

EFFECT OF PROBIOTIC AND UREA ON NUTRITIVE VALUE OF MALVA AND BARLEY SILAGE

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Abstract – This study was conducted to determine the effect of ensiling Malva grass (, Malva sylvestris) (75%) , green barley (15%), urea (5%) and molasses(5.5 - 6%) with 0, 0.2 and 0.5 % probiotic on silage quality and chemical composition, the silage were determined at 40 days of ensiling.

Results showed that physical characteristics indicate acceptable physical attributes and rang from good quality to Very good silage. Silage scores however revealed that the best physical attributes were attained at 0.2 and 0.5 % probiotic. additives improved fermentation quality by reducing final pH from 4.80 to 4.50, indicating that the silages mixtures were adequately fermented .

Silage without probiotic showed lower ($P < 0.05$) dry matter losses as compared to 0.2 and 0.5% probiotic,while, organic matter and crude protein content had more ($P < 0.05$) for silage without probiotic than probiotic additives. addition of probiotic produced silages with significantly higher ($P < 0.01$) in vitro dry matter and organic matter digestibility and metabolizable energy value than without probiotic . Neutral detergent fiber, hemicellulose and lignin decreased ($P < 0.05$) for silages 0.02 and 0.5% probiotic than without probiotic ,no significant defenses for acid detergent fiber and water soluble carbohydrate contents in silage .

In conclusion, probiotic used in this study enhanced nutritive value of silage. Ensiling may be applied as a practical approach for long-term preservation of fresh grass.

Key words: Silage quality, probiotic, Malva sylvestris

I. INTRODUCTION

In the tropics and sub tropics the grasses unavailable as feed in the off season ,the shortage of good quality forage during the dry season needed search for alternative ways to provide good quality feed (Babayemi and Igbekoyi ,2008) , hence the need for conservation as a silage .silage is one of methods to produce feedstuff by fermentation of crops or agricultural byproduct.

Malva grass biennial–perennial herbaceous plant as a weed in most parts of the world, perennial root annual stem two to three feet high, Leaves are large (Lust, 1974). *Malva sylvestris* L. (Malvaceae), usually known as common mallow, is widely used in Mediterranean and European traditional medicine for treatment of external and internal inflammation and injuries and is also locally regarded as a wild food herb . Malva grass may also be a feed resource because of high quality ,fast growth rate and easy adaptation to the environment, However, ensiling is a suitable method for forage conservation and is aimed at minimizing nutrient wastage by enhancing the growth of lactic acid producing bacteria (Baytok et al., 2005). Urea can be used to increase nitrogen content and improve the fermentation quality of the silage (Filya et al., 2000). Molasses, a source of water soluble carbohydrate (WSC), is often used with urea to help preventing silage instability (Jaurena and Pichard, 2001). Also, molasses prevents increase silage temperature and poor aerobic stability of silage (Soderholm et al., 1998), molasses added to the silages to increase dry matter concentration, fermentation rate and production of lactic acid (McDonald et al., 1991).

Previous studies have shown that inclusion of molasses as a source of readily fermentable WSC has improved the fermentation of tropical pasture silages (Catchpoole and Henzell, 1971).

The present study was designed to ensile Malva and green barley grass with probiotic as feed for ruminants .

II. MATERIALS AND METHODS SILAGE MAKING

Malva grass and green barley was harvested manually , chopped into 5-8 cm length and wilted for 24 hours in order to reduce the moisture content to 60-70%, silage was prepared as follows:

1. Malva 75% ,green barley 15%,urea 5% and molasses 6% .
2. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.8% and probiotic 0.2%.
3. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.5% and probiotic 0.5%.

Filling and compaction was done simultaneously to eliminate inherent air. The silage was prepared in polythene bags in duplicate, the polythene bags were sealed and compressed. Fermentation was done for 40 days.

Determination of silage quality

The bags were opened after 40 days, fermentation quality can be assessed by making visual observations and some physical quality such as moldiness, odor (aroma), color, temperature ,pH and texture change were determined according to Babayemi and Igbekoyi (2008).

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Fleig score was calculated by using the equation of $220+(2 \times \text{DM}\% - 15) - (40 \times \text{pH})$ (Kılıç, 1984)

Chemical composition

Crude protein, crude fiber, ether extract and ash content of the silages were carried out as described by AOAC (1995), The fiber components including neutral detergent fiber, acid detergent fiber and acid detergent lignin were determined according to Van Soest et al. (1991). Water Soluble Carbohydrates (WSC) determined according to (Pollock and Jones, 1979).

