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RESEARCH PAPER

Evaluation of precision nitrogen management practices on growth, yield and economics of fodder maize

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Abstract: A field experiment was conducted during *rabi* 2020-21 under irrigated conditions on red sandy loam soil to evaluate different precision nitrogen management practices on growth, yield and economics of fodder maize. The experiment consisted of 14 nitrogen management practices laid out in randomized block design replicated thrice. The results indicated that application of 150 kg N ha^{-1} (40 % N basal) + remaining based on LCC 5 or SPAD 50 recorded higher plant height, number of leaves, leaf area, green fodder yield, dry fodder yield, gross returns, net returns and B:C ratio, as compared to recommended dose and method of nitrogen application *viz.* 75 kg N ha^{-1} as basal and 75 kg N ha^{-1} as top dressing at 30 days after sowing.

Key words: Economics, Fodder maize, Nitrogen, Precision management

Introduction

Animal husbandry is an important subsistence enterprise of agriculture in India, contributing nearly 5.2 per cent to the national gross value addition (GVA) and 28.4 per cent of the agricultural GVA. India stands first in livestock population 536.76 million heads and milk production with 198.4 million metric tons during 2019-20 (Anon., 2021). The productivity of livestock greatly depends on feeding animals with enough quantity of nutritious fodders. However, in India there is a net deficit of 30.65 per cent green fodder and 11.85 per cent dry fodder (Anon., 2013) and total area under cultivated fodders is 8.3 million ha (Anon., 2017). There is hardly any scope for expansion of area under fodder crops because of pressure on agricultural land for food and cash crops.

Fodder maize (*Zea mays* L.) is an important annual fodder crop grown in all the seasons in the country and occupying an area of 9 lakh ha. It produces a good herbaceous fodder with high palatability and digestibility. On an average, it contains about 9-10 per cent crude protein, 60-64 per cent neutral detergent fibre, 38-41 per cent acid detergent fibre, 28-30 per cent cellulose and 23-25 per cent hemicelluloses on dry matter basis (Kumar *et al.*, 2012). In addition about 59 per cent of total maize grain produced in the country is also utilized in the preparation of concentrate feed for livestock (Raju, 2013).

Fodder maize is a very exhaustive crop and its productivity largely depends on nutrient and water management. Among nutrients, nitrogen (N) is considered as an essential plant nutrient having major role in vegetative growth and grain yield. Wide spatial variability of soil N supply limits the efficient use of N fertilizer under blanket fertilizer N recommendations. When N application is not synchronized with crop demand, it will be lost from the soil-plant system leading to low N use efficiency. Further, over-fertilization of N does not improve crop yield and reduces crop profitability by increasing fertilizer cost and also leads to environmental pollution *i.e.* nitrate leaching or loss in the form of nitrous oxide, a noxious greenhouse gas. Thus, there is a need to develop accurate N fertilization recommendations which synchronize N fertilization with high N-demand for better green fodder yield and quality and improve the N-use efficiency.

For such strategies to be successful and practical, non-destructive methods for real-time assessment of maize N status, prior to making N side-dressing recommendations need to be developed. Nitrogen recommendations based on soil sampling, leaf color chart (LCC) and crop reflectance and crop sensors like SPAD (chlorophyll meter) have been recognized to be most efficient methods for maize (Scharf *et al.*, 2006). The spectral properties of leaves can be used in a more rational manner to guide need based fertilizer N applications.

