Effect of season on nutritive value of an Alpine pasture

A. Tamburini¹, F. Gusmeroli², P. Roveda¹, G. Succi¹

¹ Istituto Zootecnia Generale, Facoltà di Agraria, Università di Milano, Italy
² Fondazione Fojanini di Studi Superiori, Sondrio, Italy

Corresponding author: Alberto Tamburini. Istituto Zootecnia Generale. Via Celoria 2, 20133 Milano, Italy
Tel. +39 02 50316453 – Fax +39 02 50316434 – Email: alberto.tamburini@unimi.it

ABSTRACT

Pasture is the cheapest source of nutrients for dairy cows, but supplementation with energetic concentrate can balance a diet with low energy/nitrogen ratio at the beginning of the grazing season or a low energy content at the end of the grazing season. Aim of this study was to evaluate the effect of seasonal variation and botanical composition on nutritive value of an alpine pasture over 3 grazing seasons. In 22 ha alpine pasture (Prà Maslino, SO, 1650 m s.l.) most important botanical species (20) were sampled every 15 days through the 3 seasons (194 samples) and were analysed for chemical composition and Gas Production. Two types of botanical association included the most important part of pasture sward: Festuca rubra (47%) and Trifolium repens (44%), with 91 different species. Gramineae species had more DM content (38.6 ± 12.1% as fed), NDF (67.9±8.6% on DM) and ADF (36.0±6.4% on DM) but less CP (10.4±3.0% on DM) than every other species (DM 27.7±10.5% as fed; NDF 52.5±11.2% on DM; ADF 33.8±7.2% on DM; CP 15.0±5.4% on DM). From June to September plant growth determined a decrease of quality, although there was a great variability for species and year of trial (average daily decrease of 0.5 g/kg DM for CP, average daily increase of 1.2 g/kg DM for NDF, while for gramineae species OM digestibility decreased 0.25%/d and 0.18%/d for other species). Multiple regressions of dOM on several analytical parameters were performed and the best significant equation for all samples was:

\[ d\text{OM} = 98.13 - 0.5305 \text{ DM (\%)} - 0.6071 \text{ ADF (\% DM)} \quad (n=144; \text{R}^2=0.63; \text{RSD}=7.69) \]

According to the Cornell system, sward samples showed a high content of slow-degradation carbohydrate fraction “b2” (46.0±6.8% CHO) and a high content of medium-degradation protein fraction “b2” (75.1±2.3% CP), while the immediately-available carbohydrate fraction “a” was 22.3±1.2% CHO, and the immediately-available protein fraction “a” was 19.1±2.3% CP. These data suggest that grazing dairy cows need concentrates which takes into account the high protein content and fermentability of pasture at the beginning of the grazing season, and the low energy and protein content of pasture at the end of the grazing season.
Chemical and nutritional characterisation of four grain legume species

S. Colombini1, L. Rapetti2, P. Roveda2, A. Ursino1, B. Pintus1, M. Odoardi1

1 Istituto Sperimentale per le Colture Foraggere, Lodi, Italy
2 Istituto Zootecnia Generale, Facoltà di Agraria, Università di Milano, Italy

Corresponding author: Stefania Colombini. Istituto Sperimentale per le Colture Foraggere. Viale Piacenza 29, 26900 Lodi, Italy – Tel: +39 0371 404747 – Fax: +39 0371 31853 – Email: chem@iscf.it

ABSTRACT

Self-supplying of plant proteins in Europe reached only 75% in 2000 and this situation leads to an important dependency of the EU on American soybean production. Development and valorisation of alternative protein sources is crucial from an economic point of view, but also in order to guarantee complete traceability and certified quality of animal productions. Grain legumes such as peas, faba beans and lupins represent an important group of crop plants with excellent nutritional value as food and feed. Unfortunately, these crops are relatively less improved in comparison with cereals, as a consequence of the lower levels of economic support for research and breeding of such crops. Aim of the present work was to define, in a fertile Italian environment, the feed value of four grain legumes species (Pisum sativum, Vicia faba minor, Lupinus albus and L. angustifolius) as feedstuff for animal nutrition. Up to 103 cultivars of these species have been tested in a comparative trial, sown in Lodi (Po Valley) in autumn 2002 and harvested in June 2003. The most adapted and high yielding cultivars of each species were selected. Grain samples of two P. sativum cvs (Alembo and Helena), one V. faba minor (Chiaro di Torre Lama), one L. albus (Multitalia) and one L. angustifolius (Quilinok) were analysed. Crude protein, ether extract, crude fibre, ash, NDF and ADF were determined. Soluble proteins, non-protein nitrogen, neutral and acid detergent insoluble protein, starch, according to CNCPS, and Gas Production (Menke and Steingass, 1988) were also determined. Among antinutritional factors, trypsin inhibitory activity (according to Kassel, 1970), and condensed tannins (following the DMACA protocol) have been tested. The nutritive value (UFL/kg DM) derived from Gas Production was: 1.12 for fababean, 1.20 and 1.10 for peas (Alembo and Helena respectively), 1.24 for L. angustifolius and 1.19 for L. albus. The highest cumulative gas production values after 24 hours were found in peas (Alembo 69.64; Helena 63.14 ml gp/24 h) and the lowest in L. albus (54.27 ml gp/24 h). The highest crude protein value was found for L. albus (41.2% DM), similar to soybean meal.
Nutritive characteristics of different varieties of favino seeds (*Vicia faba minor*)

