Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(4): 2363-2365
Received: 14-05-2018
Accepted: 18-06-2018

Samuel J Kerketta
M.Sc. Ag. Agronomy IVth Semester student, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology And Sciences, Allahabad, Uttar Pradesh, India

Rajesh Singh
Assistant Professor, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology And Sciences, Allahabad, Uttar Pradesh, India

Correspondence
Samuel J Kerketta
M.Sc. Ag. Agronomy IVth Semester student, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology And Sciences, Allahabad, Uttar Pradesh, India

Effect of integrated nitrogen management and planting geometry on growth and productivity of maize. (*Zea mays* L.) Var. SHIATS-Makka 3

Samuel J Kerketta and Rajesh Singh

Abstract

A field experiment was conducted during the kharif season of 2017 on maize crop (var. SHIATS-Makka 3) at the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Allahabad (U.P.). The experiment comprised of four integrated nitrogen management treatments, including 75% of the recommended dose of nitrogen (RDN) to be provided through urea and 25% of the RDN to be provided through vermicompost or through Farm Yard Manure, with or without *azotobactor* seed inoculation and three spacings *viz*., 50 cm x 20 cm, 60 cm x 15 cm and 60 cm x 20 cm, which were compared with control (100% of the recommended dose of nitrogen only through urea alone, hence comprising of thirteen treatment combinations, laid out in Randomized Block Design and replicated thrice. The results showed that the plots with most narrow plant-plant spacing (60cm x 15 cm) showed higher plant average height (182.18 cm). Maximum plant dry weight at 60DAS (170.09 g) was recorded in plots of 75% RDN through Urea + 25% RDN through Vermicompost with the spacing of 60cm x 20cm. Also the same plot showed highest Test weight (258.5gm) as well as Grain yield (9.52t/ha). However the factor of seed inoculation with azotobacter showed little positive effect on the grain yield.

Keywords: maize, integrated nitrogen management, planting geometry, FYM, vermicompost, azotobacter, growth and yield

Introduction

Maize is a versatile crop with a high yield potential. Amongst the various inputs that we use in our agriculture system, the use of fertilizers is the main factor for achieving the production goals. There is a need of higher doses of fertilizers for higher productivity, but with addition of higher chemical quantities to the soil leads to the problems of land degradation and hampered ecology in the long term. The demands of high production cannot be met at the cost of ecological imbalance. It is thus well established that the productivity of the crop cannot be further increased with the additional use of chemical fertilizers alone, the addition of organic fertilizers could help in increasing the yield through increased soil productivity and fertilizer use efficiency (Joshi *et al*. 2013) [4]. To maintain this balance and to achieve the maximum productions we have an option to turn to Integrated Nutrient Management and most appropriate combination of organic and inorganic fertilizers for best results. (Kalhapure *et al*. 2014) [5]. There is a supposedly optimum plant density for a crop. In low planting density, even though single plant production increases but the yield per unit area decreases. On the other hand, high density increases the competition and decreases the yield. In nutrient management, nitrogen is the most prominent for the growth and yield of maize. Ideal nitrogen management optimizes the grain yield, stover yield and also the nitrogen use efficiency, beside minimizing the potential for leaching of nitrogen. (Dar *et al*. 2014) [3]. The var. SHIATS-MAKKA 3 is a composite, white seeded maize variety with bold grains with yield potential of about 3-4 tons/ha, resistant to maydis leaf blight and downy mildew. The present experiment was conducted to see the effect of integrated nitrogen management with varying spacing on growth and yield of composite maize “SHIATS MAKKA 3” under the agro-climatic conditions of Allahabad region.

