

Response of field pea varieties (*Pisum sativum*) to sowing time in coastal West Bengal

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ABSTRACT

A field experiment was conducted at Purba Medinipur Krishi Vigyan Kendra, Nandakumar, Purba Medinipur, West Bengal, India during winter (*rabi*) season of 2021–22 to study the effect of two sowing dates (4 November and 24 November) on phenology, growth and yield of four field pea varieties ('IPFD 11-5', 'IPFD 10-12', 'IPFD 12-2' and 'IPFD 6-3'). The average phenophase duration from sowing to 50% emergence, 10% flowering, and 10% podding were 6.2, 54.1 and 63.2 days, respectively. With delay in sowing from 4 to 24 November, the growth attributes like LAI, dry matter accumulation, root length and nodulation were significantly improved. Among 4 varieties, 'IPFD 6-3' had greater plant vigour due to highest plant height (66.04 cm) and number of branches/plant (16.50) at 80 DAS. Genetic variation was noted in number of branches/plant (11.7–16.5), pod length (5.2–6.1 cm), number of seeds/pod (2.7–3.8) and 1000-seed weight (159.4–168.3 g). Field pea sown on 24 November had higher grain yield (785.6 kg/ha), which was 5.9% greater over early November sowing due to higher plant population (35.3 plants/m²) and 1000-grain weight (169.6 g). Based on yield performance, four varieties could be arranged as 'IPFD 6-3' (818.0 kg/ha) > 'IPFD 12-2' (787.5 kg/ha) > 'IPFD 10-12' (731.5 kg/ha) > 'IPFD 11-5' (716.8 kg/ha).

Key words: Field pea, Phenology, Sowing date, Thermal indices, Variety, Yield

India ranks second in the area as well as production of pea next to China (Singh *et al.*, 2020). In India, field pea is the third most popular *rabi* pulse after chickpea and lentil. Pea is grown in 0.64 m ha area with a production of about 0.88 m tonnes in the country during 2020–21. In West Bengal, field pea is cultivated in around 0.14 lakh ha area and has a production of 0.17 lakh tonnes with average productivity of 11.9 q/ha (ATARI, 2017). The major field pea growing districts, namely Nadia, Hoogly, North 24 Parganas and South 24 Parganas, are in lower *Gangetic* plains and *delta* region of the state.

Field pea, being a leguminous crop, can be cultivated instead of leaving the field fallow after *kharif* rice or replacing the conventional crops like rapeseed-mustard, *boro* rice, potato, lentil, chickpea and wheat. Moreover, choosing the proper sowing time and selecting a suitable crop variety are two important non-monetary inputs for success-

ful crop production. Early or late sowing causes a drastic reduction in yield and net profit compared to timely sowing under any situation. Even after the release of a number of high-yielding varieties of field pea by the ICAR-Indian Institute of Pulses Research, Kanpur, the majority of Indian farmers are unaware of them, and they still cultivate the low-yielding local or early-released field pea varieties. So, there is an emerging need for adaptive trials to find out suitable high-yielding varieties along with perceiving the convenient sowing time for establishing field pea as a profitable legume crop in coastal region of West Bengal.

A field experiment was conducted at Krishi Vigyan Kendra in Mulakhop, Nandakumar, Purba Medinipur (22°10' 44" N latitude, 87°52' 13" E longitude and 6.0 m above mean sea level), West Bengal, India during *rabi* season of 2021–22. The soil of the field was sandy-clay loam (order Inceptisol), slightly acidic in reaction (pH 6.13), medium in organic carbon (0.64%), available nitrogen (253 kg/ha), phosphorus (16 kg/ha) and potassium (150 kg/ha). The experiment was laid out in split-plot design with 3 replications, which consisted of 2 sowing dates (4 November and 24 November) in main plots and 4 field pea varieties ('IPFD 11-5', 'IPFD 10-12', 'IPFD 12-2', 'IPFD 6-3') in sub-plots. Seeds of 4 field pea varieties, treated with *Rhizobium* inoculum were sown manually in the experimental

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field at a spacing of 40 cm × 10 cm. A uniform basal fertilizer dose comprising urea, SSP and MOP @ 20:40:40 (N: P₂O₅: K₂O) kg/ha were applied in all the experimental plots. Two hand weeding were done at 20 and 40 days after sowing (DAS) in both early and late November sown crop. The growth attributes of field pea like plant height, branching habit, dry matter (DM) production, root length, number of nodules/plant, leaf area index, crop growth rate were noted, while yield components and grain yield were determined at maturity. The protein content (total N × 6.25) in grain was determined by modified Kjeldahl method (Sadasivam and Manickam, 2011) at Department of Agronomy, B.C.K.V, Mohanpur, Nadia, West Bengal. The data collected in the study were analyzed using 'Analysis of Variance' technique (ANOVA) following standard statistical procedures (Gomez and Gomez, 1984).

