



SHORT COMMUNICATION

Feed Intake and Nutrient Digestibility in Dairy Cows Fed Rations Containing Soybean Meal or Cotton Seed Meal Based Concentrate Mixtures

P.K. Naik*, B.K. Swain, E.B. Chakurkar and N.P. Singh

ICAR Research Complex for Goa, Old Goa-403 402, Goa, India

ABSTRACT

Six lactating dairy cows were fed rations containing soybean meal (SBM) or cotton seed cake (CSC) based concentrate mixtures. Animals of the SBM and CSC groups were individually offered daily concentrate mixture containing maize grain 70 and SBM 30 parts by weight (CM_{M+SBM}) and CM, containing maize grain 70 and CSC 30 parts by weight (CM_{M+CSC}), respectively along with limited fresh napier bajra hybrid green fodder (CO-3) and *ad lib.* jowar straw. Besides, extra 1.8 kg CSC was offered to the animals of the CSC group. The digestibility of DM and CP was lower in the animals of the CSC group than the SBM group. There was no difference in digestibility of OM, EE, CF and NFE between the CSC and SBM group. The CP% in the rations of the two groups was similar (12.59 and 13.60%) while DCP% in the ration of the CSC group (8.61) was lower than the SBM group (9.95). However, the TDN content of the ration of the CSC group (73.11) was higher than the SBM group (63.07). The exclusive feeding of mixture of maize grain and soybean meal as home-made concentrate mixture to dairy animals was superior to the mixture of maize grain and cotton seed cake in terms of digestibility and nutritive value of the ration.

Key words: Cotton seed cake, Cows, Maize, Soybean, Concentrate mixture, Nutrient digestibility

There are 2-3 ingredients used for preparation of concentrate mixture by rural dairy farmers (Naik *et al.*, 2013a). Maize is a good source of energy and cotton seed cake (CSC) is a good source of bypass protein (Sampath *et al.*, 2005). Most of the dairy farmers mix ground maize and CSC to use as home-made concentrate mixture due to shortage of feeds and fodders (Naik *et al.*, 2012a). Besides, soybean meal (SBM) is a good source of bypass protein and is used by many farmers as dairy feed ingredient (Sharma, 2004). However, it was reported that exclusive feeding of mixture of maize grain and CSC as home-made concentrate mixture to dairy animals was not profitable in comparison to mixture of maize grain and SBM (Naik *et al.*, 2013b). Therefore, present experiment was carried out to find out the nutrient digestibility and nutritive value of SBM or CSC based home-made concentrate mixture in dairy cows.

Six lactating dairy cows (Av. BW=393.8 kg; Av. milk yield =7.0 kg/d) were divided into two groups of three animals each, based on body weight (BW) and daily milk yield. All the animals were kept under loose housing system with individual feeding. In the CSC

group, a concentrate mixture (CM_{M+CSC}) containing maize grain 70 and CSC 30 parts by weight was prepared. While, in SBM group, CSC was replaced by SBM (CM_{M+SBM}). Besides, 2 parts mineral mixture and 1 part common salt were added in both types of concentrate mixture. Animals of the SBM and CSC group were individually offered daily 6 kg CM_{M+CSC} and CM_{M+SBM} , respectively along with limited (10 kg) fresh napier bajra hybrid (CO-3) green fodder and *ad libitum* jowar straw (*Kadaba kutti*). To make both the rations isonitrogenous, extra 1.8 kg CSC was offered to each animal of the CSC group. Nutrient requirements of animals of both groups were fulfilled (Ranjhan, 1998) and feeding trial was conducted for a period of 30 days. Ration was offered twice daily in equally divided doses and clean drinking water was made available thrice daily. The body weights of the animals were recorded for two consecutive days before offering feed and water in the morning. Feed offered and residues left were recorded daily. At the end of the feeding period, a 6-day digestion trial was conducted, during which samples of feeds, residues, faeces were collected quantitatively and analyzed for proximate principles (AOAC, 2000). The