G. Ferruzzi, A. Pistoia, G. Balestri, P. Poli, L. Casarosa

Dipartimento Agronomia e Gestione dell’Agroecosistema, Università di Pisa, Italy

Corresponding author: Guido Ferruzzi. Dipartimento Agronomia e Gestione dell’Agroecosistema, Sezione Scienze Zootecniche. Via del Borghetto 80, 56124 Pisa, Italy – Tel: +39 050 599207 – Fax: +39 050 540633 Email: gferruz@agr.unipi.it

**ABSTRACT**

In the last years the fababean cultivation has been developed in Central Italy, for the increasing of the EU contributions for leguminous plant seeds. The fababean represent in fact a good protein source as animal food, taking the place of the soybean, especially in the organic breeding, where GMO as well as the extraction meals are forbidden, but a too big quantity of fababean seeds can cause digestive problems to the animals, for the presence of antinutritional substance (tannins polyphenols). In this trial (ARSIA project) chemical characteristics, *in vitro* digestibility, and tannins polyphenols of four fababean seed varieties (Vesuvio, V; Torre Lama Chiaro, TLC; Torre Lama Scuro, TLS; Mars, M) were analysed on whole seed, tegument and cotyledons. The four varieties have a very similar chemical composition: crude protein varies from 27.30 (in TLS) to 29.50% (in V); crude fibre is about 10% in all the analysed samples; NDF varies from 23.01 (in M) to 25.67% (in TLC) and it is constituted by the same percentage of hemicelluloses and cellulose. In the four seeds varieties the nutritive value is about 1.3 MFU/kg DM. The tegument percentage in the whole seeds of the four varieties ranges from 15.29 (in V) to 17.14% (in M). There aren’t differences in the chemical composition of the cotyledons, whereas the tegument shows different values especially in crude fibre content and in fibrous fractions which result lower in M variety, compared to the other three (CF: 37.46 vs. 50.52, 49.57 and 47.66% in V, TLC, and TLS). Dry matter and organic matter digestibility are good in the four varieties (OMD about 90%), whereas that one of the NDF results higher (P≤0.05) in M compared to the other three (NDFD 61.56 vs. 52.73, 60.70, and 60.16% in V, TLC, and TLS). Polyphenols tannins content is lower (P≤0.05) in M and V varieties: 5.96 and 6.10 g/kg DM compared to TLC (7.31 g/kg DM) and TLS (8.29 g/kg DM), for the lower tannins content, especially in the tegument. In the four fababean seeds there aren’t significant differences related to all the evaluated parameters, so all of them can take the place of the soybean extraction meal in the organic animal breeding, for the good protein and the low tannins content.
Evaluation of the nutritive value of raw and dry roasted legume grains by in vitro gas production

F. Giannico, M.A. Colonna, S. Sanapo, V. Megna, A. Caputi Jambrenghi, G. Vonghia

Dipartimento Produzione Animale, Università di Bari, Italy

Corresponding author: Francesco Giannico. Dipartimento Produzione Animale. Via G. Amendola 165/A, 70126 Bari, Italy – Tel: +39 080 5442236 – Fax: +39 080 5442822 – Email: f.giannico@agr.uniba.it

