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Effect of varieties and phosphorus doses on growth, yield attributes and yield of pea (*Pisum sativum* L.) in saline-alkali soil

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Abstract

An investigation made for two years (2007-08 and 2008-09) at Agricultural farm of Shri Durga Ji Post Graduate, College of Chandeshwar, Azamgarh (UP), India to find out the effect of varieties (Malviya-2, Aparna, Sapana and Rachana) and phosphorus levels (0, 20, 40, 60 and 80 kg/ha) on growth and yield attributes and yield of pea (*Pisum sativum* L.) in saline-alkaline soil. All the treatments were tested in three replicated Randomized Block Design. The results indicated that the Sapana variety gave highest growth attributes viz. plant height, branches/plant, dry weight/plant and days to 50% flowering and maturity yield attributes viz., pods/plant, pods weight/plant, grains/pod and test weight and yields viz. grain yield, straw yield and harvest index, which was significantly inferior to all other varieties of pea during both the years. The application of phosphorus @80 kg/ha produced significantly higher all observed growth attributes, yield attributes and yield of pea which is at par with the application of phosphorus @ 60 kg/ha except growth attributes during both the years. Therefore, used Sapana variety along with 60 kg/ha P₂O₅ proved to be all yield attributes and yields of pea during both the years, respectively.

Keywords: Varieties, phosphorus doses, pea crop

Introduction

In a country like India where a large population is vegetarian, the cheap and best source of protein is still pulses. Pulses constitute an important ingredient in predominantly vegetarian dishes and hence it is like throughout the world. India is producing 14.76 million tons of pulses from an area of 23.63 million hectare, which is one of the largest pulses producing countries in the world. However, about 2-3 million tons of pulses are imported annually to meet the domestic consumption requirement. Thus there is need to increase production and productivity of pulses in the country by more intensive interventions. (Anonymous, 2020) [2]. The pea (*Pisum sativum* L.) is a common nutritious vegetable as well as pulse crop belonging to papilionaceae family of dicotile donae sub division of plant kingdom. The pea is grouped as *Pisum sativum* sub species hortience. Varieties are practiced, the productivity of pea may certainly be increased. Such varieties being short statured and erect growing habit require higher plant density to exploit their yield potential. The nutrients available to plant particularly phosphorus is import constituents of protein and phospholipds. Phosphorus not only enhances the root growth but also promotes early plant maturity. The present study was therefore, conducted on different pea varieties with phosphorus levels for higher production from pea cultivation in eastern Uttar Pradesh.

Materials and Methods

The present experiment was carried out for two years of Rabi seasons (2007-08 and 2008-09) at Agricultural Farm of Shri Durga Ji Post Graduate College, Chandeshwar, Azamgarh (UP), India. The research farm is situated at a distance of 8 km away from Azamgarh city on Gazipur road the experimental site falls under semiarid to sub-humid zones in India gangetic plains and lies at an situated of about 100 meter for mean sea level and is subjected to extremes of weather conditions. The treatment comprised 20 treatments combinations of four varieties of pea (Malviya-2, Aprna, Sapna and Rachna) and five phosphorus levels (0, 20, 40, 60 and 80 Kg/ha) which were tested in a Randomized Block Design with three replications. Soil of the experimental field was silty loam texture with medium fertility, 7.5 pH and EC at 25 °C of 0.20 dsm⁻¹ having 0.38% organic carbon 225.0 kg/ha available Nitrogen, 23.0 kg/ha available P₂O₅ and 245.11 kg/ha available K₂O. Application of fertilizers were applied as recommended except phosphorus. Application of P₂O₅ was done as per treatments. According to Fisher

(1950) to statistical analysis as per method of "Analysis of Variance" which data recording during the course investigation were subjected.

Results and Discussion

Growth attributes

Plant growth characters like plant height, dry weight/plant, branches/plant, days to 50% flowering and maturity of pea varieties in relation to phosphorus levels are presented in Table-1. The Sapana variety gave highest plant height, dry weight/plant and branches/plant at maturity stage of crop growth whereas lowest plant height was recorded in the Malviya-2 variety, which was significantly inferior to all other varieties of pea during both the years. The Sapana (KPMR-144-2) variety taken significantly lesser days to 50% flowering and maturity as compared to other varieties during both the years of investigation, whereas, highest days to 50% flowering and maturity were recorded in Malviya-2 during first and second year of study. It might be due to the varietal differences due to genetic characters. These findings were supported with the findings of Jadhav *et al.* (1995) [5], Ramaiah *et al.* (1994) [11] and Singh (1998) [3].