Materials and Methods

A field experiment was conducted in the kharif season of 2017 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Allahabad, Uttar Pradesh, which is located at 25° 24’ 41.27” N latitude, 81° 51’ 3.42” E longitude and at an altitude of 98 m above the mean sea level. This area is situated in the south east side of Allahabad city, on the right side of the river Yamuna. The soil of the experimental field was sandy loam with a pH 7.4. With the average rainfall of 544.8mm in the kharif season of 2017, the sowing of the crop was done on July 22nd, 2017 and was harvested in the last week of October, 2017. The field experiment consisted of 13 treatments, replicated thrice and laid out in Randomized Block Design. The treatment consisted of four combinations of integrated nitrogen management included 75% nitrogen provided through urea and 25% of the recommended dose of nitrogen was provided either through vermicompost or by FYM, with or without *azotobactor* seed innoculation and three planting geometries *i.e*. 50cm x 20m, 60cm x15cm and 60cm x 20cm compared with a control plot where 100% N was met through urea and standard spacing of 60cm x 25cm. Half dose of N and full doses of P and K were applied as basal and the remaining nitrogen was applied in two equal splits at knee height and tasseling stage. The whole amount of the organic manures were applied as basal.

Results and Discussion

The result of the experiment revealed that the treatments having integrated nitrogen management through vermicompost gave the highest grain yield among all the treatments. Higher plant height and dry matter accumulation in plants having nutrient provided by 75% RDN through Urea and the rest supported by vermicompost has also been reported by Dadarwal *et al.* 2009 [2]. Singh *et al.* 2009 [2] stated that vermicompost application significantly improved dry matter, crop growth rate and grains/cob over farmyard manure. The same was followed in the grain yield parameter; the treatment having vermicompost integrated fertilizer application with the spacing of 60cm x 20cm followed by the treatment having FYM integrated fertilizer management and the spacing of 60cm x 20cm. The better performance of vermicompost over FYM has also been reported by Channabasavanna *et al.* (2007) [1].

The planting geometry significantly influenced the plant height as well as dry weight. The taller plants with reduced dry weight was noted with increasing planting density. It was found that the taller plants were in the closely spaced treatments but had less dry weight (Plant height- 182.18cm and Dry weight-143.79gm). It could be due to increased intra-row competition for light, moisture, nutrients and other environmental resources under this treatment. The maximum dry weight was observed in the wider spacing due to less competition (Dar *et al.* 2014) [3]. The yield was maximum (7.86 t/ha) at 60cm x 20cm spacing. Similar findings have been reported by Singh *et al.* 2011 [11]. The higher number of cobs was recorded in treatments with 60 cm row-row distance due to decreased competition. The test weight showed maximum values in vermicompost integrated treatments with the spacing of 60cm x 20cm followed by treatments having the same fertilizer combination with seed inoculation of azotobacter. The minimum yield was recorded in the control treatments, the reason being widest planting geometry (60cm x 25cm) which implies to lesser crop population to produce the yield along with no integrated nitrogen management or seed inoculation with azotobacter.

Table 1: Physiological growth parameters at 60 DAS

Treatment	Plant height (cm)	Dry weight (g)	CGR (40-60 DAS) (g m^{-2} day^{-1})
100% N Urea + 60cm x 25cm	171.16	127.80	4.38
75% N Urea + 25% N FYM + 50cm x 20cm	144.95	144.92	5.11
75% N Urea + 25% N FYM + 60cm x 15cm	182.18	143.79	4.91
75% N Urea + 25% N FYM + 60cm x 20cm	148.88	152.39	5.63
75% N Urea + 25% N Vermicompost + 50cm x 20cm	170.91	167.19	5.93
75% N Urea + 25% N Vermicompost + 60cm x 15cm	177.12	153.81	5.77
75% N Urea + 25% N Vermicompost + 60cm x 20cm	175.56	170.09	5.59
75% N Urea + 25% N FYM + 50cm x 20cm + Azotobacter	175.98	155.35	5.52
75% N Urea + 25% N FYM + 60cm x 15cm + Azotobacter	149.11	146.80	5.40
75% N Urea + 25% N FYM + 60cm x 20cm + Azotobacter	161.53	156.27	5.54
75% N Urea + 25% N Vermicompost + 50cm x 20cm + Azotobacter	156.15	167.69	5.95
75% N Urea + 25% N Vermicompost + 60cm x 15cm + Azotobacter	172.50	166.61	5.56
75% N Urea + 25% N Vermicompost + 60cm x 20cm + Azotobacter	176.74	166.78	5.86
SEm±	3.14	2.868	0.19
CD(*P*=0.05)	9.16	8.465	0.40

