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GROWTH AND YIELD OF SINGLE CROSS HYBRID MAIZE (*ZEA MAYS* L.) *CV.* HQPM-1 AS INFLUENCED BY INTEGRATED NUTRIENT MANAGEMENT

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ABSTRACT

A field experiment was conducted during *kharif* season of 2011 on loamy soil to study of growth and yield on single cross hybrid maize (*Zea mays* L.) cv. HQPM-1 as influenced by integrated nutrient management. The experiment consisted of 12 treatments T_1 (100%, NPK with RDF100:60:40 kg N-P_2O_5-K_2O/ha), T_2 (100% NPK + Zn @ 3kg/ha), T_3 (100% NPK + S @ 40 kg/ha), T_4 (100% NPK + Zn @ 3 kg + S @ 40 kg/ha), T_5 (100% NPK + Seed treatment with *Azotobacter* @ 30 g/kg seed), T_6 (FYM @ 5 t/ha + 100% NPK), T_7 (100% NPK +FYM @ 5 t/ha), T_8 (FYM @ 10 t/ha), T_9 (125% NPK), T_{10} (100% NP), T_{11} (100% N) and T_{12} (Control) tested in randomized block design with four replications. The results indicated T_7 (100% NPK + FYM @ 5 t/ha) showed significantly higher the plant height, dry matter accumulation, CGR, cob weight, cob length, weight of grains cob shelling percent, 1000 grain weight, seed yield and straw yield over control and other treatments. Whereas, the CGR, no. of cobs/plant and harvest index unchanged under different treatments

Keywords:
CGR, FYM, INM, Maize, Nutrients, RGR, Yield

INTRODUCTION

Maize is considered as the “Queen of Cereals”. Being a C_4 plant, it is capable to utilize solar radiation more efficiently even at higher radiation intensity. In India, Maize (*Zea mays* L.) is the third most important cereal crop after rice and wheat that provides food, feed, fodder and serves as a sources of basic raw material for the number of industrial products *viz.*, starch, protein, oil, alcoholic beverages, food sweeteners, cosmetics, bio-fuel etc. No other cereal is being used in as many ways as maize. Maize is an exhaustive crop and requires high quantities of nitrogen during the period of efficient utilization, particularly at 25 DAS and pre-teaselling (40 DAS) stages for higher productivity. Nitrogen is indispensable for increasing crop production as a constituent of protoplasm and chlorophyll and is associated with the activity of every living cell. Similarly, phosphorus also plays an important role in energy storage and transfer in the plant system. In addition, phosphorus is an important constituent of nucleic acids, phytins, phospholipids and enzymes. Several workers have reported the beneficial effects of NPK fertilization on productivity of maize (Mehta *et al.*, 2005).

MATERIALS AND METHODS

A field experiment was conducted during *kharif* season of 2011 at Sardarkrushinagar Dantiwada Agricultural University, (Gujarat) in randomized block design with four replications. The soil was loamy in texture, neutral in reaction (pH 7.17), low in organic carbon (0.43%), available medium nitrogen (315 kg/ha), available medium phosphorus (23 kg P_2O_5/ha), medium in potassium (281 kg K_2O/ha) content, Available S (20 mg/kg) and DTPA Extractable Zn (3.65 mg/kg). The experiment consisted of 12 treatments T_1 {100% NPK (RDF100:60:40 kg N-P_2O_5-K_2O/ha)}, T_2 (100% NPK +Zn @ 3kg/ha), T_3 (100% NPK +S @ 40 kg/ha), T_4 (100% NPK +Zn @ 3 kg/ha + S @ 40 kg/ha), T_5 (100%NPK + Seed treatment with *Azotobacter* @ 30 g/kg seed), T_6 (FYM @ 5 t/ha + 100% NPK), T_7 (100% NPK + FYM @ 5 t/ha), T_8 (FYM @ 10 t/ha), T_9 (125% NPK), T_{10} (100% NP), T_{11} (100% N) and T_{12} (Control). RDF was 100:60:40 kg N-P_2O_5-K_2O/ha. The maize cv. HQPM-1 was sown on 14th July, 2011 using seed rate 20 kg/ha with a row spacing of 60 cm. The crop was harvested on 12st November, 2011.

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Table 1 Effect of integrated nutrient management on growth and yield attributes of maize

Treatment	Plant height (cm)		Dry matter (g/plant)		CGR ($g/m^{-2}/day$)	RGR (g/g/day)	Cobs/plant	Cob weight (g)
	60 DAS	At Harvest	60 DAS	At Harvest				
T_1:100% NPK (RDF)	163.55	199.27	89.70	141.50	21.02	0.048	1.05	115.90
T_2:100% NPK + Zn @ 3 kg/ha	165.40	200.07	92.72	153.75	20.51	0.043	1.10	118.90
T_3:100% NPK + S @ 40 kg/ha	162.65	199.95	92.05	154.65	20.46	0.044	1.00	115.50
T_4:100% NPK + Zn @ 3 + S @ 40 kg/ha	180.25	201.45	96.60	161.08	21.43	0.043	1.15	121.90
T_5:100% NPK + Treatment with *Azotobacter*@ 30 g/kg seed	161.15	195.05	91.22	151.63	20.09	0.043	1.00	114.60
T_6: FYM @ 5 t/ha + 100% NPK [NPK content of FYM] furrow	162.40	198.60	92.00	152.85	21.63	0.046	1.05	119.47
T_7:100% NPK + FYM @ 5 t/ha [furrow]	188.95	228.65	104.60	183.10	23.71	0.045	1.15	135.56
T_8:FYM @10 t/ha	135.60	175.85	70.40	118.60	14.07	0.037	1.00	98.68
T_9:125% NPK	186.75	224.00	98.90	162.85	21.82	0.043	1.00	122.55
T_{10}:100% NP	164.45	192.45	80.86	130.25	17.74	0.043	1.00	105.00
T_{11}:1100% N	156.85	187.45	72.60	119.42	16.16	0.044	1.00	100.19
T_{12}: Control [N_0 P_0 K_0]	125.55	143.45	50.90	78.12	10.87	0.041	0.95	83.20
CD (*P*=0.05)	22.05	28.35	10.91	19.31	1.53	NS	NS	17.98

