INTERNATIONAL JOURNAL OF FORESTRY AND CROP IMPROVEMENT (June, 2011); 2 (1) : 99-101

RESEARCH NOTE

Received : April, 2011; Accepted : June, 2011

Effect of irrigation scheduling and rate of nitrogen levels on yield and quality of summer fodder maize

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KEY WORDS : IW : CPE ratio, Fodder maize, Nitrogen, Green forage, Dry matter yield

Shah, K.A., Kadam, D.B. and Sonani, V.V. (2011). Effect of irrigation scheduling and rate of nitrogen levels on yield and quality of summer fodder maize , *Internat. J. Forestry & Crop Improv.,* **2** (1) : 99-101.

Live stock rearing is a very important part of our rural economy not only for animal products, but also for drought power. India has the largest live stock population of 520 million heard which is about 15 per cent of the world's livestock. Where as, India has only two per cent of the world's geographical area. This has put tremendous pressure on the availability of feed and fodder to livestock due to competing demands for food crops to meet the requirements ever increasing the population. The present feed and fodder resources of the country can meet only 47 per cent of the requirements with a vast deficit of 61 and 22 per cent of green and dry fodder, respectively.

Availability of green forage to the animals is the key to success of dairy enterprise and it is difficult to maintain the health and milk production of the live stock without supply of the green fodder. Fodder maize is one of the most important dual purpose crop grown through out year, if irrigation facilities are available. It is succulent, sweet, palatable, nutritious and free from toxicant and it can be safely fed at any stage of crop growth. It is also useful crop for making silage. Nitrogen requirements play a vital role in quantitative, as well as qualitative improvements in the productivity of fodder. Therefore, present experiment was planned to evaluate the effect of irrigation scheduling and rate of nitrogen levels on yield and quality of summer fodder maize.

An experiment on fodder maize was conducted at Collage Agronomy Farm, Anand Agricultural University, Anand during Summer-07. Twelve treatments comprised of three levels of irrigation (I_1: Irrigation at 0.6 IW: CPE ratio, I_2: Irrigation at 0.8 IW: CPE ratio, I_3: Irrigation at 1.0 IW: CPE ratio) and four levels of nitrogen (N_1: 80 kg N/ha, N2: 100 kg N/ha, N3: 120 kg N/ha, N_4: 140 kg N/ ha) were tested in spilt plot design with four replications. The soil of experimental field was loamy sand in texture having food drainage capacity. It was low in organic matter content and available nitrogen, medium in available phosphorus and high in available potash with pH 7.6 and EC 0.20 dsm^{-1}. African tall variety of fodder maize was selected for sowing at a distance of 45 cm between rows during the last week of February. Except the irrigation scheduling and nitrogen management's practices, whole recommendation package of practices was fallowed to raise the fodder maize.

Plant population per meter row length and leaf: stem ratio of forage maize were not influenced significantly by irrigation levels. However, numerically both parameters recorded maximum under the treatment of irrigating the fodder maize at 1.0 IW: CPE ratio (I_3). Plant height (150.1 cm) at harvest was observed significantly highest under the I_3 irrigation level (1.0 IW: CPE ratio) as compared to I1 irrigation level, which remained at par with I2 irrigation level (0.8 IW: CPE ratio). The increase in plant height at harvest under I_3 and I_2 irrigation levels was 9.88 and 7.47 per cent over I_1 irrigation level, respectively. This might be due the fact that increase in total quantity of water applied maintained moisture continuously in root zone area of plant. Therefore, it provides congenial condition for favourable growth in term of cell division and increase in cell size, which resulted in expansion of plant in term of height. Joon *et al.* (1988) also found similar types of results.

Green forage and dry matter yield of fodder maize

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Table 1 : Effect of irrigation scheduling and nitrogen levels on yield attributing, yield, quality, available N status at harvest and economics of summer fodder maize

Treatments	Plant population m^{-1} row at harvest	Plant height at harvest (cm)	Leaf: stem ratio	Yield (q/ha)		Crude protein content (%)	NDF content (%)	Av. N status at harvest (kg/ha)	Net return Rs/ha	BCR
				Green forage	Dry matter					
Irrigation levels (IW:CPE ratio) I										
I_1 : 0.6 IW :CPE ratio	11.04	136.6	0.650	218.5	59.65	5.43	77.50	188.9	4838	1.58
I_2 : 0.8 IW :CPE ratio	11.44	146.8	0.650	270.4	70.10	5.52	76.44	187.1	7449	1.85
I_3 : 1.0 IW :CPE ratio	11.75	150.1	0.660	357.9	87.91	5.73	75.78	181.4	12199	2.31
S. E. ±	0.22	2.69	0.009	1.04	0.27	0.08	0.54	1.52		
C. D. (P=0.05)	NS	9.33	NS	3.61	0.93	NS	NS	5.25		
C. V. %	7.86	7.46	5.47	10.94	11.02	6.07	2.84	3.27		
Nitrogen levels (kg/ha) N										
N_1 : 80 kg N/ha	11.08	135.5	0.623	241.4	64.42	5.30	78.35	177.5	6118	1.73
N_2 : 100 kg N/ha	11.72	143.5	0.647	279.6	72.36	5.48	76.82	183.7	8191	1.95
N_3 : 120 kg N/ha	11.57	149.9	0.681	311.1	79.14	5.68	75.84	188.5	9857	2.12
N_4 : 140kg N/ha	11.27	149.3	0.658	296.9	74.31	5.78	75.24	193.5	8783	1.97
S. E. ±	0.22	2.70	0.010	0.93	0.29	0.08	0.607	2.02		
C. D. (P=0.05)	NS	NS	0.028	2.70	0.85	0.28	1.76	5.86		
C. V. %	6.96	6.47	5.21	8.44	10.41	4.88	2.75	3.78		
Interaction (Ix N)	NS	NS	NS	NS	NS	NS	NS	NS		

