

Effect of irrigation, phosphorus and row spacing on physiological characters of pea (*Pisum sativum*)

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ABSTRACT

A field experiment was conducted during the winter seasons of 1984-85 and 1985-86 to study the effect of schedules of irrigation, levels of P_2O_5 along with 2 spacings (25 and 50 cm) on physiological characters of pea (*Pisum sativum* L. sensu lato). The maximum leaf area/plant was noted with 2 irrigations given at 50 and 70 days after sowing and the highest leaf-area ratio with 1 irrigation at 50 days after sowing during both the years. Application of P_2O_5 improved the leaf area, leaf-area index and leaf-area ratio over the control, but increase in row width reduced these parameters along with relative growth rate. Significant reduction in relative growth rate of pea was noted with application of irrigation and P_2O_5 .

Many physiological characters such as leaf area/plant, leaf-area index and leaf-area ratio might be directly correlated with growth and development of plant and contribute to yield. However, parameters like relative growth rate may have adverse affect on factors increasing yield of pea (*Pisum sativum* L. sensu lato) crop (Jenson, 1985). Since such information is meagre in pea, an experiment was conducted to assess the effect of irrigation, phosphate level and row spacing on physiological parameters of this crop.

MATERIALS AND METHODS

The experiment was conducted during the winter seasons of 1984-85 and 1985-86 at Morena. The climate of the area is subtropical with extreme hot and cold during

summer and winter respectively. The cold waves are experienced from middle of December to end of January. The annual rainfall is about 750 mm. Winter rains of 22.9 cm and 69.7 cm were received during 1984-85 and 1985-86 respectively. The humidity was higher (48.12-89.28%) during 1985-86 than that during 1984-85 (332.0-50.74%). The major meteorological parameters prevailing during 1985-86 were climatically more favourable for the growth and yield of pea crop than during 1984-85.

The soil of the experimental field was sandy loam, well-drained having organic carbon 0.16%, available N 195.5 kg/ha, available P_2O_5 43.5 kg/ha and available K_2O 400 kg/ha, with pH 7.1. The experiment was conducted in split-plot design with 4 replications, keeping irrigation in main plot

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Table 1. Effect of irrigation, P level and row spacing on leaf area, leaf-area index (LAI), leaf-area ratio (LAR) and relative growth rate (RGR) at 70–90 days after sowing, and grain yield of pea

Treatment	Leaf/area plant		LAI		LAR		RGR		Grain yield (q/ha)	
	1984–85	1985–86	1984–85	1985–86	1984–85	1985–86	1984–85	1985–86	1984–85	1985–86
<i>Irrigation schedule</i>										
No irrigation	5.74	13.92	2.29	5.55	0.63	1.29	0.024	0.021	14.70	16.44
1 irrigation, 50 DAS	6.88	14.37	2.75	2.77	0.74	1.33	0.017	0.020	19.04	22.97
1 irrigation, 70 DAS	5.83	13.77	2.32	5.50	0.72	1.10	0.018	0.018	13.30	16.78
2 irrigations, 50 and 70 DAS	7.10	14.81	2.83	5.99	0.68	1.32	0.013	0.013	18.35	18.07
CD (P = 0.05)	0.73	0.52	0.37	NS	0.19	0.17	0.003	0.003	4.66	1.81
<i>P₂O₅ (kg/ha)</i>										
0	5.94	13.41	2.37	8.39	0.64	1.17	0.024	0.023	16.16	17.64
25	6.49	13.89	2.59	5.65	0.70	1.22	0.013	0.017	18.89	18.63
50	6.59	14.40	2.63	5.75	0.71	1.26	0.012	0.019	18.92	18.81
75	6.52	15.18	2.60	6.06	0.72	1.39	0.013	0.012	19.44	19.08
CD (P = 0.05)	0.38	0.49	0.15	0.19	NS	0.15	0.003	0.003	1.19	0.91
<i>Row spacing</i>										
25 cm	6.57	14.24	2.62	5.68	0.63	1.30	0.017	0.020	20.41	20.15
50 cm	6.20	14.20	2.47	5.68	0.76	1.22	0.011	0.022	16.30	16.98
CD (P = 0.05)	0.23	NS	0.17	NS	0.08	NS	0.003	NS	1.29	1.36

DAS, Days after sowing

and phosphate levels and row spacing in subplot. The details of treatments are given in Table 1.

RESULTS AND DISCUSSION

Effect of irrigation

One irrigation at 50 days after sowing, 2 irrigations at 50 and 70 days after sowing increased the leaf area/plant, leaf-area index and leaf-area ratio significantly over the control and 1 irrigation at 70 days during both the years except leaf-area ratio during 1984-85 (Table 1). This may be due to better growth and development of plants as a consequence of timely water availability. Maximum leaf-area ratio was under 1 irrigation at 50 days during both the years, which may be attributed to the findings of Jensen (1985) that most sensitive stage to moisture stress was around flowering. Non-significant differences during 1984-85 may be because of the less rainfall in the season than during 1985-86.

The relative growth rate of the crop was maximum without irrigation during both the years. Since relative growth rate at any instance is the increase in biomass per unit of biomass present, total biomass being less without irrigation increased the relative growth rate being nominator in the formula.

Effect of phosphorus

Application of P also significantly improved the leaf area/plant, leaf-area index and leaf-area ratio over the control, except leaf-area ratio during 1984-85 (Table 1). Improvement in these physiological

characters with application of P may be because of better nutrient availability to the plant which might have increased number of leaves and branches compared with the control.

Application of P reduced the relative growth rate significantly compared with the control. Since the relative growth rate was calculated at 90 days, it was less under treatments such as phosphorus fertilization, producing more biomass as a result of better growth of plants.

Effect of row spacing

Leaf area/plant and leaf-area index reduced significantly with an increase in row spacing from 25 to 50 cm (Table 1). The difference in leaf-area ratio could not reach to the level of significance during 1985-86 because of the better growth and development of plants due to more winter rainfall. Reduction in above physiological parameters with increase in row width may be responsible for reduction in grain yield of pea by wider row spacing.

Leaf-area ratio and relative growth rate increased significantly with increase in row width during 1984-85. This increase might be because of the less growth of plants under wider row spacings due to higher intra-row competitions, since the total number of plants were same under both the treatments.

REFERENCE

- Jensen, F. 1985. Irrigation requirements at various growth stages of pea (*vide Field Crop Abstracts* 28 (9) : 538).