Forage Res., **43** (4) : pp. 304-307 (2018) **http://forageresearch.in**

EFFECT OF SEASON, ADDITIVES AND GRASS TYPES ON SILAGE QUALITY OF FODDER GRASSES

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(Received : 28 December 2017; Accepted : 15 March 2018)

SUMMARY

A study was undertaken to assess the effect of different seasons, additives and grass types on silage quality at AICRP on Forage Crops and Utilization, College of Agriculture, Vellayani, Kerala during **Rabi** 2015-16. Pooled analysis of the data over two seasons was done and perusal of the data showed that seasons had no significant influence on quality parameters of silage. But grass type had significant influence on dry matter content, total ash and crude protein content of silage. Individual effect of additives was significant on total ash and acid insoluble ash. Highest crude protein content was recorded in the silage prepared from BN hybrid+ Jaggery 2% and it was on par with BN hybrid+ Urea 1% and BN hybrid+ Tapioca flour 1%.

Key words : Silage, hybrid napier, guinea grass, pH, ash, crude protein, crude fibre

Livestock rearing is an important secondary source of income for millions of Indian rural households engaged in agriculture. India is the leading country in milk production, accounting for 18.5 per cent of world production. However productivity per animal is very poor compared to many other countries in the world. The major constraint for the low productivity of animals is inadequate availability and poor quality of fodder.

In India, Kerala has the highest percentage of cross bred animals with higher genetic potential for milk production. But the average yield of cow day^{-1} is only 7.508 kg milk and the total milk production do not meet the requirement of the state (GOK, 2016). The main reason for low productivity is inadequate availability of good quality fodder. Among the roughages, the contribution of the fodder component is extremely low in Kerala. Future development and growth of livestock are highly associated with the scope of availability of fodder from cultivated land, forest, pastures and grazing lands and also preservation of green fodder for lean season to ensure the year round availability (Shah *et al*; 2011). At present, the country faces a net deficit of 61.1 per cent in green fodder and also recent population trends of India is not matching with the livestock growth rate, signifying that India have to import milk by 2021, if the milk production does not increase at the rate of 5.5percent (Datta, 2013).

It is well known that during the wet season there is a flush growth of both natural forages and a notable increase in biomass of the fodder crops around the smallholder dairy farmers' homestead .The smallholder dairy farmers however, are not able to utilize most of the forage biomass present in the wet season because they lack appropriate and simple technologies for conserving these excess fodder grasses.

According to Stewart (2011), ensiling is a process of preserving forage for feed shortage times. The fodder grasses can best be conserved as silage but most tropical grasses have low water soluble carbohydrates and protein (Sarwatt *et al*., 1992). Silage additives will not produce poor quality forage into good quality silage, but they can help to make good quality forage into excellent quality silage (Kenilworth and Warwickshire, 2012). A study was undertaken to assess the effect of different seasons and additives on silage quality of fodder grasses like guinea grass and Bajra napier hybrid.

MATERIALS AND METHODS

The study was conducted at AICRP on Forage Crops and Utilization, College of Agriculture, Vellayani during Rabi 2015 and Kharif 2016. The treatments consisted of two grasses –bajra napier

hybrid and guinea grass along with five silage additives namely , urea 1%, urea 2%, urea 1% +jaggery 1%, tapioca flour 1% and jaggery 2%.

The crop harvested at 45 days intervals was taken for ensiling. The harvested fodder was chopped and wilted under sun for 2-3 hours to reduce the moisture content to an optimum limit. The additives were prepared by mixing with water @ 30 ml kg^{-1} green fodder and thoroughly mixed with the wilted fodder. After thorough mixing, it was filled compactly in silo bags and the bags were tightly tied. The experiment was laid out in CRD. The prepared silage was opened after 45 days of ensiling. Samples for analysis were collected and quality was estimated. The pH , dry matter content, crude protein , crude fibre , total ash and acid insoluble ash were estimated. The experiment was conducted twice in **Rabi** 2015 and **Kharif** 2016, pooled analysis of the data over two seasons was done and the results are furnished below.

RESULTS AND DISCUSSION

The colour of the silages were slightly different according to the additives used for ensiling. Although there was slight difference in colour, the colour of all the silages were in acceptable range. Colour of silages with urea as additive had more greenish colour and the colour was yellowish green, while the silages with jaggery and tapioca flour as additive was pale green in colour. In the case of urea and jaggery mixed silage the colour was same as that of urea silage. Ishrath (2016) also reported that BN hybrid silage prepared with urea as additive had more greenish colour. Delena and Fulpagare (2015) observed the colour of hybrid napier silage as light green to brown with the addition of molasses.

Pooled analysis of the data over two seasons was done and perusal of the data showed that seasons had no significant influence on quality parameters of silage.