Material and methods

A field experiment was conducted during *rabi* 2020-21 at Research Farm of IGFRI- Southern Regional Research Station, Dharwad under irrigated conditions on red sandy loam soil. The experimental site was located at 15° 26' N latitude, 75° 07' E longitude and at an altitude of 678 m above mean sea level in Northern Transition Zone (Zone-8) of Karnataka. Soil of experimental site was low in available N (214.3 kg ha^{-1}), medium in available phosphorous (25.9 kg ha^{-1}) and high in available potassium (305.78 kg ha^{-1}). The experiment consisted of 14 treatments with different N management practices *viz.,* No nitrogen (Control) (T_1), 50 kg N ha^{-1} (40 % N basal) + remaining based on SPAD meter critical value of < 40 (T_2), 50 kg N ha^{-1} (40 % N basal) + remaining based on SPAD meter critical value of < 50 (T_3), 50 kg N ha^{-1} (40 % N basal) + remaining based on LCC 4 (T_4), 50 kg N ha^{-1} (40 % N basal) + remaining based on LCC 5 (T_5), 100 kg N ha^{-1} (40 % N basal) + remaining based on SPAD meter critical value of < 40 (T_6), 100 kg N ha^{-1} (40 % N basal) + remaining based on SPAD meter critical value of < 50 (T_7), 100 kg N ha^{-1} (40 % N basal) + remaining based on LCC 4 (T_8), 100 kg N ha^{-1} (40 % N basal) + remaining based on LCC 5 (T_9), 150 kg N ha^{-1} (40 % N basal) + remaining based on SPAD meter critical value of < 40 (T_{10}), 150 kg N ha^{-1} (40 % N basal) + remaining based on SPAD meter critical value of < 50 (T_{11}), 150 kg N ha^{-1} (40 % N basal) + remaining based on LCC 4 (T_{12}), 150 kg N ha^{-1} (40 % N basal) + remaining based on LCC 5 (T_{13}) and recommended package of practices (RPP) of UAS, Dharwad (150 kg N:100 kg P_2O_5:50 kg K_2O ha^{-1}; 50 % N as basal, remaining 50 % N at 30 days after sowing) (T_{14}), tried in randomized block design and replicated thrice. A uniform dose of 10 t ha^{-1} of well decomposed farm yard manure was incorporated in the soil 3 weeks prior to sowing. Fodder maize variety 'African Tall' was sown at 30 cm rows using a seed rate of 40 kg ha^{-1} in the first fortnight of November 2020. Recommended dose of phosphorous and potassium were applied commonly for all the treatments in the form of single super phosphate (SSP) and muriate of potash (MOP) with 40 per cent of nitrogen at the time of sowing and remaining nitrogen based on SPAD and LCC critical values as top dressing in the form of urea as per treatments. At each top dressing as per SPAD and LCC values, 30 kg N ha^{-1} was applied irrespective of the N amounts *viz.*, 50, 100 and 150 kg N ha^{-1} as per the treatments. Various growth attributes were recorded at regular interval and at the time of harvest upon 50 per cent flowering for fodder. The green fodder weight was recorded immediately after harvest. Dry fodder yield was computed by multiplying the correction factor of difference in the moisture before drying and after drying multiplied with green fodder yield. The gross expenditure, net returns and benefit:cost ratios were computed using the cost of cultivation, prevailing market prices of inputs and produces.

Results and discussion

The cumulative quantity of nitrogen applied as per the treatments varied treatment-wise (Table 1). There was no nitrogen applied in control (T_1). The total nitrogen applied ranged from 70-150 kg N ha^{-1} depending upon the treatment. The highest quantity of nitrogen (150 kg ha^{-1}) applied was in RPP (T_{14}). It was at par with nitrogen applied based on SPAD meter critical value of < 50 (T_{11}) and LCC 5 (T_{13}). The variation in the quantity of nitrogen applied may be attributed to basis of nitrogen applied *viz.* SPAD and LCC. Owing to their different mechanism and yardsticks the total quantity of nitrogen applied varied. However the total quantity did not exceed that of RPP.

