https://doi.org/10.29321/MAJ.10.A02218

Madras Agric J. 74 (12) : 535–539 December, 1987

EFFECT OF NITROGEN, ZINC AND IRON ON THE DIGESTIBILITY AND YIELD OF DIGESTIBLE DRY MATTER OF BN 2 GRASS.

M. GOVINDASWAMY and T. S. MANICKAM.

The mean *In vitro* digestibility of BN 2 grass increased significantly over control from 42.21 to 47.01 per cent with N application at 150 kg N / ha. The increases were in the order of 5. 3. 8.8 and 11.4 per cent over control. 50.100 and 150 kg N/ha respectively applied after each cut. Application of $ZnSO_4$ at 5.0 kg/ha/ cut increased the digestibility over control from 44.47 to 45.74 per cent. The highest yield of digestible dry matter (35.50 t/ha) was obtained with 150 kg N / ha. Application of N at 50,100 and 150 kg/ha increased the yield by 82.7, 51.6 and 55.5 per cent over control respectively. The physical optimum dose of N worked for this parameter was 139.2 kg N/ha/cut. Application of $ZnSO_4$ at 5.0 kg/na increased tha yield by 13.4 per cent over control. The study indicated the benefical role of N and Zn in improving the feed value of the fodder obtained.

The value of any forage depends up on the amounts of nutrients that the animal can digest and use for the metabolic processes. The chemical composition of forage alone is an inadequate standard to judge the nutritive value of the forage. The first consideration is its digestibility, since the undigested nutrients do not enter the body proper (Schneider and Flatt, 1975). It is, of course, only the digestible portion of the forage can serve to maintain the vital functions of the body apart from maintenance and formation of animal products. Even though favourable influences were recorded elsewhere on the digestibility of forage grasses due to N addition (Deinum *et al.*, 1969; Wilkinson *et al*, 1970), studies on this aspect is highly sporodic in India with respect to BN 2 grass Hence a study was planned and conducted with different levels, of N, Zn and Fe to evaluate the influence of these elements on the digestibility and the yield of digestible dry matter of this grass which is popularly cultivated in Tamil Nadu.

MATERIALS AND METHODS

A field experiment was conducted during 1980-81 at Tamil Nadu Agricultural University farm in a clay loam soil deficient in available N, P, Zn and Fe and sufficient in K, Cu and Mn. A split plot design was adopted replicating three times seven main plot treatments (control, 2.5 and 5.0 kg Zn SO_4/ha, 0.5 per cent Zn SO_4 spray, 5.0 and 10.0 kg Fe SO_4/ha and 2.0 per cent Fe SO_4 spray after each cut) and four sub plot treatments (0, 50, 100 and 150 kg N/ha/cut). The grass slips were planted at 50 x 50 cm spacing and cuts after 60 days of growth unifomly and the treatments were imposed.

Department of Soil Science, Tamil Nadu Agri. University, Coimbatore-641 003.

Nitrogen was applied as urea and a single common dose of 50 kg P_2O_5/ ha and 40 kg K_2O/ha as single super phosphate and muriate of potash respectively were applied to all the plots. Spraying of $ZnSO_4$ and Fe SO_4 was done after 20 days of each cut. Eight periodical cuts were taken with an interval of 45 days for one year. Representative samples were collected after each cut, procesaed and used for chemical analysis.

The *in vitro* dry matter digestibilily of the samples were estimated by adopting the two stage rumen fermentation technique outlined by Tilley and Terry (1963). The yield of digestible dry matter was computed by multiplying dry matter yield and the per cent digestibility.

A quadratic model of the type $Y=a+bx+cx^2$ was fitted for the total yield of digestible dry matter and for arriving at the physical dose of N for maximum yield

$Y=a+bx+cx^2$ where,

RESULTS AND DISCUSSION

In vitro dry matter digestibility (IVDMD).

The results (Table 1) showed that application of N enhanced that IVDMD of the grass over control significantly and the increase being in the order of 5. 3, 8. 8, and 11.4 per cent over control for 50,100 and 150 kg N/ha respectively. Influence of N on the improvement of digestibility could be highlighted by the findings of Deinum and dirven (1976) and Kunelius [1980]. Increase in the digestibility due to N applicaton could be attributed to the increased protein synthesis. This was also corroborated by the positive relationship between crude protein and IVDMD [r o. 963**] obetained in the prestent investigation.

