Plant Archives Vol. 24, No. 1, 2024 pp. 477-482 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2024.v24.no.1.065

EVALUATION OF GARDEN PEA (*PISUM SATIVUM* L. VAR. *HORTENSE*) GENOTYPES FOR YIELD AND YIELD ATTRIBUTES TRAITS UNDER PRAYAGRAJ REGION, INDIA

Suraj Luthra[1]*, Vijay Bhadur[2], Agnivesh Yadav[1], Lalu Prasad[1], Rakesh Kumar[1], Virendra Kumar[1], Chandroday Prakash Tiwari[1] and Sirasapalli Bhargava Kiran[3]

[1]Department of Vegetable Science, ANDUA&T, Kumarganj, Ayodhya, Uttar Pradesh, India.

[2]Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (Allahabad), Uttar Pradesh, India.

[3]MS Swaminathan school of Agriculture, Department of Horticulture, CUTM, Odisha -761 211, India.

*Corresponding author E-mail : surajluthra54@gmail.com

(Date of Receiving-27-10-2023; Date of Acceptance-04-02-2024)

ABSTRACT

Garden pea (*Pisum sativum* L. var. *Hortense*) genotypes were evaluated for yield and yield attributes under Prayagraj region of India. The term “pea” can refer to small spherical seed or to the pod. Peas are consumed as fresh vegetables or dry seeds in most of the countries. Peas are starchy but, high in fiber, protein, vitamins (vitamin A, C, K and B complex vitamins such as folic acid, pantothenic acid, niacin, thiamine and pyridoxine), minerals (iron, magnesium, phosphorus and zinc) and lutein (a yellow carotenoid pigment that benefits vision). The dry pea seeds are rich source of proteins (about 19-27%) and are free of anti-nutritional substances. Five competitive plants were selected at randomly tagged from each plot to record observation on various characters viz., plant height, number primary of branches, plant spread, total number of leaves, total number of tendrils, days to first flowering, days to 50 per cent flowering, days to pod setting, days to first pod picking, number of pods per cluster, Shelling (%), moisture content in pods (%), average pod length (cm), average pod width (cm), pod yield per plant (g), Pod yield t/hac. The significant pod yield per plant (g/plant) was recorded in genotype Jawahar Matar-54 (5.61 t) followed by Arkel (4.73 t) and Kashi Uday (4.36 t), whereas the minimum pod yield (t/ha) as recorded in genotype Rachna New (2.98 t) followed by ArkaPriya (3.07 t) and Bidar Local-1(3.35 t).

Key words : Vitamins, Carotenoid , Lutein, Shelling (%).

Introduction

The common pea (also known as the garden pea), botanically known as *Pisum sativum* L. var. *Hortense* (2n=2x=14) is one of the world’s oldest domesticated crops (Ambrose, 1995). It is an annual herbaceous crop of the family *Fabaceae*or *Leguminosae* (Genus: *Pisum*, subfamily: *Faboideae* tribe: *Fabeae*), originated in the region comprising Central Asia, Mediterranean countries and Ethiopia. Peas are grown for their soft immature and mature drypods. The term “pea” can refer to small spherical seed or to the pod. Peas are consumed as fresh vegetables or dry seeds in most of the countries. Peas are starchy but, high in fiber, protein, vitamins (vitamin A, C, K and B complex vitamins such as folic acid, pantothenic acid, niacin, thiamine and pyridoxine), minerals (iron, magnesium, phosphorus and zinc) and lutein (a yellow carotenoid pigment that benefits vision). The dry pea seeds are rich source of proteins (about 19-27%) and are free of anti-nutritional substances (Petterson *et al*., 1997). Dry weight is about one-quarter protein and one-quarter carbohydrates, mostly sugars. The characteristics of a cultivar as well as combination of traits differ according to the climatic conditions of the localities (Damor *et al*., 2017).

In spite of such an economic importance, production per unit area of pea is still low in the country especially

when varieties are grown during off-season and the major constraints attributed to this are lack of high yielding varieties with poor or no resistance to powdery mildew and *Fusarium* wilt. Hence, there is an urgent need to evaluate large number of genotypes, to identify high yielding and superior varieties of pea which can be released as such for commercial production or can be incorporated in the future crop improvement programmes like its yield and quality traits.

