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ASSESSMENT OF GROWTH AND PRODUCTIVITY OF GARDEN PEA (*PISUM SATIVUM* L. *VAR. HORTENSE*) IN THE GIRD ZONE OF MADHYA PRADESH, INDIA

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ABSTRACT

A field experiment was conducted during the *rabi* season of 2024-25 at the experimental field of Horticulture, College of Agriculture, RVSKVV Gwalior, Madhya Pradesh, to assess garden pea *(Pisum sativum* L.) genotypes for growth and yield attributes under the Gird region of Madhya Pradesh. The experiment was structured following a randomized block design (RBD) with 23 genotypes and 3 replications. The genotypes included were Punjab-89, Kashi Samarth, Mater Ageta-7, Pusa Pragati, Arka Priya, Kashi Nandini, Sehore Local, Jamoniya Local, Hirapur Local, Sekhdakhedi Local, Thuna Local 1, Thuna Local 2, Murdi Local, Mungaoli Local, Alam Pura Local, Ichhawar Local, Raipura Local, Pachama Local, Doraha Local, Kakad Keda Local, Sadan Khedi Local, Fanda Local, PS10. Significant variations were recorded among genotypes. Pusa Pragati showed maximum plant height (at 90 DAS), followed by Arka Priya and Doraha Local. Kashi Samarth recorded the highest number of leaves, and Kashi Nandini had the most branches and largest leaf area, indicating superior vegetative growth. Pusa Pragati also excelled in reproductive traits, with the highest number of flowers, grains per pod and pod length. Kashi Nandini was the earliest to flower, and Alam Pura Local had the earliest pod set. The highest pod yield was observed in Kashi Nandini, followed by Pusa Pragati and Kashi Samarth. For local varieties, Sehore Local, Hirapur Local and Doraha Local showed promising performance. These genotypes, particularly the improved and well-performing local genotypes, offer huge potential for pea cultivation in Central India.

Key words : Pea (*Pisum sativum* L.), Local genotypes, Genotypes, Significant variation.

Introduction

The garden pea (*Pisum sativum* L. var. *hortense*), included in the family Fabaceae (Leguminosae), also known as the sweet pea, is a choice vegetable grown for its fresh shelled green seeds. Peas are grown for their soft immature and mature dry pods. Immature pods serve the purpose of fresh vegetables, mature dried pods as pulse. In both situations, the pea seeds are separated from the pod and used as a vegetable or pulses (Kumari and Deka, 2021). Garden pea (*Pisum sativum* L.) is a very common nutritious vegetable grown for fresh and dried seeds. The green pods from hills are accessible during April – November and this marks the time span of their flavor, sweetness and freshness. From a nutritional standpoint, the garden pea holds significant value, containing approximately 7.2 g of protein, 0.1 g of fat, and 0.8 g of minerals per 100 grams of the edible part. It also includes about 15.8 g of carbohydrates, along with 20 mg of calcium, 139 mg of phosphorus, 0.23 mg of copper, and 1.5 mg of iron. In terms of revenue generation, the garden pea ranks among the most economically rewarding vegetable crops. (Sepehya *et al*., 2015). In India, key states known for pea cultivation include Uttar Pradesh, Bihar, Haryana, Punjab, Himachal Pradesh, Odisha, Karnataka and Madhya Pradesh. Pea stands among the top ten vegetable crops in the country. According to recent data given by the Department of Agriculture and Farmers Welfare (2021) peas occupy 0.567 Mha area with 5.845 Mt production in Indian conditions. Uttar Pradesh holds the top position in terms

of both area under cultivation (0.233 Mha) and total production (2.66 Mt) of peas. It is followed by Madhya Pradesh, which accounts for 0.111 Mha of cultivated land and produces approximately 1.14 Mt (Anonymous, 2021).

In tropical and subtropical zones, its farming is generally limited to higher altitudes and the winter season (Patidar, 2014). The widespread cultivation of peas across different regions, including the plains and hilly areas, contributes to the country's high production levels. Peas are also exported to several countries, such as Saudi Arabia, Nepal, the United Arab Emirates, Bahrain, Bangladesh, Australia, the Maldives, Oman, Guinea-Bissau and others. To meet domestic demand and boost international trade, it's essential to enhance production, which can be achieved by expanding the cultivation area and adopting high-yielding varieties. However, both approaches depend on the local availability of good-quality seeds of improved cultivars at a reasonable cost. India holds the position of the world's second-largest producer of garden peas, ranking just behind China. Despite this, in terms of productivity, garden peas rank tenth among all vegetable crops cultivated in India.

