SHORT COMMUNICATION

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EFFECT OF ENSILAGE ON CHEMICAL COMPOSITION OF WHOLE CROP MAIZE, MAIZE STOVER AND MOTT GRASS

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ABSTRACT

The main objectives of this study were to investigate the effects of ensilage on chemical composition of whole crop maize (WCM), maize stover (MS) and mott grass (MG) using pit silos and to compare the chemical composition values of these forages. The experimental design was 2 (fresh vs silage) x 3 (forages) factorial arrangement using 4 replicates. All the 24 samples were analysed for percent dry matter (DM), ash, crude protein (CP), ether extract (EE), crude fibre (CF) and nitrogen free extract (NFE). Results indicated that ensilage increased CP, decreased DM and NFE, but did not affect ash, EE and CF contents. Whole crop maize was higher in NFE and lower in ash and CF contents as compared to MS or MG, but all the three forages were similar in DM content. No interaction was found between forage vs ensilage for any parameter. It was concluded that ensilage improved the CP content, which needs further investigations.

Key words: Ensilage, composition, whole crop maize, stover, mott grass.

INTRODUCTION

Ensilage is the process of preserving fresh cut forages in a silo under completely anaerobic conditions (McDonald *et al.*, 1991). Some crops are purposely grown for silage making, while others are ensiled, when surplus, after fulfilling the immediate feeding requirements of the livestock.

Silage making can be considered the most effective way of preserving green forages over hay making, if all essential steps of silage making are followed. Silage making is less dependent on weather. Moreover, earlier cutting of forages for silage had also showed higher dry matter (DM) or organic matter digestibilities. Chauhan (1985) compared the nutritive valueS of hay and silage made from maize stovers. The hay was found to be higher in DM content, but lower in crude protein (CP) content, DM intake and DM digestibility. Because of these advantages, silage making is gaining popularity in many parts of the world.

Chemical changes during ensilage process can affect the colour of forage and the fermentation acids can convert chlorophyll into the brown magnesium-free pigment, phaeophytin. Ashbell and Lisker (1988) investigated losses in maize silages, ranging from 4 to 7% DM in bunker silos.

Very little sugar remains after fermentation, usually less than 2%, and this frequently comprises, in addition to glucose and fructose, pentoses released from enzymatic and acid hydrolysis of hemicelluloses. Since the majority of lactic acid bacteria do not attack starch, most of this polysaccaride, if present, will be preserved. As a result of soluble nutrients in gaseous form or through effluent, the concentration of cell wall constituents (fiber), generally increase during ensilage. The present experiment was designed to study the effects of ensilage on chemical composition of whole crop maize, maize stovers and mote grass and to compare chemical composition values of these forages.

MATERIALS AND METHODS

The preset study was conducted at the Livestock Research and Development Farm (LRDF) Surezai, Peshawar. A local maize variety (khushal) was grown at LRDF Surezai. The crop was planted in May and harvested manually 3 to 5 inches above the ground, in August. About 1 kg representative sample was stored in freezer on the day of harvest for subsequent laboratory analysis. Approximately 3,500 kg of the chopped forage was filled in a pit silo. Then the silo was covered with polythene sheet and mud plastered from all sides.

The stovers were harvested on the same day by first removing the ears by hand and then harvesting the remaining leaf and stem by using sickle. The rest of the ensilage process was same as described earlier. The mott grass was harvested 8-12 inches above the ground and processed for ensilage as explained above.

After 21 days, a small opening was made to collect approximately one kg silage from each silo. The silage was divided into two parts; 0.5 kg was put in a pre-labelled polythene bag and stored in the freezer for subsequent analysis. While the rest of the silage was weighed in duplicate trays and placed in an oven at 100°F for 24 hours. The dried sample was milled to 3 mm and then to 1 mm to get an even particle size for subsequent proximate chemical analysis. Each sample was analysed for DM, ash, crude protein (CP), ether extract (EE), crude fiber (CF) and nitrogen-free-extract (NFE) according to the procedures described in AOAC

(1990). The data were statistically analysed using 2 x 3 factorial design (Steel and Torrie, 1981). The means were compared using least significance differences (LSD) test.

RESULTS AND DISCUSSION

Ensilage decreased (P<0.001) DM content and NFE but increased (P<0.001) CP content. No obvious change (P>0.05) was observed in ash, EE and CF contents (Table 1).

The decrease in DM and NFE contents might be due to microbial activities during ensilage. This indicates that microbes used organic components, especially water soluble carbohydrates and fermented contents, but higher (P<0.001) in NFE content, than maize stover or mott grass.

The lower ash and CF and higher NFE values in whole crop maize might be due to its ear part, which is 60% of the whole crop maize. The ears contain 80% grains, which had high concentration of starch. No interaction between forage vs ensilage was detected for any parameter in this study.

Table 1: Percent means of main effects and interactions

	DM	ASH	CP	EE	CF	NFE
Main effect means						
Fresh	29.28 [a]	7.70 [a]	7.98 [b]	1.75 [a]	30.79 [a]	51.78 [a]
Silage	28.39 [b]	7.74 [a]	8.93 [a]	1.76 [a]	30.64 [a]	50.67 [b]
Whole crop maize	29.68 [a]	6.13 [b]	8.48 [a]	2.04 [a]	28.04 [b]	55.26 [a]
Maize stover	28.46 [a]	8.69 [a]	8.24 [a]	1.57 [a]	32.11 [a]	49.36 [b]
Mott grass	28.37 [a]	8.32 [a]	8.63 [a]	1.66 [a]	32.31 [a]	49.05 [b]
Interaction means						
Whole crop maize X fresh	30.22	6.09	8.10	2.04	27.98	55.82
Whole crop maize X silage	29.13	6.18	8.89	2.04	28.1	54.70
Maize stover X fresh	28.70	8.69	7.71	1.57	32.12	49.92
Maize stover X silage	28.22	8.70	8.76	1.57	32.1	48.79
Mott grass X fresh	28.91	8.31	8.13	1.65	32.36	49.61
Mott grass X silage	27.83	8.33	9.12	1.66	32.32	48.50

The mean values with different superscripts, in the same column for each category are significantly different (P<0.05). All interactions are non significant statistically.

them into acids. Lactic acid producing bacteria are especially responsible for such conversion of sugars into acids to get optimum pH for satisfactory fermentation. Very little sugar remains after fermentation, usually less than 2.0% (McDonald, 1981). Therefore, during these processes many organic matter losses occur, which ultimately cause reduction in DM and NFE contents. Ashbell and Lisker (1988) investigated losses in maize silages ranging from 3.9 to 7.4% in bunker silos.

However, the increase in CP content during ensilage could be due to microbial protein synthesis. Phipps and Wilkinson (1985) also found increase in CP content and decrease in DM and sugar contents in maize silage.

The whole crop maize, maize stover and mott grass were found similar (P>0.05) for DM content. However, whole crop maize was lower (P<0.001) in ash and CF

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