



American Journal of  
**Food Technology**

ISSN 1557-4571



Academic  
Journals Inc.

[www.academicjournals.com](http://www.academicjournals.com)

## **Effect of Small Peptide Chelate Chromium on Growth Performance, Organ Development and Serum Traits in Spargue-Dawley Rats**

Chen Jin, Wang Zhi-Sheng and Zhou An-Guo

The experiment was conducted to study the effect of supplementing Small Peptide Chelate Chromium (SPCr) in diets on growth performance, organ development and serum traits in Spargue-Dawley rats. Seventy two SD rats with initial body weight about (65±5 g) were randomly assigned to six dietary treatment, basal diet, basal diet supplemented with 100, 200, 500 or 1000 µg/kg Cr in the form of SPCr and 200 µg/kg Cr in the form of chromium picolinate (CrPic). Each treatment had 6 replicates. The duration of the study was 35 days. The results showed that: Supplementation of Cr with different types at low-level (below 500 µg/kg) increased daily gain and feed efficiency. Supplementation of 500 µg/kg SPCr increased ADG ( $p<0.05$ ), decreased feed:gain ratio ( $p<0.05$ ) compared with control group. Serum cholesterol and triglyceride was decreased ( $p<0.05$ ) fed diets with SPCr at low-level. Supplementation of Cr with different types increased serum high density lipoprotein ( $p<0.05$ ), also decreased serum glucose and insulin compared with control group. Addition of Cr with different types increased the relative weights of liver ( $p<0.05$ ). It was concluded that SPCr had effect to improve performance and serum lipids. (*Pakistan Journal of Nutrition* 8 (7): 912-916, 2009; doi: 10.3923/pjn.2009.912.916)

## **Marketability and Nutritional Qualities of Some Edible Forest Insects in Benue State, Nigeria**

F.S. Agbidye, T.I. Ofuya and S.O. Akindele

This study investigated the marketability and nutritional qualities of four edible insect species in Benue State. Using market survey checklists, 10 out of the 23 Local Government Areas and three major towns of Benue State were covered for data collection. Proximate composition of the edible insects marketed in the study area was determined on dry weight basis. One-way ANOVA was used in analyzing the data collected. Results showed that *Cirina forda* Westwood had significantly the highest mean quantity per marketer of 13.2 kg. There was no significant difference in the mean quantity per marketer of *Bunaea alcinoe* Cram (3.5 kg), *Macrotermes natalensis* Haviland (1.6 kg) and *Brachytrupes membranaceus* Drury (0.2 kg). The proximate composition of the selected edible insects showed that the crude protein contents of the caterpillars of the emperor

moths, *C. forda* (74.35±0.09), *B. alcinoe* (74.34±0.04) were significantly highest ( $p < 0.05$ ), followed by *M. natalensis* (65.62±0.07) and then *B. membranaceus* (35.06±0.12). (*Pakistan Journal of Nutrition* 8 (7): 917-922, 2009; doi: 10.3923/pjn.2009.917.922)

## **Evaluation of Vitamin B<sub>6</sub> Status of Adult Saudis in Al-Qassim Region-Saudi Arabia**

Khalid S. Al-Numair

The aim of this study was to evaluate vitamin B<sub>6</sub> status of adult Saudis in Al-Qassim region-Saudi Arabia. A sample of 239 (127 males and 112 females) healthy Saudi adults was recruited. Vitamin B<sub>6</sub> status was evaluated by dietary intake and biochemical measurements. Results of dietary intake measurements showed that means of vitamin B<sub>6</sub> intake and intake of vitamin B<sub>6</sub> to protein ratio for males and females were 1.97±0.58 mg/day, 0.021±0.003 and 1.89±0.61 mg/day, 0.020±0.04, respectively. Results of biochemical measurements showed that means of plasma pyridoxal phosphate (PLP) concentration and average urinary 4-Pyridoxic Acid (4-PA) excretion for males and females were 29.6±9.6 nmol L<sup>-1</sup> and 7.0±2.4 μmol day<sup>-1</sup> and 31.7±10.4 nmol L<sup>-1</sup> and 6.8±2.5 μmol day<sup>-1</sup>, respectively. The study also investigated and discussed other health indicators that are related to vitamin B<sub>6</sub> status including Body Mass Index (BMI), plasma albumin concentration and alkaline phosphatase activity. Results of dietary intakes and biochemical measurements indicated an adequate status of vitamin B<sub>6</sub>. There were no significant differences between males and females in any of the previous measurements. This study indicated an adequate status of vitamin B<sub>6</sub> among healthy adult Saudis in Al-Qassim region, however due to the numerous functions and the importance of the vitamin, the study suggested a further evaluation in various groups of the Saudi population in other regions of the country. (*Pakistan Journal of Nutrition* 8 (7): 923-927, 2009; doi: 10.3923/pjn.2009.923.927)

## **Acetaminophen Induced Hepatic Toxicity: Protective Role of *Ageratum conyzoides***

S.O. Ita, E.O. Akpanyung, B.I. Umoh, E.E. Ben and S.O. Ukafia

The preventive potentials of ethanol leaf extract of *Ageratum conyzoides* (ACE) against acute acetaminophen and caffeinated acetaminophen over dose in Wister rats were investigated. Thirty Wister rats of both sexes were divided into 6 groups

of 5 rats per group. There were two control groups. Animals in control group 1 were administered 600 mg/kg body weight of acetaminophen intraperitoneally (ip) whereas, animals in control group 2 in addition to acetaminophen were administered 100 mg/kg body weight of caffeine by oral gavage. Experimental groups 3 and 4 were treated with acetaminophen as in group 1 but in addition received 250 and 500 mg/kg body weight, respectively of ACE by oral gavage. The experimental groups 5 and 6 were treated as in control group 2 and in addition received 250 and 500 mg/kg body weight, respectively of ACE. The treatment lasted 14 days. Serum Aspartate Aminotransferase (AST) and Alanine aminotransferase (ALP) levels (U/L) significantly increased ( $p < 0.001$  and  $p < 0.01$ , respectively) in group 2 than group 1 but dropped marginally in groups 3 and 4. Comparing group 2 with group 5, ALT, AST and Alkaline Phosphatase (ALP) (U/L) activities reduced significantly ( $p < 0.01$ ) in group 5 treated with 250 mg/kg of ACE. Similar significant reductions were observed in group 6 treated with 500 mg/kg of ACE, ALT activity ( $p < 0.01$ ), AST and ALP activities ( $p < 0.001$ ). Total serum protein level (g/100mL) was marginally increased in group 3 (acetaminophen plus 250 mg/kg ACE) than group 1 (acetaminophen only). Total serum protein was however increased significantly ( $p < 0.01$ ) in group 5 (acetaminophen plus caffeine plus 250 mg/kg ACE) and ( $p < 0.05$ ) group 6 (acetaminophen plus caffeine plus 500 mg/kg ACE) more than group 2 (acetaminophen plus caffeine). It is concluded from these findings that ACE offered protection against acetaminophen and caffeinated acetaminophen toxicity in rats. (*Pakistan Journal of Nutrition* 8 (7): 928-932, 2009; doi: 10.3923/pjn.2009.928.932)

### **Calcium Bioavailability from Diets Based on White Cheese Containing Probiotics or Synbiotics in Short-Time Study in Rats**

Jan Klobukowski, Monika Modzelewska-Kapitula and Kazimierz Kornacki

One of the postulated effects of pro- and prebiotics is their beneficial influence on mineral absorption from a diet. In the present study, calcium absorption from diets containing white cheese with the potentially probiotic *Lactobacillus plantarum* strain with a prebiotic addition such as inulin HPX (high performance for high temperature processes) and maltodextrin was investigated. 2.5% of each prebiotic was added to the cheese preparation. The bioavailability of minerals was expressed as apparent absorption and retention indexes. The highest calcium absorption ( $\text{mg } 5 \text{ day}^{-1}$ ) was noted in group receiving probiotic cheese, however there was no significant difference between this and the group receiving control

diet without pro- and prebiotics. Maltodextrin addition to the diet caused a negative effect on Ca balance. Both, apparent absorption (% $\cdot$ mg 5 days<sup>-1</sup>) and retention (mg 5 days<sup>-1</sup>) indexes in this group were significantly lower ( $P < 0.05$ ) compared to other groups. The apparent retention (mg 5 days<sup>-1</sup>) of calcium was significantly higher ( $P < 0.05$ ) in rats receiving probiotic cheese. Feeding rats with probiotic cheese, containing *Lactobacillus plantarum* strain, resulted in increased calcium retention compared to control and synbiotic diets. (*Pakistan Journal of Nutrition* 8 (7): 933-936, 2009; doi: 10.3923/pjn.2009.933.936)

### **Assessment of Nutritional Status of Queens College Students of Lagos State, Nigeria**

O. Akinyemi and A.G. Ibraheem

Malnutrition is a major public health and social problems among secondary school students in Nigeria. The study focuses on the assessment of nutritional status of 40 Queens College Students of Lagos State age 10-19 years. It was glaringly shown that most of the nutrients are lacking with inadequate energy intake especially among students of younger ages. (*Pakistan Journal of Nutrition* 8 (7): 937-939, 2009; doi: 10.3923/pjn.2009.937.939)

### **Effect of Chromium Picolinate Supplementation on Early Lactation Performance, Rectal Temperatures, Respiration Rates and Plasma Biochemical Response of Holstein Cows under Heat Stress**

Lai An-Qiang, Wang Zhi-Sheng and Zhou An-Guo

Twenty-four multiparous lactating Holstein cows (15-22 days post-partum) were used in this study. Cows were randomly allocated to four treatments based on days in milk, parity and milk yield. Basal diets were supplemented with 0, 3.6, 7.2 and 10.8 milligram chromium/head per day as chromium picolinate in Control (C), Low (L), Moderate (M) and High (H) chromium treatments respectively. The averaged Temperature-humidity Index (THI) was 79.61 units. The results indicated that: All cows were under heat stress. Significant DMI increase was found among treatments ( $p < 0.001$ ) and DMI increased linearly as the level of Cr supplementation increased ( $p = 0.004$ ). Milk yield could be increased by adding chromium ( $p = 0.013$ ), while no significant differences were found between the four treatments in milk fat, protein, lactose, SNF and SCC. And milk yield also increased linearly as the level of Cr supplementation increased ( $p = 0.003$ ). No

significant differences were found between the four treatments in insulin, but there was a trend of decrease with Cr supplementation compared with control ( $p = 0.079$ ). Concentration of blood glucose and the ratio of blood glucose to insulin were increased by adding chromium ( $p = 0.019$  and  $p = 0.013$ , respectively). Adding chromium did not significantly affect rectal temperatures and respiration rates of four treatments ( $p = 0.310$  and  $p = 0.265$  respectively). CK was significantly decreased by adding chromium ( $p = 0.017$ ), but LDH, AST and ALT were not significantly affected by adding chromium ( $p = 0.785$ ,  $p = 0.524$  and  $p = 0.079$  respectively). Additionally CK decreased linearly as the level of Cr supplementation increased ( $p = 0.003$ ). It could be concluded that adding chromium to the diet of dairy cows under heat stress improved milk yield without affecting milk component, chromium supplementation had positive influence on heat-stress cows. (*Pakistan Journal of Nutrition* 8 (7): 940-945, 2009; doi: 10.3923/pjn.2009.940.945)

### **Some Edible Insect Species Consumed by the People of Benue State, Nigeria**

F.S. Agbidye, T.I. Ofuya and S.O. Akindele

The study surveyed the edible insect species consumed by the people of Benue State, Nigeria and also identified the most abundant, most preferred and most consumed edible insect species in the study area. Seven hundred and eighty (780) copies of questionnaire were administered in 10 out of the 23 Local Government Areas and 3 major towns of Benue State. The frequencies generated from the questionnaire were transformed and subjected to one-way ANOVA. The termite, *Macrotermes natalensis* Haviland ( $253 \pm 92.3$ ), was the most prevalent followed by the large African cricket, *Brachytrupes membranaceus* Drury ( $252 \pm 95.9$ ) while the pallid emperor moth, *Cirina forda* Westwood ( $185 \pm 66.7$ ) came third. There were however, no significant differences in the mean frequencies of these three edible insects above ( $p < 0.05$ ). Other edible insect species encountered included *Rhynchophorus phoenicis*, *Zonocerus variegatus* L., *Oryctes monocerus* Olivier *Gryllotalpa africana* P.de.B. *Bunaea alcinoe* Cram, *Nezara viridula* L. and *Heteroligus meles* Billberger. The most abundant, most preferred and most consumed edible insect species was *Macrotermes natalensis* followed by *Brachytrupes membranaceus* and then *Cirina forda*. In all cases, the result of one-way ANOVA showed no significant differences among these three insect species ( $p < 0.05$ ). (*Pakistan Journal of Nutrition* 8 (7): 946-950, 2009; doi: 10.3923/pjn.2009.946.950)

## **Effect of Chicken Plasma Protein Powder on Performance and Cellular Immunity of Piglets**

Wei Yao, Wang Zhi-Sheng and Zhou An-Guo

The experiment was used to investigate the effect of Chicken's plasma protein powder on performance and immunity in 32 crossbred piglets weaned at 28 day of age (4 groups of 4 each,  $8.78 \pm 0.07$  kg live weight). During 0-14 d, pigs were offered for different diets in both treatments, while received the same diet during the rest time of experiment. The effects of chicken's plasma protein powder on performance, cellular immunity of weaned piglets were evaluated. The results indicated that during 0-14d, compared with the control group, Average Daily Gain (ADG), Average Daily Feed Intake (ADFI) of pigs fed with Chicken's plasma protein increased by 65.50%, 37.11%, respectively ( $p < 0.01$ ); F/G decreased by 16.41% ( $p < 0.01$ ). In 14-28 d, compared with the control group, performance of piglets in Chicken's plasma protein group was improved significantly. Compared with the control group, the serum interleukine-1 (IL-1) decrease by 8.8%, interleukine-1 receptor antagonist and interleukine-4 increased by 17.9%, 16.9%, respectively. The results suggested that Chicken's plasma protein powder could enhance performance and improve the body immune function of piglets. (*Pakistan Journal of Nutrition* 8 (7): 951-954, 2009; doi: 10.3923/pjn.2009.951.954)

## **Comparative Study of Sun Drying and Solar Tent Drying of *Hyperopisus bebe occidentalis***

R.O. Ojutiku, R.J. Kolo and M.L. Mohammed

An experiment was conducted to investigate the effect of two drying processing methods on the nutritional qualities of *Hyperopisus bebe*. The two methods used were solar tent dryer and traditional sun drying methods. The experimental fish were dried for 120 h (5 days). The results of proximate analysis showed significant difference ( $p < 0.05$ ) between the two techniques. Organoleptic evaluation showed no physical damage, no discolouration in the treatments and both had firm texture though fishes under traditional sun drying were infected by insects. (*Pakistan Journal of Nutrition* 8 (7): 955-957, 2009; doi: 10.3923/pjn.2009.955.957)