*Corresponding author: E-mail: pknaikicar@gmail.com

Table 1. Chemical composition (% DM basis) of feeds and fodders

| Parameter | Concentrate mixture | | Cotton seed cake | Napier hybrid | Jowar straw |
|------------------------|--------------------------|--------------------------|---------------------|---------------|-------------|
| | CM _{M+SBM} | CM _{M+CSC} | | | |
| Crude protein* | 22.80 ^b ±0.17 | 12.72 ^a ±0.30 | 23.14 | 10.56 | 2.12 |
| Ether extract | 1.20±0.09 | 1.33±0.16 | 0.50 | 2.67 | 0.40 |
| Crude fibre* | 4.94 ^a ±0.16 | 10.85 ^b ±0.40 | 30.60 | 33.38 | 37.13 |
| Nitrogen free extract* | 65.48 ^a ±0.31 | 70.67 ^b ±0.49 | 41.72 | 45.88 | 51.77 |
| Total ash* | 5.58 ^b ±0.07 | 4.43 ^a ±0.23 | 4.05 | 7.51 | 8.58 |
| Acid insoluble ash | 0.66±0.06 | 0.62±0.09 | 0.17 | 4.66 | 6.60 |

^{a,b}Means bearing different superscripts in a row differ significantly (P<0.05)

data were analyzed for the test of significance (Snedecor and Cochran, 1994).

The result showed (Table 1) that CP% of CM_{M+CSC} (12.72) was lower (P<0.05) than CM_{M+SBM} (22.80), but the CF content of the former (10.85%) was higher than the latter (4.94%). The nutrient content of

napier bajra hybrid green fodder (CO-3) and jowar straw was similar to the earlier reports (Ranjhan, 1998; Naik *et al.*, 2013b). The consumption of concentrate mixture in CSC group (6.73 kg/d) was higher than the SBM group (5.37 kg/d) which may be due to the additional supplementation of CSC (1.63 kg/day) to animals of

Table 2. Feed intake and digestibility of nutrients fed soybean meal and cotton seed meal based concentrate mixtures in dairy cows

| Parameter | SBM group | CSC group |
|---------------------------------------|--------------------------|--------------------------|
| Body weight (kg) | 433.00±17.37 | 370.56±27.25 |
| Dry matter intake (kg/day) | | |
| Concentrate mixture | 5.37±0.00 | 5.40±0.00 |
| Total Concentrates* | 5.37 ^a ±0.00 | 6.73 ^b ±0.17 |
| Green fodder | 1.68±0.04 | 1.50±0.24 |
| Jowar straw | 3.63±0.67 | 3.13±0.90 |
| Roughage | 5.31±0.69 | 4.63±0.90 |
| DM | 10.68±0.69 | 11.40±0.74 |
| DM intake/ 100 kg BW | 2.47±0.15 | 3.10±0.26 |
| R: C ratio | 49: 51±3.06 | 40: 60±5.21 |
| Digestibility of nutrients (%) | | |
| Dry matter* | 63.54 ^b ±1.21 | 59.39 ^a ±1.47 |
| Organic matter | 67.19±1.11 | 66.85±1.38 |
| Crude protein* | 72.75 ^b ±1.44 | 66.39 ^a ±2.33 |
| Ether extract | 69.07±2.22 | 66.98±2.96 |
| Crude fibre | 59.22±2.46 | 59.88±0.93 |
| Nitrogen free extract | 67.00±1.07 | 69.17±1.48 |
| Nutritive value (%) | | |
| CP | 13.60±0.67 | 12.59±0.82 |
| DCP* | 9.95 ^b ±0.66 | 8.61 ^a ±0.81 |
| TDN* | 63.07 ^a ±0.54 | 73.11 ^b ±2.07 |

