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CHEMICAL CHARACTERS OF *SORGHUM* SILAGE UNDER INFLUENCE OF N-FERTILIZER AND MECHANICAL TREATMENT

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Abstract - Plant required 16 basic elements for growth and development. That elements were supplied externally in the form of fertilizers. The fertilizers nitrogen (N) plays an important role in increasing productivity of plants. Application of nitrogen fertilizer to non- leguminous species, significantly increase the yield of green fodder. To regulate degree of fermentation during ensilaging, fertilizer application linked up with mechanical treatments such as pulping pressing, found to be beneficial for releasing cell content and improving silage quality

Introduction:

It is known that green plants require at last 16 nutrient elements for various metabolic processes and growth (Vaidya and Sashatrabuddhe 1979) Out of which nitrogen (N) phosphorus (P) and potassium (K) are used in large quantities, hence these are known as primary dement. Their requirement is supplemented by fertilizer application wile cultivating fodder crops use of fertilizer nitrogen (N) plays an important role to increase productivity for green product per unit land area and time it is now well established that application of fertilizer N, particularly to the non-leguminous species, significantly increase the yield of green fodder produce lush foliage and increase the content of protein and

other nutrient in foliage (Mungikar et.al. 1976 b, Dakore, 1985). N- from nitrogen fertilizer viewed as central element, because, in agriculture its supply governs the yield of crop under well irrigation facilities (Cooke,1967). When N is supplied as fertilizer it increases the yield derived from enhancement in morphological and physiological processes.

Earlier investigations (Gore et.al. 1974, Dakore et.al. 1986, Patil and Mungikar 1991 Dakore and Mungikar, 1991) have shown that application of N- fertilizer apart from increasing the yield decreases dry matter (DM), and increases N-content in foliage's with the change in chemical composition of foliages and its ensilaging character also changed. For this reason present investigation was undertaken to study the effect of fertilizer N on ensilaging characters of silage made from *Sorghum* (*S. bicolor* L).
The crop received either nil, medium 40 kg n / ha or high 120 kg n/ ha doses of nitrogen. The foliage's harvested from the plots receiving variants quantity of nitrogen (N) were taken for silage preparation.

Objectives of Study:

Conservation of surplus fodder crops produced during favourable condition or under well irrigation with minimum loss of nutrient

Hypothesis :

The popular fodder crop *Sorghum* (*Sorghum bicolor* L) was cultivated in Botanical garden of Dr. Babasaheb Ambedkar Marathwada University. A piece of land was prepared by plugging and cross plaguing the land was then divided into plots each Bering 9.30 M2 area. The sowing was done by hand

in rows30.5 am apart. Since the crops were to be harvested for the vegetative phase of growth i.e. green foliage, slightly higher seed rate was used than recommended for the production of grains. The crop was cultivated under the influence of nitrogen (N) applied at the rate of 0, 40 and 120 kg/ ha. The foliages were harvested for fodder, preferably early in the morning a sample of green vegetation was chopped into 3-4cm pieces and used for silage preparation. Three kg sample of fresh crop was pulped in IBP pulper (Davys and Pirie, 1969) and resulting pulp was used for silage making. Nine hundred gm pulp was pressed on IBP bench press (Davys et.al. 1969) for 10 min. and the juice or leaf extract released due to pressing was kept aside for preparation of leaf protein concentrate (LPC). The pressed crop, left after juice extraction was used for ensilaging. In this way silages were made from chopped, pulped and pressed foliages of *Sorghum*.

Methodology: Plant material either copped, pulped or pressed was placed in plastic container (16.5 x 9 cm) and pressed to make it compact & exclude air. The container was covered with lid, mouth of container was capped and sealed with wax, to maintain anaerobic condition. The container or "laboratory silos" were left at room temperature in dark until used. The container were opened after 30 days and physical characteristics i.e. odour, colour, texture etc. were examined all silage samples were shows good silage with pleasant smell well lushy material without any growth of mold. After opening the silos samples were analyzed for dry matter (DM) moisture content, treatable acidity (TA), buffering capacity (BC), pH, lactic acid, total volatile fatty acids (TVFA). An another sample of silage was dried in an electric oven, initially at 65 ± 5^0c. The dried sample were ground to a fine powder and used for subsequent analysis. pH is measured by using glass

electrodes. Treatable acidity (TA) determined by simple titration method. Total volatile fatty acids (TVFA) was estimated by steam distillation method as described by Choudhary (1970). Buffering capacity (BC) was detained following Playne and McDonald (1966). Lactic acid was estimated using Barker and Summerson (1941) method described by Oser (1979).

