

EFFECT OF SUBSTITUTION OF WHOLE CROP MAIZE VERSUS MAIZE STOVER SILAGES WITH COMMERCIAL CONCENTRATES ON MILK YIELD AND ITS COMPOSITION IN SAHIWAL COWS

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ABSTRACT

The main objective of the present study was to compare the effects of feeding value of silages from whole crop maize (WCM) and maize stover (MS) on dry matter intake (DMI), milk yield and its composition in lactating Sahiwal cows. Eight cows nearly of the same age, weight and lactation stage were randomly divided into 2 equal groups, A and B. Two rations viz I and II were randomly allotted to these groups. Both the rations were based on 60% test materials (WCM or MS silage) added with 40% concentrates. Each ration was offered *ad libitum* twice daily. The experiment lasted for 20 days, allowing 10 days of adaptation period. The data were statistically analyzed using completely randomized design. Non significant differences were observed between both the groups of cows fed WCM or MS silage for DMI, milk yield and its components such as fat and solid-not-fat, total solids, crude protein and casein contents. Based on the findings of this study, it was concluded that the overall response of the experimental cows to the silages from MS and WCM was similar. Therefore, it was suggested that on the commercial scale, for feeding dairy animals during drought season, conversion of the maize stover into silage should be encouraged rather than whole crop maize.

Key words: Whole crop maize, maize stover, milk yield, cows

INTRODUCTION

Whole crop maize comprises of ear, leaves and stem, except roots. Based on the area and production, maize is considered 3rd most important cereal crop in Pakistan, after wheat and rice. While on the consumption basis, it ranks 2nd after wheat in North West Frontier (NWF) Province. The NWF Province contributes more than 50% of the total maize production in the country (Amir, 1986; Byerlee *et al.*, 1986; Byerlee *et al.*, 1988).

Maize stover is the portion of maize plant that remains after removing ears (husks+grains+cob) and roots (Altaf, 1999). According to Renard (1997), the available feed resources for livestock in Pakistan include range grazing (39%), crop residues and forage crops (54%), feed grains and other concentrates (7%). Maize stover is the most abundant crop residue in the world (FAO, 1985).

A review of the literature shows that no local research work has been carried out on comparing whole crop maize (WCM) and maize stover (MS) as silages feeding to lactating cows for evaluating their effects on milk production and its composition. Therefore, this study was designed to achieve such objectives. It was hypothesized that experimental cows fed WCM silage would show better yield for milk quality and quantity as compared to those fed MS silage; because, WCM silage contains higher quantity of starch content as a source of energy than MS silage (Altaf, 1999).

MATERIALS AND METHODS

The study was conducted at the Livestock Research and Development Farm (LRDF) Surezai, Peshawar in two phases; ensilage of WCM and MS in phase I, while feeding trial in phase II.

Ensiling

Both the forages were ensiled using pit silos of 3,500 kg capacity for 21 days. The local maize variety (khushal) was grown at LRDF. The crop was sown in May and harvested manually in August. The WCM was harvested 3 to 4 inches above the ground, after attaining the desirable DM content (25 to 30%). Approximately 3,500 kg of the chopped WCM was used to fill the silo. During filling, as much compaction as possible was applied ensuring the anaerobic conditions for achieving satisfactory fermentation. Then the silo was covered with polythene sheet and plastered with mud from all sides. The MS was harvested on the same day. The ears were removed from the standing crop by hand, followed by harvesting the leaf and stem, using sickle. For ensiling, the pre-mentioned procedure was adopted.

Feeding trial

Before conducting the feeding trial, each experimental animal was treated for ecto and endo parasites and the required quantity of concentrates was

purchased from the local market in one batch. Eight lactating Sahiwal cows were selected on the basis of nearly the same milking stage, age and body weight. The experimental animals were randomly divided into 2 groups, each with four cows, using the completely randomized design. The groups were designated as A and B, while the experimental rations as I and II and were allotted to these groups, at random. Each ration contained 60% WCM or MS silage added with 40% concentrates (Table 1). Each ration was offered *ad libitum* twice daily. Fresh drinking water was available to cows throughout the day. The effectiveness of each of the ration was tested in terms of feed intake, milk yield and its composition. Based on internationally published research work (Savoie, 1992; Sarkar, 2000), 10 days were allowed for adaptation, followed by 10 days experimental period. The daily data were collected for DM intake and milk yield. The chemical components of the milk and test materials were determined using the standard procedures described by AOAC (1990).

Table 1: Composition of experimental rations (%)

Ingredients	Ration I.	Ration II
Whole crop maize silage	60	00
Maize stover silage	00	60
Wheat bran	17	17
Cotton seed cake (undecortecated)	17	17
Molasses	5	5
Common salt	1	1
Total	100	100
Chemical composition		
Dry matter	100	100
Crude protein (%)	10.30	10.19
Ether extract (%)	2.45	2.24
Ash (%)	7.46	8.82
Crude fiber (%)	19.01	21.77
Nitrogen free extract (%)	60.78	56.98

The data were statistically analyzed with the standard method of Steel and Torrie (1981). The means were compared using the least significant difference procedure (Steel and Torrie, 1981). The Statistical

Analysis System (SAS, 1997) was used to perform the above analysis on computer.

