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Evaluation of chemical composition of mulberry based silages

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Abstract

To evaluate the chemical composition of mulberry based silages the lab experiment was conducted during the month of October - November of 2016 at College of Sericulture Chintamani, University of Agricultural and Sciences, GKVK, Bengaluru. The Nutritive analysis of Mulberry based silages was carried out for different parameters viz., per cent crude protein, crude fiber, ether extract, total ash, ADF(Acid detergent fiber) and NDF (Neutral detergent fiber). Significantly higher crude protein of 16.80 per cent was in sole mulberry followed by 15.59 per cent in the silage prepared out of 50 per cent mulberry leaves with shoots + 50 per cent maize. Crude fibre (1.17) and ether extract (6.53 per cent) found effective in 50 per cent mulberry leaves with shoots with 50 per cent Napier grass combination. The total ash content of 12.45 per cent was found to be highest in 50 per cent mulberry leaves and shoots with 50 per cent maize followed by 25 per cent mulberry leaves with shoots + 75 per cent maize (12.38 per cent). Cell wall fraction like NDF (67.87 per cent) was more in sole Napier grass silage and ADF (55.91 per cent) was higher in sole mulberry silage.

Keywords: Mulberry, Crude protien, Crude fiber, Silage, nutrition.

Introduction

Mulberry (*Morus alba* L.) is considered as an indispensable crop for silkworm cocoon crop production. It has a high edible biomass and can yield 16-18 tons of DM/ha/year (ANONYMOUS, 2006). Mulberry is now used extensively as livestock feed and is likely to become a forage of excellence for feeding and supplementing the ruminants because of its high crude protein content of 15-25 per cent and *in vivo* dry matter digestibility of 75-85 per cent. Mulberry leaves having a high potential nutrient rich forage is a supplement for ruminants production. Mulberry plants grow very well throughout the year in India and there is often a surplus of biomass Mulberry foliage thus could be used as a source of protein supplement for ruminants throughout the year (Nguyen *et al.*, 2005)^[4]. Amidst this development, as a nutrient rich crop the mulberry compels the scientists to think of exploring alternate way to tap its nutritive value beyond its use for silkworm rearing.

Material and Methods

The experiment was laid in completely randomized block design with nine treatments and three replications each. The treatments have been set up with the combination of different forage material and at different quantity (percentage). The chemical composition like Crude Protein (CP), Crude Fiber (CF), Ether Extract (EE) and total ash content of the silage was analyzed. Based on the results the best suited combination of mulberry silage was worked out. The observations (Table 1 & 2) were recorded and analyzed statistically.

Results and Discussion

The highest value of 16.78 per cent crude protein was observed in 100 per cent Mulberry silage followed by 50 per cent Mulberry leaves with shoots+50 per cent Maize (15.59 per cent). The crude protein content for 100 per cent Maize, 75 per cent Mulberry leaves with shoots+25 per cent Maize, 50 per cent Mulberry leaves with shoots+50 per cent Napier, 25 per cent Mulberry leaves with shoots +75 per cent Maize and 25 per cent Mulberry leaves with shoots +75 per cent Napier was 11.46, 10.91, 9.58, 9.49 and 11.04 per cent, respectively.

These values for 100 per cent Napier grass and 75 per cent Mulberry leaves with shoots+25 per cent Napier grass were 3.92 and 7.92 per cent, respectively (Table 1).

The Crude Fiber (CF) was highest in 25 per cent Mulberry leaves with shoots +75 per cent Napier (4.73 per cent) and was lowest in 50 per cent Mulberry leaves with shoots+50 per cent Napier (1.17 per cent). The CF content for remaining treatments of 100 per cent Mulberry, 100per cent Maize, 75 per cent Mulberry leaves with shoots+25 per cent Napier, 75 per cent Mulberry leaves with shoots+25 per cent Maize, 25 per cent Mulberry leaves with shoots +75 per cent Maize, 100 per cent Napier grass and 50 per cent Mulberry leaves with shoots+50 per cent Maize ranged from 1.46 to 1.56 per cent. The results were compared with Mtui *et al.*, (2009) [3].

Ether extract content was highest in 50 per cent Mulberry leaves with shoots+50 per cent Napier (6.53 per cent) followed by 50 per cent Mulberry leaves with shoots+50 per cent Maize (6.02 per cent) and was lowest in 100 per cent Napier grass (2.46 per cent). These values were in the range of 3.10 to 5.57 per cent for the rest of the treatments (Table 1). The results were as per Mtui *et al.*, (2009) [3].

The total ash content was highest for 75 per cent Mulberry

shoots+25 per cent Napier (13.07 per cent) followed by 50 per cent Mulberry shoots+50 per cent Maize (12.46 per cent) and the value was least in 100 per cent Mulberry (9.03 per cent). The total ash ranged from 9.64 to 12.38 per cent in mulberry based silages (Table 1).

