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Studies about the different levels of phosphorus and varieties on growth and yield of pea (*Pisum satium* L.)

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Abstract

Pulse play a significant role in sustainability of agriculture, providing the cheapest source of vegetable protein for Human nutrition. Nutrient imbalance in soil system is the major reason the declined yield and nutritional quality of the pulse. It is thought the low amount of P_2O_5 fertilizer does not promote the development of extensive root system, vigorous seedlings, promoting good nodule development, and N fixation. In view of the above, the present field experiment was conducted to studies about the different levels of phosphorus and varieties on growth and yield of pea (*Pisum satium* L). The experiment containing five phosphorus levels such as Control, 20 kg. P_2O_5 / ha, 40 kg. P_2O_5 / ha, 60 kg. P_2O_5 / ha, and 80 kg. P_2O_5 / ha, and having four field pea varieties viz- Malviya-2, Aparna, Sapna and Rachana. The treatment were replicated three times in randomized block design (R.B.D). The important growth parameters such as- (plant height (cm), number of branches/plant, dry weight (g)/plant, days to 50% flowering), yield parameters, (number of pods/plant, pods weight(g)/plant, number of grains/plant, and test weight), (yield grain yield, and straw yield). The results of the study showed that the variety Sapna (KPMR-144-2) was found best regarding growth, yield components and yield. Application of 80 kg. P_2O_5 / ha, achieved best performance.

Keywords: Phosphorus, varieties of pea

Introduction

Pulses play an important role in the food and farming economy of our country. Considering their limited input requirements, soil-enriching properties and suitability for growing in areas where moisture is limited, pulses occupy a unit place in our agriculture system. In India where a large population is vegetarian, the cheap and best source of protein is still pulses. Pulse crops, also called grain legumes have been valued as food fodder and feed. The year 2007-2008 has been a successful year for pulses production in India as for the first time it has crossed the mark of 15 million tons along the cherished goal. This has cemented the status of the country as the largest pulses producer in the world with 25% share in global production from 32% area, Anonymous (2008) [1]. In India field pea (*Pisum satium* L) is grown in many states. It is the major food legume with a valuable and cheap source of protein having essential amino acid (23-25%) that have high nutritional values for over households and also serves as a break crop suitable for rotation to minimize the negative impact of cereal based mono cropping. According to Telaye *et al.* (1994) [6], the yield of field pea may be reduced. Therefore, it is of paramount importance to identify the type of varieties and fertilizer rates of a given crop; which the following specific objectives (1) To identify optimum rate of phosphorus fertilizers and the result in increased growth and yield of field pea varieties (2) To identify field pea varieties respond to rate level at study area (3) To investigate if there are interactions between P_2O_5 rate level and field pea varieties.

Materials and Method

The experiment was conducted at Research Farm S.D.J. Post Graduate College Chandeshwar Azamgarh during two cropping years 2007-2008 and 2008-2009. The farm soil is sandy loam (Sand 35.90%, Silt 47.13%, Clay 17.88%) with p^H of 7.5. The experimental design was randomized block design (R.B.D) which compared of twenty treatments made five levels of phosphorus (control, 20 kg P_2O_5 /ha, 40 kg P_2O_5 /ha, 60 kg P_2O_5 /ha, and 80 kg P_2O_5 /ha.) and four types of field pea varieties (Malviya-2, Aparna, Sapna and Rachana) with three replications.

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A 4Mx3M plot size was used as an experimental unit, with 1 meter distance between blocks each treatment was randomly assigned to the experimental unit within the block and 80 kg/ha seed rate was used for each variety. Observations were recorded such as- Growth attributes viz. Plant height(cm), number of branches/plant, dry weight (g)/plant and days to 50% flowering, Yield attributes viz. number of pods/plant, pods weight(g)/plant and number of grains/pods and test weight, yield viz. grain yield (q/ha) and straw yield (q/ha). The data collected on various parameters were subjected to analysis of variance (ANOVA). Analysis of variance was considered to test for significant differences among the treatments.

Results and Discussion

The data related to growth attributes viz., plant height (cm), number of branches/plant, dry weight (g)/plant and days to 50% flowering have been presented in Table-1. Plant height (cm), number of branches/plant, dry weight (g)/plant and days to 50% flowering increased significantly with every increase in the level of phosphorus at 90 days after sowing. Application of phosphorus@80 kg P₂O₅/ha enhanced significantly higher growth attributes except days to 50% flowering in both the years. The perusal of the data Table-2 revealed that (number of pods/plant, pods weight (g)/plant, number of grains/pods and test weight) each level of phosphorus increased the above characters in both the years. Highest performance were recorded in 80 kg P₂O₅/ha followed by 60 kg P₂O₅/ha and lowest were found in control plots. The data recorded on grain yield (q/ha) and straw yield(q) have been given in Table-3 showed that highest grain yield(q/ha) was obtained with the application of 80 kg P₂O₅/ha which is at par with the treatment 60 kg P₂O₅/ha except grain yield (q/ha) and straw yield(q/ha) significantly better in year 2008-2009. It is evident from the results of the present study the pea (*Pisum sativum* L) responded significantly to application of phosphorus. It was found that growth attributes, yield components and yield like Plant

height(cm), number of branches, dry weight (g)/plant and days to 50% flowering, number of pods/plant, pods weight(g)/plant, number of grains/pods and test weight, Yield grain yield(q/ha) straw yield (q/ha) significantly influenced due to dose of phosphorus. Finding revealed that being a leguminous crop pea significantly responded to phosphorus application of 80 kg P₂O₅/ha recorded the above characters such as growth attributes, yield attributes and yield of the crop. Results are in conformity with the results obtained by Patel *et al.* (1998) [5], Verma *et al.* (1998) [7] and Amjad *et al.* (2004) [2].

