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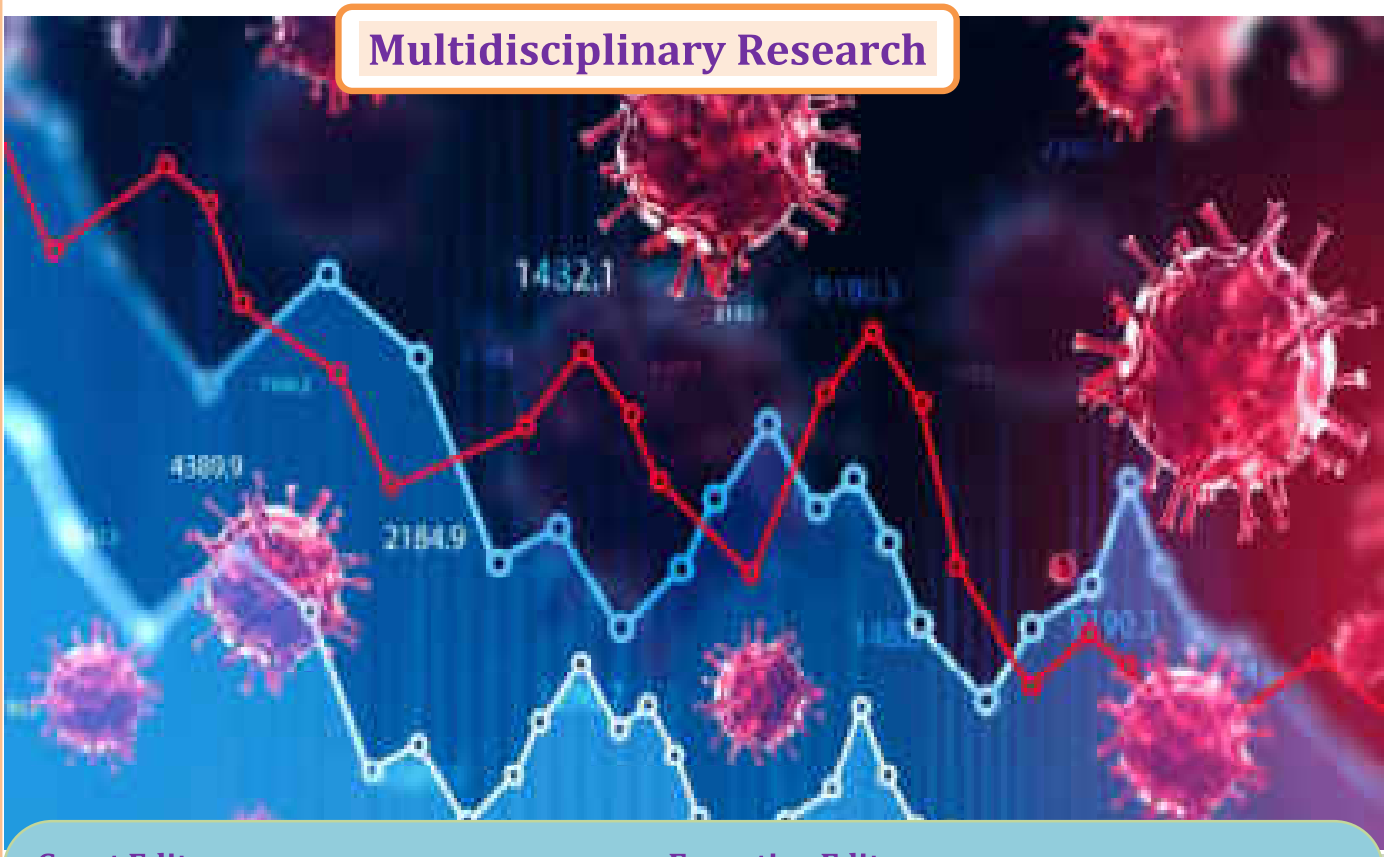

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Effect of N-Fertilizers on Silage Fermentation

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Abstract :

Indian agriculture achieving self sufficiency in food grain production since independence. In spite of having huge live stock the milk and other animal product production in not satisfactory. It is due to under nutrition as well as malnutrition among them. To provide nutritious forage, fodder crop must grow with supplements. The supplements are fertilizers particularly nitrogen N- fertilizer. N-fertilizers favors luxuriant vegetative growth of fodder and also changes its ensilaging characters. Fertilizer application produces silage with high protein content. if fertilizer application is linked up mechanical treatment like maceration and subsequent pressing, a good silage could be made from non-leguminous fodder crop.

Keyword : foliages, N-fertilizers, silage, pulping pressing

Introduction :

Spectacular advances have been made in Indian agriculture in last few decades since independence, in food grain production. [Paroda 1989]. In Spite of having great population of live-stock population, the milk and other animal products production is not satisfactory. The major cause for low production is under nutrition in cattle as well as malnutrition in them. There is tremendous gap between demand and supply of all kinds of feed material and fodder. The live stack drives its good mainly from cultivated fodder trees etc. it is necessary to grow high yielding fodder crop varieties to increase fodder production.