Effect on growth parameters

The growth parameters *viz.,* plant height, number of leaves, leaf area, leaf area index, leaf:stem ratio, fresh weight and dry weight of plants were not influenced by the precision nitrogen management practices at 30 days after sowing (Table 2 & 3). However, the stem girth was significantly influenced by the different nitrogen treatments. Application of 150 kg N ha^{-1} (40 % N basal) + remaining based on SPAD meter critical value of < 50 (T_{11}) recorded significantly higher stem girth at 30 DAS. At 60 DAS and at harvest, all the growth parameters were

Table 1. Nitrogen applied (kg/ha^{-1}) in different treatments as influenced by SPAD and LCC based N management practices

Treatments	Nitrogen applied (kg/ha^{-1}) on respective days for each treatment based on SPAD and LCC values				
	Basal dose	30 DAS	45 DAS	60 DAS	Total
T_1	0	0	0	0	Nil
T_2	20	30	30	-	80
T_3	20	30	30	30	110
T_4	20	30	30	-	80
T_5	20	30	30	30	110
T_6	40	30	-	-	70
T_7	40	30	30	30	130
T_8	40	30	30	-	100
T_9	40	30	30	30	130
T_{10}	60	-	30	-	90
T_{11}	60	30	30	30	150
T_{12}	60	30	30	-	120
T_{13}	60	30	30	30	150
T_{14}	75	75	-	-	150

Note:

T_1: No nitrogen (Control)
T_2: 50 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
T_3: 50 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
T_4: 50 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
T_5: 50 kg N ha^{-1} (40% N basal) + remaining based on LCC 5
T_6: 100 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
T_7: 100 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
T_8: 100 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
T_9: 100 kg N ha^{-1} (40% N basal) + remaining based on LCC 5
T_{10}: 150 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
T_{11}: 150 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
T_{12}: 150 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
T_{13}: 150 kg N ha^{-1} (40% N basal) +remaining based on LCC 5
T_{14}: As per package of practices (150kg N ha^{-1}; 50% N as basal and 50 % N at 30 DAS

Table 2. Growth parameters of fodder maize as influenced by SPAD and LCC based N management practices

Treatment	Plant height (cm)			Number of leaves/plant			Leaf area (cm^2/plant^{-1})			LAI		
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
T_1	42.9	107.5	168.2	5.8	9.2	11.7	839.5	3382.6	4722.3	2.80	11.28	15.74
T_2	48.7	163.7	237.7	7.3	12.1	13.9	1106.2	5105.5	6821.2	3.69	17.02	22.74
T_3	47.1	174.9	261.5	7.1	12.8	14.7	1134.5	5599.8	7411.4	3.78	18.67	24.70
T_4	44.7	164.0	242.5	6.7	12.0	13.8	1101.8	5113.7	6939.7	3.67	17.05	23.13
T_5	45.7	173.5	259.5	7.4	12.9	15.1	1173.2	5684.4	7558.1	3.91	18.95	25.19
T_6	49.1	154.7	231.7	6.5	10.8	12.8	1117.8	4452.7	5872.6	3.73	14.84	19.58
T_7	46.5	182.4	275.8	7.4	13.2	15.2	1307.5	5837.0	7732.8	4.36	19.46	25.78
T_8	44.1	168.5	246.5	7.2	12.1	14.3	1274.2	5104.1	6742.3	4.25	17.01	22.47
T_9	49.0	179.1	273.0	6.9	13.1	15.3	1427.8	5745.6	7808.7	4.76	19.15	26.03
T_{10}	50.0	157.7	234.9	6.6	11.6	13.4	1228.2	4841.2	6360.3	4.09	16.14	21.20
T_{11}	52.7	187.2	283.0	7.4	13.3	15.4	1405.2	5955.4	8109.8	4.68	19.85	27.03
T_{12}	50.4	170.8	264.9	6.9	12.6	14.6	1294.5	5288.5	7041.9	4.31	17.63	23.47
T_{13}	49.2	188.2	281.6	7.7	13.4	15.5	1472.8	5980.8	8210.8	4.91	19.94	27.37
T_{14}	51.7	172.2	269.0	7.6	12.9	14.7	1374.8	5550.5	7339.9	4.58	18.50	24.47
S.Em.±	2.2	8.2	11.6	0.3	0.4	0.5	121.0	294.4	386.6	0.40	0.98	1.29
C.D. (p=0.05)	NS	23.9	33.8	NS	1.1	1.5	NS	855.9	1123.7	NS	2.85	3.75