^{a,b}Means bearing different superscripts in a row differ significantly (P<0.05)

the former group (Table 2). However, there was no difference in the DM intake (kg/d) of green fodder (1.50 vs. 1.68), jowar straw (3.13 vs 3.63), roughage (4.63 vs. 5.31) and DM (11.40 vs 10.68) between the CSC and SBM groups. In contrast to the findings of this study, an earlier study (Naik *et al.* 2013b) reported lower intakes of jowar straw, roughages, DM and lower R: C ratio in animals fed with mixtures of maize grain and CSC as compared to mixture of maize grains and SBM. The DM intake (kg/d) as percentage of the BW of the animals between CSC group (3.10) and SBM group (2.47) was similar to that reported by Naik *et al.* (2013b) but it was lower than the findings of the Naik *et al.* (2012b) in dairy cows.

The digestibility of DM (59.39 vs. 63.54%) and CP (66.39 vs 72.75%) was lower in animals of the CSC group than the SBM group (Table 2) indicating that the protein of the CSC was less digestible than the SBM. However, there was no difference in the digestibility (%) of OM (66.85 vs. 67.19), EE (66.98 vs. 69.07), CF (59.88 vs. 59.22) and NFE (69.17 vs. 67.00) between the two groups. The CP% of the two rations was similar and ranged from 12.59 to 13.60%. The DCP% of the ration of the CSC group (8.61) was lower than the SBM group (9.95), which may be attributed to the lower digestibility of the CSC proteins than the SBM proteins. However, the TDN content (73.11 vs. 63.07, %) of the ration of the CSC group (73.11) was higher than that of the SBM group (63.07).

The exclusive feeding of mixture of maize grain and soybean meal as home-made concentrate mixture to dairy animals was superior to the mixture of maize grain and cotton seed cake in terms of digestibility and nutritive value of the ration.

ACKNOWLEDGEMENT

The authors are thankful to Indian Council of Agricultural Research, New Delhi for providing financial support to conduct the study.

REFERENCES

AOAC. 2000. *Official Methods of Analysis*, 17th ed. Association of Official Analytical Chemists, Washington, DC.

- Naik, P.K., Swain, B.K., Chakurkar, E.B. and Singh, N.P. 2012a. Assessment of potential animal and poultry feed resources in Goa. *Anim. Nutr. Feed Tech.* 12: 127-133.
- Naik, P.K., Swain, B.K., Chakurkar, E.B. and Singh, N.P. 2012b. Performance of dairy cows on green fodder maize based ration in coastal hot and humid climate. *Anim. Nutr. Feed Tech.* 12: 265-270.
- Naik, P.K., Dhuri, R.B., Swain, B.K., Karunakaran, M., Chakurkar, E.B. and Singh, N.P. 2013a. Analysis of existing dairy farming in Goa. *Indian J. Anim. Sci.* 83 (3): 299-303.
- Naik, P.K., Karunakaran, M., Swain, B.K. and Singh, N.P. 2013b. Evaluation of cotton seed cake or soybean meal as home-made concentrate mixture for dairy cows from farmers' perspective. *Indian J. Anim. Nutr.* 30: 43-46.
- Ranjhan, S.K. 1998. *Nutrient Requirement of Livestock and Poultry*, 2nd revised edn., ICAR, New Delhi, India.
- Sampath, K.T., Chandrasekharaiah, M. and Praveen, U.S. 2005. Effect of bypass protein on milk production of crossbred cows-A field study. *Indian J. Anim. Nutr.* 22: 41-43.
- Sharma, D.D. 2004. Deviation of feed industry towards quality feed production. *All India Dairy Husbandry Officers' Workshop*, Dairy Extension Division, National Dairy Research Institute, Karnal, India, p.28-33.
- Snedecor, G.W. and Cochran, W.G. 1994. *Statistical Methods*, 9th ed. Oxford and IBH Publishing Co. Calcutta, India.

Received on 20-09-2014 and accepted on 20-10-2014