Statistical analysis

Data were analyzed by using the procedure of SAS (SAS, 2002). The significant means separated using Duncan (1955) multiple range.

III. RESULTS AND DISCUSSION

Physical quality

The results of the physical quality of the silage on different additive of probiotic are shown in Table 1, The colour of silage in all treated were greenish brown, It was normal colour range for grass which was an indication of good quality silage (Oduguwa et al., 2007), The odor of silage varied from Musty (silage A) to pleasant (silage B and C) , The silages with probiotic exhibit pleasant odor which is an indication of well-made silage, Kung and Shaver (2002) reported that pleasant smell is accepted for good or well-made silage. The texture of silage A were presence of mould , which means that air has enter the silage, DM has been lost and silage quality (ME content) will have declined during storage (as show in table 3), While silage B and C were Moderately firm ,Likely to have high ME. Probably the probiotic consumed the air has enter the silage B and C , moderately firm was expected to the good texture of good silage (Kung and Shaver, 2002), Presence of mould texture or fungi growth indicates spoilage in the silage.

Addition of probiotic to silage changed the temperature from 25 (silage A) to 22 C° (silage B and C), this was due to the active of mould in silage A, ,the temperature range appears to be the fitting temperature for normal silage fermentation, The temperature of silages with probiotic lower than the range (25-27°C) obtained by Babayemi (2009) in silage of Guinea grass, good quality silage should be cooled at opening and at feed to a normal room temperature (McDonald et al., 1995). Bolsen et al. (1996) reported that any excessive heat production can result in mallard or browning reaction which can reduce the fiber and protein digestibility, If the temperature of silages was above 30°C the grass silage would have become dark or brown due to caramelization of sugars in the forage (McDonald et al., 1995), temperature is one of the essential factors affecting silage colour. Moreover, there were slightly mould in silage A which affected the temperature and odor.

Fermentation characteristics of the different silages presented in Table 2. the pH value of the silage was decreased from 4.80 to 4.5 in the silage, These were within the acceptable range for good silage in the tropics (Bilal, 2009 and Nhan et al 2009), and was within the range of 3.5 5.5 classified to be pH for good silage . The pH of the ensiled

mixtures decreased with inclusion of probiotic, This suggests that the probiotic responsible for anaerobic fermentation of the silage , according to Obua (2005) the excellent silages had pH range of 3.5 – 4.9, pH is one of the simplest and quickest ways of evaluating silage quality. However, pH may be influenced by the moisture content and the buffering capacity of the original materials. Silage that has been properly fermented will have a much lower pH (be more acidic) than the original forage. low content of water soluble carbohydrate which are essential to successful ensilage (Woolford ,1984). As shown in table 2 Water Extraction were 62.330 , 66.132 and 66.428 % for silages A, B and C respectively. table 3 show that Water-soluble carbohydrate in crops is concentrated by water evaporation during wilt time between forage cutting and chopping which the final pH drop in the ensiled crop depend largely on the type and moisture of forage being ensiled.

Wile Fleig points were 74.64, 87.27 and 87.01 for silage A, B and C respectively, Quality classify were good for silage A to Very good quality for silage B and C respectively.

Table 1: Physical quality of the different silages

Parameters	Silages		
	A	B	C
Color	Greenish brown	Greenish brown	Greenish brown
odor	Musty	Pleasant	Pleasant
Texture	Presence of mould	Moderately firm	Moderately firm
Temperature (°C)	25	22	22
Moldiness	Slightly mould	Without mould	Without mould

- A. Malva 75% ,green barley 15%,urea 5% and molasses 6%.
- B. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.8% and probiotic 0.2%.
- C. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.5% and probiotic 0.5%.

Table 2. Fermentation characteristics and Fleig points of the different silages

Parameters	Silages		
	A	B	C
PH	4.80	4.50	4.50
Water Extraction%	62.330	66.132	66.428
*F.P.	74.64	87.27	87.01
Quality classify	Good	Very good	Very good

- A. Malva 75% ,green barley 15%,urea 5% and molasses 6%.
- B. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.8% and probiotic 0.2%.
- C. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.5% and probiotic 0.5%.