Note:
T_1: No nitrogen (Control)
T_2: 50 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
T_3: 50 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
T_4: 50 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
T_5: 50 kg N ha^{-1} (40% N basal) + remaining based on LCC 5
T_6: 100 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
T_7: 100 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
T_8: 100 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
T_9: 100 kg N ha^{-1} (40% N basal) + remaining based on LCC 5
T_{10}: 150 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
T_{11}: 150 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
T_{12}: 150 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
T_{13}: 150 kg N ha^{-1} (40% N basal) +remaining based on LCC 5
T_{14}: As per package of practices (150 kg N ha^{-1}; 50% N as basal and 50% N at 30 DAS

significantly higher with the split application of nitrogen based on SPAD and LCC values. Among the treatments, the plant height, number of leaves, leaf area, leaf area index, leaf:stem ratio, fresh weight and dry weight of plants at harvest were higher with the application of 150 kg N ha^{-1} (40 % N basal) + remaining based on SPAD meter critical value of < 50 (T_{11})(283, 15.4, 8109.8, 27.03, 0.45, 229.7, 65.0) and 150 kg N ha^{-1} (40 % N basal) + remaining based on LCC 5 (T_{13}) (281.6, 15.5, 8210.8, 27.37, 0.47, 228.3, 66.4) as compared to T_2, T_4, T_6 and T_8 and it was on par with rest of the treatments. The lowest values were recorded with control (T_1) (168.2, 11.7, 4722.3, 15.74, 0.38, 128.5 and 27.6). This might be due to split application of nitrogen based on SPAD 50 and LCC 5 resulting in higher number of green leaves due to continued availability of nitrogen throughout the growth stages. Increased uptake of nitrogen increases leaf area, leaf area index which in turn enhances photosynthetic activity, enabling crop to absorb more photo synthetically active radiation. The improvement in growth parameters such as increase in plant height, increased number of nodes, results in increased leaf area, leaf area index and number of green leaves. Application of nitrogen in split doses increases protein synthesis and meristematic growth owing to higher leaf area, LAI and number of green leaves. The split application of nitrogen influences accumulation of photosynthates in stem resulting in increased growth parameters. Nitrogen application based on SPAD and LCC threshold values reduced the N losses and helped in better utilization of nitrogen based on crop need. Zahida *et al.* (2021) too recorded higher growth attributes of fodder maize due to SPAD and LCC based nitrogen management in Kashmir valley during *kharif season*. Similar findings were also reported earlier by Subramanian *et al.* (2019) and Prakash *et al.* (2020).

Effect on green and dry fodder yield

Among the different nitrogen management practices, application of 150 kg N ha^{-1} (40 % N basal) + remaining based on LCC 5 (T_{13}) recorded significantly higher green and dry fodder yield (47.76 and 13.99) and it was on par with T_{11} (47.14 and 13.38), T_7 (45.33 and 13.02) and T_9 (45.18 and 13.00) (Table 4). All these treatments recorded higher green and dry fodder yield of fodder maize over the recommended package of practices (RPP) (T_{14}) (44.23 and 12.58). The lowest green and dry fodder yield of maize was observed in absolute control with nitrogen application (T_1) (25.11 and 5.38) followed by T_6 (36.34 and 8.30), T_{10}(38.21

Table 3. Growth parameters of fodder maize as influenced by SPAD and LCC based N management practices

