Extraction of colouring matter from *Sargentodoxa cuneata* (Oliv.) Rehder & E.H. Wilson by ultrasonic technique

The ultrasonic extraction technique has been used to extract colouring matter from *Sargentodoxa cuneata* (Oliv.) Rehder & E.H. Wilson and the application of colouring matter on wool fabric were studied by researchers of P. R. China. The effects of temperature, ultrasonic power, extracting time and bath ratio on the extraction of colouring matter from *S. cuneata* have been studied. From the orthogonal experiment, the optimum extraction conditions are found to be 50°C temperature, 90 min extracting time, 200 W ultrasonic power, and 1:50 bath ratio. It is also observed that the efficiency of the ultrasonic extraction at 50°C is higher than the normal extraction at 100°C, and this optimum extraction condition is stable, feasible and has good repeatability. Ultrasonic extraction offers a promising alternative for efficient extraction of colouring matter from *S. cuneata*. As compared to normal extraction method, ultrasonic extraction has many merits, like low temperature, shorter time, and high efficiency. It has bright prospective in industrialization. Colour of the fabrics dyed by ultrasonic extracting solution is found to be deeper [Xie Xinsheng, Wang Lu, Jia Shunhua, Zhou Qicheng, Zhang Xinlong and Hu Xiaofeng, Extraction of colouring matter from *Sargentodoxa cuneata* by ultrasonic technique and its application on wool fabric, *Indian J Fibre Text Res*, 2008, 33 (4), 426-430].

Feed/Fodder

Evaluation of castor seed cake in the total mixed ration for sheep

Castor (*Ricinus communis* Linn.) seed cake (CSC), a byproduct of the vegetable-oil industry, contains fairly good amounts of protein (crude protein, 290-390g/kg) which could be a suitable substitute of conventional oil cakes like soybean meal (SBM) in livestock diets but for the presence of a toxic glycoprotein, ricin, it is not used for the purpose of animal feed. The scientists at National Institute of Animal Nutrition and Physiology and Department of Pathology, Veterinary College, Bangalore made efforts to determine the feasibility of feeding CSC as such or after detoxification with lime (4%, wt/wt) by incorporating it into a total mixed ration (TMR) containing 65 and 35 parts ragi (*Eleusine coracana* Gaertn.) straw and concentrate mixture, respectively, with 11g/kg crude protein and 50g/kg total digestive nutrient (TDN) in which the SBM of a control diet was isonitrogenously replaced with either raw or lime-treated CSC in test diets. The control and two test TMRs were fed to 24 sheep, respectively, divided at random into three dietary groups having equal number of animals for 150 days.

Although lime treatment had a positive effect in reducing ricin by 58%, no adverse effect could be noticed by feeding raw or lime-treated CSC in terms of body weight changes, macro- and micro-nutrient utilisation, blood biochemical and mineral profile, rumen fermentation pattern, carcass traits, except the level of plasma immunoglobulins which was significantly (*P*<0.05) higher in sheep fed CSC diets. No pathological lesions could be noticed in the tissues of visceral organs due to feeding the raw or treated CSC. The results suggest no adverse effect in the nutritional performance of adult sheep due to feeding the raw or treated CSC when incorporated.
It is reported that 150g/kg of lucerne \((\text{Medicago sativa Linn.})\) can be fed during the finishing period without detrimental effects on pig performance but it should be limited to less than 75g/kg during the growing period. Lucerne has a high fibre content which is poorly digested and contains antinutritional factors such as saponins which reduce palatability. Therefore, pig performance could be enhanced by supplementing lucerne-containing diets with feed additives such as flavours, enzymes or organic acids. The researchers at University of Saskatchewan, Saskatchewan, Canada evaluated the effects of these additives on nutrient digestibility, performance and carcass traits when fed to growing-finishing swine fed diets containing lucerne.

The results revealed that flavour and enzyme had no effect on nutrient digestibility, pig performance or carcass traits. During the growing period, inclusion of propionic and acetic acids increased \((P<0.05)\) the digestibility of dry matter, protein and energy. Weight gain and intake also increased \((P<0.05)\). None of the additives had any effect on pig performance during the finishing period or on carcass traits. Thus, during the growing period, including 200g/kg lucerne can be successfully incorporated into pig diets without negative effects on pig performance [Thacker Philip A and Haq Inam, Effect of enzymes, flavour and organic acids on nutrient digestibility, performance and carcass traits of growing-finishing pigs fed diets containing dehydrated lucerne meal, \emph{J Sci Food Agric}, 2009, \textbf{89}(1), 101-108].
Nutritive value and voluntary feed intake by goats of three browse fodder species

