

Paper ID: 1377

Theme 2. Grassland production and utilization

Sub-theme 2.1. Quality, production, conservation and utilization

Non-conventional silage for arid region

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Keywords: Arid region, Non-conventional silage, Silo

Introduction

Thar is one of the most heavily populated desert areas in the world and the main occupations of the people living here are agriculture and livestock production. Agriculture is not a dependable proposition in this area due to erratic rains and occurrence of frequent droughts. A large number of farmers in Thar Desert depend on animal husbandry for their livelihood. Animal husbandry, trees and grasses, intercropped with vegetables or fruit trees, is the most viable farming system for arid, drought-prone regions (Anonymous, 2012a,b). Further, livestock sector is expected to emerge as an engine of agricultural growth in the 12th plan and beyond, in view of rapid growth for the demand of animal food products. Achieving growth rate of 5-6 %, however, would require addressing challenges of shortage of feed and fodder (Anonymous, 2012a,b). According to the ministry of agriculture assessment, there is a large gap between demand and supply of feed and fodder for the livestock in the country. The shortage of dry fodder, green fodder and concentrate is as high as 40% (Pawar, 2012). The problem is compounded by the lack of reliable data regarding fodder availability. The scenario appears alarming in case of availability of quality fodder. With the existing shortages of fodder, it would be difficult for India to achieve the target of 160 MT of milk production by 2020. For increasing milk production from the current level of 40 MT to 160 MT by 2020, 494 MT of dry fodder, 825 MT of green fodder and 54 MT concentrates will be required (Das, 2012). There are several crop products potentially used after enriching their quality for animal feeding, but are being wasted. All such by-products need to be ensiled and suitable mechanism for their enrichment and ensiling need to be developed. Keeping this in view efforts were made to ensile the dry fodder after enriching their quality by modified process.

Materials and Methods

Modified ensiling process was developed for making non-conventional silage in arid region. In silage making, normally green fodder is used but in this case dry fodder and desert grasses are used as ensiling material. Fodder preservation cum storage structure of 0.9 x 1.25 m size having capacity of 300 kg at 70 percent moisture level was developed at CAZRI, Jodhpur. Reinforcement used for construction of the preservation unit was MS bars and hard drawn steel bars. Reinforcement was extended throughout the length; circular cages and longitudinal reinforcement were placed symmetrically with respect to the thickness (55mm) of the preservation unit. The circumferential and longitudinal reinforcement were adequate to give sufficient strength to withstand outward pressure on the wall exerted by silage when it settles. Inside surface of the silo wall was kept smooth, perpendicular and rigid to ensure that cavities will not form along the walls as the mass settles and adjacent silage will not get spoiled. The ensiling material was harvested and conditioned to 70 percent moisture level. This was chopped into small pieces of 0.04-0.06 m by mechanical chaff cutter and mixed with 8% molasses/jaggery, 1% urea and starter culture in the form of butter milk 6% (DM basis). Final dry matter was adjusted to 32.5% and then it was filled in the silo. The chopped material was distributed uniformly throughout the silo and trampled especially near the wall as the friction with wall retarded settling. Centre was kept higher than outside while filling so that in due course it settles down. Silo was filled completely and covered with bajra stalk and then with polythene (Chatterjee and Maiti, 1981). The concrete lid was placed on the top and plastered with 0.3 m thick layer of soil. This practice is repeated when mass settles. Concrete lid is very useful in controlling rise in temperature by squeezing out the air and keeping the mass compact as much possible.