Materials and Methods

The present investigation was carried out at the horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Science and Technology, Prayagraj. The experimental material comprised of twenty-five genotypes including check, which were collected from different source represented under (Table 1). The genotypes were grown in a randomized block design with three replicates during winter season keep line to line distance of 60 cm and plant to plant distance of 20 cm during the year 2018-2019. Five competitive plants were selected at randomly tagged from each plot to record observation on various characters *viz*., plant height, number primary of branches, Plant spread, total number of Leaves, total number of tendrils, days to first flowering, days to 50 per cent flowering, days to pod setting, days to first pod picking, number of pods per cluster, shelling (%), moisture content in pods (%), average pod length (cm), average pod width (cm), pod yield per plant (g), pod yield t/hac. The analysis of variance was done as suggested by Panse and Sukhatme (1985).

Results and Discussion

The plant height ranged from 52.16 cm to 102.83 cm with mean of 71.00 cm. The maximum plant height was observed in genotype Swarna Mukti (102.83 cm) followed by Arkel (88.23 cm) and Azad Pea-1 (85.39 cm), whereas the minimum plant height was observed in genotype Arka Sampoorna (52.16 cm) followed by Kashi Mukti (52.97 cm). The plant spread ranged from 29.29 cm to 37.13 cm with mean of 32.70. The maximum plant spread was found in genotype in Arka Karthik (37.13 cm) followed by Arka Sampoorna (35.78 cm) and followed by S-10 (35.52 cm), whereas the minimum plant spread was found in genotype Arkel (29.29 cm). Number of branches per plant ranged from 2.34 to 3.42 with mean of 2.59. The maximum branches per plant were recorded in genotype Swarna Mukti (3.42) followed by Kashi Mukti (2.83) and Azad Pea-3 (2.80), whereas the minimum branches per plant were recorded in genotype Azad Pea-1 (2.34). Total number of leaves ranged from 20.22 to 68.76 with mean

Table 1 : Experimental materials for this study consist of 25 genotypes of garden pea collected from different sources.

S. no.	Treatments	Genotype Symbol	Name of Genotypes	Source
1	T_1	G1	Hissa Harit	HAU, Hissar
2	T_2	G2	Rachna new	CSUA&T, Kanpur
3	T_3	G3	Ajad Pea-3	CSUA&T, Kanpur
4	T_4	G4	VRPM-10	IIVR, Varanasi
5	T_5	G5	Bonneville	IARI, New Delhi
6	T_6	G6	Arka Pramodh	IIHR, Banglore
7	T_7	G7	Pusa Pragati	IARI, New Delhi
8	T_8	G8	Arkel	IARI, New Delhi
9	T_9	G9	Bidar Local-1	Bidar (KA) Local
10	T_{10}	G10	Kashi Nandani	BHU, Varanasi
11	T_{11}	G11	Swarna Mukti	CSUA&T, Kanpur
12	T_{12}	G12	NSM-6	JNKVV, Jabalpur
13	T_{13}	G13	Azad Pea-9	CSUA&T, Kanpur
14	T_{14}	G14	Azad Pea-1	CSUA&T, Kanpur
15	T_{15}	G15	Kashi Uday	IIVR, Varanasi
16	T_{16}	G16	Arka Priya	IIHR, Banglore
17	T_{17}	G17	Jawahar Matar-54	JNKVV, Jabalpur
18	T_{18}	G18	VRP-7	IIVR, Varanasi
19	T_{19}	G19	Arka Karthik	IIHR, Banglore
20	T_{20}	G20	Kashi Mukti	IIVR, Varanasi
21	T_{21}	G21	Arka Sampoorna	IIHR, Banglore
22	T_{22}	G22	Rachna	CSUA&T, Kanpur
23	T_{23}	G23	S-10	HAU, Hisar
24	T_{24}	G24	GS-10	HAU, Hisar
25	T_{25}	G25	Arka Anpurna	IIHR, Banglore

Table 2 : Mean performance of garden pea genotypes.