## **Nutritional Status and Determinants of Malnutrition in Children under Three Years of Age in Nghean, Vietnam**

Nguyen Ngoc Hien and Nguyen Ngoc Hoa

To assess the nutritional status and to determine potential risk factors of malnutrition in children under 3 years of age in Nghean, Vietnam. The study carried out in November 2007, a total of 383 child/mother pairs were selected by using a 2-stage cluster sampling methodology. A structured questionnaire was administered to mothers in their home settings. Anthropometric measurement was defined as being underweight (weight for age), wasting (weight for height) and stunting (height for age) on the basis of reference data from the National Center for Health Statistics (NCHS) / World Health Organization (WHO). Logistic regression analysis was used to into account the hierarchical relationships between potential determinants of malnutrition. The mean Z-score for weight-for-age was -1.51 (95% CI -1.64, -1.38), for height-for-age was -1.51 (95% CI -1.65, -1.37) and for weight-for-height was -0.63 (95% CI -0.78, -0.48). Of the children, 103 (27.7.8%) were underweight, 135 (36.3%) were stunted and 38 (10.2%) were wasted. Region of residence, ethnic, mother's occupation, household size, mother's BMI, number of children in family, weight at birth, time of initiation of breast-feeding and duration of exclusive breast-feeding were found to be significantly related to malnutrition. The findings of this study indicates that malnutrition is still an important problem among children under three years of age in Nghean, Vietnam. Socio-economic, environmental factors and feeding practices are significant risk factors for malnutrition among under-three. (*Pakistan Journal of Nutrition* 8 (7): 958-964, 2009; doi: 10.3923/pjn.2009.958.964)

## **Analysis of *Egeria radiata* and *Thais coronata* Shells as Alternative Source of Calcium for Food Industry in Nigeria**

S.P. Malu, A.E. Abara, G.O. Obochi, B.I. Ita and C.A. Edem

*Egeria radiata* and *Thais coronata* locally called Nkop and Nko nko respectively by the Efik, are widely eaten by Niger Delta Region of Nigeria. After consuming their soft-flesh, the empty shells are constantly thrown away as waste. This research therefore is to analyzed and ascertains the suitability of these shell wastes as raw materials for calcium supplements. Results of analysis show that these shell contain a high percentage (95.54%) of Calcium Oxide (CaO), 2.52%



of Magnesium Oxide (MgO) and trace amount of other oxides. Calcium oxide has been a major source of calcium; it concluded that *Egeria radiata* and *Thais coronata* shells are suitable source raw materials for the production of calcium supplements by our indigenous food industry. (*Pakistan Journal of Nutrition* 8 (7): 965-969, 2009; doi: 10.3923/pjn.2009.965.969)

### **Effect of Garlic Extracts on Monosodium Glutamate (MSG) Induced Fibroid in Wistar Rats**

G.O. Obochi, S.P. Malu, M. Obi-Abang, Y. Alozie and M.A. Iyam

Effect of garlic extracts on MSG induced fibroid in wistar rats was studied. Fifteen rats were randomly assigned into 3 study groups. The animals in Group 1 (the control) received a placebo of 5.0 mL distilled water via gastric intubation. The animals in the Groups 2 and 3 were treated with 100 mg MSG/kg, or a combination of 100 mg MSG/kg + 100 mg garlic/kg, respectively in a total volume of 5.0 mL vehicle. However, the animals in Group 3 were treated with MSG only for 30 days before the commencement of treatment with garlic extracts. The fibroid was confirmed by myometry. The experiment lasted for 60 days. One day after the final exposure, the animals were euthanized by inhalation of overdose of chloroform. Blood was collected by cardiac puncture into EDTA sterilized sample bottles. Serum was prepared by centrifugation (6000 x g, 30 min) and used for the analysis of serum total protein, estradiol (estrogen and serum total cholesterol. The results showed that Monosodium Glutamate (MSG) alone increased total protein, cholesterol and estradiol (estrogen), which in turn, induced fibroid in the rats. However, treatment with garlic extracts near-completely abrogated/mitigated any effects that have been induced by the MSG alone. It appears that Garlic extracts acted to remove catabolic wastes from the pelvic cavity and from uterine and ovarian tissue, thereby accelerating metabolism and lymph drainage; promoted the sloughing-off tissues; corrected imbalances of estrogen metabolism associated with excessive catechol estrogens and elevated inflammatory prostaglandins. It also appears that garlic extracts stimulated the secretion of gonadotrophins and ovarian hormones and inhibited proliferation of cancer cells at the levels of the pituitary gland; promoted the exit of cells from the golgi phase of the cycle; promoted the unliganded estrogen receptors ability to transducer growth signals from other pathways, leading to apoptosis of fibroid or tumour cells. The results of this study may offer the possibility of treating women with fibroids for extended periods of time without the need for surgery or hormone add-back. (*Pakistan Journal of Nutrition* 8 (7): 970-976, 2009; doi: 10.3923/pjn.2009.970.976)

## **Correlations Between the Composition of Moroccan Urinary Stones and the Risk Factors (Food Habit)**

Laziri Fatiha, Rhazi Filali Fouzia, Amechrouq Ali and Soulaymani Abdelmajid

The aim of this study is to characterize and to analyze the likely factors to influence the composition of the Morocco urinary calculi, we took a study between July 2002 and June 2007 with 283 lithiasis patients that gave their sample (stone) for analyzes by infrared spectroscopy and replied to the questionnaire. Different informations were recorded: epidemiological characteristic (sex, age, residence zone and profession), food habits (tea; rich products in calcium, oxalate, animal proteins and spicy meals) and consumption. The results show: a strong liaison between the different studied factors and the stone mainly composed of Weddelite, Whewellite and uric acid; the age effect on the stone mainly composed of Weddelite and uric acid was confirmed. Significant correlations were noted, positive between the stone mainly composed of Weddelite and the consumption of oxalate and negative between the stone mainly composed of calcium phosphate or magnesium ammonium phosphate and tea and spicy meals. This research shows equally that the consumption of the rich products in oxalate is frequents and that the consumption of the rich products in calcium is weak. This nutrition type would be responsible to the preponderance of the stone calcium oxalate (Whewellite, Weddelite) observed in our country. (*Pakistan Journal of Nutrition* 8 (7): 977-982, 2009; *doi*: 10.3923/pjn.2009.977.982)

## **Nutrient Intake and Digestibility of West African Dwarf Bucks Fed Cassava Peel-Cassava Leaf Meal Based Diets in South Eastern Nigeria**

A.I. Ukanwoko, F.O. Ahamefule and S.N. Ukachukwu

Four West African Dwarf (WAD) bucks averaging 8.0 kg and aged 6-8 months were used to determine the intake and digestibility of cassava peel-cassava leaf meal based diets. The four diets (A, B, C and D) were formulated to contain cassava peel, palm kernel cake, brewers' dried grain, bone meal, soya bean meal, common salt and 0, 10, 20 and 30% cassava leaf meal respectively. The diets were assigned individually to the four animals in metabolism cages in a 4x4 Latin square design experiment. Feed intake, Dry Matter Intake (DMI), nutrient digestibility and the nitrogen balance status of each animal were measured. The dry matter intake, faecal-N, absorbed-N and N-balance values increased in the goats as the N-intake increased. The apparent N-digestibility did not follow any definite pattern. The faecal-N values differed significantly ( $p < 0.05$ ). These values were 2.53, 3.95, 3.12 and 3.15 g/d for diets A,B,C and D respectively. The digestibility

coefficients of DM, CP and EE did not differ significantly ( $p>0.05$ ) while those of CF, NFE and energy differed significantly ( $p<0.05$ ) among experimental animal. The Metabolic Faecal Nitrogen (MFN) (g/100 gDM), Endogenous Urinary Nitrogen (EUN) (g/day/Wkg<sup>0.75</sup>) and Digestibility Crude Protein (DCP) (g/day/Wkg<sup>0.75</sup>) values for maintenance were 0.25, 0.1420, 0.89; 0.26, 0.0279, 1.79; 0.32, 0.0232, 1.09 and 0.30, 0.0301, 2.01 respectively for diets A, B, C and D. All the diets promNoted positive N-balance. The cassava leaf meal fed diets required 1.81 times as much DCP yielded 1.17 times as much MFN and 0.19 times as much EUN as the control animals for maintenance. (*Pakistan Journal of Nutrition* 8 (7): 983-987, 2009; doi: 10.3923/pjn.2009.983.987)

### **Effect of Cooking and Drum Drying on the Nutritive Value of Sorghum-Pigeon Pea Composite Flour**

Mazaher Abd-El-Rahim Mohammed, Hattim Makki Mohamed Makki and Abd-El-Moneim Ibrahim Mustafa

The study was conducted to evaluate changes during cooking and drum drying on the chemical composition, amino acids composition, amino acids scores and digestibility of sorghum-pigeon pea composite flour. Both cooking and drum drying in the presence of 1% ascorbic acid were found to improve the energy value of the final products and the *in-vitro* protein digestibility of sorghum-pigeon pea composite flour significantly ( $p\leq 0.05$ ). In fact, drum drying without pre-cooking slightly increased the protein digestibility of the composite flour from 76-77%, while pre-cooking before drum drying of the composite flour increased the protein digestibility of the drum-dried product to about 80%. Drum drying after pre-cooking reduced lysine and methionine levels by 3.5 and 22.5%, respectively. Also, drum drying significantly ( $p\leq 0.05$ ) decreased the fat content in the two drum dried products (with or without pre-cooking). Moreover, drum drying without pre-cooking increase the ash content while the ash decreased when sorghum-pigeon pea composite flour was drum dried after cooking. (*Pakistan Journal of Nutrition* 8 (7): 988-992, 2009; doi: 10.3923/pjn.2009.988.992)

### **Influence of the Variety and Cooking Method on Glycemic Index of Yam**

Nestor Kouakou Kouassi, Georges Gnombleson Tiahou, Jacko Rhedoor Fete Abodo, Massara Camara-Cisse and Georges N'Guessan Amani

The aim of the study was to evaluate the impact of variety and cooking method on glycemic index of yams consumed in Cote d'Ivoire. On different occasions, human

volunteers consumed 50 g of available carbohydrate in yams varieties cooked either in boiled water or in a conventional oven after 10-12 h overnight fast. The glycemic index values were calculated after measured venous-blood glucose before and after ingestion at 0, 15, 30, 45, 60, 90 and 120 min. The GI results showed that in each variety of yams, the glycemic index does not vary whatever the cooking method. But, considering the yam specie, the glycemic index values varied significantly depending on the variety and cooking method used. The comparison of glycemic index of yams varieties showed differences of clinical importance and could form a basis for dietary advice to diabetic subjects. (*Pakistan Journal of Nutrition* 8 (7): 993-999, 2009; doi: 10.3923/pjn.2009.993.999)

### **Vitamin A Content of Southeastern Nigerian Vegetable Dishes, Their Consumption Pattern and Contribution to Vitamin A Requirement of Pregnant Women in Calabar Urban, Nigeria**

I.O. Williams, R.S. Parker and J. Swanson

The frequency of consumption of six dark green leafy vegetables (DGLV), their vitamin A values, and the relative contribution of these vegetables to vitamin A requirement of pregnant women in Calabar urban was assessed. A total of 101 pregnant women attending clinic at the University of Calabar Teaching Hospital (UCTH), Calabar were covered. Using a food-frequency questionnaire, the consumption pattern of the DGLV was assessed. The study revealed that 100% of the women used the six leafy vegetables chiefly in form of soups and pottages. Ikong ubong (*Telfairia occidentalis*), Mon-mon ikong (*Talinum triangulare*) and Afang (*Gnetum africanum*) were extensively consumed by the women with slight variation in their patterns of consumption, while Inyang afia (*Amaranthus hybridus*), Atama (*Heinsia crinita*) and Editan (*Lasianthera africana*) were less frequently consumed. High Performance Liquid Chromatography (HPLC) analysis showed the following values of vitamin A in  $\mu\text{g RE}/100\text{g}$  for the vegetables: Ikong ubong  $860\pm 0.10$ , Mon-mon ikong  $39\pm 0.04$ , Inyang afia  $853\pm 0.19$ , Afang  $44\pm 0.18$ , Atama  $26\pm 0.04$  and Editan  $36\pm 0.04$ . Also, Ikong soup with a vitamin A value of  $4759.75\pm 672 \mu\text{g RE}/100\text{g}$  per portion size (200g) made the highest contribution (255 %) to the vitamin A requirement of the pregnant women, while Atama as Abak (*Elaeis guinensis* pulp puree) soup (portion size: 150 g) with a vitamin A value of  $214.33\pm 46 \mu\text{g RE}/100\text{g}$  made the least contribution (12%) to vitamin A requirement in the women. The usual dietary habit of pregnant women in Calabar can sustain their vitamin A status because with the only exception of Atama (Abak soup), a portion size of each of the other green

vegetables contain higher levels of vitamin A than the required daily intake of the women. (*Pakistan Journal of Nutrition* 8 (7): 1000-1004, 2009; doi: 10.3923/pjn.2009.1000.1004)

### **Profile of the African Bread Fruit (*Treculia africana*)**

V.N. Osabor, D.A. Ogar, P.C. Okafor and G.E. Egbung

The African bread fruit is produced by *Treculia*, a wild tropical evergreen tree and has immense potential as a nutritional source for man. We evaluated its chemical and nutritional properties as a first step in realizing its food value. The seed [Dry Mass (DM) basis] contained 8% moisture, 12.5% crude protein, 4.2% fat 2.3% ash 1.6% fibre and 73% carbohydrate. The carbohydrate and protein contents in it were much higher than other parameters studied. Compositions of toxicants in seeds were quite low with levels (mg/100 g) of 0.06±0.12 for hydrocyanide 3.0±0.11 for oxalate and 0.76±0.01 for phytate. For mineral elements, the contents (mg/100 gDM) were 587±0.2 for potassium (K), 186±0.2 for Magnesium (Mg) and 850±0.02 for zinc (Zn). The sodium (Na), Calcium (Ca), iron (Fe) and Copper (Cu) contents were negligible. Results of phytochemical screening of the extract showed, that it contained appreciable amounts of flavonoid, polyphenols, anthraquinones, saponins and cardiac glycosides. These secondary metabolites are known to have microbial activity as well as other physiological activity. (*Pakistan Journal of Nutrition* 8 (7): 1005-1008, 2009; doi: 10.3923/pjn.2009.1005.1008)

### **Evaluation of Isoflavone Rich Soy Protein Supplementation for Postmenopausal Therapy**

Gita Radhakrishnan, Rashmi, Neera Agarwal and Neelam B. Vaid

To examine effects of 6 months supplementation of isoflavone rich soy protein on symptoms, lipid profiles and bone density in postmenopausal women. In this double blind, placebo controlled trial, hundred healthy postmenopausal women not taking Hormone Replacement Therapy, were randomly assigned to consume either 25 g soy protein isolate containing 75 mg isoflavones (study group) or 25 g casein protein (control group) daily. Monthly assessment for acceptability and side effects, 3 monthly for menopausal symptoms (Kupperman Menopausal Index; KMI) and serum lipid-profile, 6 monthly for follicular stimulating hormone,

Estradiol levels, vaginal cytology, endometrial thickness and bone density were done. t-test, Analysis of Variance (ANOVA) and chi-square ( $\chi^2$ ) tests were employed. Significantly higher number of cases reported improvement in hot-flashes, joint-pains and vaginal-dryness on soy treatment ( $p < 0.05$ ). Soy supplement was significantly superior to placebo in reducing KMI ( $p < 0.05$ ). Soy group showed 7.7% decrease in total cholesterol and 14% decrease in LDL-cholesterol (significantly different from control group  $p < 0.05$ ) while no effect was seen on HDL cholesterol, Blood pressure, sex hormones, vaginal cytology, uterine endometrium and bone densitometry. A 25 g soy supplement containing 75 mg of isoflavones may be an effective alternative therapy for menopausal symptoms and may offer a benefit to cardiovascular-system by altering lipid-profile favorably. (*Pakistan Journal of Nutrition* 8 (7): 1009-1017, 2009; **doi:** 10.3923/pjn.2009.1009.1017)

### **Anti-Diabetic Properties and Toxicological Studies of *Triplochiton scleroxylon* on the Liver Enzymes in Normal and Streptozotocin - induced Diabetic Rabbits**