The emergence of seedlings of field pea in 24 November sown plots were faster (4.2 days) than that of 4 November sowing (8.2 days). The average phenophase duration for sowing to 50% emergence, 10% flowering and 10% podding were 6.2, 54.1 and 63.2 days, respectively (Table 1). 'IPFD 6-3' required more time (58.1 days) to flower initiation, while 'IPFD 10-12' initiated flowering early (49.8 days) in lower Gangetic plains of West Bengal. However, Ahmed *et al.* (2020) noted the variation in days to flowering among 4 varieties between 39.0 and 53.0 days grown at Mymensingh, Bangladesh. Two varieties ('IPFD 11-5' and 'IPFD 10-12') took more days to 10% podding under late sown condition (24 November), but 'IPFD 12-2' required similar days to 10% podding under both sowings, and 'IPFD 6-3' took less period (62.8 vs. 69.7

days) to reach 10% podding, when sown on 24 November (Fig. 1).

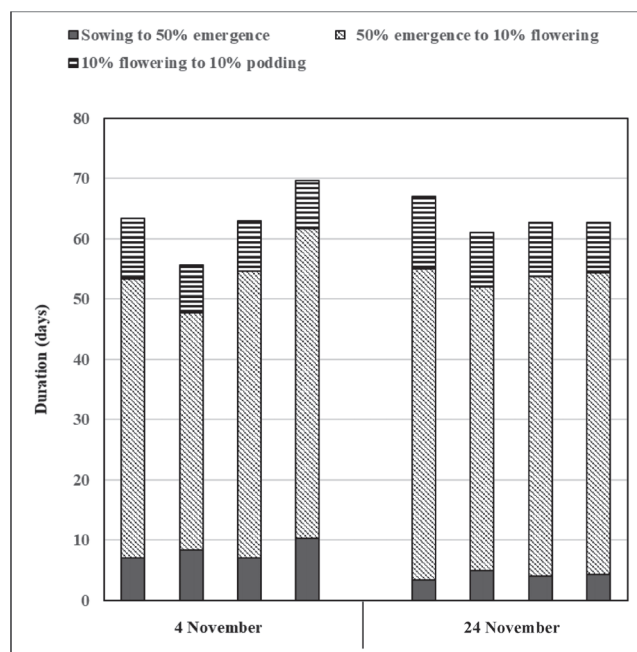


Fig. 1. Interaction effect of sowing date and variety on phenophase duration of field pea during *rabi* season

The plant height of late sown crop was higher over that of early sown crop throughout the cropping period and at maturity (66.9 vs. 57.2 cm) (Table 2). It could be explained by the fact that field pea being a cool season crop, was favored by low temperature condition when sown in late November (25.6°C day/15.5°C night) compared to early

Table 1. Effect of sowing date and variety on phenology and growth attributes of field pea during *rabi* season

Treatment	Phenophase duration (days)			LAI at 60 DAS	Dry-matter accumulation (g/m ²) at 60 DAS	CGR (g/m ² /day) at 41–60 DAS	Root length (cm) at 60 DAS	No. of nodules/ plant at 40 DAS
	Sowing to 50% emergence	50% emergence to 10% flowering	10% flowering to 10% podding					
<i>Sowing date</i>								
4 November	8.2	46.2	8.6	1.68	192.7	5.02	14.2	17.3
24 November	4.2	49.6	9.6	1.57	202.4	4.92	15.6	28.0
SEm±	0.37	1.02	0.89	0.02	0.34	0.01	0.20	1.65
CD (P=0.05)	2.41	NS	NS	0.12	2.28	0.04	1.36	10.83
<i>Variety</i>								
‘IPFD 11-5’	5.2	49.0	11.0	1.64	192.1	4.60	14.1	28.2
‘IPFD 10-12’	6.7	43.2	8.5	1.65	199.8	5.12	16.4	19.3
‘IPFD 12-2’	5.5	48.7	8.7	1.60	186.3	4.47	14.7	20.0
‘IPFD 6-3’	7.3	50.7	8.2	1.62	211.9	5.69	14.4	23.2
SEm±	0.70	1.28	0.73	0.02	0.62	0.06	0.68	1.65
CD (P=0.05)	NS	3.97	NS	NS	1.93	0.18	NS	5.13

Table 2. Effect of sowing date and variety on yield, yield associated attributes and quality of field pea during *rabi* season

Treatment	Plant height (cm)	Plant population (No./m ²)	Number of branches/plant	Pod length (cm)	Number of seeds/pod	1,000 seed weight (g)	Grain yield (kg/ha)	Protein content (%)
<i>Sowing date</i>								
4 November	57.2	32.9	13.6	5.5	3.3	157.0	741.4	17.0
24 November	66.9	35.3	14.5	5.9	3.6	169.6	785.5	17.4
SEm±	0.75	0.21	0.83	0.10	0.10	0.48	2.26	0.17
CD (P=0.05)	4.95	1.39	NS	NS	NS	3.14	14.79	NS
<i>Variety</i>								
‘IPFD 11-5’	61.7	33.0	15.3	5.2	2.7	163.9	716.8	17.3
‘IPFD 10-12’	54.8	36.0	12.7	6.1	3.7	159.4	731.5	17.4
‘IPFD 12-2’	65.5	34.0	11.7	5.6	3.8	161.6	787.5	16.5
‘IPFD 6-3’	66.0	33.5	16.5	6.1	3.7	168.3	818.0	17.5
SEm±	0.57	0.57	0.78	0.13	0.23	1.16	5.48	0.39
CD (P=0.05)	1.79	1.77	2.42	0.39	0.70	3.63	17.00	NS