Browsing ruminants have access to different biomass, depending on how high they can reach. Foliage consisting of leaves and green pods from *Acacia senegal* Willd., *Pterocarpus lucens* Lepr. ex Guill. & Perr. and *Guiera senegalensis* J.F. Gmel., was collected by researchers at Burkina Faso and Sweden according to height above ground accessible to either sheep (0.90m), goats (1.65m) or cattle (1.50m). There was a significant variation in the chemical composition of the biomass between species. The crude protein (CP) content was 114, 157 and 217g/kg dry matter (DM) and the neutral detergent fibre (aNDF) content 604, 534 and 412g/kg DM for *G. senegalensis*, *P. lucens* and *A. senegal*, respectively. There was no significant variation in chemical composition according to the height accessible by cattle, sheep or goats. The voluntary intake was studied using eight goats per diet. The six diets consisted of the three browse leaves and two pods (*A. senegal* and *P. lucens*) and a control. The leaves were fed combined with hay of *Schoenefeldia gracilis* Kunth (maximum 30%) and the control was pure hay. Apparent digestibilities of the same diets, with the exception of *G. senegalensis*, were measured using five goats per diet. All browse fodders used in the feeding and digestibility trials were high in CP (105-170g/kg DM) and lignin (164-234g/kg DM except *A. senegal*) leaves and low in fibre (322-590g/kg DM of NDF) compared to the hay (31g/kg DM of CP and 755g/kg DM of NDF). The highest intake was of the *P. lucens* diet (864g) and the lowest of the *G. senegalensis* diet (397g). The intake of pods from *A. senegal* was higher (1033g) than from *P. lucens* pods (691g). The apparent digestibility of OM and CP in the browse leaves was 0.63 and 0.57 and 0.63 and 0.64 for *A. senegal* and *P. lucens*, respectively, higher than for the hay, which showed higher digestibility of NDF. *A. senegal* pods had higher digestibility for all nutrients than *P. lucens* pods. Based on the high CP content and the intake and digestibility characteristics, *P. lucens* leaves and *A. senegal* leaves and pods can be recommended as protein supplements to low quality diets [Sanon HO, Kaboré-Zoungrana C and Ledin I, Nutritive value and voluntary feed intake by goats of three browse fodder species in the Sahelian zone of West Africa, *Anim Feed Sci Technol*, 2008, 144 (1-2), 97-110].

Replacement value of *Solanum elaeagnifolium* Cav. for alfalfa hay offered to growing goats

In order to determine the nutritional properties of *Solanum elaeagnifolium* Cav. in goat diets, chemical analysis, in vitro techniques and a feeding trial was conducted jointly by the scientists of Universidad Autonoma Agraria Antonio Narro, Mexico, University of La Laguna, Spain and University of California Davis, USA. *S. elaeagnifolium* (SE) plant was replaced by alfalfa hay in the diet of confined growing goats at 0% (T0), 25% (T25), 50% (T50), 75% (T75) and 100% (T100). Roughage comprised 300g/kg of total feed offered. Values of nutritional parameters for this plant were in vitro OMD, 522g/kg; crude protein (CP), 150g/kg; metabolizable energy, 6.52MJ/kg/DM. Maximum average daily gain (ADG; 116±22g/day) was observed in T0 animals, while goats receiving SE gained weight in the range of 40-112g/day. Most of the variation in weight gain was explained by ascending levels of SE in the diet ($R^2=0.92$), which decreased ($P<0.05$) dry matter intake (DMI) and increased feed conversion ratio (FCR; DMI/ADG). These results indicate that SE at the flowering stage is not palatable and nutritious for goats. This can replace alfalfa hay only by 25% (DM basis) without adverse effect on DMI or ADG of growing goats [Mellado M, García JE, Arévalo JR and Pittroff W, Replacement value of *Solanum elaeagnifolium* for alfalfa hay offered to growing goats, *J Arid Environm*, 2008, 72 (11), 2034-2039].
Nutritional characterization of *Mucuna pruriens* (Linn.) DC.

Velvet bean, *Mucuna pruriens* (Linn.) DC, is a tropically adapted legume cover crop that is highly attractive for sustainable farming systems around the world because it is an excellent source of green manure and a promising protein supplement. Information about maturity-related changes in concentrations of key minerals, amino acids (AA) and secondary compounds in *M. pruriens* is particularly lacking. Thus, researchers at University of Florida, Gainesville, FL, USA carried out studies to determine the stage of maturity at which the dry matter (DM) yield and nutritive value of velvet bean is optimized.