A highly signifinant and favourable influence on the digestibility due to 5.0 kg $ZnSO_4$ / ha was found to exist, the value being 45.74 per cent. Such increase could be attributed to the increased synthesis of protein in the presence of Zn as enzyme cofactor. Thc influence of Fe SO_4 on the IVDMD has not attained statistical significance over control.

The IVDMD the grass was also increased by N application in the individual cuts. The N level at 150 kg/ha continued to record significantly higher values in all the cuts except in the seventh cut in which it remained on par with 100 kg N/ha. Considerably lower digestibility has been accounted in the control compared to fertilised plots.

Significant influence for Zn and Fe on the IVDMD was noticed in the first and third cuts. In both cuts $ZnSO_4$ at 5.0 kg/ha recorded significantly higher values than the other treatments and this indicates the usefulness of Zn improved the fodder quality.

Table 1 Influence of N, Zn and Fe on the in Vitro dry matter digestibility (IVDMD) (Mean values in per cent)

(a) Nitrogen

Cuts	Treatments				S. E.	C.D.
	N_0	N_1	N_2	N_3		
1	46.44	48.32	50.30	51.98	0.39	1.10
2	42.06	43.46	44.67	43.55	0.23	0.77
3	45.37	47.87	48 67	50.30	0.40	1.15
4	43.19	46.43	47.12	48.84	0.27	0.78
5	41.49	45.07	46.84	47.77	0.29	0.83
6	41.29	43.16	45.36	46.35	0.33	0.94
7	39.32	40.85	42.42	42.51	0.32	0.93
8	38.96	40.04	41.79	42.71	0.23	0.65
Mean	42.21	44.44	45.92	47.01	0.12	0.36

(b) Micronutrients

Cuts	C	Zn_1	Zn_2	Zn_3	Fe_1	Fe_2	Fe_3	S. E	C.D.
1	50.21	49.37	50.89	48.02	49.22	49.13	47.97	0.48	1.49
2	43.39	43.42	34.19	44.07	44.24	43.87	44.29	0.28	N.S.
3	48.44	47.23	51.25	46.80	47.56	47.76	47 32	0.41	1.28
4	45.83	46.56	46 31	46.02	46.61	4U.62	46.79	0.21	N.S.
5	45.01	45.16	46 20	45.00	45 76	44 99	44.92	0.38	N S.
6	42.94	44.48	44.27	43.35	44.61	44.70	43.91	0 46	N.S.
7	40.79	41.78	41.58	41.81	41.03	40.55	41.37	0.40	N.S.
8	40.22	41.10	41.05	41.23	41.08	40:96	40.49	0.31	N.S.
Mean	44.57	44 83	45.74	44.56	44.99	4487	44 71	0.17	0.53

Yield of digestible dry matter

The highest yield (35.53 t/ha) was obtained with 150 kg N/ha but it was on par with 100 kg N/ha (34. 62 t/ha] and inturn both these levels were significantly superior to 50 kg N/ha [30.30 t/ha] and control [22.83 t/ha]. [Table 2] The increases were in the order of 32. 7, 51. 6 and 5.55 per cent over control for 50,100 and kg N/ha respectively. A quadratic responce was obtained for the applied N and the physical optimum worked out for this parameter was 139.2 kg N/ha applied after each cut. The results, therefore, indicate the over-all effect of N on the crude protien and cell-walls which reflected in the increased yield of digestible dry matter.

