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Response of Pop Corn varieties to varying fertility levels

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Abstract

A field experiment was conducted during rainy season of 2016 at Instructional Farm, Rajasthan College of Agriculture, Udaipur to ascertain suitable popcorn variety and its fertility level. Treatment consisted four popcorn varieties viz., V L Amber popcorn, BPCH-6, V L popcorn-1 and Jawahar popcorn-11 and four fertility levels viz., 90 + 30, 110 + 40, 130 + 50 and 150 + 60 kg N + P₂O₅ ha⁻¹. The soil of experimental site was having medium fertility status. The results indicated that highest values of growth, yield attributing parameters, grain (17.97 q/ha), stover yield (24.47 q/ha) and net return (₹ 157495/ha) were obtained with variety BPCH-6. Application of 130 + 50 kg N + P₂O₅/ha improved growth, yield components consequently grain (17.76 q/ha), stover (27.44 q/ha) over rest of the fertility levels and proved economically beneficial with net return (₹ 155058/ha).

Keywords: Fertility levels, Growth parameters, Pop Corn and Yield attributes

Introduction

Maize is an important cereal of our country. In Rajasthan this crop occupies 0.87 m ha area with production of 1.14 m t and productivity of 13.18 q/ha (DOA, 2016). Out of total production, 25 per cent of maize is consumed as staple food in various forms and among them popcorn is one of the most important one. Due to immense nutritionally rich food and high remunerative commercial value of popcorn, identification of suitable genotype having wider adaptability and responsiveness to fertilizer is considered essential for exploiting higher yield of pop corn in south eastern part of Rajasthan. Amongst nutrients, nitrogen and phosphorus is of paramount importance in plant system. The general recommendation of nitrogen and phosphorus for maize developed by researchers is based on crop responses over large areas. This often results in over or under fertilization leading to yield and economic losses. Thus considering these facts and paucity of research findings on these aspects in south-east Rajasthan, the present study was carried out with objectives to ascertain economically viable popcorn variety and nutrient recommendation for popcorn.

Materials and Methods

A field experiment was carried out during *kharif* 2016 at the instructional Farm, Rajasthan College of Agriculture, Udaipur, Rajasthan which is situated at 23°34'N latitude, 72°42'E longitude and 582.17 meter above the mean sea level. The soil of experimental site was clay loam in texture, having alkaline reaction (pH 7.6). The soil was medium in available nitrogen (271.4 kg/ha) and available phosphorus (17.4 kg/ha) but high in available potassium (295.9 kg/ha). The treatment consisting 4 popcorn varieties (V L Amber popcorn, BPCH-6, V L popcorn-1 and Jawahar popcorn-11), 4 fertility levels (90 + 30, 110 + 40, 130 + 50 and 150 + 60 kg N + P₂O₅/ha) were tested in factorial randomized block design and replicated thrice. The crop was sown with onset of rain on 6th July 2016. In well prepared field, furrows were opened at 60 cm apart and seeds were placed manually at a depth of 3-4 cm. As per treatment nitrogen and phosphorus were applied through urea and DAP. One third of nitrogen and full dose of phosphorus were given as basal application at the time of sowing by drilling fertilizer in crop rows about 4-5 cm below the seeds. The remaining nitrogen was given in two equal splits viz., knee high stage and at 50 per cent tasseling stage as top dressing. In order to minimize weed competition, pre-emergence application of atrazine at 0.5 kg/ha followed by one hoeing and earthing up were carried out at 20 and 30 days after sowing, respectively. The growth efficiency parameters viz., crop growth rate and relative growth rate were computed

empirically by the use of standard formulae. Different growth and yield attributes were computed on basis of average of five samples. The crop was harvested at physiological maturity which was determined by formation of black/brown layer in placental region of maize grain. Before harvesting the plants under each experimental unit, border row were harvested and removed from experimental field. Cobs from net plots were picked up and kept in gunny bags. After through drying these were shelled. After picking cobs, stover from net plot was harvested and sun dried for few days and weighed for individual plot and final stover yield was expressed in q/ha. Data obtained were statistically analyzed in factorial randomized block design using the standard techniques of analysis of variance. To workout the most profitable treatment, economics of different treatments was calculated on the basis of prevailing market prices in terms of net return (₹/ha) and B C ratio.