Thus, there is a scope to increase the productivity of garden peas in the country, which can be achieved by identifying the high-yielding genotypes/varieties. Therefore, the present study was aimed at assessing the growth and productivity of pea genotypes to identify the suitable ones for cultivation in the gird region of Madhya Pradesh.

Materials and Methods

The field experiment titled "Assessment of Growth and Productivity of Garden Pea (*Pisum sativum* L. *var. hortense*) in the Gird Zone of Madhya Pradesh" was conducted at the Vegetable Research Farm, Department of Vegetable Science, College of Agriculture, Gwalior (M.P.) during the rabi season of 2024-25. The genotypes were grown in a randomized block design with three replicates during rabi season keeping row to row distance of 30 cm and plant to plant distance of 10 cm. Pure, healthy and good quality seeds of 23 pea genotypes viz. Punjab-89, Kashi Samarth, Mater Ageta-7, Pusa Pragati, Arka Priya, Kashi Nandini, Sehore Local, Jamoniya Local, Hirapur Local, Sekhdakhedi Local, Thuna Local 1, Thuna Local 2, Murdi Local, Mungaoli Local, Alam Pura Local, Ichhawar Local, Raipura Local, Pachama Local, Doraha Local, Kakad Keda Local, Sadan Khedi Local, Fanda Local, PS10 were collected from College of Agriculture, Gwalior. Five plants were randomly selected and tagged from each treatment under each replication excluding the border plants for recording observations of the growth parameters considered in the study include plant height, number of leaves per plant, number of branches per plant, leaf area (cm^2), number of flowers per plant, days to 50% flowering, days to 50% pod set and the yield parameters taken into account are number of pods per cluster, number of pods per plant, pod length (cm), number of grains per pod, pod yield per plant (g), pod yield per plot (kg), and pod yield per hectare (q/ha).

Results and Discussion

Growth parameters

Significant variability was observed among the genotypes across all growth stages for key vegetative and reproductive traits in garden pea. In terms of plant height, Pusa Pragati exhibited consistently vigorous growth from early to late stages, followed closely by Doraha Local, Kashi Nandini, and Arka Priya, reflecting their strong adaptability and stable performance across growth phases. Similar results were previously reported by Mukherjee *et al*. (2013), Kanchan *et al*. (2017), Kanwar *et al*. (2020) and Sharma *et al*. (2020). For the number of leaves per plant, Kashi Samarth showed superior foliage development, along with Punjab-89, Kakad Keda Local and Doraha Local, indicating their potential for enhanced photosynthetic activity, supported by earlier observations of Khan (2012), Phom *et al*. (2014), Sirwaiya and Kushwah (2018), and Nagar *et al*. (2022). With respect to the number of branches, Kashi Nandini consistently outperformed other genotypes, followed by Arka Priya, Sadan Khedi Local and Kakad Keda Local, highlighting their superior shoot proliferation capacity; this finding aligns with the work of Raj *et al*. (2020) and Bairwa *et al*. (2018), who noted that temperature and moisture significantly influence vegetative traits. Leaf area was another critical trait where Kashi Nandini led across all stages, closely followed by Doraha Local, Fanda Local, Sehore Local and Sekhdakhedi Local, indicating larger photosynthetic surfaces; comparable conclusions were drawn by Hossain et al. (2002) and Noor *et al*. (2014). Regarding reproductive attributes, Pusa Pragati produced the highest number of flowers, with Hirapur Local and Kashi Nandini also performing well; these outcomes are in line with the findings of Datta and Das (2018) and Singh *et al*. (2015), who emphasized the importance of floral abundance in yield formation. In terms of earliness, Kashi Nandini, Sehore Local and Jamoniya Local achieved 50% flowering earlier than other genotypes, while Alam Pura Local, Ichhawar Local, and Raipura Local were the earliest to set pods, making them valuable for short-duration cropping systems. These observations echo the

Table 1 : Performance of different pea genotypes for growth parameters.