*M. pruriens* was harvested at 77, 110 and 123 days after planting (DAP) from quadruplicate 5m×1m plots within each of 6 blocks. At each DAP, DM yield, chemical composition, botanical composition, *in vitro* rumen fluid-pepsin DM digestibility (IVDMD) and concentrations of total polyphenols, L-dopa and tannins were determined on the whole plant and botanical fractions. Whole-plant DM yield increased (*P*<0.01) linearly with maturity; proportions of leaves and stems decreased linearly (*P*<0.01), whereas proportion of pods increased (*P*<0.01). Concentrations of neutral-detergent fibre (aNDF) in whole plant, leaf and stem increased (*P*<0.05) or tended (*P*<0.10) to increase linearly with maturity, as did the acid-detergent fibre concentration of leaves and stems. Maturity decreased (*P*<0.05) ether extract concentrations of leaves linearly and stems quadratically but increased (*P*<0.05) whole-plant and pod starch concentrations. Pods contained relatively high concentrations of lysine, histidine, phenylalanine, aspartate, glutamate, leucine, isoleucine and valine but low concentrations of methionine and cystine. The essential amino acid index did not vary with maturity. Most minerals are concentrated in the leaves and the whole plant contains sufficient Ca, P, K, Mg, Fe, Cu, Na, Mo, Mn and Zn for growing sheep, although their bioavailability of these minerals is unknown. Total polyphenol concentration quadratically (*P*<0.01) increased with maturity in the whole plant, tended to increase (*P*<0.10) in pods, linearly (*P*<0.01) decreased in stems and fluctuated in leaves. Maturity quadratically increased l-dopa concentration of the whole plant (*P*<0.05) and stems (*P*<0.01) but did not affect those of leaves and pods. Maturity quadratically increased (*P*<0.05) total tannin concentration in the whole plant but decreased (*P*<0.10) that of pods. The l-dopa was concentrated in the seeds and pods of mature (110-123 DAP) plants but tannins were concentrated in leaves and stems. Whole-plant IVDMD was not affected by maturity, but digestible DM yield linearly (*P*<0.01) increased with increasing DM yield. There was a 2-week harvest window (110-123 DAP) during which whole-plant crude protein and IVDMD remained unchanged. Nevertheless, harvesting at 123 DAP gave the best combination of biomass yield and nutritive value. The pods contain relatively high concentrations of CP, lysine, histidine, phenylalanine, aspartate, glutamate, leucine, isoleucine and valine, but low concentrations of methionine and cystine. Therefore, the pods can potentially replace some soybean meal in monogastric rations. Adesogan AT, Sollenberger LE, Badinga LK, Szabo NJ and Littell RC, Nutritional characterization of *Mucuna pruriens*: 1. Effect of maturity on the nutritional quality of botanical fractions and the whole plant, *Anim Feed Sci Technol*, 2009, 148 (1), 34-50.

Velvet bean seeds contain 250-350g crude protein (CP)/kg dry matter (DM) and are a potentially important protein supplement for livestock. However, secondary compounds in plant, including 3,4-dihydroxy-L-phenylalanine (l-dopa); 20-90g/kg DM), limit its use by monogastrics. A study was also designed by researchers at University of Florida and University of Georgia, USA to investigate ruminal degradation of *M. pruriens* (M), and the l-dopa it contains, to monitor microbial adaptation to M and synthetic l-dopa, and to determine if addition of l-dopa to soybean meal (SB) affects its rumen degradability. Three *in vitro* experiments were conducted to determine the rumen fermentability of M [24g 3,4-dihydroxy-l-phenylalanine (l-dopa)/kg dry matter (DM) and soybean meal treated with (SBD) or without (SB) 138g l-dopa/kg DM]. Additional objectives were to determine if l-dopa inhibits rumen fermentation, and if ruminal microbes can adapt to l-dopa or M. In Experiment 1, ground (1mm) substrates were incubated in triplicate at 38°C in 9ml nutrient media and 1ml rumen fluid in a series of six, 48h, consecutive batch cultures. The first culture was inoculated with rumen fluid from two donor cows. Subsequent cultures were inoculated with fluid (1ml) from the previous culture. The DM digestibility and gas production were higher from fermentation of M versus SB but similar for SB and SBD. The slopes of the relationships between DMD (g/kg)
Phytase from *Aspergillus niger* van Teighem efficiently hydrolyses phytate phosphorus present in various commercial livestock feeds and was not inactivated by various formulations and antibiotics present. The enzyme retained 90-95% phytase activity at 55°C, pH 2.5 after 72h of incubation with all the commercial feeds tested, thus indicating its suitability in feed application. Researchers at USA and India observed that the phytase hydrolysis increased with the increase in temperature and a significant release of 41nmols Pi/ml in phytase-treated feed over control sample at 55°C after 48 hours. Besides this, the enzyme was maximally effective when used under acidic condition, releasing 21 and 42nmols Pi/ml at pH 1.5 and 2.5, respectively. As the pH shifted towards 5.5, significant decline in phosphorus release was observed. However, the enzyme was able to retain almost complete phytase activity in the presence of feed constituent even after 48h over various pH tested. Thus, it can be a potential candidate in animal nutrition where the ability of present phytase to retain activity over period of time in the presence of feed constituent is desired [Vats Purva, Bharat Bhushan and Banerjee UC, Studies on the dephosphorylation of phytic acid in livestock feed using phytase from *Aspergillus niger* van Teighem, *Bioresour Technol*, 2009, 100 (1), 287-291].