Results and Discussion

Performance of varieties

The varieties did not show variation in plant stand/ha at harvest. At harvest “BPCH-6”, “V L popcorn-1” and “Jawahar popcorn-11” was statistically at par and recorded significantly higher plant height and dry matter/plant over “V L Amber popcorn”. Days to 50 per cent silking were statistically equal in all popcorn varieties. Leaf area index of “BPCH-6” was statistically at par with “Jawahar popcorn-11” and “V L popcorn-1” however, proved significantly higher over “V L Amber popcorn”. The growth efficiency *viz.* CGR between 30-60 DAS was significantly higher in BPCH-6 over rest of varieties however, RGR between this duration failed to record significant variation amongst popcorn varieties. The various yield components namely grain weight plant⁻¹, grains cob⁻¹, length of cob, girth of cob, test weight and shelling percentage were significantly higher in variety “BPCH-6” compared to rest of the varieties. The productivity in terms of grain (17.97 q/ha) and stover yield (27.47 q/ha) realized with variety “BPCH-6” were significantly higher over rest of the varieties. Harvest index did not vary significantly amongst popcorn varieties. The highest net returns (₹157495/ha) were realized with growing of variety “BPCH-6” which was significantly higher over rest of the varieties. The marked variation in growth parameters of popcorn varieties could be ascribed to their genetic capabilities to exploit available resources for their growth and development (Snehata *et al.*, 2016 and Meena *et al.*, 2017) [5, 3]. The significant increase in

yield attributes in single cross popcorn hybrid variety “BPCH-6” over other varieties seems to be on account of overall improvement in growth as evinced from higher production of dry matter.

Fertility levels

Fertility levels did not influence plant population recorded at harvest. The plant height and dry matter at harvest increased significantly by applying 130 kg N + 50 kg P₂O₅ ha⁻¹ over 110 kg N + 40 kg P₂O₅ ha⁻¹ and 90 kg N + 30 kg P₂O₅ ha⁻¹. Days to 50 per cent silking were not significantly influenced by fertility levels. An application of 110 kg N + 40 kg P₂O₅ ha⁻¹ gave significantly greater leaf area index over 90 kg N + 30 kg P₂O₅ ha⁻¹. Further, increase in fertility levels did not produce any significant variation. Application 110 kg N + 30 kg P₂O₅ ha⁻¹ significantly increased CGR over 90 kg N + 30 kg P₂O₅ ha⁻¹ between 30-60 DAS. Further increase in fertility level failed to record statistical significance. However, RGR did not differ significantly under increasing fertility levels. Application of 130 kg N + 50 kg P₂O₅ ha⁻¹ significantly improved yield component over 90 kg N + 30 kg P₂O₅ ha⁻¹ consequently increased grain and fodder yield over 110 kg N + 40 kg P₂O₅ ha⁻¹ and 90 kg N + 30 kg P₂O₅ ha⁻¹. The cob plant⁻¹ and cob girth did not differ significantly amongst different fertility levels. An application of 130 kg N + 50 kg P₂O₅ ha⁻¹ proved economically beneficial as it recorded significantly higher net returns over 110 kg N + 50 kg P₂O₅ ha⁻¹ and 90 kg N + 30 kg P₂O₅ ha⁻¹. Further increase in fertility level marginally improved net returns, however, proved statistically at par with preceding level.

The significant improvement in nutrient status of plant parts resulted in better availability of nutrients for growth and development of the plant right from early stage which seems to have promoted height of plants and growth of individual leaf by way of active cell division, and their elongation. The larger canopy development could be reasoned for increased interception, absorption and utilization of radiant energy which in turn increased overall growth and yield. The results are in close conformity with findings of Kumar (2009) [2], Nath *et al.* (2009) [4] and Meena *et al.* (2017) [3].

