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EFFECT OF ORGANIC, INORGANIC SOURCES OF NITROGEN AND MOLYBDENUM ON YIELD AND QUALITY OF BAJRA - NAPIER HYBRID GRASS (CO.2)

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ABSTRACT

Investigations were undertaken to study the effect of organic (FYM) and inorganic sources (urea, CAN) of nitrogen on yield and quality of Bajra - Napier hybrid grass. The results showed that more number of tillers and highest dry matter yield was obtained with the application of 75 kg N ha^{-1} as urea with 2.5 t of FYM ha^{-1}. As regard to forage quality, Calcium Ammonium Nitrate (CAN) proved superior for percentage of crude protein content, while crude protein yield was found to be maximum when 75 kg N ha^{-1} was applied as urea with 2.5 t on FYM ha^{-1}. Foliar spraying of molybdenum had no influence on the growth and yield, but it had significantly influenced the crude protein in all cuttings.

KEY WORDS : Molybdenum, nitrogen, calcium ammonium nitrate, bajra - napier hybrid grass

The efficiency of the ruminants to convert forage crops to milk and meat depends largely on the quality and quantity of the feed. In this context, the forage crops like high yielding Bajra - Napier hybrids play a greater role in the productivity of animals through higher yields coupled with quality food. In the evaluation of quality of fodder, crude protein occupies a significant position since many other parameters are influenced by this factor. Protein content in forage plant is of paramount importance since it is considered as the building block of living system. The composition of forage crops can be manipulated by different N management. Moreover, very little information is available about the response of forage grasses to organic and inorganic sources of N alone and in combinations. Hence the study was undertaken to find out the effect of organic and inorganic sources of N on Bajra- Napier grass.

MATERIALS AND METHODS

A field experiment was conducted at the Tamil Nadu Agricultural University, Coimbatore, (11°N latitude and 77°E longitude, mean annual rainfall 640 mm). The soil of the experimental field was sandy loam (pH = 8.2; Ec = 0.2 m.mhos/cm N = 197.2 kg/ha ; P = 18.4 kg/ha ; K = 504.2 kg/ha). 100 kg N ha^{-1} was applied through organic, inorganic sources of N and their combinations with following treatments.

T1 - 100 kg N ha^{-1} as urea

T2 - Farm yard manure (FYM) at 10 t ha^{-1}

T3 - 100 kg N ha^{-1} as Calcium ammonium nitrate (CAN)

T4 - 75 kg N ha^{-1} as urea + FYM at 2.5 t ha^{-1}

T5 - 50 kg N ha^{-1} as urea + FYM at 5.0 t ha^{-1}

T6 - 25 kg N ha^{-1} as urea + FYM at 7.5 t ha^{-1}

T7 - 75 kg N ha^{-1} as CAN + FYM at 2.5 t ha^{-1}

T8 - 50 kg N ha^{-1} as CAN + FYM at 5 t ha^{-1}

T9 - 25 kg N ha^{-1} as CAN + FYM at 7.5 t ha^{-1}

Molybdenum Treatments

Mo(-) - Without molybdenum

Mo(+) - Molybdenum 1.0 per cent foliar spray on 10th day after each cutting.

The treatment was replicated thrice in factorial randomised block design. The crop was planted in rows 50cm on either side. A basal dose of 50 kg P_2O_5 ha, 50 kg K_2O was also applied. Nitrogen was applied after each cutting. Irrigation and weeding operation was done as and when required. Grass was cut at an interval of 45 days. At each cutting, samples of 10g were collected randomly in each treatment and were dried at 70°C for 48 hr to

estimate dry matter content. The same samples were also utilized for determination of N and crude protein content (CPC) was calculated by multiplying the total N by the factor 6.25, and expressed in per centage. The crude protein yield (CPY) was expressed as t/ha. At the time of harvest, the number of tillers/clump was recorded.

RESULTS AND DISCUSSION

Among the different N management practices tried, application of 75 kg N ha^{-1} as urea with 2.5 t of FYM ha^{-1} recorded higher dry fodder yields (DFY). There is an increase in the DFY in the subsequent cuttings when compared to previous cutting (Table 1). This might be due to rapid decomposition of FYM with supplementation of inorganic form of N. Moreover this N management recorded more number of tillers / clump (Table 2). It might be due to the better availability of applied N through the combination of organic and inorganic sources of N. This would have resulted in better growth, through accelerated meristematic activity. Beneficial effect of applying organic and inorganic sources of N was also reported by Gangwar and Nirunjan (1991) in fodder sorghum and Harishkumar and Rai (1976) in fodder oats.

