Inclusion of Leucaena and Gliricidia Leaves to Improve Silage Quality of King Grass and Dwarf Napier

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Introduction

Fodder grasses can be conserved as silages through anaerobic fermentation which reduces the pH to levels that are inimical to spoilage bacteria and fungi. Tropical grasses, however, are not easily ensiled because its low sugar and protein content does not favour rapid anaerobic fermentation. Previous work have shown that the quality of tropical grass silages could be improved with the addition of urea and molasses, giving reduced pH, increased lactic acid, soluble sugar and crude protein content (Izham *et al.* 1989 . Alternatively, Tjandraamtmadja *et al.*, (1993) showed that inclusion of leguminous forages could improve the quality of Setaria silages in Australia. Our previous work (Halim and Somprasitti, 1997) has shown the benefits of interplanting the shrub forages, *Leucaena leucocephala* (Leucaena) and *Gliricidia sepium* (Gliricidia) in the interows of King Grass (*Pennisetum purpureum x P. typhoides*) and Dwarf Napier (*P. purpureum* cv. Dwarf) and it would be convenient if these fodder could be conserved as good quality silages. This study was conducted to evaluate effects of legume shrub inclusion on the quality of silages made from King grass and Dwarf Napier. Another objective is to determine the optimum ratio of legume to grass in the preparation of the mixed grass-legume silages.

References

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Materials and Methods

Two experiments were conducted, the first of which was to determine the optimum level of legume inclusion. Small air-tight 1-L plastic bags were used to simulate the silo and to ensure exclusion of air, the bags were packed into another plastic container. In the first experiment four levels of legume inclusion were compared, viz. 0, 20, 30 and 40 % by weightof legumes in the mixtures comprising of a single legume with a single grass. In the latter study, legume inclusion of 30% was compared with the addition of urea or urea and molasses to determine whether similar improvement in silage quality could be obtained from the two approaches. In both experiments the grasses and legumes were cut after six weeks regrowth from initial cutting. Once ensiled, the silages were sampled at weekly intervals to track changes in pH, soluble sugar, lactic acid and crude protein concentrations and buffering capacity during the ensilation process. The last sampling was taken after 30 days, when the silage was assumed to have matured.

Results and Discussion

The results show that for both King grass and Dwarf Napier, addition of legumes of up to 30% by weight had beneficial effects on the quality of silage produced. Increasing legume up to this level resulted in reduced pH, especially for Dwarf Napier where pH remained at a high of 5.53 without legumes but was reduced to 4.42 and 4.66 after inclusion of 30% gliricidia and leucanea, respectively. Soluble sugar levels also increased for King grass when legumes were included but effects on Dwarf Napier was not so evident. On the other hand, lactic acid levels were lower with legume inclusion, suggesting that other forms of acid such as acetic acid might have increased. As expected, crude protein increased with addition of legumes, making the silages sufficient as feed to meet protein needs of ruminants. King

grass silage without legumes had crude proetin content of 5.53% which is below critical level as feed but this increased to 7.79 and 9.08% with inclusion of gliricidia and leucaena, respectively. Dwarf Napier silage mixed with 30% leucaena had a protein concentration of 12.01%. The rapid pH decline for Dwarf Napier silage when mixed with legumes was also evident in the second experiment where pure grass silage maintained a pH of 5.03 compared with 4.34 and 4.66 when mixed with gliricidia and leuaena, respectively. Addition of urea resulted in elevated pH for both grasses, 5.23 and 5.67 for King grass and Dwarf Napier, respectively. Inclusion of legumes, particularly leucaena, gave an unexpected effect of reducing lactic acid concentration despite reduced pH, further substantiating the finding in the first experiment that other acids might have increased. Urea and molasses added together appeared to have increased lactic acid for Dwarf Napier but not for King grass. The consistent effect of legume inclusion shown in both experiments was the increase in crude protein concentration. King grass silage had a crude protein concentration of 4.23% but with addition of 30% legumes this increased to 7.10 and 8.23 % with gliricidia and leucaena, respectively. For Dwarf Napier the increase was from 8.23 to 9.12 and 11.34%. In comparison, addition of urea did not increase crude protein concentration to the same level as inclusion of legumes.

Conclusions

Inclusion of gliricidia and leucaena foliage to both Dwarf Napier and King grass gave the benefit of reduced pH and increased protein concentration. The effect of legume inclusion was better than addition of urea or urea and molasses in increasing crude protein concentration or reducing pH. The optimum level of legume inclusion is 30% by weight.

Benefits from the study

The study provided a means to improve quality of tropical grass silages that is better than the existing practice of adding urea and molasses in terms of costs and quality of the silage produced. The protein content of this silage was raised to levels that meet animal requirement. The technique also allowed fresh fodder grasses and shrub legumes to be conserved and confer the producer more flexibility in the management of his forage resources.

Patent(s), if applicable:

Nil

Stage of Commercialization, if applicable:

Nil

Project Publications in Refereed Journals:

Nil

Project Publications in Conference Proceedings

1.Halim, R.A., S. Masturi, S. Syam and A.M.H. Helmi. 2002. Effects of legume inclusion in grass based silages. In H.K. Wong et al. (eds.) Proceedings of the 24th Malaysian Society of Animal Production Annual Conference, 19-23 May 2002, Penang; p 68-69

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Graduate Research

Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year
Masturi Selaman	**Silage production**	**Crop physiology**	**M.Sc.**	**Tentative 2003**

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