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EFFECT OF FERTILIZERS AND AGE OF CROP ON CRUDE PROTEIN, PHOSPHORUS AND CALCIUM CONTENTS OF BN 2 GRASS.

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The role of N, Zn and Fe on the synthesis and accumulation of protein and also the concentration of P and Ca in the forage at different age of BN 2 grass was studied. The crude protein content was significantly increased from 8.41 to 9.90 per cent with the addition of 150 kg N/ha. Application of 5.0 kg $ZnSO_4$ increased the protein content from 8.95 to 9 65 per cent. The concentration of both P and Ca were increased with every increment of N, while these were not affected by Zn and Fe applications. Higher amounts of crude protein, P and Ca were noticed in the initial stages of the growth and gradually decreased with advancement in the age of the crop.

The quality of forage is very important as nutrient intake through the forage is more directly and significantly related to the out put of animal. In the evaluation of the quality of fodder protein content occupies a significant position since many other parameters are influenced by this factor. Protein content in forage plants is of paramount importance since it is considered as the building block of living system. Among the minerals, P and Ca occupy a prime position since these two are largely required by the animals, in active stage of growth, in advanced stage of pregnancy and milch animals. It is obivous that the composition of the forage could be manipulated favourably with proper fertilizer management practices but systematic work on this aspect is very scanty and especially for the newly introduced BN 2 grass no work has been carried out so for in Tamil Nadu. Hence, the present investigation was undertaken.

MATERIALS AND METHODS

A field study was carried out during 1980-81 at Tamil Nadu Agricultural University farm in a split plot design replicated three times. Seven micronutrient treatments (control, 2.5 and 5.0 kg $ZnSo_4$/ha, 0.5 per cent $ZnSo_4$ spray, 5.0 and 10.0 kg $FeSo_4$/ha and 2.0 per cent $FeSo_4$ spray) were assigned to main plots, while sub-plots were allotted to 4 levels of N (0, 50. 100, and 150 kg/ha/cut). The soil of the study area had low available N, P Zn and Fe and high K, Cu and Mn with clay-loam texture.

The grass slips were planted at a spacing of 50 x 50 cm and was cut after 60 days of growth uniformly around 15 cm height above the ground level and the fertilizer treatments were imposed. Nitrogen was applied as urea. A basal dose of 50 kg P_2O_5 and 40 kg K_2O/ha as single superphosphate and muriate of potash respectively were

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applied to all the plots. Spraying of $ZnSO_4$ and $FeSO_4$ were done after 20 days of each cut.

The grass was allowed for regrowth and eight periodical cuts were taken at an interval of 45 days covering one year period. Representative plant samples were collected from all the plots immediately after each cut and known quantity of the sample was dried at 60°C to constant weight. The samples were powdered in a willey mill with stainless steel blades and used for different chemical analysis.

Total N content was estimated by Humphries (1956) microkjeldahl method and the crude protein content was calculated by multiplying the total N by the factor 6.25. The P content was estimated in a known aliquot of the triple acid extract colorimetrically using vanadomolybdate method described by Jackson (1973). A known quantity of triple acid extract was used for the estimation of Ca by the versenate method described by Jackson (1973).

RESULTS AND DISCUSSION

Crude protein content

The mean crude protein content differed significantly with levels, the highest content having been recorded at 150 kg N/ha and the lowest in the control (Table 1). Each increment of N produced significant increase over the lower level. Applied N enhanced its uptake and is incorporated into aminoacids leading to increased protein synthesis. Increased protein content due to N fertilization was reported in hybrid napier grass by Tiwana *et al.* (1975), Muldoon and Pearson (1977), Randhawa and Gill (1977) and Man (1979).

Significantly higher crude protein (9.65 per cent) was found associated with 5.0 kg $ZnSO_4$/ha. The increase my be attributed to the significant role played by Zn as an essential component of enzymes associated in protein synthesis. The favourable influence of Zn in increasing the crude protein content was recorded in rice by Sing and Jain (1964) and in maize by Dwivedi and Randhawa (1973) and Sinha and Singh (1977). Although the different $FeSO_4$ treatments failed to differ significantly, soil application at both the levels were observed to increase the crude protein content over control. The lack of influence for Fe as that of Zn may be due to the fact that Fe is not directly involved as a cofactor in any of the enzymes of N metabolism.