Foliar spray of molybdenum had no influence on the growth components as well as yield of forage grass. Similarly, the interaction effect of different combination of organic and inorganic sources of N and foliar spray of molybdenum did not significantly influence DFY and growth attributes.

The results on CPC and CPY showed that accumulation of N in the presence of higher proportion of inorganic sources of N might be one of the reasons for increased protein synthesis. Applied inorganic N enhanced the uptake in the plant, resulting in increased amino acid which inturn resulted in increased protein synthesis. Application of 100 kg N ha^{-1} as CAN recorded higher crude protein content and was on par with 100 kg N ha^{-1} as urea (Table 3). Beneficial effect of CAN on crude protein content might be that the soils fertilized with CAN contain both NO^{+}_{3} - N and NH_4 - N. Plants are better competitors for NO_3 - N than micro- organisms. The increased N uptake enhanced the aminoacid synthesis which, inturn

Table 1. Effect of organic, inorganic sources of N, their combinations and molybdenum on dry matter yield (t ha^{-1})

Treatment	First cut			Second cut			Third cut			Fourth cut			Fifth cut			Total
	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	
T_1	6.74	6.84	6.79	7.96	7.86	7.91	10.05	9.92	9.99	11.16	10.97	11.07	10.73	10.56	10.65	46.41
T_2	6.20	6.32	6.26	7.70	7.61	7.66	9.76	9.73	9.75	10.79	10.85	10.82	10.55	10.72	10.64	45.13
T_3	6.59	6.52	6.56	7.81	7.71	7.76	9.99	10.02	10.01	10.95	11.25	11.10	10.65	10.71	10.68	46.11
T_4	7.26	7.10	7.18	8.64	8.69	8.67	10.65	10.72	10.69	11.73	11.70	11.72	11.44	11.48	11.46	19.72
T_5	6.66	6.52	6.59	8.04	7.88	7.96	1021	10.16	10.19	11.33	11.24	11.29	11.05	11.19	11.12	47.15
T_6	6.23	6.25	6.24	7.85	8.00	7.93	9.87	9.73	9.80	10.96	11.03	11.00	10.50	10.82	10.66	45.63
T_7	6.20	6.29	6.25	7.50	7.53	7.52	9.48	9.62	9.55	10.76	10.72	10.74	10.68	10.46	10.47	44.63
T_8	5.93	5.85	5.89	7.39	7.39	7.39	9.39	9.55	9.47	10.48	10.61	10.55	10.43	10.32	10.38	44.14
T_9	5.65	5.64	5.65	7.20	7.07	7.14	9.20	9.19	9.20	10.28	10.42	10.35	10.01	10.20	10.11	42.45
SEd/CD (P=0.05)																
N	0.11	0.22	0.08	0.17		0.11	0.23		0.05		0.10	0.05		0.11	0.19	0.39
Mo	0.05	NS	0.04	NS		0.05	NS		0.02		NS	0.12		NS	0.09	0.19
NxMo	0.15	NS	0.12	NS		0.12	NS		0.07		NS	0.16		NS	0.11	NS

(Treatment details as in the text)

Table 2. Effect of organic, inorganic sources of N, their combinations and molybdenum on number of tillers.

Treatment	First cut			Second cut			Third cut			Fourth cut			Fifth cut		
	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean
T_1	20.3	19.3	19.8	23.7	23.0	23.4	34.7	34.3	34.5	49.7	48.7	49.2	50.7	50.3	50.5
T_2	15.3	15.3	15.3	21.7	22.0	21.9	32.0	32.7	32.4	47.7	46.7	47.2	48.7	48.3	48.5
T_3	19.0	18.7	18.9	22.3	23.0	22.7	34.0	34.0	34.0	49.0	49.3	49.2	49.7	49.3	49.5
T_4	22.0	21.7	21.9	28.0	27.0	27.5	37.7	37.0	37.4	51.7	52.0	51.9	53.7	53.3	53.5
T_5	20.0	19.7	19.9	24.7	25.0	24.9	35.0	34.0	34.5	50.0	49.0	49.5	51.7	50.7	51.2
T_6	15.0	15.0	15.0	22.7	23.3	23.0	33.0	32.3	32.7	48.0	48.3	48.2	49.7	49.3	49.5
T_7	17.0	16.7	16.9	21.7	21.0	21.4	32.7	31.7	32.2	47.7	48.7	48.2	51.7	50.7	51.2
T_8	16.0	15.3	15.7	20.7	21.3	21.0	31.0	30.7	30.9	46.3	47.3	46.8	50.0	50.0	50.0
T_9	15.0	14.0	14.5	19.7	20.0	19.9	29.3	29.7	29.5	44.7	45.7	46.7	45.7	48.3	48.5
SE₁/CD (P=0.05)															
N	0.80	1.62		0.42	0.85		0.64	1.31		0.40	0.81		0.45	0.92	
Mo	0.38	NS		0.20	NS		0.30	NS		0.19	NS		0.21	NS	
NxMo	1.13	NS		0.59	NS		0.91	NS		0.57	NS		0.64	NS	

