aJava

Asian Journal of Animal and Veterinary Advances

Academic
Journals Inc.

www.academicjournals.com

Asian Journal of Animal and Veterinary Advances 6 (7): 750-753, 2011
ISSN 1683-9919 / DOI: 10.3923/ajava.2011.750.753

Crude Protein and Amino Acid Compositions of Some Protein Sources Used Livestock Production in South of Turkey

C. Ozgur Ozkan, A. Ihsan Atalay, Inan Guven, Emrah Kaya and A. Sagocak
Department of Animal Science, Kahramanmaras Sutcu Imam University, Kahramannmaras, Turkey

Corresponding Author: C. Ozgur Ozkan, Department of Animal Science, Kahramanmaras Sutcu Imam University, Kahramannmaras, Turkey

ABSTRACT

The aim of this study was to compare the Crude Protein (CP) and amino acid contents of some protein sources used in livestock production in Turkey. The protein sources had a significant ($p<0.001$) effect on the CP and amino acid contents. Generally protein sources from legume grains had significantly ($p<0.001$) lower essential amino acid content than those of Soybean Meal (SBM) and Fishmeal (FM). Protein sources from legume grains are very poor in especially methionine and lysine when compared with those of fish meal. On the other hand, protein sources from legume grains had only significantly ($p<0.001$) lower non-essential amino acid content than that of FM. As a conclusion, grains from *Lathyrus sativus*, *Vicia peregrina*, *Pisum elatius* and *Vicia narbonensis* have potential as an alternative protein source, however, grains from *Lathyrus sativus, Vicia peregrina, Pisum elatius* and *Vicia narbonensis* should be supplemented with methionine and lysine amino acids to obtain the optimum performance from livestock when these protein sources are used as an alternative protein source in livestock diets.

Key words: Protein sources, legume, grain, amino acid, methionine, lysine, livestock

INTRODUCTION

Recently locally available legume grains were used in livestock nutrition to meet their protein and amino acid requirements due to less expensive protein and amino acid sources compared with soybean and fish meal. Abeke *et al.* (2008a, b) reported that *Lablab purpureus* seed can be used up to 7.5% of diet in laying hens without any significant adverse effect and *Lablab purpureus* seed should be processed if inclusion rates are exceeded 7.5% of diet%. Karaman *et al.* (2009) suggested that *Vicia pregrina* seed had potential as an alternative protein source and can be used 10% but *Vicia pregrina* seed should be processed if inclusion rates are exceeded 10%. *Lathyrus sativus* seed had potential as an alternative protein source and grass pea seeds accounting for 50% of feed protein did not lower production and slaughter parameters of pig (Mieczan and Kwiecien, 2010). Boiled *Lathyrus sativus* seed had potential as an alternative protein source for broiler (Tadelle *et al.*, 2003). Roasted pigeon pee seeds are recommended as valuable feed ingredients at both domestic and industrial levels for monogastric animals (Akand *et al.*, 2010).

Pisum elatius seed had potential as an alternative protein source for fingerling mirror carp and raw *Pisum elatius* seed can be used up to 10% but *Pisum elatius* seed should be heat-treated if inclusion rates exceeded 10% of diet (Buyukcapar and Kamalak, 2010). *Vicia narbonensis* seed had potential as an alternative protein source and can be used up to 20% of diet as protein source

replacing expensive protein source in Tilapia (*Oreochromis niloticus*) fingerlings diets without any adverse effect (Buyukcapar *et al*., 2010).

However, there is limited research on the amino acid content of locally available legume grains such as *Lathyrus sativus, Vicia peregrina, Pisum elatius* and *Vicia narbonensis*. Therefore, the aim of this study was to compare the essential and no-essential amino acid content of some legume grains used in livestock production.

MATERIALS AND METHODS

Protein sources: In the current study, legume grains from *Lathyrus sativus, Vicia peregrina, Pisum elatius* and *Vicia narbonensis* were hand harvested from plots established in the experiment units of natural pasture at seeding stage in Kahramanmaras, Turkey in September, 2007. The grain samples were shade-dried and milled to pass through a 1 mm sieve for subsequent analysis. The commercially available soybean and fish meal protein sources obtained from a feed company (Gurdal Feed Company, Kahramanmaras, Turkey) were used as standard protein sources to compare the protein sources from legume grains.

Chemical analysis: Dry Matter (DM) contents of protein sources were determined by drying the samples at 105°C overnight. Nitrogen (N) content was measured by the Kjeldahl method (AOAC, 1990). The CP was calculated as N X 6.25. Amino acid compositions of protein sources were determined by GC-ID at the Scientific and Technological Research Council of Turkey (MAM) using a Phenomex EZ Faast GC-FID Hydrolyzed Amino Acid Analysis. The amount of amino acid was expressed as g kg^{-1} DM. All chemical analyses were carried out in triplicate.