ABSTRACT

Legumes are good suppliers of protein, carbohydrate and other important nutrients. In spite of good nutritional profile, they contain antinutritional factors which affect the digestibility of protein and starch. Heat treatments may improve the nutritive value of legumes by decreasing protein degradation in the rumen thus increasing its availability in the intestine. This study was planned in order to evaluate whether dry roasting influences the in vitro gas production and nutritive value of three legume grains, i.e. lupin (Lupinus albus), field bean (Vicia faba minor) and soybean (Glycine max). Approximately 200 mg of each feed were placed into 100 ml graduated glass syringes. Bovine rumen fluid was collected from 2 animals, filtered, flushed with CO$_2$ and added to the buffered mineral solution (1:2 v/v). Buffered rumen fluid (30 ml) was pipetted into each syringe containing feed samples that was incubated into a water bath at 39°C. Three syringes with only buffered rumen fluid served as the blank. Each incubation was carried out in triplicate. Gas production was checked until 24 h and expressed as ml g$^{-1}$ DM. The metabolisable energy (ME) of feeds was calculated according to the equation: ME (MJ kg$^{-1}$ DM) = 1.06 + 0.157GP + 0.084CP + 0.22CF - 0.081CA, where GP is 24 h net gas production (ml g$^{-1}$ DM), CP, CF and CA are crude protein, crude fat and crude ash (% DM), respectively. Among raw legumes, field bean and lupin provided a higher total gas production in comparison with soybean (203.60 and 191.00 vs. 141.96 ml g$^{-1}$ DM; P<0.01). Dry roasted field bean, lupin and soybean differed significantly among each other for the total gas production (248.03 vs. 179.86 vs. 123.31 ml g$^{-1}$ DM; P<0.01). Dry roasting significantly improved (P<0.01) the ME of field bean bringing it up to 14.83 from 12.26 MJ kg$^{-1}$ DM. Therefore, dry roasted field bean showed the best ME value as compared with both dry roasted lupin and soybean (14.83 vs. 13.89 and 13.72 MJ kg$^{-1}$ DM; P<0.01). In conclusion, dry roasting showed to be an effective technique for improving field bean nutritive value, probably due to an increase of starch digestibility, as evidenced by the greater in vitro gas production.
Effect of inoculation on fermentation quality and proteolysis in field pea (*Pisum sativum*) silage

L. Cavallarin¹, S. Antoniazzi¹, G. Borreani², E. Tabacco²

¹ Istituto Scienze delle Produzioni Alimentari, CNR, Grugliasco, Italy
² Dipartimento Agronomia, Selvicoltura e Gestione del Territorio, Università di Torino, Italy

Corresponding author: Laura Cavallarin. Istituto Scienze delle Produzioni Alimentari. Via L. da Vinci 44, 10095 Grugliasco, Italy – Tel: +39 011 6709234 – Fax: +39 011 6709297 – E-mail: laura.cavallarin@ispa.cnr.it

ABSTRACT

Field peas are a short-term catch crop with a high crude protein content, that provide a high forage yield in a short growing period. The aim of the study was to investigate the effect of the stage of maturity and inoculant application on the fermentation quality and proteolysis of silage produced from directly-cut field peas in the Po Valley, NW Italy. Stands of semi-leafless field pea, sown in spring, were harvested at 4 times at progressive morphological stages (end of flowering, I; beginning of pod filling, II; advanced pod filling, III; beginning of ripening, IV). The herbage was chopped and ensiled in 2-litre silos with (I) and without (C) inoculant (*Lactobacillus plantarum*). The silages were analysed after 60 days for the fermentation quality and nitrogen fractions. Dry matter (DM) at ensiling ranged from 146 (stage I) to 210 g kg⁻¹ (stage IV). High levels of ethanol and volatile fatty acids, especially lactic and acetic acid, were observed in all the silages, due to the high levels of WSC at ensiling (130, 189, 198, 111 g kg⁻¹ DM for stage I, II, III, IV, respectively). Despite the low pH values (4.3 and 4.1 for C and I silages, respectively) all the silages showed detectable levels of butyric acid. The silages prepared from forage harvested at the IV stage had a significantly lower value of lactic acid than the silages made from forage at the three previous stages. The inoculation treatment affected the pH and lowered the ethanol and ammonia concentrations in all the silages, with the exception of the first stage. The stage of growth significantly affected all the nitrogen fraction concentrations. The inoculation treatment lowered the total amino acid concentrations in all the silages, except in the first stage. Extensive proteolysis occurred in the I, II and III stages, while it was significantly reduced in the IV stage. The amino acid composition of silages made at the beginning of ripening (IV) was close to that of fresh herbage, with minimal losses of nutritionally essential amino acids for ruminants. The data show that field peas can be successfully directly ensiled at advanced stages of maturity with the aid of LAB inoculum.
Effects of the electromagnetic field generated by transponders on ruminal metabolism: 
an in vitro study

M. Trabalza Marinucci1, C. Antonini1, G. Acuti1, L. Mughetti1, O. Olivieri1, C. Boiti2, G. Asdrubali2

1 Dipartimento Tecnologie e Biotecnologie delle Produzioni Animali, Università di Perugia, Italy
2 Dipartimento Scienze Biopatologiche Veterinarie, Università di Perugia, Italy

