\text{g/ml}$ of lead (31.1 \pm 2.7), chlorpyrifos (29.4 \pm 2.2) and endosulfan (32.6 \pm 2.5) when compared to control (59.4 \pm 4.4). This study suggested that the mitochondrial membrane potential was primarily affected even with lowest doses of toxic chemicals. Cadmium when compared to lead and chlorpyrifos when compared to endosulfan were found to be more toxic to the spermatozoa.

Supplementing Probiotics (GalliPro) to Broiler Chicken on Growth Performance, Immunity and Gut Microbial Population

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Supplementing probiotics (Galli Pro) to broiler chicken on growth performance, immunity and gut microbial population. *Animal Nutrition and Feed Technology*, 11: 169-176. An experiment was conducted with broiler chicks reared simultaneously in cages and in floor with 0, 500 g probiotic GalliPro (*Bacillus subtilis*) from day old to 6 weeks of age. For floor experiment, 16 floor pens each with 20 chicks (8 pens per treatment) were used whereas for cage experiment, 40 cages with 8 chicks per cage (20 cages per treatment) were used. Body weight gain, feed intake and FCR did not differ ($P > 0.05$) either due to probiotic supplementation or rearing system. Cell-mediated immune response was non-significant whereas humoral response was higher ($P < 0.05$) in caged birds with probiotic supplementation. The intestinal and crop microbial counts (Total plate count, coliforms, *Staphylococcus aureus* and yeast and mould) were lower on probiotic supplementation. The carcass traits were non significant either due to rearing system or probiotic supplementation. Study envisaged GalliPro did not influence the growth performance of broilers reared in cages or floor, but was helpful in humoral immuno-responsiveness and reducing entero-pathogens of the crop and

i n t e s t i n e .