Treatment	Stem girth (cm)			Leaf:Stem ratio			Fresh weight (g/plant^{-1})			Dry weight (g/plant^{-1})		
	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest	30 DAS	60 DAS	At harvest
T_1	1.57	1.70	1.87	2.57	0.29	0.38	21.4	99.1	128.5	7.8	20.3	27.6
T_2	1.65	2.00	2.60	2.63	0.34	0.43	24.8	147.5	196.3	10.0	34.9	49.6
T_3	1.75	2.30	3.03	2.80	0.39	0.44	25.6	166.0	209.6	9.20	48.0	58.0
T_4	1.80	2.00	2.85	2.57	0.34	0.42	25.2	149.8	193.1	9.3	33.3	51.6
T_5	1.85	2.20	3.00	2.85	0.37	0.47	26.8	166.2	217.3	10.3	47.9	60.0
T_6	1.95	1.70	2.30	2.67	0.34	0.41	25.8	120.5	172.9	9.5	30.2	39.3
T_7	1.80	2.60	3.23	2.87	0.42	0.46	27.3	172.9	223.7	10.2	54.0	64.2
T_8	1.85	1.80	2.56	2.70	0.36	0.44	25.6	151.3	192.7	8.0	37.1	49.8
T_9	1.75	2.70	3.30	2.86	0.40	0.46	27.5	175.4	223.9	11.6	53.1	64.5
T_{10}	1.90	1.80	2.53	2.84	0.32	0.41	27.0	123.7	188.4	8.8	30.6	41.4
T_{11}	1.97	2.90	3.33	3.06	0.41	0.45	28.2	178.9	229.7	11.7	56.4	65.0
T_{12}	1.95	2.10	2.95	2.92	0.40	0.44	27.6	160.6	207.8	9.9	39.6	57.1
T_{13}	1.80	2.80	3.30	3.10	0.43	0.47	28.5	179.6	228.3	10.1	55.8	66.4
T_{14}	1.90	2.20	3.07	2.97	0.39	0.45	28.4	161.4	208.4	11.6	49.4	59.2
S.Em.±	0.08	0.09	0.13	0.22	0.01	0.02	1.4	6.6	7.5	0.9	3.0	3.2
C.D. (p=0.05)	0.23	0.26	0.39	NS	0.04	0.05	NS	19.2	21.9	NS	8.6	9.4

Note:
- T_1: No nitrogen (Control)
- T_2: 50 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
- T_3: 50 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
- T_4: 50 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
- T_5: 50 kg N ha^{-1} (40% N basal) + remaining based on LCC 5
- T_6: 100 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
- T_7: 100 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
- T_8: 100 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
- T_9: 100 kg N ha^{-1} (40% N basal) + remaining based on LCC 5
- T_{10}: 150 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40
- T_{11}: 150 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50
- T_{12}: 150 kg N ha^{-1} (40% N basal) + remaining based on LCC 4
- T_{13}: 150 kg N ha^{-1} (40% N basal) +remaining based on LCC 5
- T_{14}: As per package of practices (150kg N ha^{-1}; 50% N as basal and 50% N at 30 DAS

and 8.50) and T_2 (39.91 and 10.14). The higher green and dry fodder yield recorded in T_{13}, T_{11}, T_7 and T_9 may be attributed to increased growth attributes *viz*., higher plant height, dry matter accumulation, leaf:stem ratio *etc*. owing to synchronized availability of nitrogen vis-à-vis crop need through LCC and SPAD based nitrogen management. Split application of nitrogen fertilizers throughout crop growth period had direct influence on cell multiplication, division, activation of co enzymes and production of nucleotides which helped in accumulation of more photosynthates and resulted in higher green fodder yield. The lower green and dry fodder yield observed in T_1, T_6, T_{10} and T_2 was mainly due to inadequate and untimely nitrogen application to fodder maize for optimum growth and development. Begum (2018) also reported increased yield of fodder maize due to split application of nitrogen based on the crop requirement rather than routine basal and top dressing of nitrogen.