The plant height, dry weight/plant and branches/plant were increased significantly with every increase in the level of phosphorus at maturity stage of growth in both the years. Application of phosphorus @ 80 kg/ha produced significantly higher plant height, dry weight/plant and branches/plant at maturity stage of growth whereas, lowest value was recorded in control and this was found significantly inferior over all other levels of phosphorus. No application of phosphorus were significantly increased the days to 50% flowering and maturity, whereas, minimum days to 50% flowering and maturity were recorded in increasing level of phosphorus @ 80 kg/ha during both the years of present investigation. It might be due to the fact that phosphorus plays an important role in the synthesis of tryptophane, a precursor of plant growth hormones. This is in close conformity with the findings of Yadav and Chauhan (1997) [16], Varma *et al.* (1998) [15] and Patel *et al.* (1998) [9].

Yield attributes

Yield attributing characters like pods/plant, pods weight/plant, grains/pod and test weight of pea crop are presented in Table-2. The minimum number of pods/plant, pods weight/plant number of grains/pod and tested weight of pea were recorded in variety malviya-2 and maximum were recorded in variety of Sapana (KDMR-144-2). The variety of Sapana proved significantly superior over all other tested varieties during

first and second year of experimentation. It may be due to growth quality of genotypes of pea. Similar results were also observed by Singh (1998) [3], Shiva Shankar *et al.* (1990) [12], Purushotham *et al.* (2001) [10] and Gracy. Mathew *et al.* (1998) [4].

Yield attributes viz; pods/plant, pods weight/plant grains/pod and test weight of pea crop were increased significantly with increasing levels of phosphorus during both the years. Highest all observed yield attributing characters were noted under 80 kg/ha P₂O₅ which is at par with the application of phosphorus @ 60 kg/ha and minimum were recorded in control during both the years of the trial. It may be stated that adequate supply of phosphorus played an important role. Similar results were also reported by Srivastava and Ahlawat (1995) [14], Chandra *et al.* (1989) [3], Permar *et al.* (1999) [8] and Amjad *et al.* (2004) [1].

Yields

The data recorded on grain and straw yield and harvest index have been given in Table-3. The highest grain yield (17.14 and 17.65 q/ha) and straw yield (41.46 & 44.04 q/ha) were significantly recorded in variety Sapana followed by Rachana variety of pea. The lowest grain (14.19 and 14.75 q/ha) and straw yield (39.18 and 41.93 q/ha) were recorded in Malviya-2 variety followed by Aparna variety during both the years. The harvest index showed similar trend was to grain and straw yield with highest values recorded for the treatment of Sapana variety. The increase in seed yield was associated with increase in development characters like pods/plant, grains/pod and test weight and increase in straw yield might be due to the more plant height and number of leaves/plant. Similar results were also observed by Gracy-mathew *et al.* (1998) [4].

The different phosphorus levels exerted significant differences in grain and straw yield and harvest index. The application of 80 kg P₂O₅/ha gave the maximum grain yield (19.54 and 20.12 q/ha) straw yield (43.75 & 47.22 q/ha) followed by applied 60 kg P₂O₅/ha whereas, minimum value (12.01 & 11.79, 35.65 & 37.80 q/ha) were recorded in control plot during first and second year of experimentations, respectively. Harvest index showed similar trend to grain and straw yield with highest values recorded in increasing phosphorus doses of 80 kg/ha followed by 60 kg/ha and minimum value were recorded in control treatments. The increase in seed yield was associated with increase in development characters like pods/plant, grains/pods and test weight and increase in straw yield might be due to higher availability of phosphorus. Similar results were also reported by Kumrawat (1997) [6].

Table 1: Effect of varieties and phosphorus levels on growth attributes of pea during 2007-08 and 2008-09.