T.P. Prohp and I.O. Onoagbe

This study investigates the activities of liver function enzymes viz. Alkaline phosphatase (ALP), glutamate pyruvate transaminase (GPT), gamma glutamyl transferase (GGT) and glutamate oxaloacetate transaminase (GOT), following the administration of *Triplochiton scleroxylon* to normal and streptozotocin - induced diabetic rabbits. Rabbits (New Zealand strains) used weighed between 1.45 to 1.95kg. Experimental diabetes was induced in rabbits by intra - peritoneal injection of streptozotocin at the dose of 70mg/kg body weight. Blood for analyses was collected intravenously from the large veins at the back of the ears of the rabbits. Analysis of results showed that glucose concentration decreased significantly ( $P < 0.05$ ) on the 13th day in normal rabbits whilst in streptozotocin - induced diabetic rabbits significant decreases were observed on the 12th, 24th and 28th days following the administration of the extracts. However, the aqueous bark extract of this herb did not have significant effects ( $P > 0.05$ ) on the activities of liver function enzymes investigated in normal and streptozotocin - induced diabetic rabbits. The aqueous bark extract of *Triplochiton scleroxylon* may therefore be safe for and useful in the treatment of diabetes mellitus and may not contain chemicals capable of damaging the liver and interfering adversely with its central roles in metabolism. (*Pakistan Journal of Nutrition* 8 (7): 1018-1024, 2009; **doi:** 10.3923/pjn.2009.1018.1024)

## **Anti-Diabetic Properties and Toxicological Studies of *Triplochiton scleroxylon* on the Heart Enzymes in Normal and Streptozotocin - induced Diabetic Rabbits**

T.P. Prohp and I.O. Onoagbe

The effects of orally administered aqueous bark extract of *Triplochiton scleroxylon* on the activities of some heart enzymes were examined. Some of the enzymes investigated in the plasma of normal and streptozotocin - induced diabetic rabbits were glutamate oxaloacetate transaminase, creatine kinase and lactate dehydrogenase. Rabbits of New Zealand strains, weighing between 1.45 to 1.95kg were used. Experimental diabetes was induced in the test rabbits by intra-peritoneal injection of streptozotocin at the dose of 70mg/kg body weight. Blood was collected for analyses, intravenously from the large veins at the back of the ears of the rabbits. Glucose concentration decreased significantly ( $P < 0.05$ ) on the 13th day in normal rabbits but in streptozotocin – induced diabetic rabbits significant decreases were observed on the 12th, 24th and 28th days of administration of the extracts. Some of the heart enzymes investigated in normal and streptozotocin - induced diabetic rabbits were not affected significantly ( $P > 0.05$ ) after 13 and 28 days of administration of the extract respectively. On the basis of this research, extract of *Triplochiton scleroxylon* may be useful in the treatment of diabetes mellitus with the added advantage that it may not contain destructive chemical substances capable of damaging the heart. (*Pakistan Journal of Nutrition* 8 (7): 1025-1029, 2009; doi: 10.3923/pjn.2009.1025.1029)

## **Polyphenol Contents and Polyphenol Oxidase Activities of Some Nigerian Kolanuts**

T.P. Prohp, K.E. Ekpo, E.V. Osagie, A. Osagie and H. Obi

The levels of polyphenol and activities of polyphenol oxidases in some Nigerian kolanuts were investigated. *Garcina cola* had the least polyphenol content of  $15.60 \pm 1.70$  (mg/g), while *Cola nitida* (red) recorded the highest value of  $33.50 \pm 2.51$ mg/g. Polyphenol oxidase from *Garcina cola* had its optimum pH of activity in the acidic region (pH 3), but the white and red species of *Cola nitida* had a neutral (pH 7) optimum pH. With catechol as substrate, polyphenol oxidase activity was highest in *Cola nitida* (white) ( $55.70 \pm 2.60$ ) and lowest in *Garcina cola* ( $2.22 \pm 0.04$ ). Whilst the values of polyphenol obtained may explain the high incidence of enzymatic browning in some Nigeria kolanuts, the white cultivar of *Cola nitida* could be further explored as a good source of

polyphenol oxidase. (*Pakistan Journal of Nutrition* 8 (7): 1030-1031, 2009; *doi: 10.3923/pjn.2009.1030.1031*)

### **Rheological and Nutritional Characteristic of Weaning Mush Prepared from Mixed Flours of Taro [*Colocasia esculenta* (L) Schott], Pigeon Pea (*Cajanus cajan*) and Malted Maize (*Zea mays*)**

Gnahé Dago André, Kunimboa Abro Amoin Angèle Kouassi, Gbogouri Grodji Albarin, Brou Kouakou and Gnakri Dago

An infantile flour was prepared from mixed flours of Taro (*Colocasia esculenta* (L) Schott), leguminous plant (*Cajanus cajan*) and maize (*Zea mays*) was prepared. This flour contained 70% total carbohydrates, 15.7% proteins and 4.6% lipids. It also characterized by some essential amino acids such as histidine, threonine, valine, lysine, leucine and phenylalanine. It had some fatty acids (linolein acid, oleic acid) and some essential minerals such as calcium, magnesium, iron, copper, zinc, phosphorus, potassium, chloride, sodium, manganese in variable concentrations. These minerals and fatty acids are necessary for children growth. The energy density of mush prepared from this mixed flour was very high (about 119 kcal/100 ml). This weaning mush had a fluid consistency, the important rheological characteristic for young children energy intake. (*Pakistan Journal of Nutrition* 8 (7): 1032-1035, 2009; *doi: 10.3923/pjn.2009.1032.1035*)

### **Effect of Dietary Inclusion of Cassava Yeast as Probiotic Source on Growth Performance and Carcass Percentage in Japanese Quails**

Songsak Chumpawadee, Orawan Chinrasri and Suwannee Santaweek

Use of antibiotics as an additive in poultry diets to improve growth has been banned in several country. A popular alternative to the use of antibiotics has been use of probiotics. The study was conducted to investigate the effect of dietary inclusion of cassava yeast as a probiotic source on growth performance and carcass percentage in Japanese quails. Three hundred and twenty Japanese quails (1 day of age), were used. The Japanese quails were randomly allocated to 32 pens containing 10 birds each with 8 replicates and assigned to receive one of four dietary treatments (1. Control, 2. *S. cerevisiae* 1x10<sup>6</sup> organisms/kg, 3. *S. cerevisiae* 1x10<sup>7</sup> organisms/kg, 4. *S. cerevisiae* 1x10<sup>8</sup> organisms/kg) in a



completely randomized design. The results showed that feed intake, feed conversion ratio, average daily gain and carcass percentage were not significantly different among treatments ( $p>0.05$ ). However, significant differences were observed in feed intake at weeks 5 and average daily gain at week 2. The results of the present experiment showed that dietary inclusion of cassava yeast as a probiotic to Japanese quail seems to have minimal influence on growth performance and carcass percentage. (*Pakistan Journal of Nutrition* 8 (7): 1036-1039, 2009; doi: 10.3923/pjn.2009.1036.1039)

### **A Study of the Kidney of the Wistar Rat in Northern Guinea Savannah Zone: the Morphometric Aspect**

B.I. Onyeanusi, A.A. Adeniyi, C.G. Onyeanusi, J.O. Ayo and C.S. Ibe

A morphometric study was carried out on the kidney of the Wistar Rat (WR) using standard laboratory procedures. The mean live weight of the Wistar rat was found to be  $140.625\pm 3.078$  g. The average kidney weight was  $0.605\pm 0.012$  g. The right kidney, with a mean weight of  $0.632\pm 0.012$  g, was significantly ( $p<0.05$ ) heavier than the left ( $0.596\pm 0.022$  g). The male kidneys were larger than those of the female and the values obtained were  $0.633\pm 0.091$  g and  $0.572\pm 0.132$  g, respectively. The relative thickness of the medulla was 5.6. This value (5.6) indicates a high index for the length of the loop of Henle, which acts as a counter current multiplier system and directly increases the ability of the kidney to produce hypertonic urine. This high index thus suggests that the Wistar rat is anatomically adapted within its urinary system (kidney) for water conservation. Furthermore, the present study has provided a baseline morphometric data on the kidney of the Wistar rat in the Northern Savannah zone of Nigeria. (*Pakistan Journal of Nutrition* 8 (7): 1040-1042, 2009; doi: 10.3923/pjn.2009.1040.1042)

### **A Comparative Study on the Urinary System of the African Giant Rat (Cricetomys Gambianus Waterhouse) and the Wistar Rat**

B.I. Onyeanusi, A.A. Adeniyi, J.O. Ayo, C.S. Ibe and C.G. Onyeanusi

A comparative study was carried out on the urinary system of the African Giant Rat (AGR) and the Wistar Rat (WR) using standard laboratory procedures. The mean liveweight of the AGR and WR were  $863.590\pm 33.740$  and  $140.625\pm 6.078$  g, respectively. The mean kidney weight of the male and female AGR and WR were  $2.119\pm 0.062$ ,  $2.053\pm 0.009$ ,  $0.633\pm 0.091$  and  $0.572\pm 0.132$  g,

respectively. It was observed that the mean kidney weight in the male was higher than that of the female in both AGR and WR but the difference was not significant ( $p>0.05$ ). The mean weight of the right kidney was heavier than that of the left kidney in both the AGR and WR. The mean weight of the right kidney of the AGR was  $2.21\pm 0.051$  g while, the left was  $2.00\pm 0.055$  g. The mean weight of the right kidney in the WR was  $0.633\pm 0.012$  g while, the left was  $0.596\pm 0.022$  g. No significant difference ( $p>0.05$ ) was obtained in the thickness of the bladder and its length in both AGR and WR but there was a high significant difference ( $p<0.001$ ) between the ureter length of the AGR and the WR. The length of the right ureter was longer than the left and the female had a slightly longer ureter than the male in both rats. The relative thickness of the medulla, which is an indicator of the length of the loop of Henle, was 4.297 in the AGR while, that of the WR was 5.6. The higher relative thickness of the medulla (5.6) signifies that the kidney of the WR has an anatomical adaptation for the concentration of urine and thus, better conservation of water in the arid zone while, the lower relative thickness of the medulla (4.2) of the AGR suggests lack of appropriate anatomical adaptation in the kidney for conservation of water. The study has also provided a baseline morphometric data on the urinary system of both the AGR and WR in the Northern Guinea Savannah zone of Nigeria. (*Pakistan Journal of Nutrition* 8 (7): 1043-1047, 2009; doi: 10.3923/pjn.2009.1043.1047)

## **Manipulation of Rumen Ecology by Malate and Yeast in Native Cattle**

Sittisak Khampa, Pala Chaowarat, Uthai Koatdoke, Rungson Singhalert and Metha Wanapat

Four, one-year old of native cattle were randomly assigned according to a 2x2 Factorial arrangement in a 4x4 Latin square design to study supplementation of malate level at 500 and 1,000 g with yeast (*Saccharomyces cerevisiae*) at 1,000 and 2,000 g in concentrate containing high levels of cassava chip. The treatments were as follows: T1 = supplementation of malate at 500 g with yeast at 1,000 g; T2 = supplementation of malate at 500 g with yeast at 2,000 g; T3 = supplementation of malate at 1,000 g with yeast at 1,000 g; T4 = supplementation of malate at 1,000 g with yeast at 2,000 g in concentrate, respectively. The animals were offered the treatment concentrate at 1% BW of DM and urea-treated rice straw was fed *ad libitum*. The results revealed that concentration of volatile fatty acid was significantly different especially the concentration of propionic acid was slightly higher in cattle receiving T4 than T3, T2 and T1 (23.3, 21.9, 20.9 and 18.0%, respectively). The populations of protozoa and fungal

zoospores were significantly different as affected by malate level and yeast. In conclusion, the combined use of concentrate containing high level of cassava chip at 70% DM with malate at 1,000 g and yeast at 2,000 g in concentrate with urea-treated rice straw as a roughage could improved rumen ecology in native cattle. (*Pakistan Journal of Nutrition* 8 (7): 1048-1051, 2009; doi: 10.3923/pjn.2009.1048.1051)

### **Cultural Studies of Mycelia of *Volvariella volvacea*, *Pleurotus tuber-regium* and *Pleurotus sajor-caju* on Different Culture Media**

H.N. Ukoima, L.O. Ogbonnaya, G.E. Arikpo and F.N. Ikpe

Various agar culture media were investigated for culturing the mycelia of *Pleurotus sajor-caju*, *P. tuber-regium* and *Volvariella volvacea* edible mushrooms. The study was conducted at Cross River University of Technology, Calabar Campus, Nigeria. Selected mushroom species were cultured to source for low input, cheap and other method of growing active mycelia, for the production of viable mushroom spawn (seeds). The results revealed that *P. sajor-caju* had the highest mycelia growth (7.8 cm) on rice bran/soil culture media while *P. tuber-regium* had the highest mycelia growth (5.8 cm) on cassava peels/soil culture media. *V. volvacea* had the highest mycelia growth (7.1 cm) on palm fibre culture medium. The least mycelia growth (1.5-4.4 cm) was observed on potato dextrose agar culture media and yeast agar culture media. Therefore natural supernatant extracts culture media stimulated higher mycelia growth than synthetic agar culture media employed in this study. Thus it is recommended that *P. sajor-caju*, *P. tuber-regium* and *Volvariella volvacea* mycelium can be grown culturally on rice bran/soil, cassava peels/soil and palm fibre culture media respectively. (*Pakistan Journal of Nutrition* 8 (7): 1052-1054, 2009; doi: 10.3923/pjn.2009.1052.1054)

### **Evaluation of Yield and Nutritive Value of Kenaf (*Hibiscus cannabinus*) at Various Stages of Maturity**

Anut Chantiratikul, Chakrapong Chaikong, Orawan Chinrasri and Pirayos Kangkun

The objective of this study was to evaluate potential yield and chemical composition of kenaf as fodder for ruminants. Kenaf (*Hibiscus cannabinus*), variety Khon-Kaen 50, was planted at seed and row spacing of 30 and 50 cm,

respectively. The plants were sampled at 6, 8, 10 and 12 weeks after planting. The findings revealed that dry matter yield and crude protein yield of 6-12 week-old kenaf were 0.12-2.14 and 0.02-0.14 t/ha, respectively ( $p < 0.05$ ). Crude protein (14.34-6.58%) content of kenaf decreased significantly ( $p < 0.05$ ) as harvesting age advanced. On the other hand, neutral detergent fiber (41.99-48.74%) and acid detergent fiber (27.20-30.57%) of kenaf increased statistically ( $p < 0.05$ ) with maturity advanced. The results indicated that 10 week-old kenaf with DM yield of 0.95 t/ha and contained 10% of CP could be used as fodder for ruminants. (*Pakistan Journal of Nutrition* 8 (7): 1055-1058, 2009; doi: 10.3923/pjn.2009.1055.1058)

### **Cultivation of Mushroom (*Volvariella volvacea*) on Various Farm Wastes in Obubra Local Government of Cross River State, Nigeria**

H.N. Ukoima, L.O. Ogbonnaya, G.E. Arikpo and F.N. Ikpe

A study on the cultivation of *Volvariella volvacea* mushroom (Basidiomycetes), a Non-Timber Forest Product (NTFP) on different wastes (palm fibers, rice husk and saw dust) was conducted at CRUTECH, Obubra Campus, Cross River State, Nigeria. The aim was to investigate the influence of selected farm wastes on the growth of *V. volvacea*, so as to organically utilize these farm wastes and minimize the environmental nuisance caused by their burning (incineration). The highest yield of 345 g was recorded from palm fiber, followed by 231 g from rice husk and 146 g from sawdust. Palm fiber is considered the most suitable farm waste for growing *V. volvacea*. The chemical properties of the various substrates combined to influence the chemical endowment and growth of *V. volvacea*. (*Pakistan Journal of Nutrition* 8 (7): 1059-1061, 2009; doi: 10.3923/pjn.2009.1059.1061)