For greater production of green fodder adequate supply of nutrients to plants has been advocated by many workers to obtained maximum productivity of nutritive fodder. Green plants required 16 different elements for various metabolic processes and growth (Vaidya and Sahasrabudhe, 1979). Out of which nitrogen (N), phosphorus (P) and potassium (K) are used in large quantities, known as primary elements. Most f Indian agricultural lands are deficient in N,P and K. Their deficiency can be make up by using supplimented elements. The elements are referred as fertilizer elements (Motsara and Sigh, 1981). While cultivating fodder crops use of N- fertilizer plays important role in increasing productivity of green product per unit land area and time. It is now well established that application of fertilizers, particularly to non-legume species increase the yield of green fodder, produce lush foliage and increase the content of protein and other nutrients in foliage (Mungikar et al. 1976 b, Dakore, 1985)

Experimental :

The popular fodder variety of maize was cultivated as sole crop under the influence of nitrogen fertilizer (N) application. The fertilizers are given in 0, 40 or 120 Kg/ha. Nitrogen acts as an important constituent of protein and nucleic acid. It increases the yield derived from enhancement in morphological and physiological process. The popular fodder crop maize was cultivated in the Dr. B.A.M. University botanical garden. A piece of land was prepared by ploughing and cross- ploughing. The land was then divided into plots each bearing 9.3m^2 area.

The sowing was done by hand in rows 30.5 cm apart. Since the crop was sown for green foliage production little higher seed rate was used than recommended for grains. When ever necessary weeding was done by hand. The crop were grown under irrigation.

The foliages were harvested for fodder preferably early in the morning at pre-flowering stage. Harvested foliages were immediatly brought into laboratory. The Another sample of silage was dried in an electric oven initially at 95+5℃ and subsequently at 65 ± 5℃ till constant weight. The dried samples were ground to a fine powder and used subsequently analysis. A 40 gm of fresh silage sample was mixed with 40 ml distilled water & Squize. through cotton cloth pressed and juice was collected in a breaker The pH was measured using glass electrode. To determine titratable acidity 5 gm of fresh silage was macerated in 75 ml distilled water; boiled for few minute filtered through cotton cloth dilute up to 100 ml, titrate against 0.1 N NaOH using phenolphthalein indicator. Total volatile fatty acid was estimated by Steam distillation method as describe by Chowdhari (1970). Buffering capacity (BC) was determined by following Playne and McDonald (1966). Lactic acid was estimated using a method of Barker and Summerson (1941) as described by Oser (1979).

Dry Samples were used for determination of remaining constituents. One gm of dry sample was boiled in water filtered through what man filter paper and filtrate was used for the measurement of water Soluble reducing Sugars(WSRS) in term of glucose using folin Wu tubes (Oser, 1970). The N – content was determined by micro-jeldahl method with sulphuric acid in presence of catalyst (C9 K_2SO_4 : 1 $CuSO_4$: 0.02 SeO_2) and titration of ammonia liberated during distillation (Bailey 1967). The value of crude protein (CP) was expressed as N × 6.25. The foliages were chopped in to 3 -4 cm pieces and used for the preparation of silage. Three kg (3 kg) sample of fresh crop was pulped on 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 release due to pressing was kept aside for preparation of leaf protein concentration (CPC). The pressed crop, left after extraction of juice was used for ensilaging. In this way silages were made from chopped, pulped and pressed foliages.

Preparation of silage – plant material either chopped, pulped or pressed was placed in plastic container (16.5 × 9 cm) and press to make it compact and exclude air. The container were covered with lid, mouth of container was capped and sealed with wax to maintain complete anaerobic conditions. The container or "laboratory silos" were kept at room temperature in dark until used.

After 30 days the containers or silos were opened and physical characters i.e. colour, texture odour etc of resulting silage were examined. A sample of fresh silage was taken for determination of pH, buffering capacity (BC), titratable acidity (TA) total volatile fatly acid (TVFA) and lactic acid (LA). All samples were analyzed in duplicates and where ever necessary the data was subjected to statistical analysis following Panse and Sukhatme (1978).