Treatments	Plant height		No. of branches/plant		Dry wt./plant		50% flowering		Date of Maturity	
	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
Varieties										
Malviya-2	54.13	55.53	2.59	2.66	17.02	17.10	72.20	71.66	128.06	128.00
Aparna	54.40	55.84	2.79	2.79	17.47	17.88	71.00	71.00	127.53	128.33
Sapana	152.69	154.38	4.46	4.46	21.34	21.95	69.00	68.93	123.00	123.13
Rachana	132.46	134.24	3.06	3.06	21.10	21.17	70.66	70.60	125.06	125.66
SE(d)	0.23	0.20	0.13	0.11	0.18	0.12	0.22	0.24	0.18	0.21
CD at 5%	0.64	0.58	0.36	0.33	0.51	0.36	0.56	0.69	0.50	0.60
Levels/ Phosphorus										
Control	96.49	97.92	2.49	2.41	17.68	17.83	71.91	71.58	128.25	129.08
20 kg/ha	97.59	99.25	2.74	2.74	18.25	18.43	71.00	70.50	127.33	127.66
40	98.51	100.14	3.16	3.16	19.40	19.66	70.41	70.41	126.08	126.42
60	99.24	101.12	3.66	3.74	20.10	20.49	70.41	70.33	127.75	124.91
80	100.28	101.55	4.07	4.16	20.74	21.23	69.83	69.91	123.16	123.33
SE(d)	0.25	0.23	0.14	0.13	0.20	0.14	0.22	0.27	0.26	0.23
CD at 5%	0.72	0.65	0.40	0.37	0.57	0.40	0.63	0.77	0.56	0.67

Table 2: Effect of varieties and phosphorus levels on yield attributes of pea during 2007-08 and 2008-09.

Treatments	Pods/Plant		Pods wt./ Plant		Grains/pod		Test weight	
	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
Varieties								
Malviya-2	21.00	21.13	375.91	369.82	4.66	4.47	295.33	296.07
Aparna	28.40	28.86	494.28	498.88	4.53	4.73	299.00	300.33
Sapana	31.06	30.40	651.74	617.85	5.40	5.33	328.13	328.53
Rachana	27.80	28.20	567.98	596.02	5.27	5.26	316.13	318.73
SE(d)	0.16	0.20	0.89	1.20	0.09	0.11	1.48	1.31
CD at 5%	0.47	0.58	1.80	2.44	0.27	0.31	4.24	3.77
P₂O₅ levels								
0	25.50	25.42	441.61	442.19	4.50	4.58	293.83	295.83
20	26.16	26.16	477.63	463.78	4.75	4.58	301.58	304.42
40	26.75	27.33	519.37	522.83	4.91	4.91	310.00	309.83
60	28.08	28.00	560.37	571.84	5.16	5.17	317.50	318.75
80	28.83	28.83	613.41	602.59	5.50	5.50	325.33	325.75
SE(d)	0.18	0.23	0.99	1.35	0.11	0.12	1.66	1.47
CD at 5%	0.53	0.65	2.02	2.73	0.30	0.34	4.74	4.21

Table 3: Effect of varieties and phosphorus levels on yields of pea during 2007-08 and 2008-09.

Treatments	Grain yield (q/ha)		Straw Yield		Harvest Index	
	2007-08	2008-09	2007-08	2008-09	2007-08	2008-09
Varieties						
Malviya-2	14.19	14.75	39.18	41.93	23.45	21.90
Aparna	16.06	16.20	41.12	42.26	24.56	25.09
Sapana	17.14	17.65	42.46	44.04	25.48	25.14
Rachana	16.74	16.62	41.08	43.20	24.68	24.04
SE(d)	0.82	0.59	0.59	0.78	0.62	0.64
CD at 5%	1.65	1.20	1.19	1.58	1.25	1.29
0	12.01	11.79	35.65	37.80	22.05	22.0
20	13.98	14.16	40.07	42.75	24.55	23.54
40	16.19	17.22	42.37	42.85	24.45	24.23
60	18.46	18.24	42.96	43.68	25.33	24.60
80	19.54	20.12	43.75	47.22	26.33	25.84
SE(d)	0.91	0.66	0.66	0.87	0.69	0.71
CD at 5%	1.82	1.34	1.33	1.77	1.40	1.44

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