S. no.	Genotypes	Plant height (cm)	Plant spread (cm)	Primary branches per plant	Total number of leaves	Total number of Tendrils	Days to first flowering	Days to 50 % flowering	Days to first pod set	Days to first pod picking
1	HissarHarit	59.55	32.99	2.56	20.22	5.93	36.33	41.53	40.98	61.07
2	Rachna New	73.17	33.23	2.48	67.25	12.68	63.27	68.50	68.23	74.87
3	Azad Pea-3	76.19	34.17	2.80	46.98	7.43	42.81	50.51	47.75	58.18
4	VRPM-10	69.01	30.97	2.57	49.24	9.37	52.40	61.92	58.82	65.93
5	Bonneville	61.00	31.34	2.52	34.83	7.60	61.05	66.66	63.60	72.43
6	ArkaPramodh	71.24	33.30	2.53	37.11	9.13	59.76	67.62	64.73	74.03
7	PusaPragati	67.30	31.86	2.50	44.60	9.61	32.64	44.57	37.32	54.07
8	Arkel	88.23	29.29	2.64	33.00	8.11	38.64	44.50	42.30	63.00
9	Bidar Local-1	63.86	30.37	2.55	67.02	14.53	41.30	46.38	45.72	71.18
10	Kashi Nandani	64.05	33.20	2.38	25.68	5.15	30.40	35.71	34.49	45.85
11	SwarnaMukti	102.83	32.43	3.42	48.07	9.21	41.92	47.04	44.97	60.02
12	NSM-6	73.52	32.30	2.56	41.01	7.20	44.32	59.80	47.63	61.55
13	Azad Pea-9	83.18	34.30	2.44	53.70	7.07	43.42	52.78	47.87	63.22
14	Azad Pea-1	85.39	33.68	2.34	40.20	9.12	38.43	48.17	42.28	52.88
15	Kashi Uday	68.05	34.73	2.46	68.76	14.30	30.07	37.90	33.92	46.84
16	ArkaPriya	65.69	30.76	2.66	53.71	9.54	45.79	58.53	49.85	69.90
17	Jawahar Matar-54	72.86	33.54	2.59	28.93	15.21	40.66	60.34	44.77	51.57
18	VRP-7	81.29	32.16	2.39	41.58	8.74	36.97	46.46	41.13	57.30
19	ArkaKarthik	56.00	37.13	2.59	46.93	8.12	39.40	50.47	43.03	53.69
20	ArkaSampoorna	52.16	35.78	2.75	50.11	10.43	43.73	58.37	48.12	67.87
21	Rachna	71.91	30.57	2.56	64.40	14.37	64.45	75.55	68.17	82.36
22	S-10	78.58	35.52	2.48	38.37	7.50	40.16	52.52	44.53	58.34
23	GS-10	75.51	31.75	2.66	37.25	8.21	41.68	54.18	43.58	64.80
24	Kashi Mukti	52.97	30.50	2.83	57.17	8.21	40.37	48.77	48.72	65.31
25	ArkaArpuma	61.38	31.51	2.56	56.63	7.21	43.41	54.03	47.60	56.55
	Mean	**71.00**	**32.70**	**2.59**	**46.11**	**9.36**	**43.74**	**53.31**	**48.00**	**62.11**
	C.V.	3.33	1.76	8.22	4.34	4.60	3.42	3.29	3.26	5.79
	F ratio	73.22	32.88	2.92	128.00	123.51	120.69	96.09	112.01	18.88
	F Prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S.E.	1.36	0.33	0.12	1.15	0.25	0.86	1.01	0.90	2.07
	C.D. 5%	3.88	0.95	0.35	3.28	0.71	2.45	2.88	2.57	5.90
	C.D. 1%	5.18	1.26	0.47	4.38	0.94	3.27	3.84	3.43	7.87
	Range Lowest	52.16	29.29	2.34	20.22	5.15	30.07	35.71	33.92	45.85
	Range Highest	102.83	37.13	3.42	68.76	15.21	64.45	75.55	68.23	82.36

Table 3 : Mean performance of garden pea genotype.