Grass types and silage quality

Grass type had significant influence on dry matter content, total ash and crude protein of silage. Highest value for dry matter content (44.26%) and total ash (10.01 %) was recorded in silage prepared from Guinea grass. Total ash is the non combustible fraction of the feed, representing the total mineral content in the feed. The total ash content of maize silage harvested at 75 days maturity and prepared in synthetic nylon bag silos was 11.3% (Khandaker and Uddin, 2013) Though not significant, acid isoluble ash was also higher in guinea grass silage. Significantly higher crude protein was recorded in BN hybrid silage (5.66%) than in guinea grass silage. Ishrath (2016) noticed high crude protein content of 11.59 % in bajra napier hybrid silage prepared from fodder harvested at 45 days interval. Eventhough fibre content in the silage was not significantly influenced by grass type, comparatively lower fibre content was estimated in the guinea grass silage. Ishrath (2016) reported lower

TABLE 1
Effect of season, grass and additives on quality parameters of silage

Treatments	Dry Matter content (%)	pH	Total ash	Acid insoluble ash	Crude protein	Crude fibre
(a) Season						
Rabi	39.63	4.27	8.46	1.79	4.46	40.44
Kharif	39.72	4.24	8.20	2.06	4.20	40.30
CD	NS	NS	NS	NS	NS	NS
(b) Fodder crops						
Hybrid Napier	35.09	4.35	6.65	1.79	5.66	41.11
Guinea grass	44.26	4.17	10.0	2.06	2.99	39.64
C. D. (P=0.05)	3.2	NS	1.44	NS	1.04	NS
(c) Silage Additives						
Urea 1%	36.79	4.29	7.21	1.66	4.72	40.04
Urea 2%	43.04	4.17	7.99	1.78	4.54	39.38
Urea 1%+Jaggery 1%	38.61	4.38	8.31	2.21	3.79	41.91
Tapioca flour 1%	41.0	4.38	8.58	1.73	4.46	40.98
Jaggery 2%	38.91	4.05	9.56	2.26	4.14	39.54
C. D. (P=0.05)	NS	NS	1.44	1.437	NS	NS
S. Em±	3.8	2.83	5.23	6.99	7.28	3.68

TABLE 2
Interaction effect of grasses and additives on quality parameters of silage

Treatments combination	Dry Matter content (%)	pH	Total ash	Acid insoluble ash	Crude protein	Crude fibre
BN hybrid+Urea 1%	30.75	4.38	5.92	1.843	5.63	41.2
BN hybrid+Urea 2%	36.95	4.04	6.12	1.52	5.22	41.44
BN hybrid+Urea 1%+Jaggery 1%	33.73	4.29	7.27	1.96	5.07	40.45
B. BN hybrid+Tapioca flour 1%	38.67	4.47	7.41	1.84	6.15	39.33
BN hybrid+Jaggery 2%.	35.33	4.54	6.5	1.81	6.24	43.68
Guinea grass+Urea 1%	42.83	4.21	8.51	1.47	3.81	38.88
Guinea grass+Urea 2%	49.13	4.30	9.82	2.04	3.85	37.31
Guinea grass+Urea 1%+Jaggery 1%	43.5	4.48	9.35	2.46	2.52	43.37
C. Guinea grass+Tapioca flour 1%	43.33	4.29	9.75	1.62	2.78	42.63
Guinea grass+Jaggery 2%.	42.5	3.57	12.62	2.72	2.03	35.99
C. D. (P=0.05)	NS	0.28	1.07	0.305	0.733	NS
S. Em±	3.8	2.83	5.23	6.99	7.28	3.68

Silage in bags

Silage after 45 days

crude fibre content(29.01%) in bajra napier hybrid silage, when the fodder was harvested at 45 days interval than when harvested at 75 days interval (42.9%).

Additives and silage quality

Individual effect of additives was significant on total ash and acid insoluble ash content of silages. Highest total ash and acid insoluble ash was estimated in silage prepared with Jaggery 2% as additive. Total ash content was on par with silage additives urea 1% + jaggery 1% and tapioca flour 1%. Even though additives had significant influence on the total acid content in the silages, the ash content was within the optimum level of 10%. Acid insoluble ash was found to be on par with all other additives. Lowest total ash and acid insoluble ash was recorded in the silage prepared with urea 1% as additive and was found to be on par with all other treatments except that of jaggery 2% for total ash content. Acid insoluble ash is directly related to the ash content and indicates the amount of silica present in the sample. This fraction of ash is unavailable to cattle and indicates poor quality of feed. In this study, the values of acid insoluble ash were found to be within the acceptable limit 0f 1.0-2.5%. Naik *et al.* (2013) also observed similar acid insoluble ash content in bajra napier hybrid silage prepared in bunker silo without using any additives.

Interaction effect of grass types and additives on silage quality

Interaction effect of grass and additives was found to be significant on pH, total ash, acid insoluble

ash and crude protein content of silage.