The crude protein content from the individual cuts were compared, the first cut showed higher value, a constancy up to fifth cut and thereafter a declining trend was noticed. Decrease in crude protein with age of grass may be attributed to the lower uptake of N with maturity, decreased root proliferation and reduced vigour of the plants due to frequent cuttings.

The influence of Zn and Fe on the crude protein content was significant in the first, third and fourth cuts but the differences among the treatments were only marginal. However, 5.0 kg $ZnSO_4$ and 10 kg $FeSo_4$/ha were superior to the other levels in the third and fourth cuts. The significant interaction obtained between N and micronutrients in the first cut once again proved the essential role of N and Zn in protein synthesis.

Phosphorus Content

The mean P content was significantly altered by N levels and the highest value was recorded at150 kg N/ha (Table 2) Successive increments of N had resulted in significant increase in P content. The increase in P content with applied N may be attributed to the increased vegetative growth leading to higher P uptake. This was in agreement with the earlier finding of Mani (1979). In contrast, Tiwana et al. (1975) and Eriksen and Whiteny (1981) recorded a decrease in P content in bajra-napier hybrid and napier grasses with increased applications of N.

The results of the present study indicated that both Zn and Fe failed to produce significant variation in the P content of the grass.

Phosphorus content in different cuts

The influence of N on the P content of the grass was found to be markedly significant in all the cuts. A progressive decline in the P content from the first cut was noticed with advancement in the age of the grass.

Calcium content

The concentration of Ca progressively increased from 0.54 in the control to 0.66 per cent at 150 kg N/ha (Table 3). The results of the study indicated that Ca content of the grass increased significantly with every increment of N. This might be due to enhanced uptake of Ca by the plants because of N addition. This observation was found to be in conformity with earlier finding by Tiwana *et al.* (1975) and Eriksen and Whitney (1981). Application of Zn and Fe failed to produce significant variation in the Ca content of grass. However, Singh and Dahiya (1980) reported that application of Fe increased the Ca content of oats forage

Calcium content in different cuts

Marked variations in the Ca content due to N application were obseverd in the individual cuts excepting the fourth and sixth cuts. In all these cuts, highest Ca concentration was observed at 150 kg N/ha, while the level at 100 kg N/ha continued to be on par with it except in seventh cut. Higher Ca concentration was observed in the first three cuts and then a declining trend with the age of the grass was noticed.

From the results of the study, it can be concluded that protein, P and Ca could be well manipulated by judicious application of fertilizer N since all these are significantly influenced by the added N. The role of Zn in protein synthesis is of worth mentioning.

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Table 1 Influence of N, Zn and Fe on the crude protein content (Mean values in per cent)

(a) Nitrogen

Cuts	Treatments					S.E.	C.D.
	N_0	N_1	N_2	N_3	Mean		
1	9.77	10.45	11.97	12.12	11 08	0.12	0.33
2	8.49	8.91	9.35	9.79	9.13	0.11	0.31
3	8.64	9.59	10.93	11.37	10.13	0.14	0.39
4	8.46	8.91	9.23	9 38	8.99	0 13	0.38
5	8 25	8.70	9.11	9.50	8.89	0.14	0.41
6	8,01	8.55	8.67	9.02	8.56	0.13	0.37
7	8.01	8.61	8.91	8.99	8.63	0.13	0.38
8	7.65	8.61	9.04	9.02	8.58	0.13	0.37
Mean	8.41	9.04	9.65	9.90	—	0.05	0.14

(b) Micronutrients

Cuts	C	Zn_1	Zn_2	Zn_3	Fe_1	Fe_2	Fe_3	S.E.	C.D.
1	10.99	11.36	10.78	11.10	11.46	10 52	11.31	0 13	0.41
2	8.91	9.28	9.59	8.86	8 96	9.38	8.96	0.16	N.S.
3	9.38	10.21	10.89	10.11	9.85	10.58	9.90	0.16	0.50
4	8 65	8.81	9.54	8.91	9.07	9.28	8.71	0.18	0.57
5	8.70	8.76	9.53	8.81	8.76	9.01	8.65	0.20	N.S.
6	8.29	8.55	9.01	8 49	8.55	8.55	8.49	0.13	N.S.
7	8.39	8.55	8.96	8.75	8.44	8.65	8.65	0.21	N.S.
8	8.29	8.44	8.94	8 55	8.60	8.70	8.55	0.16	N.S.
Mean	8.95	9.24	9.65	9 20	9.21	9.33	9.15	0.08	0 23