Genotypes	Varieties	Plant height (cm)	Number of leaves per plant	Number of branches per plant	Leaf area (cm^2)	Number of flowers per plant	Days of 50% flowering	Days to 50% pod set
G1	Punjab-89	67.99	45.82	6.97	10.39	12.88	55.48	70.47
G2	Kashi Samarth	68.54	46.63	6.83	10.49	12.89	50.04	65.74
G3	Mater Ageta-7	71.14	43.34	7.01	10.43	11.95	52.39	69.76
G4	Pusa Pragati	84.92	43.66	7.17	10.53	13.51	52.62	69.51
G5	Arka Priya	83.01	44.07	7.48	10.51	12.1	52.63	68.73
G6	Kashi Nandini	83.01	43.27	8.17	11.40	13.28	46.06	66.63
G7	Sehore Local	75.37	42.82	7.67	11.16	13.26	46.56	66.36
G8	Jamoniya Local	75.90	43.94	6.58	10.16	13.03	47.65	67.46
G9	Hirapur Local	77.58	42.51	7.40	10.91	13.33	48.65	69.92
G10	Sekhdakhedi Local	76.51	43.47	7.65	10.94	13.4	49.66	68.87
G11	Thuna Local 1	73.90	44.39	7.70	10.72	12.99	50.43	67.75
G12	Thuna Local 2	74.66	42.85	7.45	10.21	12.78	49.81	73.50
G13	Murdi Local	75.54	41.26	6.74	10.31	11.8	54.69	66.71
G14	Mungaoli Local	74.25	41.63	7.33	10.77	13.11	55.67	68.46
G15	Alam Pura Local	74.72	42.48	7.08	10.65	12.6	50.58	62.45
G16	Ichhawar Local	75.44	43.25	7.50	10.35	13.21	49.55	63.46
G17	Raipura Local	75.26	44.57	6.17	9.80	11.66	50.56	65.50
G18	Pachama Local	77.48	43.83	6.69	10.04	12.22	49.79	68.83
G19	Doraha Local	83.70	45.01	7.81	10.76	9.12	55.80	73.73
G20	Kakad Keda Local	82.68	45.50	7.80	10.71	9.27	52.48	70.81
G21	Sadan Khedi Local	71.03	45.19	7.62	10.67	11.93	52.66	65.66
G22	Fanda Local	71.85	43.85	7.70	10.70	8.96	47.65	67.49
G23	PS10	63.93	44.88	6.68	9.92	8.84	48.43	72.59
SEm(±)		0.151	0.210	0.118	0.160	0.118	0.112	0.090
CD 5%		0.305	0.424	0.240	0.324	0.238	0.227	0.181

Table 2 : Performance of different pea genotypes for yield parameters.

Genotypes	Varieties	Number of pods per cluster	Number of pods per plant	Pod length (cm)	Number of grains per pod	Pod yield per plant (g)	Pod yield per plot(kg)	Pod yield per hectare (q/ha)
G1	Punjab-89	1.79	9.00	9.00	8.60	50.48	3.72	60.33
G2	Kashi Samarth	1.86	9.10	9.10	8.70	52.39	3.91	59.29
G3	Mater Ageta-7	1.77	8.40	8.40	7.90	50.56	3.77	52.37
G4	Pusa Pragati	1.94	9.80	9.80	9.60	48.31	4.02	62.29
G5	Arka Priya	1.82	8.30	8.30	8.10	50.52	3.77	60.57
G6	Kashi Nandini	1.65	9.50	9.50	9.20	53.30	4.14	60.87
G7	Sehore Local	1.96	9.50	9.50	9.30	49.87	3.66	59.49
G8	Jamoniya Local	1.75	9.00	9.00	8.70	51.48	3.71	54.54
G9	Hirapur Local	1.67	9.50	9.50	9.27	50.48	3.56	61.82
G10	Sekhdakhedi Local	1.84	9.60	9.60	9.20	50.51	3.37	51.90
G11	Thuna Local 1	1.93	9.30	9.30	9.10	51.39	3.77	51.44
G12	Thuna Local 2	1.56	9.00	9.00	8.70	49.35	3.21	50.49
G13	Murdi Local	1.65	8.10	8.10	7.70	49.61	3.56	59.52
G14	Mungaoli Local	1.72	9.40	9.40	9.20	50.47	3.70	55.11
G15	Alam Pura Local	1.55	8.90	8.90	8.60	49.64	3.71	52.69
G16	Ichhawar Local	1.86	9.40	9.40	9.00	49.32	3.73	50.81
G17	Raipura Local	1.56	8.10	8.10	7.30	50.31	3.87	52.50
G18	Pachama Local	1.88	8.50	8.50	8.30	49.69	3.75	53.65
G19	Doraha Local	1.93	5.30	5.30	4.50	49.36	3.64	52.83
G20	Kakad Keda Local	1.57	5.40	5.4	5.00	50.90	3.40	51.43
G21	Sadan Khedi Local	1.84	8.00	8.0	7.70	50.57	3.85	56.58
G22	Fanda Local	1.78	5.20	5.2	4.60	45.80	3.71	52.84
G23	PS10	1.33	5.14	7.4	7.00	45.36	3.36	51.08
SEm (±)		0.019	0.093	0.093	0.111	0.134	0.102	2.081
CD 5%		0.039	0.187	0.187	0.225	0.270	0.205	4.194

results of Khichi *et al*. (2017), Datta *et al*. (2018), Kanwar *et al*. (2020) and Sharma *et al*. (2020), who attributed such earliness to genetic makeup and favorable environmental factors like temperature, rainfall, relative humidity, and sunlight.

