

Evaluation of Garden Pea (*Pisum sativum* L.) varieties for Growth and Flowering Attributes under Malwa Region of Madhya Pradesh

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ABSTRACT: An experiment was conducted to evaluate the garden pea (*Pisum sativum* L.) varieties for growth, yield and quality attributes under Malwa region of Madhya Pradesh. Result revealed that in the present investigation, the genotypes differed significantly with respect to different growth and flowering parameter. Growth attributes viz., plant height, number of primary branches per plant, number of leaves per plant and number of node of first flowering. Variation in these attributes among the varieties is mainly due to genetic nature of varieties. Variety Arka Kartik was recorded maximum plant height (24.93, 49.27 and 78.40 cm), variety Kashi Shakti was recorded in highest number of primary branches per plant (1.73, 4.60 and 6.53) and highest number of leaves per plant (29.47, 52.33 and 55.47) at 30, 45 and 60 days after sowing over other varieties studied, variety Kashi Shakti had the highest number of node of first flowering (10.93). Flowering attributes viz., day to first flower appearance, day of 50% flowering and day of first picking. The result revealed that variety Pusa Shree had the noted minimum day first flower appearance (31.00 days), day of 50% flowering (41.03 days) and day of first picking (55.36 days).

Keywords: Pea (*Pisum sativum* L.), varieties, growth attributes, flowering attributes, number, plant height, flowering.

INTRODUCTION

The garden pea (*Pisum sativum* L.) is a well-known winter crop among leguminous vegetable crops and belongs to the Leguminosae (fabaceae) family. It is native to Europe and western Asia. The genus *Pisum* includes 6-7 species, but only *Pisum sativum* (2n = 14) is being farmed. The Garden pea is a self-pollinating crop that is a short-lived annual herbaceous and climber. Pods are swollen or compressed, straight or twisted on a short stalk. Botanically, Seeds might be angular, globose and smooth or wrinkled. The consumed fruit is referred to as a 'pod' (Nath and Swamy 2016). Pea cultivars are classified into different types. On the basis of height cultivars are classified into three types, i.e., bush, medium tall and tall types and according to maturity three types are early, mid-season

and late cultivars (Thamburaj and Singh 2016). Peas are grown for their soft immature and mature dry pods. Immature pods are used as fresh vegetables and mature dried pods are used as pulses. In both situations, the pea seeds are separated from the pod and used as a vegetable or pulses and as well as in making soup (Kumari and Deka 2021). Fresh garden pea include 75.6% water, 16.90 g carbohydrate, 0.40 g fat, 6.20 g protein, 2.50 g crude fibre, 0.90 g ash, 32.00 mg calcium, 102.00 mg phosphorus, 6.00 mg sodium, 350.00 mg potassium, 1.20 mg iron, 405.00 ug carotene, 0.28 mg thiamine, 0.11 mg riboflavin, 2.80 mg niacin and 27.00 Ascorbic acid per 100 g edible portion (Bose *et al.*, 2003). Peas grow best in regions where the temperature gradually changes from cool to warm. The ideal temperature for seed germination is around 22 degrees Celsius (Singh and Singh 2011).

Optimum temperature range for garden pea cultivation is 10-30°C. The minimum temperature for germination is about 10°C. However, it can germinate up to 5°C but at slow rate (Shaukat *et al.*, 2012). Good agronomic practices like growing high yielding varieties, providing proper spacing, irrigation, use of fertilizers, optimum sowing time and appropriate plant protection measures to be essentially followed in order to increase the productivity. Among all these factors, identification of high yielding varieties for certain region is most important. Cultivar performs differently under various agro-climatic conditions and various cultivars of same species grown even in same environment often have yield differences. Yield and quality of crop are very complex characteristics depending on certain biological alignments between environment and heredity. The characteristics of a cultivar as well as combination of traits differ according to the climatic conditions of the localities (Damor *et al.*, 2017).