One g of dry sample was boiled in water, filtered through whatmann filter paper and filtrate is used for measurement of water soluble reducing sugars (WSRS) in terms of glucose using Folin-wu tubes (Oser, 1979). The -N content was determined by micro-jeldahl method with sulphuric acid (H_2So_4) in presence of catalyst (9 K_2So_4 : 1 $Cuso_4$: O.2 Se O_2) and titration of ammonia liberated during distillation (Bailey,1967). The value of crude protein (CP) was analyzed in duplicates and whenever necessary statistical analytical methods was followed by Panes and Sukhatme (1978).

Result and discussion: Application of fertilizer N-produced abundant green foliages. The silage made form either chopped, pulped or pressed foliages from all plots receiving various levels of nitrogen (N) were of good quality The moisture content in chopped sample is more between 70.1 and 71.7 % the increased values are due to fertilizer application and increased moisture content from 78.2 to 80.2 and 70.9 to 71.7 was observed in pulped and pressed silages respectively. The values for titratable acidity (TA)and buffering capacity(BC) was minimum in chopped medium in pressed and higher in pulped silage which did not receive fertilizer N; it gradually increased in to 64.5 due to application of fertilizer. Similarly in chopped maize silage TA increased from 86.2 to 109.9, while in pulped silage fertilizer application

had minimum or non-significant effect on these two parameters, and variation was mainly due to either pulping or pressing. Lactic acid production generally increased with application of fertilizer. The chopped and pressed materials showed lower values for lactic acid production in comparison of those obtained from pulped material .In spite of producing less lactic acid pH of chopped and pressed sorghum silages decreased to desirable level (below 4.2) due to low buffering capacity. The pulped *Sorghum* which Receives 120 kg N / ha could only results in desirable pH value of 4.09 . The variation in pH was , however , not significant due to both mechanical as well as fertilizer application. The values for Total Volatile Fatty Acid (TVFA) decreases insignificantly due to application of fertilizer. The TVFA fluctuated between4.1 and 4.5 , 5.5 and 5.6 and 8.0 and 10.2 respectively in pressed , pulped and chopped silage samples , showing markable influence of mechanical treatment on this parameter. (Table.1)

As, usual pressing of crop increased the dry matter content in the material with subsequent decrease in nitrogen and crud protein content. The fertilizer application lowered dry matter and increased the content of protein in silages made from all types of foliages. The pulped material gives higher values for non-protein nitrogen while application of fertilizer N resulted in to increased values for both protein nitrogen as well as non- protein nitrogen. Table 1 also give dry matter (DM) nitrogen and protein content of various silage samples.

Conclusion: The result indicates that fertilizer application increased CP content in foliages and subsequently in the resulting silages too. The data on protein nitrogen (PN) and non-protein nitrogen (NPN) suggested maximum proteolytic

activity in chopped and pulped silages. From above investigation it was concluded that fertilizer application had very little effect on the quality silage.

Suggestion:

If fertilizer application is associated with mechanical treatment good silage could be produced.

Table-1: Effect of mechanical treatments (chopping , pulping , and pressing) and N fertilizers on Silages made from *Sorghum*.

State of the crop	Treatment (Kg N / ha)	Moisture (%)	Titratable acidity m-equi /100 g DM	Buffering Capacity m-equi/ 100g DM	pH	Lactic Acid (% of DM)	Total volatile fatty acids (TVFA) mM/ 100 g
Chopped	0	77.8	53.8	20.9	4.21	1.28	10.2
	40	79.0	57.6	14.1	4.24	2.33	8.8
	120	78.7	65.7	16.9	4.02	2.49	8.0
Pulped	0	78.2	139.7	49.9	4.45	2.83	5.5
	40	80.2	142.0	46.6	4.28	3.50	5.6
	120	79.6	141.6	30.1	4.09	3.98	5.5

Pressed	0	70.1	86.8	27.3	4.16	1.77	4.5
	40	71.7	88.5	20.5	4.12	2.09	4.1
	120	70.9	88.0	17.2	4.11	2.27	4.1

Table 1 : Cont….

State of the crop	Treatment (Kg N / ha)	% dry matter (DM)	% of dry matter (DM)			
			Crud protein (CP)	Total Nitrogen (TN)	Non protein Nitrogen (NPN)	Protein Nitrogen (PN)
Chopped	0	22.2	14.7	2.35	0.54	1.81
	40	21.0	16.3	2.60	0.63	1.97
	120	21.3	20.20	3.20	0.91	2.29
Pulped	0	21.8	18.1	2.90	0.73	2.17
	40	19.8	21.8	3.48	1.03	2.45
	120	20.4	24.7	3.95	1.38	2.57
Pressed	0	29.9	9.38	2.00	0.47	1.53
	40	28.3	12.2	2.43	0.60	1.83
	120	29.1	14.4	3.09	0.82	2.27

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