

Short communication

Effect of date of sowing on growth and yield of vegetable pea genotypes under rain-fed mid-hill conditions of Uttarakhand

Rajni Tiwari*, Lalit Bhatt and Rahul Dev**

Department of Horticulture, G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal

ABSTRACT

A field experiment was conducted to study the effect of three sowing dates (1st, 15th and 13th August) with six varieties/ genotypes (SP X VL-7, SP X DVP-1, Arkel, VL-7, PSM-3, VL-10) of vegetable pea during rainy-autumn season 2009-10 at GBPUAT, Hill Campus, Ranichauri (Uttarakhand). Results revealed that among the three sowing dates, 1st august sown crop gave significantly higher fresh and dry weigh per plant, number and fresh weight of nodules per plant, pod yield net return and B:C ratio. Variety/ genotype D₁V₂ (sowing for SP X DVP-1 on 1st August) gave the green pod yield along with highest net profit and B:C ratio.

Key words: Growth, pea, sowing time, yield.

Pea fetches very high returns to growers in the hills of Uttarakhand as it cannot be grown in the plane during summer months. Choosing the appropriate variety and timely sowing can help in boosting the income of farmers. The agro-climatic conditions of mid- hills are ideally suited for cultivation of pea as an off-season vegetable crop. As a result green pod sell at a high premium bringing lucrative return to growers of mid-hills of Uttarakhand. Information on the effect of dates of sowing on growth and yield characters in vegetable pea is meagre. Therefore, the present investigation was undertaken to see the effect of sowing dates on growth and yield of vegetable pea varieties/ genotypes.

The field experiment was conducted at Vegetable Science Research Block of Hill Campus, Ranichauri (GBPUA&T), Tehri Garhwal (Uttarakhand) during rainy-autumn season of 2009-10. Ranichauri is located 2000 m above mean sea level at a latitude of 30°15'N and longitude of 78°50'E. Three sowing dates, viz., 1st August, 15th August and 30th August with four varieties Arkel, VL-7, PSM-3 and VL-10) and two genotypes (SP × VL-7 and SP × DVP-1) of vegetable pea along with 18 treatments were taken. The experiment was carried out in split plot design with three replications keeping date of sowing in the main plots and varieties in the sub-plots. The ultimate plot size was 4.2 m² with spacing 30.0 cm × 5.0 cm. A basal application of 30 kg nitrogen, 60 kg P₂O₅ along with 150 q/ha FYM was applied. The soil analysis values of the experimental field were p_H: 6.06 and organic matter 2.05%. Plant data were recorded on

five randomly selected plants. Observations were recorded on vegetative growth characters, pod and yield characters, qualitative characters and biochemical characters including TSS.

Sowing date significantly influenced the growth and yield attributes. Plant height, number of primary branches and root length were recorded maximum on 30th August sowing, while days to first green pod pickings, fresh and dry weight of plant, number and fresh weight of nodules per plant were found maximum on 1st August sowing. The present results are in accordance with the findings of Kumar *et al.* (8) and Sharma *et al.* (11). Maximum number of nodules was reported during early sowing date (Raman *et al.*, 6). Number of pods per kg weight, pod length, pod diameter, number of green ovules per pod, shelling percentage and green pod yield were the major attributes governing the yield for which the maximum values were found during early sowing, i.e., 1st August. The decreased yield in latter sowing dates might be due to slow growth of the plants under low temperature (Sarkar *et al.*, 4; Sharma, 3; Surwase and Suryawanshi, 10). Total soluble solids was found to increase continuously from 1st date of sowing (1st August) to last date of sowing (30th August), which might be due to higher temperature during early sowing dates increasing the total sugars content. The maximum gross and net return with highest benefit : cost ratio (1.86) was obtained on 1st August and minimum in D₃ (30th August); it means early sowing of pea in mid Himalayan region would give good income to the farmers. Similar findings were also reported by Yusufali (7), Kaya (9) and Sharma *et al.* (11).

Vegetable pea varieties differed significantly among themselves with respect of growth yield

*Corresponding author's E-mail: raj.gbpuat08@gmail.com

**CAZRI, Jodhpur, Rajasthan

qualitative and biochemical parameters. Genotype SP × VL-7 was first in terms of plant height, whereas, the days taken to first picking nodules and number per plant were recorded maximum in genotype SP × DVP-1. The maximum for number of primary branches per plant was observed in the variety VL-7 and it was minimum in PSM-3. The maximum gross and net return with highest benefit : cost ratio (2.04) was obtained in SP × DVP-1 and SP × VL-7 (2.01) it means these varieties have potential to give good returns to the farmers. Variation among varieties is mostly governed by the genetic makeup of the respected variety. These findings are in accordance to those obtained by Sharma (3) and Bozoglu *et al.* (5).