Data on CP and amino acid contents of protein sources were subjected to one way of ANOVA using GLM of SPSS for Windows (2002). Significance between individual means was identified using the Tukey's Multiple Range test. Mean differences were considered significant at $p<0.05$. Standard errors of means were calculated from the residual mean square in the analysis of variance.

RESULTS AND DISCUSSION

The amino acid and total crude protein contents of some protein sources used in livestock production in Turkey are given in Table 1.

The protein sources had a significant ($p<0.001$) effect on the essential and non-essential amino composition. Generally protein sources from legume grains had significantly ($p<0.001$) lower essential amino acid contents than those of SBM and FM. Protein sources from legume grains are very poor in especially methionine and lysine when compared with those of fish meal. On the other hand, protein sources from legume grains had only significantly ($p<0.001$) lower non-essential amino acid contents than that of FM.

The leucine, threonine, methionine, lysine, tyrosine, glycine and proline contents of *Vicia narbonensis* obtained current study were comparable with those reported by Hadjipanayiotou and Economides (2001). Although the valine, isoleucine, phenylalanine and serine contents were lower, the histidine, alanine, aspartic acid and glutamic acid contents of *Vicia narbonensis* obtained current study were higher than those reported by Hadjipanayiotou and Economides (2001). On the other hand, the essential and non-essential amino acid compositions of grasspea (*Lathyrus sativus*) obtained in the current study are consisting with finding of Karadag and Yavuz (2010) reported that grasspea had potential to supply enough crude protein and amino acids for

Table 1: The essential and non-essential amino acid compositions of different protein sources used livestock nutrition in Turkey

	Protein sources							
Composition	*L. sativus*	*V. pregrina*	*P. elatius*	*V. narbonensis*	SBM	FM	SEM	Sig.
Essential (g kg^{-1} DM)								
Valine	10.95^{d}	11.68^{cd}	11.50^{cd}	12.35^{c}	26.10^{b}	43.24^{a}	31.27	***
Leucine	17.63^{e}	18.52^{d}	18.09^{de}	19.68^{c}	32.38^{a}	64.31^{a}	16.81	***
Isoleucine	9.19^{e}	10.53^{c}	9.91^{c}	10.40^{c}	24.63^{b}	39.87^{a}	40.32	***
Threonine	9.82^{c}	9.76^{c}	8.59^{d}	9.98^{c}	20.71^{b}	32.62^{a}	16.88	***
Methionine	0.00^{d}	1.19^{c}	1.01^{c}	1.02^{c}	4.84^{b}	23.05^{a}	15.26	***
Lysine	17.94^{d}	17.96^{d}	14.44^{e}	19.50^{c}	30.18^{b}	73.53^{a}	35.83	***
Phenylalanine	9.85^{d}	11.18^{c}	10.97^{d}	11.11^{c}	24.18^{b}	34.90^{a}	39.87	***
Histidine	17.35^{d}	16.43^{d}	12.84^{e}	28.63^{a}	21.58^{b}	19.02^{c}	38.65	***
Tyrosine	6.53^{c}	7.04^{c}	6.54^{c}	7.27^{c}	16.85^{b}	32.06^{a}	23.37	***
Non essential (g kg^{-1} DM)								
Alanine	10.76^{cd}	11.03^{c}	10.56^{d}	10.98^{cd}	24.41^{b}	46.37^{a}	13.22	***
Glycine	9.12^{c}	9.33^{c}	9.28^{c}	9.82^{c}	21.36^{b}	36.58^{a}	28.31	***
Serine	11.82^{c}	12.88^{b}	11.99^{c}	13.05^{b}	27.90^{a}	28.22^{a}	12.77	***
Proline	9.82^{c}	10.66^{c}	10.07^{c}	10.58^{c}	26.79^{b}	34.38^{a}	27.04	***
Aspartic acid	43.33^{c}	40.02^{e}	44.26^{c}	41.56^{d}	62.73^{b}	109.80^{a}	44.35	***
Hydroxyproline	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	37.98^{a}	1.92	***
Glutamic acid	41.55^{e}	44.14^{d}	39.65^{f}	47.85^{c}	82.65^{b}	101.16^{a}	22.37	***
Total CP	267.00^{e}	290.30^{e}	246.00^{f}	270.60^{d}	466.6^{b}	772.6^{a}	0.900	***

Row means with common superscripts do not differ (p>0.05): SEM: Standard error mean; Sig: Significance level, DM: Dry matter, SBM: Soybean meal, FM: Fish meal, CP: Crude protein, ***p<0.001

monogastric animal, except methionine. The difference in amino acid contents is possibly due to differences in genotype of *Vicia narbonensis* plant and environment conditions where Vicia *narbonensis* plant grows.