Effect on economics

The gross returns varied significantly with the application of nitrogen based on SPAD and LCC values (Table 4). Among the treatments, application of 150 kg N ha^{-1} (40 % N basal) + remaining based on LCC 5 (T_{13}) recorded significantly higher gross returns (119395) and net returns (63107) and it was on par with T_{11} (117839 and 61595), T_9 (112954 and 57114), T_7 (113320 and 57508), T_{12} (107165 and 52124), T_5 (107346and 52003) and T_3 (107450 and 52101) among the different treatments. The lowest gross returns (62769) and net returns (14020) were recorded with control (T_1). Similar trend was observed in case of net returns also. There was significant variation in B:C ratio due to application of N based on SPAD and LCC. Among the treatments, application of 150 kg N ha^{-1} (40 % N basal) + remaining based on LCC 5 (T_{13}) recorded significantly higher B:C ratio (2.12) and it was statistically at par with T_{11} (2.10), T_9 (2.02) and T_7 (2.03). The increase in gross returns, net returns and B:C ratio with the application of 150 kg N ha^{-1} in four splits based on LCC 5 over recommended package of practice was to the extent of 7.96 %, 12.54 % and 6 %, respectively. Higher economic returns with the nitrogen application on the basis of LCC were also reported by Amareshappa (2018) and Ahirwar and Jatav (2021).

Conclusion

Based on the results it was concluded that LCC and SPAD meter can be used to apply nitrogen fertilizer in fodder maize. Application of 60 kg N ha^{-1} as basal + 90 kg N ha^{-1} in three splits based on LCC 5 or SPAD 50 was found to be optimum for better growth

Table 4. Yield and economics of fodder maize as influenced by SPAD and LCC based N management practices

Treatment	Green fodder yield (t/ha^{-1})	Dry fodder yield (t/ha^{-1})	Gross return (Rs/ha^{-1})	Net Return (Rs/ha^{-1})	Benefit: Cost ratio
T_1: No nitrogen (Control)	25.11	5.38	62,769	14,020	1.29
T_2: 50 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40	39.91	10.14	99,779	45,607	1.84
T_3: 50 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50	42.98	11.88	107,450	52,101	1.94
T_4: 50 kg N ha^{-1} (40% N basal) + remaining based on LCC 4	40.32	10.80	100,802	46,586	1.86
T_5: 50 kg N ha^{-1} (40% N basal) + remaining based on LCC 5	42.94	11.85	107,346	52,003	1.94
T_6: 100 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40	36.34	8.30	90,837	38,066	1.72
T_7: 100 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50	45.33	13.02	113,320	57,508	2.03
T_8: 100 kg N ha^{-1} (40% N basal) + remaining based on LCC 4	42.07	10.85	105,170	50,598	1.93
T_9: 100 kg N ha^{-1} (40% N basal) + remaining based on LCC 5	45.18	13.00	112,954	57,114	2.02
T_{10}: 150 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <40	38.21	8.50	95,527	42,223	1.79
T_{11}: 150 kg N ha^{-1} (40% N basal) + remaining based on SPAD meter critical value of <50	47.14	13.38	117,839	61,595	2.10
T_{12}: 150 kg N ha^{-1} (40% N basal) + remaining based on LCC 4	42.87	11.51	107,162	52,124	1.95
T_{13}: 150 kg N ha^{-1} (40% N basal) +remaining based on LCC 5	47.76	13.99	119,395	63,107	2.12
T_{14}: As per package of practices (150kg N ha^{-1}; 50% N as basal and 50% N at 30 DAS	44.23	12.58	110,583	56,074	2.00
S.Em.±	1.93	0.86	4,834	4,834	0.09
C.D. (p=0.05)	5.62	2.51	14,051	14,051	0.26

parameters leading to higher green fodder yield, dry fodder yield, gross returns and net returns over the existing recommended N management practice of application of 75 kg N ha^{-1} as basal and 75 kg N ha^{-1} as top dressing 30 days after sowing.

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