MATERIAL AND METHODS

The present field experiment conducted to evaluation of garden pea (*Pisum sativum* L.) varieties for growth, flowering attributes under Malwa region of Madhya Pradesh at the Bahadari Farm, College of Horticulture, Mandsaur (M. P.) during *Rabi* season of 2020-21. The experiment was laid out in a Randomized Block Design with three replications and used different varieties of pea *viz.* V₁ (Arka Ajit), V₂ (Arka Apoorva), V₃ (Arka Kartik), V₄ (ArkaPriya), V₅ (Arkel), V₆ (Azad Pea-3), V₇ (KashiAgeti), V₈ (Kashi Mukti), V₉ (Kashi Nandini), V₁₀ (Kashi Samarth), V₁₁ (Kashi Samridhi), V₁₂ (Kashi Shakti), V₁₃ (KashiUday), V₁₄ (Matar Ageta-6), V₁₅ (Mater Ageta- 7), V₁₆ (Palam Priya), V₁₇ (Palam Sumool), V₁₈ (Palam Triloki), V₁₉ (PSM-3), V₂₀ (Punjab-89), V₂₁ (Pusa Pragati), V₂₂ (Pusa Shree) with 22 different varieties was obtained from Department of Vegetable Science, College of Horticulture, Mandsaur (M.P.). Seeds were treated first with 2 g mancozeb 75 % WP + 1 g carbendazim 50 % WP @ per kg seed, thereafter with 5 g PSB and 3 g *Rhizobium leguminosarum* culture @ per kg seed before sowing. The seed was sown in lines at a spacing of 30 × 10 cm with a depth of 3-4 cm and covered with soil. The crop was well managed for optimum growth and yield. The fertilizers were applied at the time of sowing @ 25 kg N, 50 kg P₂O₅ and 30 kg K₂O/ha. Pre-sowing irrigation was given. Thereafter, optimum soil moisture was maintained in the field by irrigations. Use of Dimethoate 30% EC (1.5 ml/litre), Chlorpyrifos 20% EC (2 ml/litre) was done to control the insect pests. Prophylactic spray of Mancozeb 75% WP (2 g/litre) and Carbendazim (1 g/litre) was done to check the diseases. Five plants were randomly selected and tagged from each treatment under each replication excluding the border plants. Observation data were recorded on the tagged plants for the growth, flowering attributes of garden pea. The mean values over the

replications in the respective years and pooled over years were statistically analyzed as per the standard statistical procedures (Gomez and Gomez 1984).

RESULT AND DISCUSSION

Growth attributes. It is essential to evaluate high yielding genotypes since a superior genotype may exhibit its potentiality when grown under set of agro-climatic conditions. In the present investigation, the genotypes differed significantly with respect to different growth parameters *viz.*, plant height, number of primary branches per plant, number of leaves per plant and number of node of first flowering. Variation in these parameters among the varieties is mainly due to genetic nature of germplasm.

Arka Kartik produced longest plant. It was followed by Arka Priya, Arka Apoorva and Arka Ajit, respectively who were at par with each other in decreasing order. These differences in plant height of different varieties could be attributed to their genetic contribution and adaptability to prevailing environmental conditions (Sirwaiya and Kushwah 2018) such as temperature and moisture conditions also favored the vegetative development of the crop. The variation in plant height can be partly attributed to variations of soils and climatic factors (Bairwa *et al.*, 2018).

Highest number of primary branches per plant at all growth stages was recorded in variety Kashi Shakti over other varieties studied followed by Kashi Samarth, Kashi Samridhi and Kashi Nandini were the next to arrive. The increase in number of branches might be due to the enhanced cell division which increased the number of vegetative buds on the main stem. The temperature and moisture conditions also favored the vegetative development of the crop (Bairwa *et al.*, 2018). Sirwaiya and Kushwah (2018); Raj *et al.* (2020); Sharma *et al.* (2020) in pea were reported as results to under this study.

The maximum number of leaves per plant was found under variety Kashi Shakti followed by Kashi Samarth, Kashi Samridhi, Kashi Nandini and Pusa Pragati. Higher number of branches might have lead to higher number of leaves in garden pea was earlier reported by Sirwaiya and Kushwah (2018).

Differences in number of node of first flowering in different varieties have been found. The variety Kashi Shakti had the highest number of node of first flowering, followed by Kashi Samarth, Kashi Samridhi and Kashi Nandini, all of which were close to each other. Genetic makeup of the varieties might be responsible for differences in number of node of first flowering. These similar results have been observed by Devi *et al.* (2018).