As can be seen from Table 1 the protein contents of protein sources ranged from 246.0 to 772.6 g kg^{-1} DM. Although the CP contents of *Lathyrus sativus*, *Vicia peregrina*, *Pisum elatius* and *Vicia narbonensis* were significantly lower than those of soybean meal and fish meal, these legume grains have potential to supply enough crude protein for livestock.

The CP content of *Lathyrus sativus* obtained in the current study is consistent with finding of Tadelle *et al.* (2003) and Smulikowska *et al.* (2008). The CP content of *Vicia narbonensis* obtained in the current study is lower than that reported by Mikic *et al.* (2009). The difference in protein contents is possibly due to differences in genotype of *Vicia narbonensis* plant, fertilization and environment conditions where Vicia *narbonensis* plant grows.

CONCLUSION

As a conclusion, grains from *Lathyrus sativus, Vicia peregrina, Pisum elatius* and *Vicia narbonensis* have potential as an alternative protein source, however, grains from *Lathyrus sativus, Vicia peregrina, Pisum elatius* and *Vicia narbonensis* should be supplemented with methionine and lysine amino acids to obtain the optimum performance from livestock when these protein sources are used as an alternative protein source in livestock diets.

ACKNOWLEDGMENT

The authors would like to thank the Resource Fund of the University of KSU (Turkey) for their financial support (2007/2-5) of the experiment.

REFERENCES

AOAC, 1990. Official Methods of Analysis. Association of Official Analytical Chemists, Washington, DC. USA., pp: 69-88.

Abeke, F.O., S.O. Ogundipe, A.A. Sekoni, I.I. Dafwang, I.A. Adeyinka, O.O. Oni and A. Abeke, 2008a. Response of laying hens to dietary levels of cooked lablab purpureus beans. Asian J. Anim. Vet. Adv., 3: 9-16.

Abeke, F.O., S.O. Ogundipe, A.A. Sekoni, I.A. Adeyinka, O.O. Oni, A. Abeke and I.I. Dafwang, 2008b. Effect of duration of cooking lablab purpureus beans on its utilization by broiler finishers (4-8 Weeks). Asian J. Anim. Vet. Adv., 3: 85-91.

Akand, K.E., M.M. Abubakar, T.A. Adegbola, S.E. Bogoro and U.D. Doma, 2010. Chemical evaluation of the nutritive quality of pigeon pea [*Cajanus cajan* (L.) mill sp.]. Int. J. Poult. Sci., 9: 63-65.

Buyukcapar, H.M and A. Kamalak, 2010. Nutritive value of wild pea (*Pisum elatius*) seed as a dietary protein source for fingerlings of mirror carp (*Cyprinus carpio*). The Israeli J. Aquacult. Bamidgeh, 62: 272-280.

Buyukcapar, H.M., M.I. Mezdegi and A. Kamalak, 2010. Nutritive value of narbon bean (*Vicia narbonensis*) seed as ingredient in practical diet for tilapia (*Oreochromis niloticus*) fingerlings. J. Applied Anim. Res., 37: 253-256.

Hadjipanayiotou, M. and S. Economides, 2001. Chemical composition, *in situ* degradability and amino acid composition of protein supplements fed to livestock and poultry in Cyprus. Livestock Res. Rural Develop., 13.,

Karadag, Y. and M. Yavuz, 2010. Seed yields and biochemical compounds of grasspea (*Lathyrus sativus* L.) lines grown in semi-arid regions of Turkey. Afr. J. Biotechnol., 9: 8343-8348.

Karaman, M., S. Canogullari, M. Baylan and A. Kamalak, 2009. Nutritive value of culban (*Vicia peregrina*) seeds as dietary protein source for Japanese quail (*Coturnix coturnix japonica*). J. Anim. Vet. Adv., 8: 839-842.

Mieczan, A.W. and M. Kwiecien, 2010. The effectiveness of grass pea (*Lathyrus sativus* L.) seed in pig feed. Turk. J. Vet. Anim. Sci., 34: 155-162.

Mikic, A., V. Peric, V. Dordevic, M. Srebric and V. Mihailovic, 2009. Anti-nutritional factors in some grain legumes. Biotechnol. Anim. Husbandry, 25: 1181-1188.

Smulikowska, S., W. Rybinski, J. Czerwinski, M. Taciak and A. Mieczkowska, 2008. Evaluation of selected mutants of grasspea (*Lathyrus sativus* L.) var. Krab as an ingredients in broiler chicken diet. J. Anim. Feed Sci., 17: 75-87.

Tadelle, D., Y. Alemu, D. Nigusie and K.J. Peters, 2003. Evaluation of processing methods on the feeding value of grass pea to broilers. Int. J. Poult. Sci., 2: 120-127.