The Andhra Agric. J 63 (2): 273-275, 2016

Growth, Yield and Quality of Fodder Maize as Influenced by Varied Nitrogen Levels and Crop Geometry

Bhadre Chandbashi K, N Sunitha, A V Nagavani, J V Ramana and G Prabhakara Reddy

Department of Agronomy, S V Agricultural College, Tirupati 517 502, Andhra Pradesh

ABSTRACT

A field experiment was conducted during *kharif,* 2013 at S V Agricultural College Farm, Tirupati to find out optimum nitrogen level and crop geometry for fodder maize. The outcome revealed that application of the highest level of nitrogen @ 220 kg ha^{-1} produced higher LAI, dry matter and green fodder yield as well as the best quality of fodder maize *viz.,* higher crude protein, crude fat and total ash percentage over 180 and 140 kg N ha^{-1}. The crop geometry of 30 × 10 cm resulted in significantly higher LAI, dry matter and green fodder yield over 30 × 15, 30 × 20, 45 × 10, 45 × 15 and 45 × 20 cm. The highest crude protein, crude fat and total ash were obtained from the crop geometry of 45 × 20 cm which was significantly higher over all other crop geometries tried.

Key words : Dry Matter, Fodder Maize, Green Forage Yield, LAI, Quality Attributes.

Maize is the most important cereal crop in India, which provides food, feed and fodder. It plays a key role in human diet, animal feed and provide adequate amount of energy and protein. The importance of fodder crops in agriculture needs no emphasis because of the fact that a regular, an adequate and nutritious fodder is the basic requirement for livestock production to meet the demand of milk production, butter and other by-products for human consumption. Fodder maize is highly fertilizer responsive and yields more than other composite varieties grown for staple food. Nitrogen is the most important major nutrient element for maize plant as it increases the vegetative growth of plant as well as the total dry matter production, which are the twin desirable qualities of an ideal fodder crop. Therefore, it becomes necessary to determine the optimum dose of nitrogen. The crop geometry is an important factor that greatly influences the potential yield of fodder maize. In wider crop geometry with less plant population, solar radiation falling within the row might be wasted particularly during early stages of crop growth. Narrow crop geometry in maize leads to more absorption of solar radiation in upper part of canopy and shading of leaves in lower part which may negatively influence the yield. Therefore crop geometry helps in altering the canopy architecture affecting light interception and carbon dioxide assimilation. The optimum plant population may vary depending upon the crop geometry and fertility status of the soil. Thus, there is possibility of supporting the higher plant population with increase in fertilizer application. Information on the performance of African Tall, high yielding fodder maize grown at varying plant population and applied fertilizer, is less available and needs thorough investigations. Keeping in view the above consideration, the present study was undertaken to study the effect of different nitrogen levels and varied crop geometry on the fodder maize.

MATERIAL AND METHODS

The study pertaining to the effect of different nitrogen levels and varied crop geometry on the growth, yield and quality of fodder maize was carried out at S.V. agricultural college, Tirupati, Acharya N.G. Ranga Agricultural University during *kharif,* 2013. The experiment was laid out in split plot design with three replications. The treatments of nitrogen levels in main plots were: N□ - 140 kg ha^{-1}, N, - 180 kg ha^{-1} and N*f* - 220 kg ha^{-1} while the treatments of crop geometry in sub plots were:

P□ - 30 x 10 cm, P, - 30 x 15 cm, P*f* - 30 x 20 cm, P,, - 45 x 10 cm, P… - 45 x 15 cm and P† - 45 x 20 cm. The crop sown during the fourth week of July, 2013. The full dose of phosphorus and potash at the rate of 75 and 30 kg ha^{-1} respectively was applied at the time of sowing. Nitrogen was applied as per the treatment in two splits as half of the dose at the time of sowing and remaining half of nitrogen was applied at knee high. The nitrogen, phosphorus and potash were applied in the form of urea, single super phosphate and muriate of potash respectively. All other agronomic practices were followed uniformly for all the treatments. The crop was harvested at milky stage. The quality parameters *viz.,* crude protein, crude fat and total ash content were analyzed by using standard methods. The data on yield, quality and other biometric data were analyzed statistically as per Panse and Sukhatme (1978).

Table 1. Effect of different nitrogen levels and crop geometry on growth, yield and quality of fodder maize.

Treatment	Leaf area index		Dry matter (kg ha^{-1})		Green fodder yield (q ha^{-1})	Crude protein (%)	Crude fat (%)	Total ash (%)
	40 DAS	At harvest	40 DAS	At harvest				
Nitrogen levels (kg ha^{-1})								
N_1-140	2.43	3.45	3046	4745	189.8	8.03	1.22	8.68
N_2-180	2.86	3.91	4185	5803	232.2	8.43	1.40	9.29
N_3-220	3.16	5.04	5253	7181	286.4	9.19	1.62	9.71
SEm±	0.03	0.06	95.81	128.0	4.8	0.05	0.01	0.04
CD (P = 0.05)	0.12	0.22	375	501	18.9	0.19	0.06	0.19
Crop geometry								
P_1 - 30 × 10 cm	3.62	5.42	6344	8459	337.7	7.74	1.19	8.60
P_2 - 30 × 15 cm	3.01	4.63	4638	6351	253.9	8.09	1.31	8.96
P_3 - 30 × 20 cm	2.62	3.65	3575	5196	207.8	8.82	1.46	9.55
P_4 - 45 × 10 cm	2.96	4.58	4446	6167	246.3	8.16	1.67	8.93
P_5 - 45 × 15 cm	2.57	3.57	3467	5098	204.7	8.92	1.50	9.51
P_6 - 45 × 20 cm	2.09	2.96	2500	4188	166.6	9.57	1.68	9.82
SEm±	0.04	0.03	67.16	177.8	4.5	0.03	0.00	0.05
CD (P = 0.05)	0.13	0.11	193	339	13.0	0.09	0.02	0.14