Corresponding author: Massimo Trabalza Marinucci. Dipartimento Tecnologie e Biotecnologie delle Produzioni Animali. Via S. Costanzo 4, 06126 Perugia, Italy – Tel: +39 075 5857707 – Fax: +39 075 5857784 – Email: vete3@unipg.it

ABSTRACT

Biological effects due to the exposure of cells and tissues to electromagnetic (EM) fields have been reported in literature. The objective was to investigate the effects of the electromagnetic field generated by transponders (rumen boluses), used for the electronic identification of cattle, on the activity of rumen bacteria. Six flasks containing filtered rumen fluid, artificial buffer (1:4 ratio), ground alfalfa hay (2 g) and ground maize (0.2 g) were divided in 2 equal groups (control, CTRL, and treated, TREAT) and placed in two incubators at 39°C for 48 h. Handling and incubation were performed under anaerobic conditions. The TREAT flasks, containing the rumen bolus, were exposed to a constant electromagnetic field, comparable to that generated by the portable reader (134.2 KHz). The experiment was repeated three times. At 24 and 48 h of incubation fluid samples were collected from both TREAT and CTRL flasks for pH measurement, evaluation of NH3 content and VFA production. Anaerobic culture media for the enumeration of total, amylolitic and cellulolytic bacteria were inoculated at the end of the incubation period. Values of pH were significantly lower in flasks exposed to electromagnetic field, both after 24 h (6.80±0.02 vs. 6.86±0.03, P<0.05) and 48 h incubation (6.91±0.03 vs. 7.04±0.04, P<0.05), suggesting a higher bacterial activity. These data were confirmed by higher bacterial concentrations (n/ml, log) found in TREAT flasks compared to the controls (total: 7.28±0.11 vs. 6.50±0.19, P<0.01; amylolitic: 7.21±0.08 vs. 4.98±0.95, P<0.05; cellulolytic: 4.51±0.57 vs. 3.11±0.79, P=0.17). An increased proteolytic activity may justify the higher NH3 content (P<0.001) detected in TREAT flasks after 48 h incubation (10.15±0.60 vs. 8.39±0.38 mg/100ml). The difference in VFA production between the two experimental groups was not statistically significant. Data suggest that exposure to electromagnetic field may increase growth rate and consequently metabolic activity of rumen bacteria.
A novel approach to the diagnosis of beef allergy in dogs

R. Ricci¹, F. Gottardo¹, A. Bertoli², A. Marin³, I. Andrighetto¹

¹ Dipartimento Scienze Zootecniche, Università di Padova, Italy
² Dipartimento Chimica Biologica, Università di Padova, Italy
³ Istituto Zooprofilattico Sperimentale delle Venezie, Legnaro, Italy

Corresponding author: Rebecca Ricci. Dipartimento Scienze Zootecniche. Viale dell'Università 16, 35020 Legnaro, Italy – Tel: +39 049 8272638 – Fax: +39 049 8272669 – Email: rebecca.ricci@unipd.it

ABSTRACT

Although different diagnostic tools have been evaluated in the past to diagnose food allergy in dogs and cats, at the present time they are still considered unreliable for such purpose and the gold standard method remains the exclusion diet trial. The aim of this study was to confirm beef sensitivity in dogs challenged with the suspected allergenic food and to assess a relationship among beef administration, clinical signs, serum total and beef-specific IgE. For this purpose, we used five suspected beef allergic and five healthy dogs of different breed, age, weight and gender, belonging to different owners. The trial consisted of daily administration of bovine ground meat for 14 days, introduced as 10% of the total diet, and if any adverse clinical reactions were manifested, it would be interrupted. Clinical and pruritus evaluations and blood collections were carried out at day 0, 7, 14 and 21 and at the onset of the symptoms. Total serum IgE were measured using an ELISA technique whereas to detect specific IgE binding proteins homogenized bovine meat samples were subjected to 12% SDS-PAGE immunoblotting. Beef oral challenge resulted in a severe pruritic cutaneous adverse reaction only in one suspected allergic dog. Some slight cutaneous and gastrointestinal signs were observed in other 3 dogs (2 suspected allergic and one healthy) but the features of these signs and time of their appearance were not attributable to an IgE-mediated adverse food reaction. Although total IgE measurement had not a predictive value of an allergic status, Western-blot analyses showed that the only one subject who manifested severe cutaneous signs after the ingestion of the meat presented a band with an apparent molecular mass of about 40 kDa, that might be consistent with actin.