RESULTS AND DISCUSSION

Table 2 shows the mean values for daily DMI, milk yield and its composition (butter fat, crude protein, casein, total solids and solid not fat contents) of cows fed on rations I (WCM) and II (MS). The results showed non significant differences between both the groups of cows fed WCM or MS silage for all the parameters studied (Table 2).

The results of this study showed non significant differences in the milk yield of the cows fed WCM or MS silage. It was hypothesized that the WCM silage, containing grains as starch source, would improve milk yield of the cows over those fed MS silage based diet. However, ensiling WCM along with the ear (grains+husks+cob) and then feeding it to dairy cows did not increase their milk yield or feed intake. The obvious reasons could be i) the similar fermentation characteristics between whole crop maize and maize stover silages i.e. pH 3.65 and 3.70 and lactate concentration of 3.25 and 3.27% (Altaf, 1999) and ii) the absence of amyolytic activities in the WCM silage (Spoelstra, 1992). Mohamed (1997) studied the effects of corn stover silage or whole plant corn silage on lactating buffaloes. The daily milk yield and milk fat contents were found similar, when the buffaloes were fed corn stover and whole plant corn rations. Similar milk yield of cows fed on WCM or MS silage might be due to the affects of grains fed in the WCM containing high fibrous material, which increased the flow rate of small particles. This resulted in excretion of the maximum quantity of starch in faeces and did not benefit the animal to increase milk yield. Why was the milk yield of cows on WCM silage not improved, remains unclear.

Non-significant differences in the parameters studied might be due to no change in the rumen microbial behaviour on feeding two different silages. Iwama (1999) also found no effect on milk composition when sudan grass silage and maize silage were fed to dairy cows.

Table 2: Comparison of the mean values for various parameters

Parameters	Group-A Whole crop maize silage	Group-B Maize stover silage	LSD values
Daily DMI (kg)	12.8	12.5	0.51 ^{NS}
Daily milk yield (litres)	4.2	4.3	0.42 ^{NS}
Butter fat (%)	4.6	4.7	0.21 ^{NS}
Crude protein (%)	3.01	3.00	0.12 ^{NS}
Casein (%)	2.48	2.47	0.52 ^{NS}
Total solids (%)	12.25	12.23	0.11 ^{NS}
Solid not fat (%)	7.67	7.58	0.44 ^{NS}

NS = Non significant (P>0.05).

REFERENCES

- Altaf, U.R., 1999. Laboratory evaluation of the enzyme treated whole crop maize and maize stover as silage for ruminants. Ph.D Thesis. Univ. Reading, UK.
- Amir, P., 1986. Maize marketing and utilization in Pakistan. PARC/CIMMYT. Islamabad, Pakistan Paper No. 86, pp: 4.
- AOAC, 1990. Official methods of analysis (13th ed). Association of Analytical Chemists. Washington D.C., USA.
- Byerlee, D., A.D. Shiekh and S.S. Hussain, 1986. Maize production in NWFP: A review of technological issues in relation to farmers' circumstances, PARC/CIMMYT Islamabad, Pakistan, pp: 10-12.
- Byerlee, D., A.D. Shiekh, K. Khan and M. Ahmed, 1988. Diagnosing research and extension priorities for small farmers. In "Maize in the Swat Valley", PARC/CIMMYT Islamabad, Pakistan, pp: 80-87.
- FAO, 1985. Better utilization of crop residues and by-products in animal feeding. Research Guidelines, Rome, Italy. Food and Agriculture Organization of the United Nations.
- Iwama, Y., 1999. Feeding value of Sudan grass vs maize silage for lactating dairy cattle. Bull. Kyushu National Agri. Exp. Station, pp: 41-47.
- Mohamed, A.H., 1997. Effect of corn stover silage or whole plant corn silage on the performance of lactating buffaloes. Egyptian J. Nutr. Feeds, pp: 251-252.
- Renard, C., 1997. Crop residues in sustainable mixed crop/livestock farming systems, In: Feed Resources in West/Central Asia-North Africa, Published by the International Crops Research Institute For the Semi-Arid Tropics (ICRISAT), India, pp: 322.
- Sarkar, M., 2000. Lactation curves of milk yield and some major milk constituents of cows. Indian Vet., J., 77: 551-552.
- SAS, 1997. A handbook of statistical analysis system version 6.04. Institute Inc; Cary, NC.
- Savoie, P., 1992. Effect of length of cut on quality of stack silage and milk production. Canadian J. Anim. Sci., 72: 253-263.
- Spaelstra, S.F., 1992. The effects of ensiling whole crop maize with a multi-enzyme preparation on the chemical composition of the resulting silages. J. Sci. Food and Agri., 60: 223-228.
- Steel, R.G.D. and J.H. Torrie, 1981. Principles and Procedures of Statistics. McGraw Hill Book. Co. Inc. New York.