Results and Discussion

Assessment of final quality of silage was done on the basis of physical and chemical parameters. Efficiency of silo was assessed on the basis of losses occurred during ensiling process. All the silages produced from dry fodder were readily acceptable by lactating animals and can replace up to 20% of feed concentrate. Silage produced in the structure was brown to golden brown, non-sticky and moist having pH as four in case of silage prepared by modified process. Urea-molasses

treatment was positive with crude protein level increased from 3.8 to 12.5%. The losses were also less in case of silage prepared by modified process as 2.8 and 0.54 % on the top portion and bottom portion, respectively having pH 4.0. In case of silage prepared by standard process the losses were 5.6 and 0.84% on top and bottom portion, respectively, with dark brown colour, sticky texture and pH 4.3. The quality of silage is most readily assessed by determining its pH which should be less than 4.2. The spoilage percentage (Table-1) was within the standards and variation between percentage spoilage in modified process and non-treated silage can be attributed to lactobacillus and molasses addition and anaerobic and subsequent microbial activity at the top and the bottom. Silage produced in the structure was brown to golden, brown, non-sticky and moist in case of treated silage from modified process. Colour (Table 2) is important index of the quality. The silage maintained golden brown colour except at the top surface in case of untreated silage. The pH was 4.0 and 4.3 in case of treated and untreated silage respectively. Effect of urea-molasses treatment was positive with crude protein level increased from 3.8 to 12.5%. The spoilage was found more at the top as compared to bottom. The losses are due to residual respiration based on conversion of oxygen surrounded in the silo and fodder material. The spoilage was found more at the top as compared to bottom. The losses are due to residual respiration based on conversion of oxygen surrounded in silo and the fodder material. This can be reduced by proper compression and by quick locking of the silo after filling is completed. The silage was fed to Tharparkar animals and 7.52 % increase in milk yield during feeding period and was 3.03 % after the feeding trial. Table 1. Spoilage percentage in silage Per cent spoilage (% DM) Untreated Treated (modified process) Top portion of silo 5.6 2.8 Bottom portion of silo 0.84 0.54 Table 2. Silage characteristics Un-treated Treated (modified process) 1. pH 4.3 4.0 2. Dry matter 28-33% 24-28% 3. Colour Dark Brown Golden Brown 4. Odour Palatable Sweet and Pleasant 5. Texture Moist and Sticky Moist and Non-Sticky 6. Temperature of silo 31.5 °C 31.5 °C 7. Water Soluble Carbohydrates (WSC) 0.41-0.56 0.62-0.65 8. Lactic Acid 2.50-3.00 4.00-4.39 Table 3. Effect of silage feeding on milk production Before silage feeding During silage feeding After silage feeding Milk production 160.07 ± 9.96 172.95 ± 3.59 (7.52%) 165.17 ± 4.50 (3.03%)

Spoilage in silo	Control (Untreated)	Modified Process (Treated)
Top portion of silo	5.6	2.8
Bottom portion of silo	0.84	0.54

Characteristics	Control (Untreated)	Modified Process (Treated)
1 pH	4.3	4.0
2 Dry Matter%	28-33	24-28
3 Colour	Dark Brown	Golden Brown
4 Odour	Palatable	Sweet and Pleasant
5 Texture	Moist and Sticky	Moist and Non-Sticky
6 Temperature of silo at the time of opening	31.5 C	31.5 C
7 Water Soluble Carbohydrates, WSC	0.41-0.56	0.62-0.65
8 Lactic Acid	2.5-3.0	4-4.39

	Before Silage Feeding	During Silage Feeding	After Silage Feeding
Milk Production, Kg	160(+)-9.96	172+-3.59	165.17+-4.50
Fat%	3.5(+)-0.26	4.33+-0.26	4.67+-0.39
SNF%	8.86(+)-0.16	9.13+-0.11	9.01+-0.16

Conclusion

The soil in the arid region is sandy and granular in the nature so trench or kachcha silo are difficult to be maintained. Therefore, the concrete silo structure with sufficient reinforcement will be suitable for arid region while the molasses and urea addition will improve the fermentation and nutritive value of poor quality fodder. The quality of silage was assessed as non-sticky, golden brown in colour and having good aroma. Crude protein content increased from 3.8 to 12.5%. Feeding trials on Tharparkar animals revealed that milk yield was increased by 7.52%. The technology needs popularization in villages. This will augment fodder availability round the year, particularly in lean period.

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Acknowledgement

The authors are grateful to Director, ICAR-CAZRI, Jodhpur for his valuable guidance and support for conducting the study.