*Fleig points = $220 + (2 \times \% \text{ dry matter} - 15) - 40 \times \text{PH}$ (kilic,1986)

Where Fleig Points: 81 -100 Very good , 61 – 80 Good ,40-60 Satisfactory, 21 – 40 Middle,0 -20 Bad.

Chemical composition

Chemical composition of different silages is shown in Table 3.it was observed that in vitro dry matter , organic matter digestibility and metabolizable energy value in silage B and C significantly higher (P < 0.01) (58.50%, 51.88% and 8.775 MJ/kg DM,59.38%,51.46% and 8.907 MJ/kg DM respectively) compared with silage A(48.36, 47.59 % and 7.25 respectively), There were significantly differences (P<0.05) in the Dry matter contents of the silage , The highest Dry matter content was for silage B (97.220%) and silage C (97.433 %),while the lowest Dry matter content was for silage A (93.150), The reduction in the silage dry matte might be due to the fermentation process. Organic matter content significant highest (P<0.05) for silage A (91.093%) compared with silage B and C (87.821 and 87.280%) ,while Crude protein content of the silage was significantly lower (P<0.01) in silage B and C (15.272 and 15.461 %) compared with silage A (17.391%).There were no significant different in ash, Water Soluble Carbohydrates and ether extract contents of all silages.

The chemical composition of the cell wall are presented in Table 4 ,There were significant differences (P<0.05) in the Neutral detergent Fiber and Lignin contents of the silages,Silage A (34.242 and 14.406 %) had the highest followed by silage B and C (30.486 and 12.265, 30.863 and 12.084 %),this could be attributed to the anaerobic fermentation case by probiotic. the contents of Hemicellulose were significant higher (P<0.05) in the silage A (8.770%) and low in silage B and C (5.850 and 5.290%),the Cellulose contents had significant higher (P<0.05) in the silage C (13.487%) follow silage B (12.370%) then silage A (11.07%),While there is no effect on silage Acid Detergent Fiber .

Table 3. Chemical Composition (g/100g) and estimated energy (MJ/Kg DM) of the of the different silages

Parameters	Silages			
	A	B	C	
Dry matter	93.150 _b	97.220 _a	97.433 _a	*
Dry matter recovery	30.820	31.138	31.005	NS
Organic matter	91.093 _a	87.821 _b	87.280 _b	*
Crude protein	17.391 _a	15.272 _b	15.461 _b	*
Ash	16.057	16.003	16.155	NS
Ether extract	2.799	2.806	2.743	NS
WSC	17.327	17.431	17.357	NS
IDMD%	48.36 _b	58.50 _a	59.38 _a	**
IOMD%	47.59 _b	51.88 _a	51.46 _a	**
ME (MJ/kg DM)	7.250 _b	8.775	8.907 _a	**

Means on the same row with different superscripts differ significantly (P<0.05).

A. Malva 75% ,green barley 15%,urea 5% and molasses 6% .

B. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.8% and probiotic 0.2%.

C. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.5% and probiotic 0.5%.

WSC:Water soluble carbohydrate ,

ME (MJ/kg DM)= 0.15 × IDMD (MAF,1975)

Table 4. Chemical Composition (g/100g) of plant cell wall of the different silages

Parameters	Silages			
	A	B	C	
Neutral detergent Fiber	34.242 _a	30.486 _b	30.863 _b	*
Hemicellulose	8.770 _a	5.850 _b	5.290 _b	*
Acid Detergent Fiber	25.472	24.633	25.571	NS
Lignin	14.406 _a	12.265 _b	12.084 _b	*
Cellulose	11.07 _b	12.370 _{a,b}	13.487 _a	*

Means on the same row with different superscripts differ significantly (P<0.05).

A. Malva 75% ,green barley 15%,urea 5% and molasses 6% .

B. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.8% and probiotic 0.2%.

C. Malva 75% ,green barley 15%,urea 5 % ,molasses 5.5% and probiotic 0.5%.

IV. CONCLUSION

Data of the present study indicate that the use of probptic in silage cause to improved the nutritive value of silage ,Applying this kind of additives in silage had a benefit ,this effect might be due to the probptic microbial that consumed oxygen in silage container to good fermentation and cell wall degradation, reduced initial populations of yeasts and mold that caused to delayed the fermentation ,and inhibition of rising temperature .

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