Flowering attributes. The data with respect to days to first flower appearance, days of 50% flowering and day of first picking of pods determines whether a genotype is early or late flowering for selection of suitability of variety for production

Earliest first flower appearance was observed under variety Pusa Shree, followed by Kashi Nandini, Matar Ageta-6, Matar Ageta-7, Kashi Ageti, PSM-3, Arkel, Palam Triloki and Palam Priya. Generally, early maturing varieties taking minimum days to start flowering are compared to other varieties (Khichi *et al.*, 2017) but, some other factors *i.e.* genetic hereditary and

favorable climatic conditions like temperature, rainfall, high relative humidity and dry sunshine also confirmed that favorable environment must be required for flowering in pea (Bairwa *et al.*, 2018). This similar results found by Kanwar *et al.* (2020); Sharma *et al.* (2020).

Table 1: Performance of different pea varieties for growth attributes.

T/t	Varieties	Plant height (cm)			Number of primary branch per plant			Number of leaves per plant			Number of nodes at first flowering
		30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	30 DAS	45 DAS	60 DAS	
V ₁	ArkaAjit	22.93	43.73	71.80	1.20	3.14	5.20	21.60	41.60	46.73	8.93
V ₂	ArkaApoorva	23.07	43.93	74.60	1.13	3.13	5.07	21.47	41.27	46.53	8.93
V ₃	ArkaKartik	24.93	49.27	78.40	1.27	3.20	5.27	22.00	41.87	47.47	9.07
V ₄	ArkaPriya	23.13	44.40	75.27	1.20	3.13	5.27	21.73	41.87	47.00	9.07
V ₅	Arkel	20.80	38.20	63.60	1.33	3.27	5.27	23.67	44.07	48.87	9.33
V ₆	Azad Pea-3	20.67	37.53	62.00	1.27	3.20	5.27	22.93	43.53	48.67	9.20
V ₇	KashiAgeti	20.60	37.27	61.33	1.27	3.20	5.27	22.53	42.80	48.60	9.13
V ₈	KashiMukti	21.27	38.93	64.53	1.40	3.33	5.33	24.07	44.33	49.00	9.45
V ₉	KashiNandini	22.13	40.47	70.00	1.47	3.53	5.60	25.93	48.87	52.07	10.03
V ₁₀	Kashi Samarth	22.40	41.07	70.67	1.53	3.60	5.73	28.53	50.80	55.40	10.56
V ₁₁	KashiSamridhi	22.20	40.53	70.00	1.47	3.60	5.60	27.27	49.40	52.13	10.11
V ₁₂	Kashi Shakti	22.60	42.00	71.07	1.73	4.60	6.53	29.47	52.33	55.47	10.93
V ₁₃	KashiUday	21.07	38.87	64.07	1.33	3.33	5.33	24.00	44.27	48.93	9.37
V ₁₄	Matar Ageta-6	21.53	39.20	65.27	1.40	3.33	5.40	24.53	44.47	49.00	9.53
V ₁₅	Matar Ageta-7	19.60	36.53	61.20	1.27	3.20	5.27	22.47	42.47	48.00	9.13
V ₁₆	PalamPriya	16.20	30.40	55.93	1.00	2.73	4.40	17.87	33.73	40.73	7.87
V ₁₇	PalamSumool	18.93	34.00	59.80	1.07	3.07	4.93	20.80	38.47	43.80	8.27
V ₁₈	PalamTriloki	19.07	36.20	59.87	1.13	3.13	5.00	21.13	41.07	45.07	8.53
V ₁₉	PSM-3	21.53	39.93	67.67	1.40	3.33	5.47	24.67	46.53	50.20	9.60
V ₂₀	Punjab-89	21.53	39.87	67.20	1.40	3.33	5.47	24.67	45.33	49.93	9.53
V ₂₁	PusaPragati	21.87	40.07	69.47	1.40	3.40	5.60	25.80	46.73	50.27	9.60
V ₂₂	Pusa Shree	17.67	32.93	57.93	1.00	3.07	4.80	19.87	35.13	41.93	8.04
SEm (±)		0.58	1.23	1.20	0.06	0.11	0.14	1.09	1.41	1.42	0.17
CD at 5%		1.66	3.51	3.43	0.16	0.32	0.41	3.11	4.02	4.05	0.49

Table 2: Performance of different pea varieties for flowering attributes.