Highest silage pH was recorded in BN hybrid + Jaggery 2% and it was on par with all other treatment combinations except silages prepared from BN hybrid + urea 2%, Guinea grass+ urea 1% and Guinea grass + Jaggery 2%. pH of the silage was in the range of 3.57- 4.54. pH mainly represents the fermentation quality of silage, as it reflects the changes occurred during ensiling. The result was supported by the findings of Yokota *et al* (1992), who reported the pH of napier grass silage treated with 4% molasses as 3.79. Otieno *et al.* (1999) also observed the pH within 3.0 - 4.0 for good silage using gunny bag ensiling technique. The results of the present study is in confirmity with the earlier findings, though a slight increase in pH above 4.4 was noticed in some samples.

Significantly highest total ash and acid insoluble ash content was recorded in the silage prepared from Guinea grass + Jaggery 2%. Acid insoluble ash content is directly related to the ash content because this is the acid insoluble portion of total ash content and indicates the silica present in the sample. Ash content in silage gives information about the organic matter as well as mineral content in the feed. Results of studies conducted by Ranjhan (1977) indicated that the optimum ash content of the feed is below 10%. Aganga *et al.* (2005) reported the total ash content of 7- 13.5% in hybrid napier silage with the addition of molasses 5% as well as molasses 5% and urea 1%.

As in the case of green fodder, crude protein is the major quality parameter of silage. In general the crude protein content of silage in this study is higher. Since the silage was prepared in bag silos, the possibility of leaching loss of nutrients especially nitrogen during the ensiling process is less. In this study, highest crude protein content was recorded in silage prepared from BN hybrid+ Jaggery 2% and it was on par with BN hybrid+ Urea 1% and BN hybrid+ Tapioca flour 1%. Ishrath (2016) had reported higher crude protein content of bajra napier silage in which urea was used as additive.

ACKNOWLEDGEMENTS

The authors are thankful to Principal Scientist (Agronomy), AICRP FCU, Jhansi for providing necessary guidelines to conduct the agronomy trial under AICRP on FC&U; Kerala Livestock Development Board, Dhoni, Palakkad and Kerala Agricultural University.

REFERENCES

Aganga, A. A., U. J. Omphile, T. Thema and J. C. Baitshotlhi, 2005 : Chemical composition of Napier grass at different stages of growth and napier grass silages with additives. *J. Biol. Sci.* **5** : 493-496.

Datta, D. 2013 : Indian fodder management towards 2030: a case of vision or myopia. *Int. J. Manag. Social Sci. Res.* **2** : 221-230.

Delena, M. F. and Y. G. Fulpagare, 2015 : Characteristics of silage prepared from hybrid napier, maize and Lucerne. *IOSR J. Agric. Vet. Sci.* **8** : 13-16

GOK [Government of Kerala]. 2016 : *Agricultural Statistics 2014-15* [on-line] Department of Economics and Statistics, Govt. of Kerala. Available: http:// www.ecostat. kerala.gov.in/ docs/pdf/reports/ agristat/1516/agri-stat_1415_1.pdf [20 Nov.2016].

Ishrath, P. K. 2016 : Cutting intervals and additives for quality silage production. MSc Ag Thesis, Kerala Agricultural University, Thrissur

Khandaker, Z. H. and M. J. Uddin, 2013 : Cost effective preservation technique of green fodder and its impact on quality silage. *Livest. Res. Rural Dev.* **25** : 233-243.

Kenilworth and Warwickshire, 2012 : Silage Additives. Dairy Co. Agriculture and Horticulture Development Board, 12 p.

Naik, P. K., B. K. Swain and N. P. Singh. 2013 : Quality of napier bajra hybrid silage prepared in bunker silo without additives. *Indian J. Vet. Res.* **22** : 36-39.

Otieno, K., J. F. M. Onim, and M. N. Mathuva. 1999 : A Gunny-Bag Ensiling Technique for Small-Scale Farmers in Western Kenya. Proceedings of the FAO Electronic Conference on Tropical Silage. 1 September to 15 December, 1999, Rome, Italy.

Ranjhan, S. K. 1977 : Animal Nutrition and Feeding Practices in India. Vikas publishing House Pvt Ltd, Delhi. 350p.

Sarwatt, S. V., N. A. Urio, and A. Ekern. 1992 : Evaluation of Some Tropical Forage as Silage. In: *Improved Dairy Production from Cattle and Goats in Tanzania* (Edited by Professor Ola Syrstad) Norwegian Centre for International Agricultural Development (NORAGRIC) No. 11: pp.14 -24.

Shah, V. D., M. Makwana, and S. Sharma. 2011 : Economics of production, processing and marketing of fodder crops in Gujrat.Agro- economic research centre, Sardar Patel University, Gujrat.

Stewart, W.M. 2011. Plant Nutrition Today. From scientific staff of the international Plant Nutrition Institute (IPNI), Norcross, Georgia, p. 350.

Yokota, H., T. Okajima, and M. Oshima. 1992 : Effect of environmental temperature and supplementation of molasses on quality of napier grass silage. *Asian- Aus. J.Anim. Sci.* **4** : 377-382.