The interaction of date of sowing and varieties/ genotypes had shown a significant impact on different characters of vegetable pea. The maximum plant height (75.50 cm), number of primary branches (3.51), and plant fresh weight (54.30 g) were recorded with these combinations D₃V₂, D₃V₄, D₂V₄ and D₁V₅, respectively. For characters like days to first green pod picking, number of nodules per plant, pod length, number of green ovules per pod and green pod yield, the maximum values were obtained in D₁V₂. With respect to podding behavior, treatment D₁V₄ had shown the maximum pod diameter (12.40 mm). The maximum number of pods kg⁻¹ (216.00) was recorded in the treatment D₁V₃, while combination D₃V₅ showed the highest shelling percentage (49.45). These findings are supported by those obtained by Ishtiaq *et al.* (2), Raman (6), Kumar *et al.* (8) and Sharma *et al.* (11).

It can be concluded that the treatment D₁V₂ (sowing of genotype SP × DVP-1 on 1st August) is the most suitable treatment for getting highest yield and maximum net profit under rainfed mid-hill condition of Uttarakhand. Besides this, the second best treatment combination which could also be recommended for farmers cultivation is D₁V₁ (sowing of genotype SP × VL-7 on 1st August).

REFERENCES

1. Bozoglu, H., Peksen, E., Peksen A. and Gulumser, A. 2007. Determination of yield performance and harvesting periods of fifteen pea (*Pisum sativum* L.) cultivars sown in autumn and spring. *Pakistan J. Bot.* **39**: 2017-25.
2. Gomez, K.A. and Gomez, A.A. 1984. *Statistical Procedures in Agricultural Research*, Wiley, New York.
3. Ishtiaq, M., Ara, N. and Rashid, A. 2001. Response of different pea cultivars to various planting dates under the agro-climatic

Table 1. Effect of sowing date and variety on performance of pea under Uttarakhand conditions.

Treatment	Plant height (cm)	Plant FW (g)	Plant DW (g)	No. of nodules	Nodule wt. (g)	Root length (cm)	No. of pods/kg	Pod length (cm)	Pod dia. (mm)	Green ovules per pod	Shelling (%)	Green pod yield (q/ha)	TSS (°Brix)	B:C ratio
Date of sowing 1 st August	59.59	50.09	9.04	34.33	2.11	10.91	204.66	8.87	11.81	7.05	47.84	63.79	14.94	1.86
15 th August	56.43	48.19	8.11	29.72	1.69	10.65	191.44	7.92	11.28	5.81	47.65	60.47	16.05	1.76
30 th August	64.21	44.24	7.08	30.83	1.57	10.94	185.00	7.64	10.47	5.65	44.26	57.36	16.64	1.68
CD at 5%	0.44	5.77	0.11	1.46	0.05	0.26	5.01	0.96	0.21	0.26	2.86	0.62	0.81	
Variety SP × VL-7	69.82	48.64	8.28	32.00	1.82	10.15	194.22	8.45	11.42	6.55	45.20	69.08	15.61	2.01
SP × DVP-1	65.05	47.10	7.98	32.66	1.79	11.37	191.33	8.49	11.37	6.64	44.30	70.28	14.50	2.04
Arkel	60.44	44.60	7.47	32.00	2.15	11.75	200.33	8.61	10.91	6.49	46.80	52.46	16.77	1.53
VL-7	57.30	44.25	7.90	30.00	1.68	9.83	187.66	8.01	11.92	6.14	48.79	54.75	15.67	1.60
PSM-3	57.67	51.18	8.32	32.33	1.59	11.49	200.66	7.56	10.69	5.50	48.89	60.67	16.61	1.78
VL-10	59.53	49.28	8.54	30.77	1.71	10.40	188.33	7.74	10.83	5.72	45.33	56.02	16.11	1.64
CD at 5%	1.82	2.19	0.85	1.43	0.12	0.28	4.32	0.26	0.20	0.37	1.64	0.84	0.19	

Table 2. Interaction effect of sowing date and variety on performance of pea under Uttarakhand conditions.