NS=Non-significant

were significantly differed among the different irrigation treatments. Treatment I_3 (1.0 IW: CPE ratio) recorded significantly the highest green forage yield of 357.9 q/ha and dry matter yield of 87.91 q/ha, where as, treatments I_1 showed remarkably lower green forage (218.5 q/ha) and dry matter (59.65 q/ha) yields. The magnitudes of increase in green forage yield of 63.79 and 32.36 per cent and dry matter yield of 47.37 and 25.40 per cent under the I_3 irrigation treatment over I_1 and I_2 treatments, respectively. This might be due to positive effect of irrigation which increases the availability of essential nutrients, resulted in balanced nourishment of the plants and the formation of taller, thicker leaves ultimately increased the green forage and dry matter yield. The present findings lend support from results of Joon *et al.* (1988), Patel and Patel (1991) and Agrawal *et al.* (2000).

Although, non significant but numerically higher value of crude protein content (5.73 %) was observed under I_3 irrigation treatments. Similarly, neutral detergent fiber content was not remarkably affected by irrigation treatments.

Irrigation treatment I_1 and I_2 being at par with each other recorded significantly higher available N status over treatments I_3. The decrease trends of nitrogen status of the soil as the irrigation level increase might be due to more absorption of available N forms from the soil solution, which can be signifies by the higher data of green forage and dry matter yield obtained under I_1 treatment. Maximum net realization of 1219 Rs/ha and BCR of 2.31 were accursed under the treatments I_3, where as, minimum net realization (4838 Rs/ha) and BCR (1.58) under the I_1 treatment.

Nitrogen levels did not show any significant effect on plant population at harvest. Plant height (149.9 cm) at harvest was recorded significantly highest under the application of 120 kg N /ha, which being at par with the treatment N_2 (100 kg N/ha) and N_4 (140 kg N/ha), compared to lower level of nitrogen (80 kg/ha). The increase in plant height with nitrogen application was due to its pronounced effect on cell division and its multiplication, which might be probable reason of increase in plant height. Sood *et al.* (1994) and Devi (2002) also found similar types of results.

Significantly the highest leaf: stem ratio (0.681) was observed under the same treatments of application of 120 kg N/ha over lower dose of 80 and 100 kg N/ha, which remained at par with 140 kg N/ha. The probable reason behind this was poor development of stem as compared to leaves resulting in higher proportion of leaves in plants. Application of 120 kg N/ha recorded significantly highest green forage (311.19 q/ha) and dry matter (79.14 q/ha) yield, where as, significantly the lowest green forage (241.49 q/ha) and dry matter (64.42 q/ha) yield was registered under treatments N_1 (80 kg N/ha). The magnitudes of increase in green forage yield of 4.78, 11.27, and 28.87 per cent and dry matter yield of 6.50, 8.57 and 22.85 per cent over the treatment N_4 (140 kg N/ha), N_2 (100 kg N/ha) and N_1 (80 kg N/ha), respectively. The increase in green forage and dry matter yield are closely related with plant growth characters. All pant growth character like plant height and leaf: stem ratio were increased with the nitrogen application. The increase in leaf part due to nitrogen application might have ultimately resulted in higher photosynthetic activities and also in production of more photosynthesis. Similar types of results were closely conformed by Joon *et al*. (1988), Sood *et al*. (1994) and Dudhat *et al*. (2004).

Treatments N_4 (140 kg N/ha) and N_3 (120 kg N/ha) remained at par with each other recorded significantly higher crude protein content over N_1 (80 kg N/ha). Application of nitrogen play vital role in protein synthesis because it is a important constituent of protein and chlorophyll. NDF content was found significantly higher with the application of 80 kg N/ha (N_1) over N_3 (120 kg N/ha) and N_4 (140 kg N/ha), but it was at par with N_2 (100 kg N/ha). The reduction in NDF content was observed with application of nitrogen might be due to increase in succulence of plant by reducing formation of polysaccharides viz., cellulose, hemi-cellulose and lignin, which generally account for NDF in the plant.

Significantly the highest available nitrogen was found under the higher levels of nitrogen application *i.e.* 140 kg N/ha as compared to treatments N_1 and N_2, which remained at par with the application of 120 kg N/ha.

Nitrogen application @ 120 kg/ha registered the maximum net realization (9857 Rs/ha) and highest BCR (2.12) followed by treatments N_4, N_2 and N_1.

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