### **Nutritional Evaluation of Sheabutter Fat in Fattening of Yankasa Sheep**

A.M. Yusuf, O.A. Olafadehan, C.O. Obun, M. Inuwa, M.H. Garba and S.M. Shagwa

Fifteen Yankasa rams, balanced for their weight, were used to evaluate the effects of feeding basal diet of *Pterocarpus erinaceus* forage supplemented with Sheabutter Fat (SBF) based concentrate diets on performance, nutrient digestibility and economic benefit. The rams were submitted to four supplemental diets containing: 0 g/kg SBF (control), 50 g/kg SBF and 100 g/kg SBF in a

completely randomized design for 56 days. Average Daily Gain (ADG), intakes of Ether Extract (EE) and Crude Protein (CP), Feed Conversion Ratio (FCR), digestibility coefficients of EE and Organic Matter (OM), digestible OM, digestible and metabolizable energy concentrations and net benefit improved ( $p < 0.05$ ) with increasing levels of SBF supplementation. While forage intake was reduced ( $p < 0.05$ ) in SBF diets, the reverse was the case for the concentrate ( $p < 0.05$ ). Dry Matter (DM) intake and intake as the percentage of live weight, CP, OM and Crude Fibre (CF) intakes and CF digestibility were similar among the treatments. SBF diets improved ( $p < 0.05$ ) digestibilities of DM and CP compared to the control. OM intake was higher ( $p < 0.05$ ) in 50 g/kg SBF than in the control which compared with 100 g/kg SBF. Cost of feed consumed/sheep was lower ( $p < 0.05$ ) for 100 g/kg SBF compared to the control and 50 g/kg SBF. Feed cost/kg of mutton decreased ( $p < 0.05$ ) progressively from the control to 100 g/kg SBF. Differential and relative benefits were more ( $p < 0.05$ ) for 100 g/kg SBF than for 50 g/kg. 100 g/kg SBF supplementation improved the performance, nutrient digestibility and economic benefit. (*Pakistan Journal of Nutrition* 8 (7): 1062-1067, 2009; doi: 10.3923/pjn.2009.1062.1067)

### **Influence of Nutritional Flushing Prior to Mating on the Performance of West African Dwarf Goats Mated in the Rainy Season**

P.K. Karikari and E.Y. Blasu

The effect of nutritional flushing for a period of six weeks prior to mating on the physical condition, serum metabolic and hormonal status at mating and litter size at birth of 32 pluriparous West African Dwarf (WAD) goats was studied using a  $2 \times 2$  factorial design. The factors in the design were age (young, 3-4 years old versus old, 5-6 years old) and nutritional flushing regime (pasture alone versus pasture plus concentrate supplementation). The young does gained more weight and body condition ( $2.0 \pm 0.30$  kg;  $0.53 \pm 0.10$  units;  $p > 0.05$ ) over the 6-wk nutritional flushing period than the old does ( $1.4 \pm 0.30$  kg;  $0.40 \pm 0.10$  units), but the old does were heavier ( $p < 0.05$ ) at mating. The overall mean ( $\pm$ SE) total serum protein was  $86.1 \pm 0.76$  g/l at mating and did not differ ( $p > 0.05$ ) between treatments. The serum glucose concentrations were also similar for the treatment groups and averaged  $2.6 \pm 0.10$  mmol/l at mating. At the end of the nutritional flushing period, supplemented does had a higher ( $p < 0.05$ ) serum concentration of insulin ( $19.1 \pm 0.63$  versus  $15.1 \pm 0.63$   $\mu$ IU/ml) than the unsupplemented does. Young does also had higher ( $p < 0.05$ ) serum insulin concentrations ( $19.8 \pm 0.63$   $\mu$ IU/ml) than old does ( $14.3 \pm 0.63$   $\mu$ IU/ml). Serum Luteinizing Hormone (LH) concentration at mating was similar for supplemented and unsupplemented

does, but was higher ( $p < 0.05$ ) for young does ( $11.8 \pm 0.23 < \mu > \text{IU/ml}$ ) than for old does ( $1.8 \pm 0.23 < \mu > \text{IU/ml}$ ). Young does had a higher litter size ( $1.81 \pm 0.12$ ) than old does ( $1.50 \pm 0.12$ ) and supplemented does had a larger litter ( $1.81 \pm 0.12$ ) than the unsupplemented does ( $1.50 \pm 0.12$ ). These differences were, however, not statistically significant ( $p > 0.05$ ). There was, however, an interaction between age of doe and nutritional flushing treatment with young does that were supplemented having a mean ( $\pm \text{SE}$ ) litter size of  $2.13 \pm 0.18$  compared to  $1.50 \pm 0.18$  for each of the other three treatment groups. It was concluded that young (3-4 years old) does may benefit from concentrate supplementation of wet season grazing, but that old does (5-6 years old) will not benefit from this supplementation if they are in moderate body condition six weeks before mating. (*Pakistan Journal of Nutrition* 8 (7): 1068-1073, 2009; **doi**: 10.3923/pjn.2009.1068.1073)

### **The Effect of Lecithin-A Non-Absorbing Emulsifying Agent on Cookie Production**

M.Z. Hoque, K.M. Hossain and F. Akter

Emulsifying agents have an effect on cookies and the finished product partially, depending on the system and the type of emulsifier used. Lecithin's molecular structure makes it an effective emulsifier for the interaction of water and oil. Phospholipids, the major component of lecithin, are partly hydrophilic (attracted to water) and partly hydrophobic (repelled from water). Fat is particularly important in the texture of a low-moisture cookie. The present study has desirable significance which relates to practical issues like cookies dough emulsions, optimization of manufacturing, quality control and effects on prolonging shelf life prediction. The investigation revealed that the method applied was very suitable for determining the effects of lecithin on cookie production. According to the method 0.27, 0.21, 0.19 and 0.16% lecithin were mixed based on dough weight by using a Horizontal-Z-Drum mixture machine in four different cookie samples (S-1, S-2, S-3 and S-4 respectively) and the moisture absorption rate of four samples were analyzed by using Scaltec auto moisture analyzer. The moisture absorption rate at 30 minutes for S-1, S-2, S-3 and S-4 were 2.10, 3.11, 3.19 and 3.23% respectively. For S-1, 0.27% lecithin shown minimal moisture absorption at 30 min. Therefore, it is clear that increase of emulsifying agent decreases the rate of moisture absorption in cookies and lecithin might have a great effect on preservation of cookies. The study recommends that further enthusiastic investigation may continue for the prediction of optimum dose of lecithin for maximum shelf-life of cookies. (*Pakistan Journal of Nutrition* 8 (7): 1074-1077, 2009; **doi**: 10.3923/pjn.2009.1074.1077)

## ***In vitro* Gas Production and its Prediction on Metabolizable Energy, Organic Matter Digestibility and Short Chain Fatty Acids of Some Tropical Seeds**

O.J. Babayemi, M.A. Bamikole and Modupe O. Daodu

Eight tropical seeds from browse, shrubs and pulses plants were assessed for their nutritive value using *in vitro* gas production technique. Dry Matter (DM), Crude Protein (CP), crude fibre, ash, ether extract and Neutral Detergent Fibre (NDF) were analyzed. Milled seeds were incubated using 200 mg/30 ml inoculum for 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24 h. At post incubation, the total gas volume was measured for methane using 4 ml of 10 M NaOH. Dynamics of gas production characteristics over time were described by equation  $V_t = V_f \times [1 + \exp \{2-4 \times S \times (t-L)\}] - 1$ . Metabolizable Energy (ME; MJ/kg DM), Organic Matter Digestibility (OMD; %) and short chain fatty acids (SCFA;  $\mu\text{mol}/200 \text{ mg DM}$ ) were estimated. DM was lowest (88.1%) in *Leucaena leucocephala* and was the best (95.6%) in *Tephrosia bracteolata* seeds. CP ranged from 25-38.9% being the least (25.0%) for *Lablab purpureus* and the highest (38.9%) for *Tephrosia candida*. NDF of the seeds varied from 27.1% in *Tephrosia bracteolata* to 49.1% in *Leucaena leucocephala*. The volume of gas produced by the seeds consistently increased ( $p < 0.05$ ) and was significantly ( $p < 0.05$ ) highest in pulse legumes. Potential extent ( $V_t$ ) of gas production ranged from 36.8-53.6 and that of fractional rate of gas production from 0.043-0.07. The ranged values 7.5-10.4, 50.7-70.4 and 0.751-1.185 for ME, OMD and SCFA respectively were significantly ( $p < 0.05$ ) highest in *Tephrosia bracteolata* seeds. The  $\text{CH}_4$  production varied from 148  $\mu\text{ml}$  in *Albizia lebbek* to 300  $\mu\text{ml}$  in *Carnivalia ensiformis*. The result showed that the seeds were high in nutrients, digestible and metabolizable energy with relatively low methane production and therefore could be used for ruminants as feedstuffs. (*Pakistan Journal of Nutrition* 8 (7): 1078-1082, 2009; doi: 10.3923/pjn.2009.1078.1082)

## **Cyanobacteria in Biological Soil Crust of Chadormalu Area, Bafq Region in Central Iran**

A. Moghtaderi, M. Taghavi and R. Rezaei

Arid and semi-arid regions are characterized by sparse vegetation or absence of vegetation cover. The absence of a dense distribution of macrophytes (higher plants), much of arid and semi-arid surfaces are covered by microphytic communities of small non-vascular plants. An important group of organisms comprising soil crusts in such habitats are cyanobacteria. In this research the genus

and species of cyanobacteria were detected at the Chadormalu desert, Yazd Province of Iran. The study showed that cyanobacteria (*Microcoleous vaginatus*, *Nostoc.sp*, *Microcystis.sp*, *Ocellatoria.sp*, *Chroococcuss.sp*, *Chroococcidiopsis*, *Ocellatoria.sp*, *Chroococcuss.sp*, *Microcystis.sp*) at Chadormalu Desert are comparable with other Deserts in cold and warm dry conditions. (*Pakistan Journal of Nutrition* 8 (7): 1083-1092, 2009; *doi*: 10.3923/pjn.2009.1083.1092)

### **The Relative Bioavailability of Sodium Selenite and High Selenium Yeast in Human**

Abdul-Wahab R. Hamad, Monzer M. Krishan, Ramadan K. Hejazin, Ayman S. Mazahreh, Mohammed Al - Damanhoory and Jihad M. Quasem

The yeast was more highly absorbed, peaked at a later time and remained in the blood for a longer period of time than the selenite. These results are in agreement with our long term animal supplementation study in which we found a greater blood selenium concentration after feeding rats yeast as compared with selenite. The urine results also corroborated the blood in that the yeast selenium was less excreted, i.e. more retained than the selenite. (*Pakistan Journal of Nutrition* 8 (7): 1093-1096, 2009; *doi*: 10.3923/pjn.2009.1093.1096)

### **Quality Characteristics of Cookies from Composite Flours of Watermelon Seed, Cassava and Wheat**

S.C. Ubbor and E.N.T. Akobundu

The use of composite flour from watermelon seed, cassava (TMS 99/6012 variety) low in cyanide and wheat in the production of cookies was investigated. The proximate composition and functional properties of the samples were determined. Quality of cookies made with the blends was evaluated by a 20-member sensory panel. The watermelon seed flour was blended with wheat and cassava flour at the ratios of 0:100, 10:90, 15:85, 20:80, 50:50 and 100:0, 90: 10, 85:15, 80:20, 50:50, respectively. The protein and fat content of WC<sub>1</sub> (watermelon seed flour/cassava flour, 90:10 ratio) was highest followed by WC<sub>2</sub> (watermelon seed flour/ cassava flour, 85:15). WM<sub>3</sub> cookies (wheat/watermelon seed flour, 80:20) ranked best in sensory evaluation conducted. All cookies were acceptable, scoring below 4.00 on a 9-point hedonic scale. Up to 20% wheat and 15% cassava flours could be replaced with watermelon seed flour in cookies. (*Pakistan Journal of Nutrition* 8 (7): 1097-1102, 2009; *doi*: 10.3923/pjn.2009.1097.1102)



## **Hypolipidaemic Activity of *Rauwolfia serpentina* Benth**

Shamim A. Qureshi and Shamsa K. Udani

Hypolipidaemic activity of *Rauwolfia serpentina* benth was investigated to provide a base for isolation of active principle and to validate its use for the control of hyperlipidaemia, the major cause of cardiovascular diseases prevailing worldwide. Twelve days trial was done with oral administration of root powder of *R. serpentina* (30 mg/kg) and distilled water (1 ml/kg) in test and control rabbits respectively. The blood was collected from each group on 1st, 4th, 8th and 12th day to estimate serum Triglycerides (TG), Total Cholesterol (TC), Low Density Lipoprotein (LDL-C), High Density Lipoprotein Cholesterol (HDL-C), Alanine Aminotransferase (ALT) and Lactate Dehydrogenase (LDH). Gradual decrease observed in TG and LDL-C levels from 204.76-111.94 and 33.31-10.85 mg/dL, respectively in test when compared with control rabbits ( $p < 0.0001$ ). Similarly, TC was significantly decreased when compared 1st-12th day of treatment in test group ( $p < 0.0001$ ) and test on 12 day compared with control ( $p < 0.05$ ). However, HDL-C remained constant in test rabbits throughout the study but found higher than control ( $p < 0.05$ ). ALT and LDH levels were found normal. According to the data, root powder of *R. serpentina* has hypotriglyceridemic and hypocholesterolemic effects with undetectable side effects on liver and cardiac functions. (*Pakistan Journal of Nutrition* 8 (7): 1103-1106, 2009; doi: 10.3923/pjn.2009.1103.1106)

## **Probiotics Bacteria in Fermented Dairy Products**

Omer Turki Mamdoh Ershidat and Ayman Suliman Mazahreh

The nutritional value of diary based product that contains probiotic bacteria on the gastrointestinal health and functions have been investigated in this study. Both probiotic *Lactobacillus bulgaricus* and *Streptococcus thermophilus* species, contribute to the formation of yogurt as a result of anaerobic fermentation of lactic acid in the milk. The benefits of yogurt consumption on the gastrointestinal function mediated through the gut micro flora, bowel transit and the enhancement of gastrointestinal immune responses. Numerous studies suggested beneficial therapeutic effect of probiotic bacteria in the yogurt and other fermented dairy products on the gut health. Certain disease with gastrointestinal tract such as, lactose intolerance, diarrhea, colon Cancer, inflammatory bowel disease and other bacterial infection were inhibited through high consumption of yogurt. Probiotic

bacteria can protect against enteric infection and inhibit chemically Carcinogens induce tumorization in the gastrointestinal tract. Modulation of the gut microflora and the enhancement of mucosal immunity of the gut are both mechanisms of probiotic function potentially influence gut function. Combination of Probiotic active culture and prebiotics non digestible food ingredient, beneficially affect the host by improving the survival of live microbial dietary supplement through its transit in the gut and by stimulating the activity of colon bacteria, specially *Bifidobacteria* and *Lactobacilli* genera. Further well-designed, controlled animal studies are needed to confirm the effects of different sources of probiotic strains used in the diary products, on gut health and function. (*Pakistan Journal of Nutrition* 8 (7): 1107-1113, 2009; **doi:** 10.3923/pjn.2009.1107.1113)

### **Effects of Dietary Supplementation with Copper Sulfate or Tribasic Copper Chloride on Carcass Characteristics, Tissular Nutrients Deposition and Oxidation in Broilers**