S. no.	Genotypes	Number of pods per cluster	Pod width (cm)	No of seeds per pod	Moisture percentage (%)	Shelling percentage %	Average pod weight (g)	Average pod length (cm)	Pod yield per plant (g)	Pod yield (t/ha)
1	HissarHarit	1.61	1.51	7.72	51.18	50.39	5.00	5.65	60.54	3.63
2	Rachna New	2.00	1.28	6.22	37.34	35.32	3.74	5.74	49.62	2.98
3	Azad Pea-3	1.79	1.84	7.12	52.40	52.22	4.89	6.51	65.10	3.91
4	VRPM-10	1.66	1.45	7.22	54.00	54.15	5.72	7.45	69.55	4.17
5	Bonneville	1.77	1.74	7.08	71.15	45.81	5.70	8.17	67.18	4.03
6	ArkaPramodh	1.66	1.84	7.10	81.67	48.33	5.78	5.92	58.38	3.50
7	PusaPragati	1.93	1.57	7.69	72.50	50.82	5.65	8.25	65.39	3.92
8	Arkel	1.73	1.42	6.33	71.71	51.30	4.43	8.23	78.76	4.73
9	Bidar Local-1	1.47	1.49	7.12	75.28	43.25	5.49	6.40	55.89	3.35
10	Kashi Nandani	1.66	1.55	7.18	74.11	42.27	5.45	6.53	58.90	3.54
11	SwarnaMukti	1.71	1.82	5.43	73.29	41.79	3.95	7.93	62.57	3.75
12	NSM-6	1.72	1.31	7.62	72.97	47.31	6.95	7.97	61.33	3.63
13	Azad Pea-9	1.46	1.61	7.43	81.33	53.15	5.02	6.83	72.61	4.36
14	Azad Pea-1	1.67	1.65	7.40	82.07	52.14	5.06	7.34	71.74	4.30
15	Kashi Uday	1.92	1.28	6.41	73.53	49.73	5.66	7.83	72.65	4.36
16	ArkaPriya	1.81	1.50	7.41	74.54	49.36	5.16	7.61	51.18	3.07
17	Jawahar Matar-54	1.72	1.53	7.93	81.66	45.50	5.69	5.48	93.39	5.61
18	VRP-7	1.72	1.44	6.62	84.36	50.64	4.68	7.00	60.46	3.63
19	ArkaKarthik	1.66	1.40	6.02	75.82	52.33	4.87	7.03	66.82	4.01
20	ArkaSampoorna	1.77	1.56	6.32	67.50	50.83	4.45	6.47	67.25	4.03
21	Rachna	2.00	1.24	5.65	65.71	36.31	3.72	5.12	63.93	3.84
22	S-10	1.32	1.61	7.63	74.96	46.79	5.72	8.63	61.58	3.70
23	GS-10	1.32	1.59	7.90	76.10	45.63	5.60	7.59	61.67	3.73
24	Kashi Mukti	2.05	1.53	6.43	67.08	46.73	5.24	8.18	68.24	4.10
25	ArkaArpuma	1.46	1.72	6.82	72.62	45.12	5.01	7.53	60.95	3.66
	Mean	**1.70**	**1.54**	**6.95**	**70.60**	**47.49**	**5.15**	**7.10**	**65.03**	**3.90**
	C.V.	11.69	0.58	2.30	2.01	1.25	7.08	5.25	1.97	1.91
	F ratio	2.88	1097.20	57.17	185.07	204.03	12.00	21.33	144.01	153.37
	F Prob.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	S.E.	0.11	0.01	0.09	0.82	0.34	0.21	0.22	0.74	0.04
	C.D. 5%	0.33	0.01	0.26	2.33	0.98	0.60	0.61	2.10	0.12
	C.D. 1%	0.44	0.02	0.35	3.10	1.30	0.80	0.82	2.81	0.16
	Range Lowest	1.32	1.24	5.43	37.34	35.32	3.72	5.12	49.62	2.98
	Range Highest	2.05	1.84	7.93	84.36	54.15	6.95	8.63	93.39	5.61

of 46.11. The maximum total number of leaves were recorded in genotype Kashi Uday (68.76) followed by Rachna New (67.25) and Bidar Local-1 (67.02), whereas the minimum total number of leaves were recorded in Hissar Harit (20.22). Total number of tendrils ranged from 5.15 to 15.21 with mean of 9.36. The maximum total number of tendrils were recorded in genotype Jawahar matar-54 (15.21) followed by Bidar Local-1 (14.53) and Rachna (14.37), whereas the minimum total number of Tendrils were recorded in Hissar Harit (5.93). Days to first flowering ranged from 30.07 to 64.45 days with mean of 43.74 days. The minimum days to first flowering were recorded in genotype Kashi Uday (30.07 days), whereas the maximum days to first flowering were recorded in genotype Rachna (64.45 days) followed by Rachna New (63.27 days) and Bonneville (61.05 days). Days to 50 % flowering ranged from 35.71 to 75.55 days with mean of 53.31 days. The minimum days to first flowering were recorded in genotype Kashi Nandani (35.71 days), whereas the maximum days to first flowering were recorded in genotype Rachna (75.55 days) followed by Rachna New (68.50 days) and Bonneville (66.66 days). Similar findings also reported by Sirwaiya and Kushwah (2018) and Devi *et al*. (2021). Data represented under Tables 2 and 3.