Table 2 Effect of integrated nutrient management on yield attributes and yield of maize

Treatment	Cob length (cm)	Weight of grains/cob (g)	Shelling (%)	Test weight (g)	Yield (kg/ha)		Harvest Index (%)
					Grain	Straw	
T_1:100% NPK (RDF)	17.10	85.70	75.29	196.81	3480	4862	41.72
T_2:100% NPK + Zn @ 3 kg/ha	17.54	86.65	76.18	199.41	3670	5016	42.26
T_3:100% NPK + S @ 40 kg/ha	17.41	86.73	76.12	201.25	3585	4971	41.77
T_4:100% NPK + Zn @ 3 + S @ 40 kg/ha	18.15	92.63	76.85	202.55	3841	5197	42.48
T_5:100% NPK + Treatment with *Azotobacter*@ 30 g/kg seed	16.82	86.53	76.10	194.95	3593	4979	41.96
T_6: FYM @ 5 t/ha + 100% NPK [NPK content of FYM] furrow	17.05	84.30	75.19	197.55	3540	5011	41.40
T_7:100% NPK + FYM @ 5 t/ha [furrow]	18.47	99.90	78.60	211.81	4292	5647	43.18
T_8:FYM @10 t/ha	16.00	74.46	68.09	185.17	2690	3530	43.25
T_9:125% NPK	18.45	94.20	76.90	203.25	3990	5492	42.08
T_{10}:100% NP	15.30	76.89	74.37	192.17	3089	4331	41.63
T_{11}:1100% N	14.00	69.57	73.24	186.25	2560	3573	41.82
T_{12}: Control [N_0 P_0 K_0]	11.10	48.19	54.90	162.19	1719	2295	42.83
CD (*P*=0.05)	2.28	12.43	10.46	24.54	480	615	NS

RESULTS AND DISCUSSION

Effect of INM on growth

The results indicated T_7 (100% NPK + FYM @ 5 t/ha) showed significantly higher the plant height (60 DAS and at harvest), dry matter accumulation (60 DAS and at harvest) and CGR and being at par with T_4 (100% NPK + Zn @ 3 kg/ha + S @ 40 kg/ha) in plant height and dry matter accumulation (60 DAS) over other treatments and control (Table-1). However, the CGR unchanged under different levels of treatments. This might be due to the decomposition of FYM at later stage resulted into higher availability of nitrogen to crop growth. Application of inorganic with Farm yard manure (FYM) might have supplied the adequate and continuous amount of nutrients at different stages due to release of sufficient amount of nutrients by mineralization at a constant level that resulted in higher plant growth. These results are in conformity with (Sargoni and Poss, 2000: Pathak *et al*., 2002; Reddy and Reddy, 2005).

Effect of INM on yield attributes and yield

Application of 100% + FYM @ 5 t/ha significantly higher the cob weight, cob length, weight of grains cob shelling percent, 1000 grain weight, seed yield and straw yield and remained at par with T_2, T_4 T_6 and T_9 in cob weight and T_1, T_2, T_3, T_4, T_5, T_6 and T_9 and T_4 and T_9 (100% NPK + Zn @ 3 kg/ha + S @ 40 kg/ha and 125% NPK) in weight of grain cob, seed yield and straw yield and T_1, T_2, T_3, T_4, T_5, T_6, T_9, T_{10}. in shelling percent and T_1, T_2, T_3, T_4, T_5, T_6, T_9 and T_{10} in 1000 grain weight. Increase in maize grain yield with addition of farmyard manure and fertilizer may be attributed to the fact that farmyard manure being the store house of nutrients also made release of applied nutrients at its optimum at the same time improved the soil physical condition (Pathak *et al*., 2005). However, number of cobs/plant and harvest index unchanged under different levels of treatments (Table-1). Increased dry matter accumulation with application of recommended dose of fertilizer or combined use of farmyard manure with nitrogen might have been resulted because of higher uptake of nutrients due to release of sufficient amount of nutrients by mineralization at a constant level that in turn gave higher yields(Table-2). These results are in close agreements with the findings with Kumar *et al*. (2005); Haque *et al*. (2010).

CONCLUSION

On the basis of the results of one year experiment, it is concluded that the maximum grain and straw yield from the maize (*var*. HQPM-1), can be achieved with the application of 100% NPK + FYM @ 5 t/ha whereas under the shortage or unavailability of FYM crop may be fertilized with 125% of recommended NPK or 100% recommended NPK + Zn @ 3 kg/ha + S @ 40 kg/ha under North Gujarat Agro-climatic condition for getting comparable grain and straw yield.

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