RESULTS AND DISCUSSION

The effect of different doses of nitrogen on LAI, dry matter, green forage yield and the quality of fodder maize was presented in Table 1. The results revealed that LAI, dry matter and green forage yield of fodder maize significantly influenced by increasing nitrogen dose and at varied crop geometry. The application of nitrogen @ 220 kg ha^{-1} produced maximum leaf area index, highest dry matter as well as the green forage yield followed by the application of 180 kg N ha^{-1} and the lowest was with 140 kg N ha^{-1}. Increase in LAI with higher levels of nitrogen application might be due to its beneficial effect exerted on cell division and expansion. The present findings are in conformity with those of Girija (2002) and Joshi and Kuldeep Kumar (2007). Increased adsorption of nitrogen might have maintained higher meristematic activity with favourable effect on cell enlargement resulting in more number of leaves and production of larger leaves. Thus, the increase in source size might have resulted in better utilization of radiant energy, there by enhanced the

photosynthetic efficiency, which eventually resulted in higher dry matter and green fodder yield. The findings evidenced in this investigation corroborates with the reports of Puri and Tiwana (2008) and Sheraz *et al.* (2010).

The crop geometry of 30 × 10 cm with 3,33,333 plants ha^{-1} produced maximum LAI and higher dry matter as well as the green forage yield compared to rest of the crop geometries tried. The lowest of the parameters was obtained with 45 × 20 cm (1,11,111 plants ha^{-1}). Induced higher plant density per unit area, which in turn produced more number of green leaves per unit area might have resulted in higher LAI, dry matter and green forage yield. These results are in agreement with the findings of Verma *et al.* (1999).

Crude protein, crude fat and total ash percentage of fodder maize were significantly influenced by the nitrogen levels and varied crop geometry at harvest. The application of nitrogen @ 220 kg N ha^{-1} recorded the highest crude protein, crude fat content and total ash percentage than the other two levels. It was followed by 180 kg N ha^{-1}. The improved quality of fodder maize with increase in nitrogen level might be due to the reason that application of nitrogen resulted in better physiological and bio-chemical activity of plants under comfortable level and also enhanced the amino acid formation. Findings of the present investigation are in agreement with those of Muhammad *et al.* (2012) and Spandana (2012).

The quality of fodder maize was observed to be significantly influenced by the crop geometry. Therefore, 45 × 20 cm of crop geometry resulted in significantly higher crude protein, crude fat and total ash percent compared to other crop geometries tried. By narrowing the crop geometry the quality of fodder maize was decreased and it was the lowest with 30 × 10 cm. Similar results have been reported Muhammad *et al*. (2011) and Spandana (2012).

The study revealed that crop geometry of 30 × 10 cm (3,33,333 plants ha^{-1}) produced highest green fodder yield under 220 kg N ha^{-1}, where as the best quality was obtained with 45 × 20 cm (1,11,111 plants ha^{-1}) and 220 kg N ha^{-1} in fodder maize.

LITERATURE CITED

Girija Devi L 2002 Forage yield of maize (Zea mays L.) as influenced by nitrogen levels and biofertilizers. *Forage Research,* 27(4): 263-266

Joshi Y P and Kuldeep Kumar 2007 Effect of nitrogen levels and seed rate on growth, yield and quality of fodder maize variety African Tall. *Forage Research,* 33(3): 171-173

Muhammad Asif Shehzad, Muhammad Maqsood, Muhammad Altaf Bhatti, Wahid Ahmad and Muhammad Rafiq Shahid 2012 Effects of nitrogen fertilization rate and harvest time on maize (Zea mays L.) fodder yield and its quality attributes. *Asian Journal of Pharmaceutical and Biological Research,* Vol-2

Muhammad Aslam, Asif Iqbal, Muhammad Shahid Zamir, Muhammad Mubeen and Muhammad Amin 2011 Effect of different nitrogen levels and seed rates on yield and quality of maize fodder. *Crop and Environment,* 2(2): 47-51

Panse V G and Sukhatme P V 1978 Statistical Method for Agricultural workers, ICAR, New Delhi, 152 pp.

Puri K P and Tiwana U S 2008 Effect of organic and inorganic sources of nitrogen in forage maize. *Forage Research,* 34(1): 62-63

Sheraz Mahdi S, Badrul Hasan R A, Bhat and Aziz M A 2010 Yield and economic of fodder maize as influenced by nitrogen, seed rate and zinc under temperate condition. *Forage Research,* 36(1): 22-25

Spandana P Bhatt 2012 Response of sweet corn hybrid to varying plant densities and nitrogen levels. *African Journal of Agricultural Research,* Vol. 7(46): 6158-6166

Verma S S, Kumar A and Sing V 1999 Effect of nitrogen levels and row spacing on nitrogen content and uptake in fodder maize. *Forage Research,* 25(2&3): 139-140

(Received on 24.06.2014 and revised on 05.03.2016)