Table 2. Influence of N, Zn and Fe on the phosphorus content (Mean values in per cent)

a) Nitrogen

cuts	Treatments						
	N_0	N_1	N_2	N_3	Mean	S. E.	C. D.
1	0.256	0.262	0.270	0.276	0.266	0.004	0.011
2	0.223	0.234	0.241	0.246	0.236	0 028	0.079
3	0.213	0.221	0 219	0.223	0.236	0.028	0.078
4	0.209	0 214	0 214	0.217	0.213	0 002	0.005
5	0.199	0.204	0.208	0 211	0 205	0.003	0.008
6	0.191	0.195	0.198	0.198	0.195	0.002	0.006
7	0.187	0 189	0.192	0.195	0.191	0.002	0.006
8	0.180	0.187	0.189	0.192	0.187	0.002	0.006
Mean	0.207	0.213	0 217	0.220	—	0.001	0.003

b) Micronutrients

Cuts	C	Zn_1	Zn_2	Zn_3	Fe_1	Fe_2	Fe_3	S.E.	C.D.
1	0.273	0.268	0.267	0.269	0.259	0.262	0.264	0.005	N.S.
2	0.232	0.237	0.235	0.237	0.234	0.237	0.238	0.003	N.S.
3	0.218	0.217	0 218	0.217	0.221	0.220	0.220	0 002	N.S.
4	0.211	0.212	0.215	0 213	0.214	0.212	0.215	0.002	N.S.
5	0.205	0.204	0.207	0.203	0.230	0.207	0.208	0.003	N.S.
6	0.198	0.198	0.200	0.195	0.191	0.191	0.195	0.003	N.S.
7	0.188	0.191	0.187	0.193	0.192	0.194	0.191	0.002	N.S.
8	0.184	0.186	0.190	0.187	0.180	0.190	0.187	0.003	N S.
Mean	0.213	0 214	0.215	0.214	0.213	0.214	0.215	0.001	N.S.

Table 3. Influence of N, Zn and Fe on the calcium content (Mean values in per cent)

(a) Nitrogen

cuts	Treatments					S.E.	C.D.
	N_0	N_1	N_2	N_3	Mean		
1	0.67	0.71	0.77	0.79	0.73	0.02	7.06
2	0.59	0.68	0.79	0.83	0.72	0.02	0.06
3	0.59	0.65	0.72	0.75	0.68	0.02	0.05
4	0.54	0.59	0.57	0.60	0.57	0.02	N.S.
5	0.52	0.58	0.59	0.62	0.58	0.02	0.05
6	0.54	0.55	0.55	0.57	0.55	0.01	N.S.
7	0.45	0.51	0.53	0.57	0.51	0.01	0.04
8	0.43	0.50	0.54	0.56	0.51	0.02	0.05
Mean	0.54	0.59	0.63	0.66		0.01	0.02

(b) Micronutrients

	C	Zn_1	Zn_2	Zn_3	Fe_1	Fe_2	Fe_3	S.E.	C.D.
1	0.79	0.81	0.77	0.73	0.67	0.67	0.72	0.02	0.06
2	0.75	0.75	4.76	0.64	0.74	0.71	0.71	0.03	N.S.
3	0.69	0.67	0.71	0.67	0.65	0.66	0.69	0.03	N.S.
4	0.61	0.61	0.66	0.56	0.57	0.55	0.55	0.03	N.S.
5	0.59	0.58	0.56	0.57	0.57	0.55	0.66	0.03	N.S.
6	0.52	0.55	0.55	0.55	0.55	0.62	0.54	0.02	N.S.
7	0.50	0.53	0.52	0.49	0.49	0.52	0.54	0.02	N.S.
8	0.49	0.50	0.52	0.51	0.51	0.51	0.52	0.02	N.S.
Mean	0.62	0.62	0.62	0.59	0.60	0.60	0.61	0.01	N.S.

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