Interaction (Sowing date x Variety)	Plant height (cm)	Days to 1 st picking	No. of primary br.	Plant FW (g)	Plant DW (g)	No. of nodules	Nodule wt. (g)	Root length (cm)	No. of pods kg ⁻¹	Pod length (cm)	Pod dia. (mm)	Green ovules per pod	Shelling (%)	Green pod yield (q/ha)	TSS (°Brix)	B:C ratio
D ₁ V ₁	66.50	67.33	2.41	51.01	9.36	34.00	2.03	9.95	200.00	9.25	11.86	7.52	47.13	73.48	14.40	2.13
D ₁ V ₂	63.73	69.00	2.41	49.05	8.88	38.00	2.12	10.25	197.00	9.65	12.06	7.99	47.66	74.35	13.23	2.16
D ₁ V ₃	55.32	62.00	3.10	45.50	8.43	36.00	2.53	11.45	216.00	8.92	12.24	6.71	47.37	53.06	16.42	1.55
D ₁ V ₄	55.33	64.36	2.80	48.36	8.53	33.00	1.89	10.07	211.00	8.22	12.40	6.58	48.56	57.63	14.94	1.68
D ₁ V ₅	57.53	67.00	2.44	54.30	9.62	37.00	2.15	12.04	209.00	8.00	10.93	6.17	48.56	64.84	15.30	1.80
D ₁ V ₆	59.16	69.00	3.03	52.36	9.43	36.00	1.95	11.31	195.00	9.17	11.39	7.36	48.13	59.42	15.35	1.89
D ₂ V ₁	67.48	69.66	3.00	49.33	8.36	28.00	1.64	9.73	194.66	8.18	11.19	6.25	48.09	68.48	15.94	1.99
D ₂ V ₂	62.13	72.00	3.35	48.66	8.03	35.00	1.76	12.40	188.00	8.00	11.81	6.15	46.00	70.35	15.06	2.04
D ₂ V ₃	64.56	63.33	2.35	42.70	7.35	29.00	2.18	11.13	198.00	8.78	10.49	6.53	44.56	52.44	16.25	1.53
D ₂ V ₄	61.27	62.00	3.25	46.90	7.56	25.00	1.55	9.20	178.00	7.78	12.00	5.60	49.12	54.32	15.42	1.59
D ₂ V ₅	57.06	63.66	2.74	52.36	9.13	32.00	1.35	11.55	198.00	7.69	11.13	5.23	49.00	60.84	17.03	1.77
D ₂ V ₆	56.43	64.66	3.32	49.22	8.25	31.00	1.68	9.88	192.00	7.12	10.35	5.14	49.16	56.42	16.63	1.65
D ₃ V ₁	75.50	63.33	3.46	45.58	7.13	30.00	1.70	10.76	188.00	7.92	10.49	5.89	40.40	65.28	16.50	1.90
D ₃ V ₂	69.29	60.33	3.15	43.60	7.03	31.00	1.58	11.47	189.00	7.83	10.24	5.78	39.25	66.15	15.23	1.93
D ₃ V ₃	61.43	53.00	3.25	45.60	6.65	23.00	1.76	12.29	187.00	8.15	10.00	6.22	48.47	51.89	17.64	1.52
D ₃ V ₄	55.29	56.33	3.51	37.50	7.63	32.00	1.60	10.24	174.00	8.05	11.38	6.24	48.71	52.32	16.65	1.53
D ₃ V ₅	61.31	59.00	2.63	46.90	6.23	26.00	1.29	10.90	195.00	7.00	10.01	5.11	49.45	56.34	17.50	1.65
D ₃ V ₆	64.21	54.33	2.95	46.28	7.83	27.00	1.50	10.03	178.00	6.93	10.75	4.66	39.31	52.22	16.35	1.53
CD at 5%	3.16 ^{***}	3.79 ^{**}	0.45 ^{**}	3.80 ^{**}	0.14 ^{**}	2.48 ^{**}	0.21 [*]	0.49 ^{**}	7.49 ^{**}	0.45 ^{**}	0.36 ^{**}	0.65 ^{**}	0.34 ^{**}	1.46 ^{**}	0.34 ^{**}	

- conditions of Swat (Pakistan). *Sarhad J. Agric.* **17**: 327-32.
4. Kaya, M., Sanli, A. and Tonguc, M. 2010. Effect of sowing dates and seed treatments on yield, some yield parameters and protein content of chickpea. *African J. Biotech.* **9**: 3833-39.
 5. Kumar, L., Kumar, S. and Rathi, A.S. 2009. Effect of different sowing time on pod yield of early cultivar of garden pea (*Pisum sativum* L.) var. *hortense*. *Green Farm.* **2**: 915-16.
 6. Raman, J. 2007. Effect of sowing dates and nitrogen levels on nodulation and green pod yield of pea (*Pisum sativum*). *Agric. Res. New Series*, **28**: 132-34.
 7. Sarkar, M., Sharma, R.A. and Deshmukh, P.S. 2003. Physiological studies on pod and seed characters in relation to productivity in garden pea. *Ann. Agric. Res. New Series*, **24**: 289-93.
 8. Sharma, S.K. 2002. Effect of sowing time and spacing levels on seeds production of pea cultivar Arkel. *Seed Res.* **300**: 88-91.
 9. Sharma, A., Sharma, M., Sharma, K.C., Singh, Y., Sharma, R.P. and Sharma, G.D. 2014. Standardization of sowing date and cultivars for seed production of garden pea (*Pisum sativum* var. *hortense* L.) under northwestern Himalayas *Legume Res.* **37**: 287-93.
 10. Yusufali, A.N., Salagundagi, S.C., Mansur, C.P., Hosamani, S.V. and Muimmigatti, O.V. 2007. Effect of date of sowing and seed rate of fodder production potential and economics of field bean genotypes under rainfed condition. *Karnataka J. Agric. Sci.* **29**: 13-16.
 11. Surwase, A.G. and Suryawanshi, A.P. 2013. Effect of sowing dates and pea varieties on powdery mildew and yield. *Ann. Pl. Prot. Sci.* **21**: 416-62.

Received: October, 2013; Revised: April, 2014;
Accepted: May, 2014