T/t	Varieties	Day to first flower appearance	Day of 50% flowering	Day of first picking
V ₁	ArkaAjit	46.82	57.28	77.37
V ₂	ArkaApoorva	45.61	56.89	76.65
V ₃	ArkaKartik	49.57	60.75	80.09
V ₄	ArkaPriya	47.41	58.14	78.71
V ₅	Arkel	38.01	49.17	62.81
V ₆	Azad Pea-3	39.33	49.94	64.76
V ₇	KashiAgeti	37.00	47.72	61.99
V ₈	KashiMukti	39.00	49.51	64.65
V ₉	KashiNandini	35.07	44.70	60.04
V ₁₀	Kashi Samarth	39.73	49.99	65.76
V ₁₁	KashiSamridhi	43.98	56.16	73.54
V ₁₂	Kashi Shakti	44.34	56.18	74.95
V ₁₃	KashiUday	40.13	50.01	65.84
V ₁₄	Matar Ageta-6	36.84	46.34	60.84
V ₁₅	Matar Ageta-7	36.98	47.11	61.47
V ₁₆	PalamPriya	38.51	49.37	63.83
V ₁₇	PalamSumool	45.54	56.71	75.67
V ₁₈	PalamTriloki	38.09	49.19	63.29
V ₁₉	PSM-3	37.51	47.74	62.08
V ₂₀	Punjab-89	48.12	59.98	79.73
V ₂₁	PusaPragati	40.33	50.31	66.19
V ₂₂	Pusa Shree	31.00	41.03	55.36
SEm (±)		0.17	0.69	0.53
CD at 5%		0.49	1.98	4.51

Days required for 50 % flowering was significantly influenced by different pea varieties. Earliest days to 50% flowering had noted in the variety Pusa Shree which was comparable to Kashi Nandini, Matar Ageta-6, Matar Ageta-7, Kashi Ageti, PSM-3, Arkel. Lower number of node of first flowering and days to first flowering consequently resulted in lesser number of days to 50% flowering (Patidar, 2014). These results are supported with those of Kanchan *et al.* (2017); Kanwar *et al.* (2020) in pea.

Days required for first picking of green pods of pea was significantly influenced by different varieties. The variety Pusa Shree noted minimum days of first picking as compare to all other varieties. It was followed by Kashi Nandini, Matar Ageta-6, Matar Ageta-7, Kashi Ageti, PSM-3 and Arkel. The difference in green pod harvesting days might be due to the genetic characters of particular variety and growing conditions. But favorable climatic conditions and sometimes the change in the microclimate will affect the days required for pod setting and green pod harvesting (Bairwa *et al.*, 2018). Similar results reported by Kanwar *et al.* (2020); Sharma *et al.* (2020).

CONCLUSION

On the basis of present experiment, it may be concluded that variety Kashi Shakti was superior in terms of number of primary branches per plant, number of leaves per plant and number of node of first flowering followed by Kashi Samarth, Kashi Samridhi, Kashi Nandini and Pusa Pragati. Variety Arka Kartik was found maximum plant height. The variety Pusa Shree was indicated earlier picking followed by Kashi Nandini, Matar Ageta-6 and Matar Ageta-7. Based on the result obtained from evaluation of pea varieties, Kashi Shakti, Arka Kartik, Kashi Samarth, Kashi Samridhi, Kashi Nandini, Pusa Pragati and PSM-3 are the best for growth and phenological parameters. Hence, it can be concluded these varieties may be adopted for commercial cultivation in Malwa region of Madhya Pradesh.

FUTURE SCOPE

The following recommendations for further study effort are given based on the findings:

These experiments should be repeated in the next 2-3 years to confirm the results. These varieties can be evaluated at different dates of sowing under the agro-climatic conditions of the area. More varieties can be used for future experiments.

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Conflicts of Interest. None.

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