(Treatment details as in the text)

Table 3. Effect of organic, inorganic sources of N, their combinations and molybdenum on crude protein content (per cent)

Treatment	First cut			Second cut			Third cut			Fourth cut			Fifth cut		
	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean	Mo (-)	Mo (+)	Mean
T_1	8.83	8.40	8.62	9.00	8.83	8.92	9.27	9.17	9.22	9.10	9.07	9.09	9.17	9.07	9.12
T_2	5.43	5.30	5.37	5.60	5.63	5.62	5.67	5.87	5.77	5.40	5.40	5.40	6.10	5.93	6.02
T_3	9.03	8.90	8.97	9.17	9.13	9.15	9.40	9.30	9.35	8.97	9.03	9.00	9.07	8.93	9.00
T_4	8.33	8.20	8.27	8.53	8.40	8.47	8.60	8.47	8.54	8.70	8.73	8.72	9.00	8.97	8.99
T_5	8.00	7.90	7.95	8.20	8.13	8.17	8.30	8.20	8.25	8.50	8.40	8.45	8.90	8.90	8.90
T_6	7.13	7.03	7.08	7.23	7.27	7.25	7.77	7.67	7.72	7.43	7.33	7.38	8.50	8.43	8.47
T_7	8.20	8.33	8.27	8.40	8.33	8.37	8.47	8.37	8.42	8.60	8.55	8.58	8.87	8.77	8.82
T_8	7.90	7.80	7.85	8.10	8.00	8.05	8.17	8.13	8.15	8.20	8.20	8.20	8.57	8.47	8.52
T_9	6.57	6.60	6.59	6.77	6.87	6.82	7.50	7.43	7.47	7.27	7.27	7.27	8.07	7.97	8.02
SE₁/CD (P=0.05)															
N	0.13	0.26		0.09	0.17		0.10	0.20		0.12	0.25		0.08	0.16	
Mo	0.04	NS		0.04	N		0.05	NS		0.06	NS		0.04	0.08	
NxMo	0.13	NS		0.12	NS		0.14	NS		0.18	NS		0.11	NS	

(Treatment details as in the text)