Result & Discussion :

Application of N-fertilize abundant green foliages in all crops. The silages made from either pulped, Chopped or pressed foliages from popular varieties of maize and wheat. The moisture content in maize chopped silage was between 79.5 and 89.8 application of fertilizers increase the moisture content. An increasement was observed from 80.2 to 81.2 and 71.6 to 74.6

was observed due to fertilizers in pulped and pressed silages respectively. The titratable acidity was minimum (43.0) in pressed maize silage which did not received fertilizer N, it gradually increase to 64.5 due to application of N- fertilizers. Similarly in chopped maize silage TA increases from 96.2 to 109.9 while in pulped silage the increase was from 106.1 to 139.9. Thus the mechanical treatment as well as fertilizer application was responsible for variation in the titratable acidity. It was maximum in pulped medium in chopped and minimum in pressed crop. The buffering capacity (BC) was maximum in pulped material ranging from43.1 to 57.2, showing lower values neither chopped or pressed materials (Table – 1)

Table :1 Effect of mechanical treatments (chopping , pulping and pressing) and N-fertilizer on silages made from maize

State of the crop	Treatment (Kg / ha)	Moisture (%)	Titratable acidity m-equiv. / 100g DM	Buffering capacity m-equiv. / 100g DM	pH	Lactic acid (% of DM)	Total volatile fatty acid (TVFA) mM /100 g
Chopped	0	79.5	86.2	21.2	4.82	2.44	13.8
	40	79.3	100.8	23.2	4.57	3.13	9.7
	120	81.8	109.9	22.1	4.44	3.29	9.5
Pulped	0	80.2	106.1	48.4	4.67	3.82	10.0
	40	80.6	123.0	43.1	4.19	4.18	13.5
	120	81.2	139.9	57.2	4.05	4.05	10.0
Pressed	0	71.6	43.0	21.1	4.16	1.99	8.8
	40	73.0	57.0	22.6	4.17	2.28	10.8
	120	74.6	64.5	27.9	4.08	2.19	8.4
CD (P=0.05)		4.31	7.81	9.86	0.40	2.02	4.60
F value for treatment		*	**	NS	NS	NS	NS

Table 1 : contd….

State of the crop	Treatment (Kg / ha)	% dry matter (DM)	% of dry matter (DM)			
			Crude Protein (CP)	Total nitrogen (TN)	Non-protein nitrogen (NPN)	Protein Nitrogen (PN)
Chopped	0	20.5	14.7	2.35	0.63	1.72
	40	20.7	19.9	3.17	0.75	2.42
	120	18.2	21.9	3.51	0.91	2.59
Pulped	0	19.8	16.1	2.50	0.72	1.78
	40	19.4	20.3	3.10	0.85	2.25

	120	18.8	24.4	4.10	1.02	2.66
Pressed	0	28.4	11.6	1.85	0.50	1.35
	40	27.0	17.4	2.79	0.63	2.16
	120	25.4	19.2	3.17	0.83	2.34
CD (P= 0.05)		1.49	1.80	0.43	0.17	0.28
F value for treatment		*	**	**	**	**

The pH in chopped maize silage samples decreased gradually from 4.80 to 4.44 due to application of increasing levels of nitrogen (N). A similar decrease in pH from 4.67 to 4.05 and 4.19 to 4.08 was observed in pulped and pressed maize silages respectively. The data on pH values clearly indicated that mechanical treatment as well as, fertilizer applicant were effective for producing silage with lower pH values. It is, thus, evident that fertilizer application is beneficial in producing silage with low pH value.

Lactic acid (LA) content in unfertilized chopped, pulped and pressed materials were 2.49, 3.82 and 1.99% respectively. It increases gradually with the application of fertilizer N. All silages were with high lactic acid content when made from foliages harvested from fertilizer plots. The results indicated that application of fertilizers may increase sugar content in the foliages resulting into higher lactic acid production during silage fermentation. This results in lowering pH values in spite of high moisture content and higher suffering capacity. Total volatile fatty acid (TVFA) content was low in pressed maize silages. It varied widely from 8.4 to 13.8%. Neither mechanical treatment nor fertilizers application had significant effect on TVFA content in silage.

Table 1 also gives dry matter (PM), nitrogen and protein content of various silage samples. As expected pressed maize silage had higher values for percent dry matter ranging from 25.4 to 28.4%. The values for DM in chapped and pulped foliages were law ranging between 18.2- to 20.7% Fertilizer applications decreased DM content in resulting silages. Higher values for nitrogen and crude protein (CP) was observed in pulped silages, where in N content was a high as 4.10% in pulped material receivign120 Kg N/ha. I am chopped silage samples the CP content increased from 14.7 to 21.9% due to fertilizer application while the increase was from 11.6 to 19.2 % in pressed maize silages. The results indicate that fertilizers application increase Cp content in foliages and subsequently in the resulted silages too. The data on protein nitrogen (PN) and Non- Protein Nitrogen (NPN) suggested maximum proteolytic activity in chapped and pulped silages.

Conclusion:

The overall results obtained during present study suggested that maize gave better quality of silage. Particularly after maceration and / or pressing. It is felt that if applications of fertilizer (N) is linked up with maceration and subsequent pressing of crop the excess protein removed in juice could be used for production of leaf protein concentration (LPC) and good silage could be made from pressed crop residue (PCR).

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