Yield parameters

Significant genetic variability was observed among the genotypes for pod-related traits, indicating their differential reproductive efficiency and yield potential. In terms of the number of pods per cluster and pods per plant, genotypes such as Sehore Local, Pusa Pragati, Thuna Local 1 and Doraha Local stood out, demonstrating a superior fruit-setting capacity per floral unit. Likewise, Sekhdakhedi Local, Kashi Nandini, and Hirapur Local showed promising performance for overall pod production per plant, highlighting their suitability for yield enhancement programs. Many of these better-yielding genotypes had also shown stronger vegetative attributes, such as higher plant height, more branches, or larger leaf area, suggesting that good growth parameters often complement and support reproductive success. In contrast, genotypes like PS10, Fanda Local and Kakad Keda Local exhibited relatively lower pod development, which corresponded with their moderate or weaker vegetative performance, indicating a possible link between limited growth and reduced yield potential. These differences may be attributed to their inherent genetic makeup as well as favorable soil and climatic adaptability, as reported by Damor *et al*. (2017), Bhusashan *et al*. (2013), Kanchan *et al*. (2017), Sirwaiya and Kushwah (2018), and Kanwar *et al*. (2020). In terms of pod length, which directly affects seed size and grain number, Pusa Pragati, Sekhdakhedi Local, Kashi Nandini, and Hirapur Local recorded the longest pods, making them superior in seed content and yield potential. Mungaoli Local and Ichhawar Local also showed notable pod length, whereas Doraha Local, Fanda Local, and Kakad Keda Local reflected limited pod growth. The genetic differences in pod size were in line with the findings of Mukherjee *et al*. (2013), Datta and Das (2018), Sirwaiya and Kushwah (2018) and Devi *et al*. (2021). Similarly, grain count per pod correlated with pod length, with genotypes like Pusa Pragati, Sehore Local, and Hirapur Local achieving superior grain numbers, while Doraha Local and Fanda Local had the least, reinforcing the significance of pod morphology in seed development. These trends support earlier studies by Chadha *et al*. (2013) and Datta and Das (2018), who observed similar varietal differences. When assessing pod yield per plant, per plot and per hectare, Kashi Nandini, Pusa Pragati, and Kashi Samarth emerged as high-yielding genotypes, while Fanda Local registered the lowest yield. The strong growth traits of these high-yielding varieties likely contributed to their productivity, showing that balanced vegetative and reproductive development is key for maximizing returns. Nonetheless, several local genotypes, such as Murdi Local and Sadan Khedi Local, demonstrated stable performance, suggesting their adaptability under regional conditions. The yield variation was primarily influenced by the number of pods per plant, pod size and pod weight, as substantiated by the findings of Rana *et al*. (2006), Singh and Singh (2011), Chadha *et al*. (2013), and Kanwar *et al*. (2020). Collectively, the observed phenotypic diversity in pod traits across genotypes presents valuable opportunities for targeted breeding programs aiming at enhancing productivity and yield stability in garden peas. The results are shown in Table 2.

Conclusion

The evaluation of garden peas genotypes under the Gird region conditions revealed clear differences in both growth and yield performance. Pusa Pragati and Kashi Nandini, stood out with strong plant stature and favorable pod traits, while Sehore Local, Kashi Samarth, and Hirapur Local also showed promising yield potential along with balanced vegetative growth. Sekhdakhedi Local and Mungaoli Local, performed well in specific traits such as pod length and grain number, contributing to competitive yields. In contrast, Fanda Local and PS10 recorded comparatively lower yields despite moderate growth, highlighting that vegetative vigour alone does not ensure productivity. Overall, genotypes that combined robust growth with desirable yield attributes, particularly those adapted to the region's conditions *viz*.; Pusa Pragati, Kashi Nandini, Sehore Local, Kashi Samarth, and Hirapur Local can be promoted for improving returns and ensuring production stability for local farmers.

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