Zhang Xiang-Qi, Ke-Ying Zhang, Xue-Mei Ding and Shi-Ping Bai

The experiment was conducted to compare the effects of dietary Tribasic Copper Chloride (TBCC) and Copper Sulfate ( $\text{CuSO}_4$ ) on carcass characteristics, copper deposition and tissular nutrients oxidation in broilers. A  $2 \times 5$  factorial (two copper sources:  $\text{CuSO}_4$  or TBCC; five added copper levels as 0, 50, 150, 250 or 350 mg/kg) completely randomized design was conducted in experiment. 1,890, 1 day old, Cobb 48 commercial male chicks were randomly allotted into 63 floor pens of 30 birds each and fed to 40-days-old. Two birds from each pen were sacrificed. Their carcass characteristics and the contents of crude fat, copper,  $V_E$  or Malondialdehyde (MDA) in tissues were determined. Results indicated that: when added copper level was 150 mg/kg, half-evisceration yield and breast yield of broilers increased. The evisceration yield of broilers was raised by feeding TBCC and supplementation with 50 mg/kg copper from TBCC got the biggest evisceration yield; when added copper levels increased from 50-350 mg/kg, contents of copper or crude fat in liver or muscles and the level of  $V_E$  in heart were increased significantly, while, the levels of  $V_E$  or MDA in liver decreased; when added copper levels were less than or equal to 150 mg/kg, the copper levels in liver or muscles were similar between copper sources; while added copper levels were  $>150$  mg/kg, the smaller quantities of copper in liver were gained by using TBCC comparing with feeding  $\text{CuSO}_4$ . It implicated that TBCC was a safe dietary copper source. (*Pakistan Journal of Nutrition* 8 (8): 1114-1119, 2009; **doi:** 10.3923/pjn.2009.1114.1119)

## **Nutritive and Anti-Nutritive Evaluation of Wonderful Kola (*Bucchozia coricea*) Seeds**

N.C. Amaechi

Levels of some nutrients, anti-nutrients and dietary fibre of wonderful kola (*Bucchozia coricea*) seeds were determined using standard analytical methods. Crude protein, crude fat, crude fibre, ash, carbohydrate, moisture contents and calorific values were 13.28%, 2.50%, 1.70%, 4.53%, 77.18%, 1.34%, and 384.33% Kcal, respectively. The total, insoluble and soluble dietary fibre contents were found to be 11.77%, 11.09%, and 0.68%, respectively. Elemental analysis of the seeds indicated that the dried seeds contained magnesium (1.58%), sodium (1.20ppm), potassium (1.26ppm), phosphorus (0.18mg/g) and calcium (0.17%). Anti-nutrient composition of saponin, oxalates, tannins and phytates in mg/100g. The values were 4.03±0.26, 1.06±0.04, 0.11±0.004 and 3.18±0.01, respectively, while trypsin inhibitor was 0.53±0.07 TIU. These results reveal that these seeds contain appreciable amounts of nutrients especially carbohydrates and proteins with good caloric value and low levels of toxicants and should be included in human diets to supplement our daily allowance needed by the body. (*Pakistan Journal of Nutrition* 8 (8): 1120-1122, 2009; doi: 10.3923/pjn.2009.1120.1122)

## **Effect of Local Cassava Fermentation Methods on Some Physiochemical and Sensory Properties of FUFU**

E.A. Uyoh, V.O. Ntui and N.N. Udoma

The effects of two fermentation methods (fixed and unfixed) on the HCN content, texture, colour, flavour, water retention capacity and bulk density of *fufu*, a cassava based entree were studied using an improved cassava cultivar, TMS 0635. Results obtained showed that the HCN content of *fufu* from fixed fermentation method was significantly lower ( $p < 0.001$ ) than that from unfixed fermentation. On the other hand, bulk density and water retention capacity were significantly higher ( $p < 0.001$ ) in *fufu* processed from fixed fermentation method. Texture, colour and flavour were, however, not significantly different ( $p > 0.05$ ) in *fufu* processed from the two methods. The fixed fermentation method is, therefore, recommended for *fufu* processing with cassava cultivar TMS 0635. (*Pakistan Journal of Nutrition* 8 (8): 1123-1125, 2009; doi: 10.3923/pjn.2009.1123.1125)

## Breast-Feeding Behaviours of the Mothers

Didem Onay, Mehmet Akman, Sengul Akdeniz and Ayse Kacaroglu Vicdan

Breast-feeding is the most useful nutrient due to the facts that its contents change according to the requirements of the newly-born, it protects them against the infections and it meets all the physiological and psychological needs of the baby in the first six months and it is economical. In the following months, the infants getting breastmilk could be supported by additional nutrients so that they can make a healthy start in life being far away from the malnutrition and infection risks. This study was conducted at the local hospitals of Aksehir, Konya, with an aim to determine the breast-feeding behaviors of the volunteered 345 mothers who had 0-24-month-old babies. The ratio of the mothers who had breastfed their babies in wake of the birth was found to be 50.1%, while the ratio of the ones who did that in the first two hours was 35.9%. It was also found that 14.0% of the mothers hadn't breastfed their babies in the first three or more hours. Another finding in the study was that 89.0% of the mothers had given colostrums, while 7.2% of them hadn't. The other 3.8% said that they didn't remember if they had done that or not. The relationship between giving colostrums and the education level was found to be significant ( $p < 0.05$ ). It was also found that 79.7% of the mothers had chosen breast-feeding as the first nutrient to their babies in wake of the birth. The frequency of breast-feeding was found to vary as follows: 45.8 % of the mothers breastfed when their babies needed, 40.3% of them did that when their babies cried and the other 13.0% did breast-feeding according to a scheduled timetable. The ratio of the mothers who did not breast-feeding was 0.9%. The relationship between that frequency and mother education level was found to be significant statistically ( $p < 0.05$ ), but the relationship between breast-feeding frequency and other variables such as mother age, the order of the child in family and the number of children was found to be insignificant ( $p > 0.05$ ). The period in which the babies were fed by only breast milk without any additional nutrient was found to vary as follows: 69.1% of the babies were breastfed during 4-6 months, 27.0% were breastfed less than 4 months, 4.1% of them 7-12 months. The average breast-feeding period without any additional nutrient intake was found to be  $4.5 \pm 0.8$  months. 73.6% of the mothers who started giving the additional nutrient did that in the 4-6 months after the birth, while 17.2% of them did that before the fourth month and the other 9.2% of them did that after the sixth month following the birth. (*Pakistan Journal of Nutrition* 8 (8): 1126-1131, 2009; doi: 10.3923/pjn.2009.1126.1131)

## **Antibacterial Effect of Autochthonous *Lactobacillus* Strains Isolated from Traditional Yogurts**

Ebtehaj Pishva, Nazila Hassannia, Mohammad Reza Fazeli, Asghar Havaee, Hossein Jamalifar, Mearaj Pour Hossein, Hassan Shojaee and Mojtaba Akbari

It is obvious that some of resident gastrointestinal bacterial flora represented by *Lactobacilli* have protective role in pathogenic infections. There are many examples of probiotic effect of Lactic Acid bacteria on enteropathogens. Lactic acid bacteria are derived from the intestinal microbiota of healthy humans or dairy products. These bacteria interact with the diet and the host, contributing to protection against intestinal pathogens through colonization resistance and providing nutritional and colonic health benefits via their metabolic activities. In this study we isolated strains of *Lactobacilli* from Iranian traditional yogurts and identified by biochemical tests. We tested antibacterial activity of strains against *Escherichia coli* and *salmonella typhi* by spot test method. Then we assayed zone of pathogenic bacteria. Also, we determined death kinetic of pathogenic bacteria. Most of *Lactobacilli* strains had potential activity against the enteropathogenic bacteria of *E. coli* and *Salmonella*. This antagonistic effect against *E. coli* was more than *Salmonella*. *Lactobacillus Casei* showed the most preventive effect. Activity of probiotics in prevention and treatment of infections by *E. coli* and *salmonella* are effective. (*Pakistan Journal of Nutrition* 8 (8): 1132-1137, 2009; doi: 10.3923/pjn.2009.1132.1137)

## **Chemical and Microbiological Properties of Sudanese White Soft Cheese Made by Direct Acidification Technique**

Kamal Awad Abdel Razig and Nagla Ali Ahmed Babiker

The chemical and microbiological properties of Sudanese white soft cheese made by direct acidification technique were investigated. Three kinds of acidulant, namely lemon, orange and grapefruit juices were used to assess some quantitative and qualitative properties of white soft cheese. The parameters evaluated included yield of cheese, physicochemical composition and microbiological analyses. Cheese made by the use of lemon juice recorded the highest yield (18.5%), but values of 16.0 and 14.8% were obtained for orange and grapefruit juices, respectively. Both kinds of acidulants and storage period imparted negative effects by causing highest loss of weight (28.35%), using lemon juice; lowest (25.79%) in case of grapefruit. The loss of weight (27.03%) accounted for orange juice occurred at an intermediate position. Storage period significantly ( $p \leq 0.05$ ) caused loss of weight that showed a trend of gradual increase until the end of the storage

period, being the lowest (26.40%) after 15 days and highest (38.23%) after 60 days. The total solids recorded 53.32, 51.70 and 49.48%, for lemon, orange and grapefruit juices, respectively. Similarly, the storage period caused significant ( $p \leq 0.05$ ) and consistent increase as the storage period progressed. The protein content indicated significant amount being 22.91, 22.51 and 22.10%; for lemon, orange and grapefruit and interrupted by decrease after 45 days of storage, before that a steady increase was attained. Significant increase in the fat content occurred at highest level (23.82%) when lemon juice was used but 22.10 and 20.08% were recorded for orange and grapefruit. The significantly enhanced fat concentration occurred from 19.38% at the beginning to 23.77% once the time elapsed after 60 days. The orange and grapefruit juices had similar leftover ash content lower than that obtained from lemon. The ash content increased with time until the end of the storage period. The highest pH-value (3.74) was recorded by adding grapefruit juice; other values got less 3.48 and 3.28 for orange and lemon, respectively. The storage period has given the highest pH-value (5.20) at the beginning and lowest (2.73) at the end. The total bacterial count decreased during storage of the three types of cheese, while the coliform, yeast and mould and *Staphylococcus aureus* recorded nil in all cheese samples during storage. (*Pakistan Journal of Nutrition* 8 (8): 1138-1143, 2009; doi: 10.3923/pjn.2009.1138.1143)

### **Effect of Carboxymethylcellulose and Starch as Thickening Agents on the Quality of Tomato Ketchup**

Md. Khayrul Alam, Maruf Ahmed, Mst. Sorifa Akter, Nurul Islam and Jong-Bang Eun

The objective of this study was to evaluate the effect of thickening agents such as carboxymethylcellulose and starch on the quality parameter of tomato ketchup during storage at 30°C. The carboxymethylcellulose was used at the rate of 0.75-1.25% while, starch was 3-4% in the formulation of tomato ketchup. The moisture content of ketchup was increased by the addition of both the thickening agents. The protein, fibre, ash, acidity and total soluble solid of tomato ketchup were decreased gradually when higher percentage of starch and carboxymethylcellulose were added. Amounts of lycopene, vitamin C and reducing sugar content were higher in the ketchup where starch was used. Starch and carboxymethylcellulose had <10 cfu/g of molds and total viable bacteria throughout storage at 30°C for 60 days. Carboxymethylcellulose treated ketchup was found more suitable than the starch treated through sensory evaluation. (*Pakistan Journal of Nutrition* 8 (8): 1144-1149, 2009; doi: 10.3923/pjn.2009.1144.1149)

## **The Effect of Dried Sweet Orange (*Citrus sinensis*) Fruit Pulp Meal on the Growth Performance of Rabbits**

F.M. Hon, O.I.A. Oluremi and F.O.I. Anugwa

A feeding trial was conducted with thirty six mixed breeds of rabbits to assess the feeding value of sun dried sweet orange (*Citrus sinensis*) fruit pulp meal (SOPM). The sweet orange peel meal was analyzed for its proximate nutrients and its crude fibre constituents. The nutrients in SOPM were 7.71% CP, 9.6% CF, 2.12% EE, 5.18% ash, 75.31% NFE and 3756.14kcalME/kg. The crude fibre fractions were 15.04% cellulose, 20.46% hemi-cellulose, 38.28% NDF, 18.32% ADF and 3.28% ADL. The experimental rabbits were randomly assigned to six dietary treatments: T<sub>0</sub>, T<sub>5</sub>, T<sub>10</sub>, T<sub>15</sub>, T<sub>20</sub> and T<sub>25</sub> in which SOPM replaced maize at 0, 5, 10, 15, 20 and 25%, respectively at the rate of six rabbits per dietary group. The rabbits were fed these diets for 84 days during which performance and nutrient digestibility were evaluated. Experimental diets had significant effects ( $p < 0.05$ ) on the body weight gain, water intake, water: feed ratio, protein efficiency ratio and final live weight. Coefficient of digestibility and nutrient digestibility, were not adversely affected by the inclusion of SOPM in the diets. This study has shown the possibility that sweet orange fruit pulp meal can be used as a replacement feedstuff for maize in the ration of grower rabbit up to a level of 20%. (*Pakistan Journal of Nutrition* 8 (8): 1150-1155, 2009; doi: 10.3923/pjn.2009.1150.1155)

## **Effect of Processing Methods on Quality of Soymilk**

T.Y. Tunde-Akintunde and A. Souley

Soymilk is one of the easiest ways to add soyprotein, a high quality protein, to the human diet because it doesn't alter the taste of food. It is a highly nutritious drink and must be prepared in such an easy way that the quality is maintained. Soymilk was processed using 5 methods including delayed filtration, hot extraction, cold extraction, soaking and blanching, potash and sodium bicarbonate processing methods. The highest protein content was between 3.05% for delayed filtration and 2.23% for soaking in potash. The sensory properties of the soymilk increased with decrease in nutritional quality indicating that methods which increase sensory properties of soymilk by reducing its beany flavour have lower nutritional qualities. (*Pakistan Journal of Nutrition* 8 (8): 1156-1158, 2009; doi: 10.3923/pjn.2009.1156.1158)

## **Growth, Reproduction and Milk Yield of Holstein Friesian Heifers Born and Adapted in Kuwait**

M.A. Razzaque, S.A. Mohammed, T. Al-Mutawa and M. Bedair

Kuwait's dairy producers import pregnant Holstein Friesian Heifers and they thrive for 2.3 lactations with poor milk yield. Offspring of imported dams are subjected to high mortality, poor growth and reproduction. This study investigated growth, reproduction, milk yield and composition of locally born heifers fed two types of diets. Total 92 weaned 90 d old heifers born in Kuwait from imported dams were assigned to two different diets. Control (C): 25 heifers were fed commercial diet and Treatment (T): 67 heifers were fed balanced improved diets containing 17.5% and 15.1% CP, respectively. T diet was also balanced with vitamins and minerals, where, as C diets were not. Both herds were individually monitored for their heights and live weights; followed by reproductive and lactation performance. Herd T gained significantly ( $p < 0.05$ ) better live weight (T: 0.88 Kg vs. C: 0.71 Kg/h/d) than that of C and reaching significantly ( $p < 0.01$ ) better heights (T: 59% vs. C: 15%) of total standard height of 132 cm. Farm to farm differences in first service (mean $\pm$ SD) conception rate and pregnancy rate did not differ between C and T herds ( $p = 0.05$ ). Milk yield differences for C and T herds were  $16.86 \pm 0.70$  and  $18.30 \pm 1.40$  L/cow/day, respectively as well as Milk composition were not significant ( $p = 0.05$ ). Milk Urea Nitrogen (MUN) concentration was significantly higher ( $p < 0.001$ ) in T herd than that of C reflecting a better protein nutritional status in T than that of C herd. (*Pakistan Journal of Nutrition* 8 (8): 1159-1163, 2009; doi: 10.3923/pjn.2009.1159.1163)