Table 2: Yield attributes parameters

Treatment	Test weight (gm)	Grain Yield (t/ha)	Stover yield (t/ha)	Harvest Index
100% N Urea + 60cm x 25cm	228	4.43	11.52	28.68
75% N Urea + 25% N FYM + 50cm x 20cm	206.3	6.50	16.90	30.22
75% N Urea + 25% N FYM + 60cm x 15cm	205.7	6.30	16.38	29.57
75% N Urea + 25% N FYM + 60cm x 20cm	231	5.63	14.64	32.66
75% N Urea + 25% N Vermicompost + 50cm x 20cm	231.3	7.50	19.50	29.18
75% N Urea + 25% N Vermicompost + 60cm x 15cm	220.7	6.90	17.94	27.86
75% N Urea + 25% N Vermicompost + 60cm x 20cm	258.5	7.86	20.45	29.48
75% N Urea + 25% N FYM + 50cm x 20cm + Azotobacter	228.8	7.43	19.32	28.37
75% N Urea + 25% N FYM + 60cm x 15cm + Azotobacter	216.7	7.26	18.89	30.54
75% N Urea + 25% N FYM + 60cm x 20cm + Azotobacter	217.8	7.76	20.19	31.67
75% N Urea + 25% N Vermicompost + 50cm x 20cm + Azotobacter	232.1	7.16	18.63	30.38
75% N Urea + 25% N Vermicompost + 60cm x 15cm + Azotobacter	208.6	6.93	18.02	27.56
75% N Urea + 25% N Vermicompost + 60cm x 20cm + Azotobacter	239.8	7.40	19.24	28.38
SEm±	10.52	0.45	1.16	2.13
CD (*P*=0.05)	21.72	1.30	3.38	4.40

Conclusion

From the above experimental findings, it can be concluded that for obtaining higher growth and yield of *kharif* maize 25% recommended dose of nitrogen should be met out through vermicompost application in addition to 75% N through urea and should be sown at a spacing of 60 cm x 20 cm.

References

1. Channabasavanna AS, Nagappa Biradar DP. Effect of Integrated Nutrient Management on Productivity, Profitability and Sustainability of Irrigated Maize. Karnataka J Agric. Sci. 2007; 20(4):837-839.
2. Dadarwal RS, Jain NK, Singh D. Integrated nutrient management in baby corn (*Zea mays*). Indian Journal of Agronomy. 2009; 79(12):102-1025.
3. Dar EA, Harika AS, Datta A, Jat HS. Growth, yield and economic return from the dual purpose baby corn (*Zea mays)* under different planting geometry and nitrogen levels. Indian Journal of Agronomy. 2014; 59(3):468-470.
4. Joshi E, Nepalia Verma A, Singh D. Effect of integrated nutrient management on growth, productivity and economics of maize (*Zea mays*). Indian Journal of Agronomy. 2013; 58(3):434-436.
5. Kalhapure A, Shete B, Dhonde M, Bodake P. Influence of different organic and inorganic sources of nutrients on maize (*Zea mays)*. Indian Journal of Agronomy. 2014; 59(2):295-300.
6. Singh D, Nepalia V. Influence of integrated nutrient management on quality protein maize (*Zea mays*) productivity and soils of southern Rajasthan. Indian Journal of Agricultural Sciences. 2009; 79(12):1020-1022.
7. Singh U, Saad AA, Ram T, Chand L, Mir SA, Aga FA. Productivity, economics and nitrogen-use efficiency of sweet corn (*Zea mays saccharata*) as influenced by planting geometry and nitrogen fertilization. Indian Journal of Agronomy. 2011; 57(1):43-48.