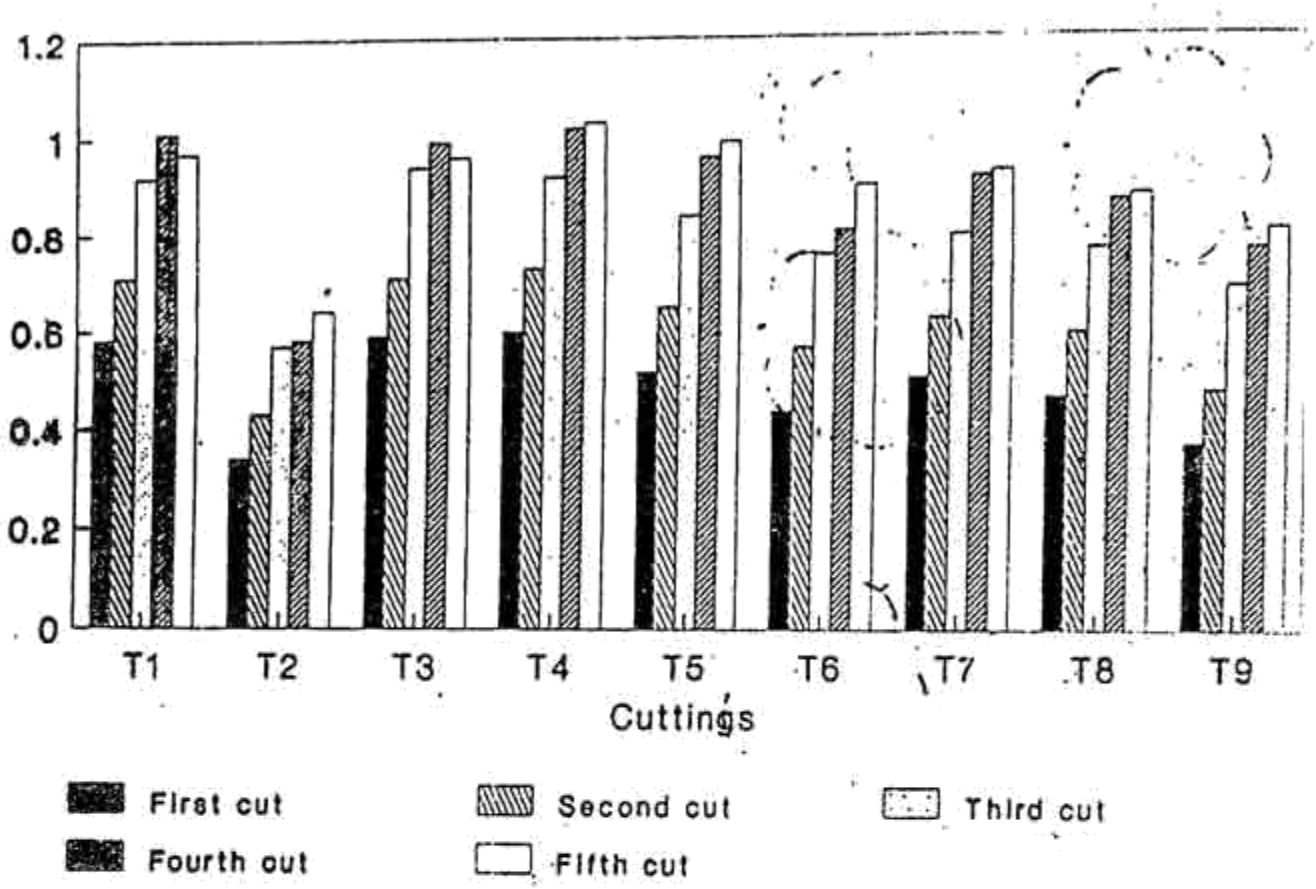

Fig.1. Effect of organic and inorganic sources of N on crude protein yield t ha^{-1}

resuted in increased protein synthesis (Paul and Junia, 1981) However, the crude protein yield was higher with 75 kg N ha^{-1} as urea when applied with 2.5 t of FYM ha^{-1} (Fig 1). This might be due to increased dry matter yield recorded with the N management.

There was a significant influence on the CPY by one per cent foliar spray of molybdenum in all the five cuttings and influence on CPC in fifth cutting only. The reason might be that molybdenum is an important micronutrient for N fixation, assimilation and reduction of N to amino acids and protein synthesis. Molybdenum is specific for activation of enzyme nitrate reductase, when the N fertilizer was applied along with molybdenum. The nitrate- N taken up by the grass is reduced to NO_2, the conversion of NO_2 to NH_4 is catalysed by nitrate reductase. This ammonia ions enters into the protein metabolism of the TCA cycle where two other metobolisms namely fat and carbohydrate enters at one stage, so when one metabolism is increased, it will have a direct effect on other two metabolisms resulting in better growth of the plant Once the plant growth is luxurious, there is an increase in the uptake of nutrients and minerals resulting in improved quality and mineral content (Goodwin and Morcer, 1972).

REFERENCES

GANGWAR, K.S and NIRANJAN K.P. (1991). Effect of organic manures and inorganic fertilizers on rainfed fodder sorghum. **Indian J. agric. Sci., 61** : 193-194.

GOODWIN, T.W. and MERCER E.I. (1972) **Introduction to Plant BioChemistry**. Pergamon Press Ltd., pp.

HARISH KUMAR and RAI, S.D (1976) Effect of different rates and sources of nitrogen on the yield and quality of forage oats, (*Avena sativa*) **Forage Res., 2** : 131-136.

PAUL, E.A. and JUNIA, N.G (1989) Mineralization and immobilization of soil nitrogen by micro-organism. In *Terrestrial Nitrogen Cycles* **Ecological Bulletin 3** : 179 - 195.

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