Days to first pod set ranged from 33.92 to 68.23 days with mean of 48.00 days. The minimum days to first flowering were recorded in genotype Kashi Uday (33.92 days), whereas the maximum days to first flowering were recorded in genotype Rachna New (68.23 days) followed by Rachna (68.17 days) and Bonneville (63.60 days). Days to first pod picking ranged from 45.85 to 82.36 days with the mean of 62.11. The minimum days to first pod picking were recorded in genotype Kashi Nandani (45.85 days), whereas the maximum days to first pod picking were recorded in genotype Rachna (82.36 days) followed by Rachna New (74.87 days) and Bonneville (72.43 days). Number of pods per cluster ranged 1.32 to 2.05 with mean of 1.70. The maximum pods per cluster were observed in genotype Kashi Mukti (2.05) followed by Rachna (2.00), Pusa Pragati (1.93), whereas the minimum pods per cluster were observed in genotype in genotype GS-10 (1.32). Pod width (cm) ranged from 1.24 to 1.84 with mean of 1.54. The maximum pod width was observed in genotype Azad pea-3 (1.84 cm) followed by Arka Pramodh (1.84 cm), Swarna Mukti (1.82 cm), whereas the minimum pod width were observed in genotype Rachna (1.24 cm). No of seeds per pod ranged from 5.43 to 7.93 with mean of 6.95. The maximum no of seeds per pod were observed in genotype Jawahar Matar-54 (7.93) followed by GS-10 (7.90).Hissar Harit (7.72), whereas the minimum pod width were observed in genotype Swarna Mukti (5.43). Moisture Percentage ranged from 37.34 to 84.36 with mean of 70.60. The maximum moisture percentage were observed in genotype VRP-7 (84.36%) followed by Azad Pea-1 (82.07%). Arka Pramodh (81.67%), whereas the minimum moisture percentage was observed in genotype Rachna New (37.34). Shelling percentage ranged from 35.32 to 54.15 with mean of 47.49. The maximum shelling percentage was observed in genotype VRPM-10 (54.15%) followed by Azad Pea-9 (53. 15%). Arka Karthik (52.33%), Whereas the minimum Shelling Percentage were observed in genotype Rachna New (35.32%). Similar findings reported by Sharma *et al*. (2016) and Kanwar *et al*. (2020). Data represented under Tables 2 and 3.

Average pod weight ranged from 3.72 to 6.95 with mean of 5.15. The maximum average pod weight were observed in genotype NSM-6 (6.95) followed by Arka Pramodh (5.78).VRPM-10 (5.72). Whereas, the minimum average pod weight were observed in genotype Rachna (3.72). Pod length per plant ranged from 5.12 to 8.63 with mean of 7.10. The significant pod length was recorded in genotype S-10 (8.63 cm) followed by Arka Pramodh (8.23), Arkel (8.25), Bonneville (8.17 cm) and Kashi Mukti (8.18 cm), whereas the minimum pod length was recorded in genotype Rachna (5.12 cm) followed by Jawahar Matar-54 (5.48 cm) and Rachna New (5.74 cm). Pod yield per plant (g/plant) ranged from 49.62 g to 93.39 g with mean of 65.03 g. The Significant pod yield per plant (g/plant) was recorded in genotype Jawahar Matar-54 (93.39 g) followed by Arkel (78.76 g) and Kashi Uday (72.65 g), whereas the minimum pod yield per plant (g/plant) was recorded in genotype Rachna New (49.62 g) followed by Arka Priya (51.18 g) and Bidar Local-1(55.89 g). Pod yield (t/ha) ranged from 5.61 t to 2.98 t with mean of 3.90. The Significant pod yield per plant (g/plant) was recorded in genotype Jawahar Matar-54 (5.61 t) followed by Arkel (4.73 t) and Kashi Uday (4.36 t), whereas the minimum pod yield (t/ha) as recorded in genotype Rachna New (2.98 t) followed by Arka Priya (3.07 t) and Bidar Local-1 (3.35 t). Similar findings reported by Kanwar *et al*.(2020). Data represented under Table 3.

Future scope

The findings support the following suggestions for additional research effort: To validate the findings, these studies ought to be conducted again in the next two to three years. Under the local agroclimatic circumstances, these varieties can be assessed at various sowing dates. Future trials can make advantage of additional kinds.

Acknowledgments

The authors are highly thankful for the facilities and funds provided by the Department of Horticulture,Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj (Allahabad), Uttar Pradesh, India

Conflicts of interest

None.

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