The from Table-1 that variety Sapna (KPMR-144-2) produce significantly Plant height(cm), number of branches/plant, dry weight/plant as compared to other rest varieties during both the years. Malviya-2 was achieved poor performance in both years. However highest days to 50% flowering were recorded during 2007-08 and 2008-09. The data Table-2 showed that number of pods/plant, pods weight (g)/plant, number of grains/pods and test weight found significant differences in above mentioned yield attributes due to varieties were observed. The variety Sapna which was superior to among other rest variety during both the years of experimentation. Varieties exerted significant difference in grain yield and straw yield in shown in (Table-3. The highest grain yield was observed in variety Sapna followed by Rachana, Aparna and Malviya-2. In straw yield variety Sapna in year 2007-08 significantly superior amongst all varieties. The varieties of pea (Malviya-2, Aparna, Sapna and Rachana) vary in: Plant height (cm), number of branches, dry weight (g)/plant and days to 50% flowering due to genetic characters. Sapna produced significant differences in amongst the varieties. Jadhav *et al.* (1995) [4] reported that Sapna (KPMR-144-2) out yield genotype and it has several desirable characters. The different pea varieties showed highly significant differences in yield components and yield. Similar results were observed by Shiv shankar *et al.* (1990) and Birari *et al.* (1993) [3].

Table 1: Effect of different levels of phosphorus on growth attributing characters of Pea (*Pisum sativum* L)

Varieties	Plant height (cm)		No. of branches/plant		Dry weight(g)		Days to 50% flowering	
	2007	2008	2007	2008	2007	2008	2007	2008
Malviya-2	54.13	55.53	2.59	2.66	17.02	17.10	72.20	71.66
Aparna	54.40	55.84	2.79	2.79	17.47	17.88	71.00	71.00
Sapana	152.69	154.38	4.46	4.46	21.37	21.95	69.00	68.93
Rachana	132.46	134.24	3.06	3.06	21.10	21.17	70.66	70.60
S.E (m [±])	0.23	0.20	0.13	0.11	0.18	0.12	0.20	0.24
C.D.5%	0.64	0.58	0.36	0.33	0.51	0.36	0.56	0.69
Levels of P2O5 kg/ha								
Control	96.49	97.92	2.49	2.41	17.68	17.83	71.91	71.58
20 kg/ha	97.59	99.25	2.74	2.74	18.25	18.43	71.00	70.50
40 kg/ha	98.59	100.14	3.16	3.16	19.40	19.66	70.41	70.41
60 kg/ha	99.24	101.12	3.66	3.74	20.10	20.49	70.41	70.33
80 kg/ha	100.28	101.55	4.07	4.16	20.74	21.23	69.83	69.91
S.E (m [±])	0.25	0.23	0.14	0.13	0.20	0.14	0.22	0.27
C.D. 5%	0.72	0.65	0.40	0.37	0.57	0.40	0.63	0.77

Table 2: Effect of different levels of phosphorus on yield attributing characters of Pea (*Pisum satium* L)

Varities	No of pods/plant		Pods weight/plant(g)		No of grains/plant		Test weight(g)	
	2007	2008	2007	2008	2007	2008	2007	2008
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	300.53
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
S.E (m [±])	0.16	0.20	0.89	1.20	0.09	0.11	1.48	1.31
C.D.5%	0.47	0.58	1.80	2.44	0.27	0.31	4.24	3.77
Levels of P ₂ O ₅ kg/ha								
Control	25.50	25.42	441.61	442.19	4.50	4.58	293.83	295.83
20 kg/ha	26.16	26.16	477.63	463.78	4.75	4.58	301.58	304.42
40 kg/ha	26.75	27.33	519.37	522.83	4.91	4.91	310.00	309.83
60 kg/ha	28.08	28	560.33	571.84	5.16	5.17	317.50	318.75
80 kg/ha	28.83	28.83	663.41	602.59	5.50	5.50	325.33	325.75
S.E (m [±])	0.18	0.23	0.99	1.35	0.11	0.12	1.66	1.47
C.D. 5%	0.53	0.65	2.02	2.73	0.30	0.34	4.74	4.21

Table 3: Effect of different levels of phosphorus on yield characters of Pea (*Pisum satium* L)

Varities	Grain yield (q/ha)		Straw yield (q/ha)	
	2007	2008	2007	2008
Malviya-2	14.19	14.75	39.18	41.93
Aparna	16.06	16.20	41.12	42.26
Sapna	17.14	17.65	42.46	44.04
Rachana	16.74	16.62	41.08	43.20
S.E (m [±])	0.82	0.59	0.59	0.78
C.D.	1.65	1.20	1.19	1.58
Levels of P ₂ O ₅ kg/ha				
Control	12.01	11.79	35.65	37.80
20 kg/ha	13.98	14.16	40.07	42.75
40 kg/ha	16.19	17.22	42.37	42.85
60 kg/ha	18.46	18.24	42.96	43.68
80 kg/ha	19.54	20.12	43.75	47.22
S.E (m [±])	0.91	0.66	0.66	0.87
C.D at 5%	1.82	1.34	1.33	1.77

Conclusion

The present study concluded that application of P₂O₅ 80 kg/ha in pea significantly affected the growth attributes, yield components and yield, and variety pea Sapna (KPMR-144-2) was the best variety regarding above characters which were mentioned.

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