### Aflatoxin contamination of consumer milk through feed meal

In southern Sweden, elevated levels of aflatoxin M1 were observed in routine checks of consumer milk. A trace-back study revealed contaminated milk from several farms and a total of 68 farms were banned from delivering milk to dairies for shorter or longer periods. The maximum level of aflatoxin M1 in a single sample from an individual farm was 257ng/kg fresh milk.

The scientists at National Veterinary Institute, Uppsala, Sweden analysed aflatoxin of commercial compound feed which revealed that the contamination originated from the ingredient rice feed meal, a by-product from the preparation of Basmati rice for human consumption. Up to 56 µg/kg of aflatoxin B1 was found in rice feed meal at one feed mill. Thus, an aflatoxin-contaminated minor feed ingredient included at less than 10% (w/w) of compound cattle feed can significantly contaminate the milk produced. This emphasises the need for effective monitoring of the feed chain of food-producing animals in order to prevent food contamination [Nordkvist Erik, Stepinska Anna and Häggblom Per, Aflatoxin contamination of consumer milk caused by contaminated rice by-products in compound cattle feed, *J Sci Food Agric*, 2009, 89(2), 359-361].
Salinity of soil and water has been a major impediment to plant growth and crop production worldwide, and a viable solution is not forthcoming, at least in the near future. One potential means for addressing this problem lies in cultivating plant species that are able to tolerate the adverse conditions prevailing in such situations. A search was done by researchers at Pakistan and USA among halophytic plant species to find suitable fodder replacement for calves and identified a local perennial grass, *Panicum turgidum Forsk.*, with biomass yields of about 60,000kg/ha/year (fresh weight) when grown in saline soil (EC 10-15mS/cm) irrigated with brackish water (EC 10-12mS/cm). When grown with a salt accumulator (*Suaeda fruticosa Forsk. ex J. F. Gmel.*) in adjacent rows and with frequent irrigation, this system may be sustainable in terms of soil salt balance with little change in soil salinity detected. *P. turgidum* was used as a complete replacement for maize in a cattle feeding trial and resulted in equivalent growth and meat production.

The scientists at Faculty of Engineering and Technology, Multimedia University, Melaka, Malaysia conducted studies to investigate the abrasive behaviour of chopped untreated sugarcane fibre (C-SCRP), unidirectional sugarcane fibre (UM-SCRP) and chopped strand mat of glass fibre (CSM-GRP)-reinforced polyester composites (in two different orientations, APO and PO). The effects of chopped fibre length (1, 5 and 10mm) in C-SCRP, orientation of long fibre mat in UM-SCRP, and orientation of chopped fibre mat in CMS-GRP composites have been determined using SiC of 400grit size abrasive paper under various loads and sliding velocities. Experimental results revealed that wear resistance of C-SCRP composite, tends to increase with increasing fibre length at lower load by about 44-75% and at higher load by about 17-50% while friction coefficient (0.35-0.1) showed no much dependence on fibre length and decreased significantly with increasing load and fluctuate with increasing speed. UM-SCRP composite gave wear resistance about two times higher than C-SCRP composite due to the fact that long fibres in UM-SCRP composite were well embedded in the matrix and subjected to the abrasion process only at their ends which required high energy to facilitate failure in the sugarcane fibres (SCFs). Beside that UM-SCRP composite with APO, consistently showed higher wear resistance compared to composite with PO and friction coefficient of similar trends and values as those observed for C-SCRP composite. SEM studies of the worn surfaces indicated that in C-SCRP composite wear mechanism dominated by material removal due to excessive deterioration in both fibre and matrix. While UM-SCRP composite showed less extent of fibre and matrix damage compared to C-SCRP and CSM-GRP composites. Comparison between SCRP and GRP composites revealed that wear resistance of CSM-GRP composite was about 2-3 times greater than UM-SCRP composite and 3-5 times greater than C-SCRP composite suggesting that the ranking order of the three composites tested according to the wear resistance is CSM-GRP (WR_{APO} > WR_{PO} >> UM-SCRP (WR_{APO} > WR_{PO} >> C-SCRP(WR_{1mm} >> WR_{10mm} [El-Tayeb NSM, Two-body abrasive behaviour of untreated SC and R-G fibres polyester composites, *Wear*, 2009, 266(1-2), 220-232].