## **The Effects of Different Sizes of Nanometer Zinc Oxide on the Proliferation and Cell Integrity of Mice Duodenum-Epithelial Cells in Primary Culture**

M. Feng, Z.S. Wang, A.G. Zhou and D.W. Ai

The MTT activity and LDH release were investigated in the proliferation and cell integrity of mice duodenum-epithelial cells which exposed to 10-15 nm and 100 nm nanometer zinc oxide (nano-ZnO). The mice duodenum-epithelial cells supplied two different sizes of nano-ZnO where supplemental Zn concentrations were 0, 0.4, 0.8, 1.6, 3.2, 6.4, 12.8  $\mu\text{g ml}^{-1}$ , respectively. The results showed that the MTT activity increased with the increased concentrations of 10-15 nm and 100 nm nano-ZnO, while the concentration 12.8  $\mu\text{g ml}^{-1}$  of 10-15 nm nano-ZnO decreased the MTT activity. The LDH released increased significantly under the



concentration  $12.8 \mu\text{g ml}^{-1}$  of 100 nm nano-ZnO and  $6.4 \mu\text{g ml}^{-1}$ ,  $12.8 \mu\text{g ml}^{-1}$  of 10-15 nm nano-ZnO. In summary, the nano-ZnO promoted the proliferation of the cells and did not injury the cells at lower concentrations. (*Pakistan Journal of Nutrition* 8 (8): 1164-1166, 2009; doi: 10.3923/pjn.2009.1164.1166)

### **Effect of Dried Brewers' Grains as a Source of Fibre in the Diet of Angora Rabbits on the Growth Performance**

Siddaramanna, B.S.V. Reddy, H.S. Madhusudhan

An attempt was made to study the effect of incorporation of Dried Brewers' Grains (DBG) as a source of fibre on the growth performance of Angora rabbit. Forty Angora rabbits of eight month age were selected, sheared and grouped into four body weight categories namely Low Weight (LW), Medium Low Weight (MLW), Medium Heavy Weight (MHW) and Heavy Weight (HW) groups, each with 10 rabbits. There were five treatments, namely, T<sub>1</sub> (Control with 40% Dehydrated Lucerne Meal (DLM) as a major fibre source), T<sub>2</sub> (Equal parts of DLM and DBG as major fibre sources), T<sub>3</sub> (40% DBG as a major fibre source without DLM), T<sub>4</sub> (Ricebran extraction as a major fibre source without DLM), T<sub>5</sub> (DLM and sunflower cake as major fibre source). Two rabbits from each body weight category were randomly allotted to all the treatments (8 rabbits in all) such that average initial weight was uniform under all dietary treatments. All rabbits were fed *ad libitum* and weighed once a week. The rabbits had an average body weight of 2.83, 2.97, 2.97 and 3.05 kg with mean gain in body weight as 12.7, 13.3, 8.8 and 9.8 g per day showed the feed efficiency of 11.8, 12.2, 20.8 and 15.3 under LW, MLW, HW and MHW groups respectively, among which feed efficiency of first three were statistically similar ( $p = 0.01$ ) within themselves whereas, LW and MLW category were significantly different ( $p = 0.01$ ) from HW category. Despite a non-significant ( $p = 0.01$ ) effect in the gain in body weight or feed efficiency due to treatments, the T<sub>2</sub> diet (13.8) may prove satisfactory. (*Pakistan Journal of Nutrition* 8 (8): 1167-1169, 2009; doi: 10.3923/pjn.2009.1167.1169)

### **Screening of *Achatina achatina* and *Pila ovata* for Trace Metals in Makurdi Metropolis**

S.Y. Aboho, B.A. Anhwange and G.A. Ber

The viscera and shells of *Achatina achatina* and *Pila ovata* were analysed for the following trace metals; copper, cadmium, lead, iron, arsenic and zinc. The

results indicate the mean concentrations (mg/g) of Cu, Pb, Fe and Zn for the viscera of *Achatina achatina* to be 0.31, 0.43, 0.50 and 0.47, respectively, while the values for the shell *Achatina achatina* were as follow; 0.08, 0.79, 0.74 and 1.81 for Cu, Pb, Fe and Zn, respectively. The viscera of *Pila ovata* had 0.14, 0.92, 0.78 and 0.72 as mean concentrations values in mg/g for Cu, Pb, Fe and Zn, respectively. The mean concentration values (mg/g) for Cu, Pb, Fe and Zn in *Pila ovata* shells were found to be 0.56, 0.92, 0.58 and 1.47, respectively. Cadmium and arsenic concentrations were not detected in both the viscera and shells of *Achatina achatina* and *Pila Ovata*. Generally, the concentrations of these trace metals in the samples were low but continuous bioaccumulation may lead to some health threat. (*Pakistan Journal of Nutrition* 8 (8): 1170-1171, 2009; doi: 10.3923/pjn.2009.1170.1171)

### **The Role of Locust Bean and Ironwood Trees in Human Nutrition and Income in Nigeria**

T.N. Tee, J.A. Ogwuche and E.T. Ikyagba

This study was conducted in North-Central Nigeria to access the role of African locust bean tree and Ironwood tree in the nutrition and income of the people in this area. Through focus group discussions with key informants and interviews held with 120 household heads, information on the contribution of the 2 tree species to households nutrition and income in the area were elicited between July, 2008 and February, 2009. Market survey of mean retail prices and operational costs of products from these trees were also recorded for analysis. Using Gross income and Total variable cost, Net incomes from each product was determined. The result revealed that both trees contributed significantly to the nutritional wellbeing of the people of North-Central Nigeria; and that their monthly net incomes from products of these trees compared favourably with the national minimum wage of N7500 (USD59 equivalence). Many of them were living above the national minimum wage. However, the sustainability of these benefits is threatened as these trees are being subjected to over exploitation and very limited efforts at establishing their plantations and maintaining their populations in the wild. The study therefore recommended improved harvesting and post-harvest techniques, intensive silvicultural research, and the establishment of plantations of these tree species in the area and beyond. Similarly, improved pricing policies and enhanced processing and marketing of products from these species for value addition are strongly recommended. (*Pakistan Journal of Nutrition* 8 (8): 1172-1177, 2009; doi: 10.3923/pjn.2009.1172.1177)

## **The Effects of Nanosilver (Nanocid®) on Survival Percentage of Rainbow Trout (*Oncorhynchus mykiss*)**

Delavar Shahbazzadeh, Hamed Ahari, Narges Mohammad Rahimi, Farhad Dastmalchi, Mahdi Soltani, Mansour Fotovat, Jafar Rahmannya and Neda Khorasani

Nano materials have unique antimicrobial properties. The toxic level of nanosilver, with the commercial name of Nanocid was studied. Rainbow trout (*Oncorhynchus mykiss*) with median weight of 1.049 g, was treated with 1, 2, 5, 10 and 20 ppm of nanosilver. The results were analyzed after 24, 48, 72, and 96 h and the lethality dose obtained between 1.25-10 ppm. In conclusion, the 48, 72 and 96-h median lethal concentrations (LC50) of nanosilver tests were obtained at 3.5, 3 and 2.3 mg/L, respectively, indicating moderate toxicity of nanocid in rainbow trout fish. (*Pakistan Journal of Nutrition* 8 (8): 1178-1179, 2009; doi: 10.3923/pjn.2009.1178.1179)

## **Tenderize Chicken Breast Meat by Using Different Methods of Curing**

N.A. Nadia Al-Hajo

The aim of this study is tenderizing breast spent hens meat by using cheap local materials such as (bitter orange juice, vinegar, salt and sugar for (1, 2 and 3) h, distilled water is used (T<sub>1</sub>) in curing to make it as standard. Bitter orange juice (acidity of 1.5) (T<sub>2</sub>), vinegar (acidity of 7) (T<sub>3</sub>), table salt (2%) (T<sub>4</sub>) and sugar (2%) (T<sub>5</sub>) were used. The processed meat was investigated to determine the influence of the type of treatment and the periods of storing and submersion on the sensory properties and chemical qualities through estimating the percentage of moisture, volume of the released extract. A sensory properties evaluation of the qualities of flavor, juiciness, tenderness and overall acceptance was carried out. The following findings were obtained: The percentage of moisture increased significantly ( $p < 0.05$ ) of the treatment groups compared with T<sub>1</sub>. It was found that the highest significant differences ( $p < 0.05$ ) was T<sub>4</sub>. A decrease appeared in the volume of the released extract. The highest significant ( $p < 0.05$ ) was T<sub>1</sub> and the lowest one was T<sub>4</sub>. Results of sensory evaluation indicated the improvement of the sensory qualities of the samples treated with the different solutions especially of tenderness and juiciness. These results were reflected on the quality of general acceptance by

the consumer of the samples. Results of sensory evaluation revealed that T<sub>2</sub> and T<sub>4</sub> was the best sample. Significant differences (p<0.05) as far as the periods of curing were noticed. Thus we can recommend using 2% salt and bitter orange juice (1.5 acidity) in curing breast spent hens meat. (*Pakistan Journal of Nutrition* 8 (8): 1180-1183, 2009; doi: 10.3923/pjn.2009.1180.1183)

### **The Influence of a Pectinase and Pectinase/hemicellulases Enzyme Preparations On percentage Pineapple Juice Recovery, Particulates and Sensory Attributes**

Bitange Nipa Tochi, Zhang Wang, Shi-Ying Xu and Wenbin Zhang

Two commercial enzyme preparations (from *Aspergillus niger*), a pectinase and a liquid pectinase/hemicellulases were used singly or in combination at a rate 0.03% (w/w) in a two step extraction of pineapple juice at 35, 37.5 and 40°C for 30 min. The percentage juice recovery, soluble sugars, total phenolics, titratable acidity, viscosity and turbidity of the recovered juice were measured to ascertain the influence of the enzyme preparations on extraction against the control. The ready to serve pineapple juice (RTS) was rated for acceptance on a 5 point hedonic scale. (*Pakistan Journal of Nutrition* 8 (8): 1184-1189, 2009; doi: 10.3923/pjn.2009.1184.1189)

### **Methods of Preparation and Nutritive Value of Some Dishes Consumed in the West Region of Cameroon**

Fokou Elie, Ponka Roger, Tchinda Dimofa Patrice Honoris, Domguia Kenmogne Hernan Brice,

This study deals with the description of the methods of preparation and the nutritive value of some dishes consumed in the West region of Cameroon. These dishes are prepared from potatoes, yams, cassava, unripe bananas, maize, soybeans, beans, peanuts, egusi seeds and green leafy vegetables. The contents in moisture, ash, proteins, lipids, fibres and carbohydrates were determined by standard AOAC methods. The results obtained are expressed in g/100 g fw for moisture and g/100 g dw for ash, proteins, lipids, fibres and carbohydrates. The moisture content ranges from 43 (*Tag bankun*) to 96 (*Na'm pfeu*); ash, from 2.2 (*Poumseing djap mtom*) to 17.8 (*Na'm pfeu*); proteins, from 1.5 (*Site ngali*) to 33 (*Sog sojà*); lipids from, 1 (*Na'm pfeu*) to 70 (*Na'nou'ne*); fibres, from 1.8

(*Site sembùn*) to 21.5 (*Na'm pfeu*) and carbohydrates, from 4.8 (*Ndzap njheu'*) to 69.7 (*Poumseing djap mtom*). The results show that a higher consumption of Sog *sojà* meals is to be encouraged in order to fight against malnutrition. (*Pakistan Journal of Nutrition* 8 (8): 1190-1195, 2009; doi: 10.3923/pjn.2009.1190.1195)

### **Enumeration of Thermoduric and Thermophilic Spores in Commercial Repacked Milk Powder**

Imran Rashid Rajput, M. Khaskheli, A.H. Soomro, N. Rajput and G.B. Khaskheli

The present study was carried out to enumerate the thermoduric and thermophilic spores in commercial repacked milk powder. A total of 30 dried milk powders, 10 each of Skim Milk Powder (SMP), Semi Skim Milk Powder (SSMP) and Full Cream Milk Powder (FCMP) purchased from market of Hyderabad, Sindh were evaluated for microbiological quality characteristics of Thermoduric Count (TDC) and Thermophilic Spore Count (TPSC). Thermoduric count, ( $5.15 \times 10^2 \pm 2.6 \times 10^1$  cfu/g) was significantly ( $p < 0.05$ ) higher in FCMP compared to SMP  $2.7 \times 10^2 \pm 4.7 \times 10^1$  and SSMP  $1.6 \times 10^2 \pm 3.1 \times 10^1$ . TPS count enumerated from FCMP ( $8.68 \times 10^2 \pm 4.1 \times 10^1$  cfu/g) and SSMP ( $7.75 \times 10^2 \pm 1.74 \times 10^1$ ) were relatively similar ( $p < 0.05$ ), but significantly different ( $p < 0.05$ ) from SMP ( $4.06 \times 10^2 \pm 5.9 \times 10^1$  cfu/g). The overall average count of TD, ( $3.17 \times 10^2 \pm 3.7 \times 10^1$  cfu/g), TPS ( $6.83 \times 10^2 \pm 7.3 \times 10^1$ ), were detected higher (3.7 folds), (6.83 folds), (18.4 folds) compared to ISI standard respectively. Although, TPS indicates the unhygienic condition of dried milk powders with higher risk level for human health. While TD count appeared in higher concentration level may reveal significant influence on the quality of the final product. (*Pakistan Journal of Nutrition* 8 (8): 1196-1198, 2009; doi: 10.3923/pjn.2009.1196.1198)

### **Some Biochemical, Haematological and Histological Responses to a Long Term Consumption of *Telfairia occidentalis*-Supplemented Diet in Rats**

Emeka, E.J. Iweala and Onyechi Obidoa

Some biochemical, haematological and histological responses were studied in rats undergoing a long term feeding with a *Telfairia occidentalis*-supplemented diet.