On the basis of results emanated from the present experiment it is concluded that under prevailing agro climatic conditions of SE Rajasthan, application of popcorn variety “BPCH-6” and application of 130 kg N + 50 kg P₂O₅ ha⁻¹ are efficient and economically profitable.

Table 1: Performance of popcorn varieties under varying fertility levels on growth and yield attributes of maize

Treatments	Plant harvest (000/ha)	Height at harvest (cm)	Days to 50% silking	DM at 90DAS (g)	LAI at 60 DAS	CGR 30-60 DAS	RGR 30-60 DAS	Grain weight/plant	Grain/cob	Cob length(cm)
Varities										
V L Amber Pop corn	81.25	185.1	50.3	99.8	1.97	4.91	0.034	21.91	462.4	17.75
BPCH-6	81.44	200.1	50.7	106.5	2.41	5.40	0.035	24.58	489.3	19.80
V L Popcorn-1	81.28	201.5	50.3	106.8	2.28	5.45	0.035	22.32	487.7	18.69
Jawahar Popcorn-11	81.46	201.3	50.3	107.1	2.30	5.42	0.034	22.06	481.7	18.50
SEm±	0.381	3.7	0.5	2.27	0.05	0.16	0.001	0.67	8.8	0.29
CD (P = 0.05)	NS	10.6	NS	6.56	0.15	0.46	NS	1.93	25.3	0.84
Fertility levels (kg ha ⁻¹)										
90 kg N + 30 kg P ₂ O ₅	81.34	176.6	50.6	96.5	2.07	4.77	0.035	19.89	446.8	17.29
110 kg N + 40 kg P ₂ O ₅	81.35	197.6	50.7	105.4	2.27	5.31	0.035	22.73	485.0	18.37
130 kg N + 50 kg P ₂ O ₅	81.40	206.7	50.8	108.3	2.30	5.52	0.034	23.89	493.8	19.54
150 kg N + 60 kg P ₂ O ₅	81.33	207.2	49.5	110.0	2.33	5.59	0.034	24.36	495.6	19.54
SEm±	0.381	3.7	0.5	2.27	0.05	0.16	0.001	0.67	8.8	0.29
CD (P = 0.05)	NS	10.6	NS	6.56	0.15	0.46	NS	1.93	25.3	0.84

DM: Dry matter, LAI: Leaf area index, CGR: Crop growth rate, RGR: relative growth rate

Table 2: Performance of popcorn varieties under varying fertility levels on yield and economics

Treatments	Test weight (g)	Shelling (%)	Yield (q/ha)		Harvest index (%)	Net returns (₹ /ha)
			Grain	Stover		
Varities						
V L Amber Pop corn	110.9	71.94	15.80	23.88	38.09	135274
BPCH-6	119.0	75.39	17.97	27.47	39.62	157495
V L Popcorn-1	110.5	67.60	16.03	24.23	39.41	137660
Jawahar Popcorn-11	105.9	71.84	16.10	24.34	39.41	138342
SEm±	2.0	1.64	0.45	0.68	1.21	4621
CD (P = 0.05)	5.7	4.74	1.31	1.97	3.51	13346
Fertility levels (kg ha ⁻¹)						
90 kg N + 30 kg P ₂ O ₅	102.0	65.29	13.75	19.83	38.14	115165
110 kg N + 40 kg P ₂ O ₅	110.3	70.03	16.08	24.18	39.94	138418
130 kg N + 50 kg P ₂ O ₅	116.1	74.98	17.76	27.44	39.29	155058
150 kg N + 60 kg P ₂ O ₅	117.8	76.48	18.32	28.47	39.16	160129
SEm±	2.0	1.64	0.45	0.68	1.21	4621
CD (P = 0.05)	5.7	4.74	1.31	1.97	3.51	13346

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