November sowing (27.4°C day/17.1°C night). Field pea sown on 28 November at Gopalganj in Bangladesh was found to produce the tallest (65.0 cm) plant at 60 DAS, which was greater over 13 November (62.1 cm) and shortest (49.7 cm) plant was noted under 13 December sowing (Haq *et al.*, 2021). However, Singh *et al.* (2020) reported that plant height of field pea sown in 1st fortnight of November was higher with greater branching than earlier (2nd fortnight of October) or later sowing (2nd fortnight of November) at Patiala, Punjab. ‘IPFD 6-3’ showed greater plant vigor having tallest plants (66.0 cm) and better branching (16.5 branches/plant) as compared to other three varieties. Although no significant variation in leaf area index was noted among the varieties, but early sowing (4 November) resulted in higher leaf area index 1.68 at 60 DAS. But late sown (24 November) crop accumulated greater DM at 60 DAS (202.4 g/m²) probably due to better branching habit than early November sown crop. Varietal difference in dry matter (DM) yield was also found significant at mid-late growth stage (60 DAS) in the study. At 41-60 DAS, field pea sown on 4 November recorded greater CGR (5.02 g/m²/day) and among the varieties ‘IPFD 6-3’ had highest CGR (5.69 g/m²/day). Late November sown field pea produced longer root (15.6 cm) at 60 DAS and higher number of nodules/plant (28.0) at 40 DAS than early November sown crop. Though ‘IPFD 10-12’ had maximum root length (16.4 cm), but it recorded the lowest number of nodules on roots (19.3/plant).

Late sowing (24 November) resulted in greater population in 1 m² area (35.3), which was significantly greater over early November sowing (32.9). This non-expected significant variation might be due to differences in germination, emergence and seedling mortality at varied sowing times (4 and 24 November) along with subsequent crop

management practices like gap filling and thinning in the field. Although sowing time had no significant effect on pod length and number of seeds/pod in the study, but there was gradual decrease in number of pods/plant and number of seeds/pod of vegetable pea at Koraput, Orissa (Dass *et al.*, 2005). Among four varieties, ‘IPFD 10-12’ recorded the highest plant population (36.0/m²) and this could be due to varietal difference in quality and germinability of the seeds used in the experiment. ‘IPFD 12-2’ produced maximum seeds/pod (3.84), while ‘IPFD 11-5’ had the least (2.67). Pod length and test weight, being genetical characters, differed significantly among four field pea varieties with a range between 5.2 and 6.1 cm, and 159.4 and 168.3 g in the study.

Field pea sown on 24 November produced higher grain yield (785.5 kg/ha) compared to 4 November sown crop (741.4 kg/ha) due to higher plant population (35.3/m²) and test weight (169.6 g). However, Ahmed *et al.* (2020) noted that 13 November might be the optimum time of sowing of field pea as it recorded higher seed yield rather than early sowing (29 October) or late sowing (28 November) at Mymensingh, Bangladesh. ‘IPFD 6-3’ yielded highest (818.0 kg/ha), which was 30.4, 86.5 and 101.1 kg/ha greater over ‘IPFD 12-2’, ‘IPFD 10-12’ and ‘IPFD 11-5’, respectively. The maximum grain yield of ‘IPFD 6-3’ could be attributed to maximum number of branches/plant (16.5) accommodating more pods and 1000 seed weight (168.3 g). Moreover, ‘IPFD 6-3’ produced the maximum grain yield at both sowing dates (780.9 and 855.0 kg/ha). But two pea varieties (‘DPEPP-15-1’ and ‘Arka Apoorva’) performed better when sown on 21 October, while ‘Mithi Phali’ on 5 November at Palampur, Himachal Pradesh (Eshanee *et al.*, 2022). The protein content remained unaffected due to different sowing dates as well as field pea

varieties, but it was found to vary between 16.5% ('IPFD 12-2') and 17.5% ('IPFD 6-3'). However, Majid *et al.* (2017) identified four field pea genotypes ('SKUA-P-RF-34', 'SKUA-P-RF-36', 'SKUA-P-RF-55' and 'SKUA-P-RF-113') for having higher protein content than check variety ('Shalimar Pea 1') in Kashmir valley.

Thus, it can be concluded that 'IPFD 6-3' appeared as a promising variety due to high grain yield (818.0 kg/ha) and protein content (17.5%), while late November could be an optimum time for sowing of field pea crop for better performance in coastal West Bengal.

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