Biochemical and hematological parameters investigated included serum protein, total cholesterol, lipid peroxidation, haemoglobin, white blood cells, Aspartate aminotransferase, Alanine aminotransferase, Alkaline phosphatase, Glutathione-s-transferase and Superoxide dismutase. Histological changes associated with *Telfairia occidentalis*-supplemented diet on the liver, intestine and testes were also examined. Results showed that *Telfairia occidentalis*-supplemented diet caused a significant increase ( $p<0.05$ ) in weight and haemoglobin. Cholesterol and lipid peroxidation were significantly reduced ( $p<0.05$ ). There were however no significant changes in the enzymes including Aspartate aminotransferase, Alanine aminotransferase, Alkaline phosphatase, Glutathione-s-transferase and Superoxide dismutase. Only Alkaline phosphatase was significantly reduced ( $p<0.05$ ). Histological changes showed hypertrophy of the intestinal propia and reduced goblet cells while the testes exhibited thick basement membrane and large spermatogonia. (*Pakistan Journal of Nutrition* 8 (8): 1199-1203, 2009; *doi: 10.3923/pjn.2009.1199.1203*)

### **Proximate Composition, Nutritionally Valuable Minerals, Protein Functional Properties and Anti-Nutrient Contents of Mucuna Preta, Mucuna Ghana and Mucuna Veracruz Mottle**

I.A. Amoo, V.N. Atasié and O.O. Kolawole

Results of the proximate composition, functional properties and physico chemical properties of mucuna ghana, mucuna preta and mucuna Veracruz mottle is reported. The ranges are; ash (3.17-4.33), moisture (8.50-8.85), crude protein (30.92-33.25) and crude fat (46.20-49.34). Mineral contents showed phosphorus to be most abundant while manganese and copper were least. Lead was not detected. Functional properties of the protein showed a good Water Absorption Capacity (WAC) ranges (145-160) and Oil Absorption Capacity (OAC) ranges (130.10-138.23). The foaming capacity (17.00-25.00), mucuna preta was least and mucuna ghana highest. The Oil Absorption Capacity (OAC) (130.10-138.23) with mucuna ghana highest and mucuna veracruz mottle least. The Least Gelation Concentration (LGC) and emulsion capacity (ES) are relatively good. The Foaming Capacity (FC) after 2 h showed appreciable and acceptable values (17.00-25.00) in which mucuna preta was least and mucuna ghana was highest. The Foaming Stability (FS) values were also within acceptable ranges (9.0-12.50). Emulsion stability (59.00-66.00) has mucuna ghana least and mucuna veracruz mottle highest. Plots of the protein solubility against pH showed protein to be soluble at both acidic and alkaline regions. Anti-nutrients in the samples

showed tannic acid range (8.54-10.30), Oxalate mg/g (6.78-8.31) and phytate mg/g (55.11-85.47). The ranges were however within acceptable values. (*Pakistan Journal of Nutrition* 8 (8): 1204-1208, 2009; **doi:** 10.3923/pjn.2009.1204.1208)

### **Distribution of Heavy Metals in Bones, Gills, Livers and Muscles of (Tilapia) *Oreochromis niloticus* from Henshaw Town Beach Market in Calabar Nigeria**

Edem Christopher A., Osabor Vincent, Iniama Grace, Etiuma Rebecca and Eke Joseph

Two sets of samples of commercially important fish species *Oreochromis niloticus* of size 29 cm and 20 cm respectively were purchased from the Henshaw town beach market in Calabar, Calabar South Local Government Area of Cross River State, Nigeria in October 2007. The concentrations of five heavy metals (Pb, Zn, Cd, As and Hg) in their bones, gills, livers and muscles were determined using flame atomic absorption spectrophotometer. The result showed the heavy metal concentrations in the 29 cm size samples to be Pb (0.069 ppm) Cd (0.019 ppm) and Zn (0.103 ppm) in the bones. Pb (0.173 ppm) Cd (0.049 ppm) and Zn (0.257 ppm) in the livers. Pb (0.053 ppm) Cd (0.015 ppm) Zn (0.079 ppm) in the muscles Pb (0.133 ppm), Cd (0.038 ppm) and Zn (0.198 ppm) in gills. While the 20 cm size samples had Pb (0.067 ppm) Cd (0.019 ppm) and Zn (0.100 ppm) in bones. Pb (0.067 ppm) Cd (0.019 ppm) and Zn (0.099 ppm) in livers. Pb (0.062 ppm) Cd (0.017 ppm) and Zn (0.095 ppm) in muscles and Pb (0.153 ppm) Cd (0.044 ppm) and Zn (0.227 ppm) in gills. Arsenic and mercury were not detected in any of the samples. The result revealed the distribution of the heavy metal in both 29 cm and 20 cm size samples to follow the order Zn > Pb > Cd while the distribution of the heavy metals in the investigated parts (organs) is shown to follow the order livers > gills > bones > muscles for the 29 cm size samples. And Gills > Livers = bones > muscles in the 20 cm size samples. The result also revealed that the 29 cm size samples had higher concentrations of the heavy metals than the 20 cm size samples. The result also showed that the muscle of Tilapia is safer to consumed than the other parts investigated as it has been shown to contain the least concentrations of the heavy metals determined. This reveals the adverse health effect the people in the study area could be exposed to by the consumption of liver, gills and bones of Tilapia which have high levels of these heavy metals. (*Pakistan Journal of Nutrition* 8 (8): 1209-1211, 2009; **doi:** 10.3923/pjn.2009.1209.1211)

## **Culture of Food Preservation among Bushehrian People in Iran**

Maryam Ravanipour, Masoumeh Ravanipour, Shahnaz Pouladi, Hakimeh Vahedparast, Mohammadreza Yazdankhahfard, Fatemeh Hajinejad and Heidarali Abedi

The correlation between food and health has been documented through many studies. Cultures have a fundamental role in the process of food selection, preparation and storage methods. It is important that health professionals and nutritionists develop a cultural awareness and use resources targeted toward a specific group. Because the main goal of this study was to find a description of cultural structures of food preservation among Bushehrian people, we used a qualitative method of research which deals with direct description of a group, culture or community-Ethnography-among Bushehrian people. Four main categories were emerged from the findings: 1) foods tendency of the families, 2) economic-environment point of view, 3) paradox between tradition and technology and 4) believes about the foods. Health considerations were placed in the core of all categories. So, it can be the main point of attentions for interventions for health care professionals. (*Pakistan Journal of Nutrition* 8 (8): 1212-1217, 2009; *doi*: 10.3923/pjn.2009.1212.1217)

## **Consumer Awareness on Food Poisoning**

Semra Akar Sahingoz and Hande Sahin

This study aims to determine the level of knowledge of consumers on types of food poisoning and whether or not they have had food poisoning in the past. The research sample consisted of 232 people. The research data were collected using a questionnaire, face-to-face interviews and observation. The data were analyzed using SPSS 13.0 for Windows. Chi-square test was applied in order to determine whether a statistical difference between the participants existed or not, by taking their education levels as the variable and the results were tabulated using  $p = 0.005$  and  $p = 0.01$  significance values as principle. It was determined that 46.6% of the participants had experienced a problem because of food and 29.5% of these were nausea problems, 28.7% of them got poisoned because of the food consumed in their cafeteria at work and 29.6% was because of chicken, 85.2% of the consumers were poisoned in the summer, 33.3% were poisoned in 2007, 81.5% had not gone to a health center, of those who had gone to a health center 75.0% were identified as poisoned. As the education level of the consumers increase, they start to have some knowledge on HACCP but this knowledge is



incomplete ( $p < 0.01$ ). (*Pakistan Journal of Nutrition* 8 (8): 1218-1223, 2009; *doi*: 10.3923/pjn.2009.1218.1223)

### **Selective Amplification of *SEA*, *SEB* and *SEC* Genes by Multiplex PCR for Rapid Detection of *Staphylococcus aureus***

Hamed Ahari, Delavar Shahbazzadeh and Ali Misaghi

*Staphylococcus spp.*, is a common bacteria in cattle mastitis. Detection of the low number of bacteria requires a sensitive method. We used Multiplex Polymerase Chain Reaction (M-PCR) assay to detect the genes encoding SEA, SEB, SEC toxins that are specific in *Staphylococcus aureus* bacteria. The gene of 23S rRNA that is conserved in all *Staphylococcus spp.*, also used as control. Due to the stiffness and low effective enzyme activity such as lysozyme, proteinase k and mutilysine on bacterial cell wall, it lysed with liquid nitrogen and multiplex PCR was performed after DNA extraction. The obtained results in molecular method were compared with cell culture. The total number of 60 samples of non pasteurized milk was collected in Tehran province restrict from dairy cattle housing and 4 positive samples were detected by PCR and microbial cell culture methods. The accuracy of the test was monitored by using serial dilution ( $1-10^6$ ) of overnight cell culture of *Staphylococcus spp.*, bacteria ( $OD_{600}:0.02 = 10^7$  cell). It showed that the sensitivity of PCR is 10 bacteria per ml of cells within few hours, meanwhile in bacterial blood agar cell culture; the number of 100 cells was detected after 48 h. This is the first report of molecular detection technique over *Staphylococcus aureus* bacteria in Iran which indicates the more sensitive and rapid test that can be substituted by conventional bacterial culture method. (*Pakistan Journal of Nutrition* 8 (8): 1224-1228, 2009; *doi*: 10.3923/pjn.2009.1224.1228)

### **Utilization of Concentrate Supplements Containing Varying Levels of Sunflower Seed Meal by Growing Goats Fed a Basal Diet of Corn Silages**

Pramote Paengkoum and M. Wanapat

The objective of this study was to evaluate the effect of varying levels of sunflower seed meal on feed intake, digestibility and rumen fermentation of goats fed corn silage as roughages. Eight growing crossed Thai native x Anglo-Nubian goats between 8-10 months of age and pre-trial average body weight of  $14.2 \pm 1.7$  kg

were allotted into two groups on the basis of body weight in a randomized double 4 x 4 Latin square design to investigate the utilization of concentrate mixtures of varying levels of Sunflower Seed Meal (SSM). The four concentrate mixtures had SSM included at 0% (control), 7.3 % (SSM1), 14.5% (SSM2) and 22.0% (SSM3) in concentrate as replacing Soybean Meal (SBM) with SSM as 25% CP, 50% CP and 75% CP, respectively. On average, all parameters measured, including Dry Matter Intake (DMI), nutrients digestibility, ruminal ammonia-N ( $\text{NH}_3\text{-N}$ ), ruminal total Volatile Fatty Acid (total VFA), individual VFAs concentration (mM/L), microbial N supply and N retention increased ( $p < 0.05$ ) with the addition of SSM in concentrate up to 14.5% (SSM2) in concentrate, thereafter decreased ( $p < 0.05$ ) in goats fed SSM 22% (SSM3). The results indicated that replacing SBM with SSM as 50 %CP (SSM2), resulted in higher animal performance as a consequence of improved ruminal fermentation, microbial yield and N balance, but decreased ( $p < 0.05$ ) with 22.0% SSM diet. It is concluded that sunflower seed meal can successfully replace soybean meal 50% CP as a protein source in growing goats. (*Pakistan Journal of Nutrition* 8 (8): 1229-1234, 2009; **doi**: 10.3923/pjn.2009.1229.1234)

## **Food Security and Resource Allocation among Farming Households in North Central Nigeria**

H. Ibrahim, M. Bello and H. Ibrahim

The study determined the food security status of farming households as well as an optimal farm plan that can enhance the food security status of farming households in Nasarawa State. Data was collected from 180 farming households using random sampling. A food security line and linear programming model were used for data analysis. Majority of the farming households (58.9%) were food insecure. The optimal farm plan recommends the production of Cassava, Maize/Cowpea, and Bennisseed and Groundnut/Yam enterprises at 0.64, 0.34, 0.35 and 0.22 ha respectively to yield a net return of 141692.89 Naira. The major food security crops were identified to be Maize, Cassava and Yam. It was concluded that an effective allocation of resources can enhance the food security status of farming households. The study recommends the encouragement of the production of Cassava, Yam and Maize and the introduction of participatory family planning techniques among the food insecure households. (*Pakistan Journal of Nutrition* 8 (8): 1235-1239, 2009; **doi**: 10.3923/pjn.2009.1235.1239)

## **Effects of Plant Spacing on Yields and Nutritive Values of Napier Grass (*Pennisetum purpureum* Schum.) Under Intensive Management of Nitrogen Fertilizer and Irrigation**

Sumran Wijitphan, Pornchai Lorwilai and Chutipong Arkaseang

There was a significant effect of plant spacing on total dry matter yield among 50 x 40, 50 x 40, 50 x 40 and 50 x 100 cm plant spacing of Napier Grass. The highest total dry matter yield of 70.84 t ha<sup>-1</sup> was obtained from 50 x 40 planting configuration. There was significant effect of plant spacing on dry matter production of the grass from 8 harvests. In a 50 x 40 planting configuration, the range of dry matter production from 11 harvests was 2.6-10.19 t ha<sup>-1</sup>. Plant spacing did not have significant ( $p>0.05$ ) effect on Crude Protein (CP), Acid Detergent Fiber (ADF) and Dry Matter Digestibility (DMD) but Neutral Detergent Fiber (NDF) was significantly affected ( $p<0.01$ ) by plant spacing. The ranges of CP, ADF, NDF and DMD under different planting configurations were 13.2-13.9, 41.5-43, 66.9-68.2 and 74.7-75.5%, respectively. Intensive management of Napier Grass pasture may help to overcome the problem of shortage and low quality of feed supply during the dry season. (*Pakistan Journal of Nutrition* 8 (8): 1240-1243, 2009; doi: 10.3923/pjn.2009.1240.1243)

## **Effect of Cutting Heights on Productivity and Quality of King Napier Grass (*Pennisetum purpureum* cv. King Grass) under Irrigation**

Sumran Wijitphan, Pornchai Lorwilai and Chutipong Arkaseang

An experiment to study the effect of cutting heights on yield and nutritive values of King napier grass (*Pennisetum purpureum* cv. King grass) was conducted on sandy loam, Korat soil series (Oxic Paleustults) under irrigation during June 2006 to November 2007 at Khon Kaen Animal Nutrition Development Research Center, Thailand. Four treatments of cutting height at 0 (T1), 5 (T2), 10 (T3) and 15 (T4) cm above ground level in randomized complete block design with 4 replications were employed. The results showed that the Total Dry Matter Yield (TDMY) and Average Dry Matter Yield (ADMY) (65,707.5, 67,070.0, 69,697.5 and 71,403.1 kg/ha/year; 5,973.4, 6,096.4, 6,336.2 and 6,491.2 kg/ha/cut, respectively) were significantly higher ( $p<0.05$ ) in T4 than T1. There were no significant differences in CP and DMD among treatments, ranging from 12.1-12.9 and 75.5-76.6%, respectively but the percentage of ADF, NDF and ash were highly significantly different (41.7-43.5, 64.6-66.2 and 13.1-14.7%),

respectively. Based on this research, it can be concluded that cutting height can affect the forage DM yield and nutritive values of King Napier grass. Cutting 35 day interval at 15 cm height above ground level could be the optimal level for harvesting King Napier grass in Northeast of Thailand. (*Pakistan Journal of Nutrition* 8 (8): 1244-1250, 2009; doi: 10.3923/pjn.2009.1244.1250)

## **Effect of Pomegranate (*Punica granatum*) Peels and It's Extract on Obese Hypercholesterolemic Rats**

Fatma Labib Ahmed Hossin

There has been an inverse association between fiber intake and cardiovascular diseases. Dietary supplementation with nutrients rich in antioxidants is associated with inhibition of atherogenic modifications to LDL, macrophage foam cell formation and atherosclerosis. Pomegranates are a good source of polyphenols and other antioxidants. The present study was performed to evaluate the effect of pomegranate peel powder and it's extract on lipids metabolism in hypercholesterolemic male rats. pomegranate peel powder were added to hypercholesterolemic diet by 5, 10 or 15% as dietary fiber supplemented. While pomegranate peel extract were added to hypercholesterolemic diet by 1, 2 or 3% supplemented. Forty adult male rats were assigned to eight groups for four weeks feeding period; group (1) control negative, group (2) control positive hypercholesterolemic rats, groups (3, 4 and 5) hypercholesterolemic rats fed 5, 10 or 15% pomegranate peel powder as dietary fiber supplemented and groups (6, 7 and 8) hypercholesterolemic rats fed 1,2 or 3 % pomegranate peel extract supplemented. At the end of the feeding period, animal's blood were collected for serum lipid measurements. Results showed that hypercholesterolemic rats had highly significant changes in all tested lipids parameters comparing with control negative group. all hypercholesterolemic rats administrated with different levels of pomegranate peel powder (5, 10 and 15%) had significant decrease in food consumption and body weight gain ratio comparing with control positive group. Liver, kidney spleen to body weight ratio and all tested lipid parameters except HDL had highly significant decrease for all hypercholesterolemic rats administrated with different levels of pomegranate peel powder (5, 10 and 15%) or administrated with different levels of pomegranate peel extracts (1, 2 and 3%) comparing with control positive group. In conclusion, the potent antioxidative capacity of pomegranate peel powder or it's extract against lipid peroxidation may be the central link for the antiatherogenic effects of pomegranate peel powder or it's extract on lipoproteins. Moreover, It suggested that, consumption of pomegranate peel powder or it's extract may modify the risk of hypercholesterolemia and it have more potential as a health supplement rich in

natural antioxidants. (*Pakistan Journal of Nutrition* 8 (8): 1251-1257, 2009; doi: 10.3923/pjn.2009.1251.1257)