The NDF content was highest in 100 per cent Napier grass (67.87 per cent) followed by 25 per cent Mulberry shoots +75 per cent Napier (65.98 per cent). These values were in the range of 52.43 to 58.79 per cent for the rest of the treatments. Whereas the ADF contents were highest in 100% Mulberry (55.91 %) and lowest in 50% Mulberry leaves with shoots + 50%Maize (40.9%). Both the values showed significant differences ($p < 0.1$) levels among the treatments (Table 2). The values are on par with (Saddul *et al.*, 2005.) [5]

This was due to crop ensiled, climatic factors, soil manure application and fertilizer application to the crops (Mtui *et al.*, 2009) [3]. The Leguminosae crops contain more CP content and less CF content (Kabi and Bareeba, 2008) [2]. The results are in conformity with the findings of the Sahoo *et al.*, (2011) [6] who reported the chemical composition of mulberry leaves ie, CP of 22 per cent, CF of 15.6 per cent, ash content of 13.6 per cent, ether extract of 3.6 per cent when compared to the other crops.

Table 1: Chemical composition of different percentage of mulberry based silages with maize and Napier grass

Treatments	Crude protein (%)	Crude fiber (%)	Ether extract (%)	Total ash (%)
100% Mulberry	16.78 ^b (4.16)	1.46 ^a (1.40)	3.10 ^a (1.90)	9.03 ^a (3.09)
100% Maize	11.46 ^a (3.46)	1.65 ^a (1.47)	3.49 ^a (2.00)	9.73 ^b (3.20)
100% Napier	3.92 ^a (2.10)	3.76 ^c (2.06)	2.46 ^a (1.72)	10.56 ^c (3.33)
75% Mulberry leaves with shoots +25% Maize	10.91 ^a (3.38)	2.25 ^b (1.66)	5.57 ^b (2.46)	10.45 ^c (3.31)
75% Mulberry leaves with shoots +25% Napier grass	7.92 ^a (2.90)	1.73 ^a (1.49)	4.88 ^b (2.32)	13.07 ^c (3.68)
50% Mulberry leaves with shoots + 50%Maize	15.59 ^b (4.01)	4.56 ^d (2.25)	6.02 ^c (2.55)	12.45 ^d (3.60)
50% Mulberry leaves with shoots + 50% Napier grass	9.58 ^a (3.17)	1.17 ^a (1.29)	6.53 ^c (2.65)	10.72 ^c (3.35)
25% Mulberry leaves with shoots +75%Maize	9.49 ^a (3.16)	3.07 ^c (1.89)	4.47 ^b (2.23)	12.38 ^d (3.59)
25% Mulberry leaves with shoots +75% Napier grass	11.04 ^a (3.40)	4.73 ^d (2.29)	3.52 ^a (2.00)	9.64 ^b (3.18)
Mean	10.74	2.71	4.45	10.89
S. Em±	0.88	0.23	0.289	0.145
CD @ 1%	3.57	0.95	1.178	0.591

Table 2: Composition of cell wall fraction (NDF & ADF) contents of mulberry based silages with different percentage of maize and Napier grass

Treatments	Neutral detergent fiber (%)	Acid detergent fiber (%)
100% Mulberry	56.04 ^a (7.52)	55.91 ^d (7.51)
100% Maize	58.79 ^b (7.70)	46.51 ^b (6.86)
100% Napier	67.87 ^c (8.27)	50.28 ^c (7.13)
75% Mulberry leaves with shoots +25% Maize.	56.63 ^a (7.56)	46.83 ^b (6.88)
75% Mulberry leaves with shoots +25% Napier grass.	52.43 ^a (7.28)	43.11 ^a (6.60)
50% Mulberry leaves with shoots + 50%Maize.	57.69 ^b (7.63)	40.91 ^a (6.44)
50% Mulberry leaves with shoots + 50% Napier grass	59.48 ^b (7.74)	44.39 ^b (6.70)
25% Mulberry leaves with shoots +75%Maize.	53.73 ^a (7.36)	45.42 ^b (6.78)
25% Mulberry leaves with shoots +75% Napier grass.	65.98 ^c (8.15)	49.86 ^c (7.10)
Mean	58.57	47.03
S. Em±	1.09	0.67
CD @ 1%	4.43	2.72

Conclusion

The present study showed that, the mulberry leaf is a good feed stuff for ruminants. High crude protein makes it superior to the silage of other crops. So it can be used as supplement to replace the other silage crops. Mulberry supplementation not only provides the fermentable energy, but also fermentable protein, so that the use of mulberry in silage preparation can replace the other forage crops without any negative effect.

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