Table 2 Influence of N, Zn and Fe on the Yield of digestible dry matter (mean values in t/ha)

(a) Nitrogen

Cuts	Treatments				S. E.	C. D.
	N_0	N_1	N_2	N_3		
1	5.04	5.72	6.33	6.47	0.20	0.58
2	4.54	5.23	5.55	5.58	0.15	0.43
3	2.54	3.31	3.70	3.86	0.14	0.40
4	2.87	3.84	4.31	4.38	0.12	0.34
5	2.39	3.79	4.31	4.42	0 17	0.48
6	2.35	3.48	3.84	4.11	0.14	0.40
7	1.87	2.65	3.56	3.58	0.11	0.31
8	1.24	2.20	3 02	3.10	0.10	0 28
Total	22.8	30.3	34.62	35.5	0.41	1.17

(b) Micronutrients

Cuts	C	Zn_1	Zn_2	Zn_3	Fe_1	Fe_2	Fe_3	S.E.	C.D.
1	6.43	5.99	6.02	5.72	5.57	5 60	5.88	0.30	N S
2	4.76	5.07	5.83	5.04	5.09	5 60	5.21	0.22	N.S.
3	3.11	3.44	3.66	3 23	3.22	3 43	3.35	0.17	N S.
4	3.47	3 95	4.01	3.79	3.88	3.92	3.91	0 09	0 29
5	3.27	4 03	4.15	3.45	3.65	3.84	3·72	0.13	N.S.
6	3.13	3.45	3.72	3.50	3.44	3.45	3.41	0.16	N.S.
7	2.54	3.03	2.94	2.92	2.81	3.05	3.12	0.17	N.S.
8	2.31	2 24	2.47	2.51	2.40	2.43	2.36	0.13	N.S.
Total	29.98	31.20	32.87	30.17	30.00	31.50	30.97	0.38	1.17

Soil application of $ZnSO_4$ at 5.0 kg/ha was found to enhance the yield over control as well as other levels significantly and the increase being 13.4 per cent over control. The data also indicate that all the treatments except 5.0 kg $FeSO_4$/ ha produced significant increase in the yield over control and thus, the results obtained established the importance of micronutrients too, in imporving the value of the fodder.

The data of individual cuts revealed the positive influence of N with the two higher levels remaining on par. Since the influence of N was positive on the yield of green matter and IVDMD such a trend is anticipated. Treatments with Zn and Fe eventhough failed to differ among themselves, causes significant increase in the yield over control in the fourth cut. The level at 5.0 kg of $ZnSO_4$/ha was oberved to record the highest yield.

From the results, it could be concluded that the applied N exercied a highly significant and favourable influence on the IVDMD and yield of digestible dry matter. The optimum does for obtaining the highest yield was observed to he at 139.2 kg/ha/cut. Application of ZnSO at 5.0 kg/ha was found to increase both the parmeters significantly over control. The influence of $FeSO_4$ was not substantitive.

ACKNOWLEDGEMENT

The first author is grateful to the Tamil Nadu Agricultural University for according permission to publish the data which forms part of his Ph. D thesis.

REFERENCES

DEINUM, B., and J. G. P DIRVEN, 1976, Climate nitrogen and grass-comparison of production and chemical composition of *Brachiaria ruziziensis* and *Setaria sphacelata* grown aa different temperatures, Neth. J. Agric. Sci, 24 : 67-78.

DEINUM, B., A. J H. VANES and P. J. VANSOEST. 1968, Climate, nitrogen and grass. II. The influence of light intensity temperature and nitrogen on *in Vivo* digestibility of grass and the prediction of these effects from some chemical procedures Neth, J, Agric, Sc 16 : 217-223.

KUNEELIVS H. T. 1980. Effects of N rates and harvest schedules on yield and quality of Western-worlds rye grass grown as a summer annual Can. J. Pl. Sci, 60 : 519-524,

REYNOLDS, J, H,. K. M, BARTH and M. E, FARYER 1969. Effect of harvest frequency and nitrogen fertilisation on estimated total digestible nutrients of orchard grass. Agron J 61 : 433-435.

SCHNEIDER. B. H. and W. P, FLATT 1975, *The Evaluation of Feeds through Digestibility Experimenrs* The Univ, Georgia Press, Athens,

TILLEY, J. M. A. and R, A, TERRY, 1963. A two stage technique for the *in vitro* digestion of forage crops. J Brit. Grass Soc, 18 : 104-111,

WILKINSON. S, R.. W, E. ADAMS and M, A, JACKSON. 1970. Chemical composition and *ih vitro* digestibility of vertical layers of coastal bermuda grass. Agron. J. 62 : 39.43.