### **Effect of Trans Fatty Acids Consumption on Some Haematological Indices in Albino Wistar Rats**

G.E. Egbung, E.U. Essien and I.J. Atangwho

This study was carried out to investigate the effect of trans fatty acids on haematological indices. This was done by supplementing the diets fed to the albino Wistar rats with different concentrations of thermally oxidized palm oil and margarine as sources of trans fatty acids. Fifty albino Wistar rats were used for this study and were randomly selected into five groups of ten rats. Group 1 rats serving as the control received only the stock diet. Group 2 received 85% rat pellet supplemented with 15% margarine. Group 3 was fed with 75% rat pellet and 25% margarine. The fourth group was fed with 85% rat pellet supplemented with 15% thermally oxidized palm oil. Group 4 was fed with 75% rat pellet supplemented with 25% thermally oxidized palm oil. The feeding experiment lasted for six weeks at the end of which rats were sacrificed for determination of haematological indices. Results showed significant ( $p < 0.05$ ) decrease in Red Blood Cell (RBC) count, White Blood Cell (WBC) and platelet counts, Haemoglobin (Hb) concentration and Packed Cell Volume (PCV) in all test groups. This probably suggests that trans fatty acids may adversely affect the health of an individual and should be reduced in diet. (*Pakistan Journal of Nutrition* 8 (8): 1258-1261, 2009; doi: 10.3923/pjn.2009.1258.1261)

### **The Effect of Poultry Manure on Proximate Composition and *in vitro* Gas Production of *Panicum maximum* cv T 58 in the Derived Savanna Zone of Nigeria**

F.G. Sodeinde, J.A. Akinlade, O.A. Aderinola, S.R. Amao, J.A. Alalade and A.T. Adesokan

The *in vitro* gas production and the proximate composition of field grown *Panicum maximum* cv T 58 (Guinea grass) harvested from poultry manured soil and harvested after 6 weeks of regrowth was determined. The experiment was a split plot design with three replicates. Poultry droppings increased the volume of the gas produced in both stem and leaf of *P. maximum* cv T 58. The result reveals that stems produce higher methane gas than the leaf. This indicates that the stem lost high energy compared to the leaves when fed to the ruminants. There were no significant differences ( $P > 0.05$ ) in metabolizable energy (ME), organic

matter digestibility (OMD) and short chain fatty acids (SFA) measured. *Panicum maximum* from fertilized poultry dropping recorded higher crude protein 8.40% content in the leaf compared with the stem of 5.08 %. Despite these variations, the forage generally contained adequate amounts of the minerals to meet livestock requirements. In production systems, the quality of *Panicum maximum* a major feed of grazing animals in south Western Nigeria could be enhanced by application of the poultry dropping to the soil. (*Pakistan Journal of Nutrition* 8 (8): 1262-1265, 2009; doi: 10.3923/pjn.2009.1262.1265)

### **Proximate and Mineral Composition of Boiled *Carnavalialia ensiformis* Seeds**

A.A. Akingbade, F.G. Sodeinde, C.O. Olaniy, O.S. Oyetayo, O.R. Fadare and A.O. Rabi

The study examines the proximate and mineral composition of *Carnavalialia ensiformis* seeds subjected to varying periods of boiling in water. There were four treatments, which comprised: 1 hr, 2 hrs, 3 hrs and 4 hrs water boiling. Each treatment was made up of three replicates. After the expiration of each boiling period, the water was discarded, sun-dried for 7 days and thereafter milled to pass through 1 mm sieve and subjected to laboratory analysis. The study revealed the following: Dry matter did not differ significantly,  $P < 0.01$ , across treatments. Crude protein recorded for the 4 hrs boiling had a higher value of 21%. Highest crude fibre was recorded for the 2 hrs boiling. Ether extract decreased in value up to the 3 hrs treatment time but later increased in seeds boiled for 4 hrs. Ash content decreased from 4% in the raw seeds to 2% after boiling for 2 hrs but later increased to 4% in seeds subjected to 4 hrs boiling. Magnesium level increased to 20% in seeds boiled for 3 hrs but zinc level decreased from 0.73% in the raw seeds to 0.42% in seeds subjected to 4 hrs of boiling. Iron content recorded a decrease at 3 hrs of boiling but boiling for 4 hrs recorded an increase while copper content recorded an increase in seeds boiled for 3 hrs. The results revealed that subjecting seeds of *Canavalia ensiformis* to 4 hrs boiling in water led to a release more nutrients in improve form. (*Pakistan Journal of Nutrition* 8 (8): 1266-1268, 2009; doi: 10.3923/pjn.2009.1266.1268)

### **Utilization of Some Edge-Row Plants as Forage in Nigeria**

Modupe O. Daodu and O.J. Babayemi

In Nigeria, pasture is routinely available such that it is abundant in the rainy season and very scarce in the dry season. Browse trees are not seasonal and a number of

the browse trees are acceptable by cattle, sheep and goats as supplements to the scanty pasture in the off-season. It is against this background that the present study was carried out to assess the nutritive value of some relatively unexploited browse plants including neem (*Azadirachta indica*), almond (*Terminalia catappa*), mango (*Mangifera indica*) and bitter leaf (*Vernonia amygdalina*). Chemical composition of the forages was determined for CP, NDF, ADF and ADL. Presence of secondary metabolites including tannin, saponin and steroids was determined qualitatively. Residue obtained from qualitatively determined secondary metabolites (extracted) and that of whole samples (unextracted) were further subjected to *in vitro* gas production at 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24 h incubation periods to elicit extent of degradability. Results indicate that CP, NDF, ADF and ADL ranged from 10.5-21.8, 34.5-38.5, 21.0-26.3 and 6.5-15.5% respectively. Saponin was present in mango tree while all samples showed presence of condensed tannin and steroids. Extracted residue enhanced degradability as total gas production, metabolizable energy, organic matter digestibility and methane production were more than those of the whole browse samples. It is concluded that browse trees have nutritive value and the presence of secondary metabolites in them are assets for the reduction of methane capable of increasing environmental pollution. (*Pakistan Journal of Nutrition* 8 (8): 1269-1274, 2009; **doi**: 10.3923/pjn.2009.1269.1274)

### **Determination of Nutritive Values of Jamun Fruit (*Eugenia jambolana*) Products**

Muhammad Shahnawaz, Saghir Ahmed Sheikh and S.M. Nizamani

Study on the nutritive values of stored Jamun (*Eugenia jambolana*) products, namely jam, squash, ready-to-drink juice, seed powder and pulp powder was carried out at the Institute of Food Sciences and Technology, Sindh Agriculture University Tandojam. The specific fruit cultivar undertaken for this scientific evaluation was commonly known as (Improved) variety of Jamun. Besides of jam, squash and juice products, Jamun seed and pulp powder also have good nutritive values and were quite rich in carbohydrates accompanied by enough protein, ash, crude fibers but were not sufficient in fat composition. It was observed that nutritional values were varied at different packaging and storage temperature. The glass package among the packages and refrigerator temperature among the storage temperatures showed good results in terms of retaining good quality nutritive values and extensive shelf life of the products. The results were statistically significant. This study could be a beneficial source to the dieticians/nutritionist to consider Jamun as best nutraceutical fruit with natural curing and food industries for manufacturing commercially viable food products. (*Pakistan Journal of Nutrition* 8 (8): 1275-1280, 2009; **doi**: 10.3923/pjn.2009.1275.1280)

## **Antinutritional Appraisal and Protein Extraction from Differently Stabilized Rice Bran**

Saima Hafeez Khan, Masood Sadiq Butt, Faqir Muhammad Anjum and Amer Jami

Rice bran from Basmati Super cultivar was stabilized by dry heat, microwave heat and parboiling. All the stabilization techniques were found effective in reduction of antinutrients including trypsin inhibitor, haemagglutinin-lectin and phytates. No adverse effect of stabilization was observed on chemical composition of rice bran. Protein was extracted from differently stabilized rice bran along with unstabilized bran by enzymatic extraction. Protein isolates yield remained highest for the unstabilized bran, followed by Microwave Stabilized Rice Bran Protein Isolates (MWRBPI), Dry Heat Stabilized Rice Bran Protein Isolates (DHRBPI) and Parboiled Rice Bran Protein Isolates (PAR-RBPI). (*Pakistan Journal of Nutrition* 8 (8): 1281-1286, 2009; **doi:** 10.3923/pjn.2009.1281.1286)

## **Effect of Storage Period and Irradiation Doses on Red Chillies**

Muhammad Abrar, Faqir Muhammad Anjum, Tahir Zahoor and Haq Nawaz

The samples of red chillies were packed in High Density Polyethylene (HDPE) bags and irradiated using 2, 4 and 6 kGy gamma radiation. The irradiated samples were stored at room temperature and relative humidity along with control (0 kGy) for 90 days. The samples were evaluated for proximate composition, total phenolics and aflatoxin. Irradiation and storage showed non-significant effect on proximate composition and total phenolics whereas irradiation showed significant effect on aflatoxins as compared to control. There was gradual decrease in aflatoxin contents with the increase level of gamma rays. It was concluded that red chillies for better quality retention can be safely stored in polyethylene bags. The use of radiation can be helpful for the preservation of chillies with respect to the production of aflatoxin during storage. (*Pakistan Journal of Nutrition* 8 (8): 1287-1291, 2009; **doi:** 10.3923/pjn.2009.1287.1291)

## **Effect of Pre-Treatments and Polyethylene Packaging on Overall Chemical Constituents Such as Sugars and Organoleptic Parameters like Colour, Texture, Taste and Flavour of Chaunsa White Variety of Mango During Storage**

Habib Ahmed Rathore, Tariq Masud, Shehla Sammi and Eijaz Hussain Soomro

Polyethylene packaging and Pre-treatments had significant effect ( $p < 0.05$ ) on overall chemical constituents such as reducing and non-reducing sugars (RS, TIS,



SUC) Total Sugars (TS), Sugar Acid Ratio (SAR) and other organoleptic parameters like; Skin Color (SKC), Flesh Color (FLC), Texture (TEX), Taste (TAS) and Flavour (FLA) of Chaunsa white variety of mango fruit at ambient temperature (28-33°C and 56.7- 69.7% relative humidity) during storage. It was investigated that fruit treated with coating emulsions having fungicide, ethylene absorbent and antiripening agent, packed in polyethylene had lower RS ranged from (8.35-10.70%), TIS (17.78-24.66), SUC (9.07-13.75), TS (17.31-23.93), SAR value (25.31-39.79), lower SKC (.3.83-4.88), FLC (3.84-4.50), TEX (5.05-5.68), TAS (3.21-4.28) and FLA (3.74-4.76) with an average mean of 9.07%, 20.95%, 10.80%, 20.06%, 26.31, 3.93, 4.08, 5.20, 3.70 and 4.09 respectively at ambient temperature during 30 days of storage. The coated fruit packed in polyethylene had longer shelf life, minimum quality loss and slower increase in RS, TIS, SUC, TS contents, SAR, or lower score of SKC, FLC, TAS, higher TEX and slower increase of FLA respectively of fruit during storage. Whereas, the control sample had greater compositional changes with maximum quality loss, higher RS (9.67%), TIS (28.51%), SUC (19.83%), TS (29.38%), SAR (103.60), SKC (5.82), FLC (4.56), TAS (4.67), FLA (4.81) and lower TEX (4.98) and fruit was unacceptable after 12 days of their storage due to its unattractive skin, brown pulp color and poor taste. (*Pakistan Journal of Nutrition* 8 (8): 1292-1300, 2009; **doi:** 10.3923/pjn.2009.1292.1300)

### **Consumer Acceptance of Standardized Mixed/Composite Foods for Optimal Accuracy in Nutrient Estimation**

Perveen Liaqat, Mahnaz Nasir Khan and Faqir Mohammad

This study was conducted to develop standardized mixed composite foods for assessing consumer acceptance and for achieving optimal accuracy in nutrient estimation of Pakistani meals. Since, it was a pilot study only two composite foods Dal maash (*Phaseolus Radiata*) and Tori Bujia (*Luffa Segyptice*) were selected. Nine recipes were selected from a recipe pool. Three different recipes for each composite food were prepared and evaluated by the Preference Evaluators (PE) for consumer acceptability. The composite food with the Highest Preference Score (HPS) was selected and subjected to the process of standardization. Both the mixed/composite foods were prepared and assessed on nine point Hedonic scale for consumer acceptability by sensory evaluation. Standardized recipes of both Dal maash and Tori Bujia scored highest points with mean values ranging from 8.0-8.8 for three attributes of sensory evaluation taste, texture and color with LSD = 0.30. The Nutritional assessment of the two standardized composite foods was calculated using Pakistani Food Tables (2001) and values were compared with the values of food items (cooked or raw) given the national food tables. The study concluded that nutritional composition of standardized composite

food (Tory Bujia) differed remarkably from those presented as raw edible food part reflected in the Pakistani Food Composition Tables as the recipes are either not included in these food tables or have limitation for not being standardized. (*Pakistan Journal of Nutrition* 8 (8): 1301-1303, 2009; *doi: 10.3923/pjn.2009.1301.1303*)

### **Assessment of Nutritional Status of Adolescents Versus Eating Practices in Islamabad City**

Hajra Ahmad, Perveen Liaqat, P.I. Paracha, Abdul Qayyum and M. Arshad Uppal

The study was focused on adolescents' (n = 654) age 14-16 years studying in class 9<sup>th</sup> and 10<sup>th</sup> in Federal government schools. Anthropometric data and eating practices of adolescents were collected with the help of a pretested questionnaire and food intake diary. Selected anthropometric measurements were taken using standard techniques. Their Body Mass Index (BMI) for age was calculated and compared with WHO (2007) standards. The results revealed that three main meals were taken by the adolescents per day. The 79.51% took breakfast regularly all days of the week which had an excellent bearing on their nutritional status (p = 0.006). The 82.8% took lunch regularly in all days of the week and enjoyed better Nutritional Status (p = 0.033). Dinner was the main meal of the day and 83.8% (n = 654) dined regularly. Consumption of foods from different food groups varied. Junk foods consumption was quite high, as 95.4% consumed these regularly. Fizzy drinks were taken by 86.9% by the children of educated mothers and from higher Socio Economics Status consumed more (p<0.050). Majority i.e. 66.2% of adolescents was normally nourished and 14.1% were obese or overweight. Stunting was 12.2% and male adolescents were affected more (p = 0.053). The nutritional status and eating practices of majority of the adolescence in the urban capital are found satisfactory in terms of meal pattern. However inclination towards consumption of fast and junk foods, fizzy drinks is alarming for the future researchers. (*Pakistan Journal of Nutrition* 8 (8): 1304-1308, 2009; *doi: 10.3923/pjn.2009.1304.1308*)

### **Metagenomics and its Application in Rumen Ecosystem: Potential Biotechnological Prospects**

Shakira Ghazanfar and Atiya Azim

Genetic and biological diversity of microorganisms is an important area of scientific research. Considering the importance of ruminants in livestock strategies their ability to converts locally available feedstuff to animal products should be

improved. Recent advances in the molecular biology and genomics now offer new opportunities to conduct a more holistic examination of the structure and function of rumen communities. To understand the complex microbial communities function and how microbes interact within their niches represents a major challenge for rumen microbiologists today. Metagenomics has the potential for providing insight into the functional dimensions of the rumen genomic database and will help to achieve a major goal of rumen microbiology; the complexities of microbial communities function and interaction among these microbes. This review summarizes the molecular methods of culture-independent insight 'metagenomics' and their recent application to studies of the rumen ecosystem for enhancing the livestock productivity. (*Pakistan Journal of Nutrition* 8 (8): 1309-1315, 2009; **doi:** 10.3923/pjn.2009.1309.1315)