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Evaluation of pea genotypes for green pod yield under Chhattisgarh plains

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Abstract

The result revealed that the treatment T₁ (IGP-1) was recorded significant maximum germination percentage (96.66%), plant height (164.58 cm), number of pods/cluster (1.95), number of flowers clusters/plant (25.88), 50% flowering (64.00 days), number of pods / plant (50.64), fresh pod weight/plant (130.61 gm), fresh pod yield (182.25 q/ha) and stover weight (5.01 gm) among the different pea genotypes. The maximum number of nodes/plant (22.93) and 1st flowering (55.50 days) was obtained in treatment T₄ (IGP-4), whereas the seed diameter (39.43 mm), fresh 100 seed weight (39.43 gm) and dry 100 seed weight (23.65 gm) was highest recorded at treatment T₇ (IGP-7). On the basis of present investigation treatment T₁ (IGP-1) was found significantly superior for most of the growth and yield parameters.

Keywords: Pea, genotypes, yield attributes, Chhattisgarh plains

Introduction

Pea (*Pisum sativum* L) is an early food crop, cool-season, annual, herbaceous belongs to the family Leguminosae. In India pea is an important crop, which plays a major role in farmer's economy. It is the most common crop and has a great commercial demand due to its nutritive value. Pea are grown for cash returns and as a break crop for disease control and soil fertility improvement in mixed cropping rotations. In pea sweetness in seed, high yield of the pods, long green pods, resistance to insect- pests and diseases are major objectives regarded for the genetic improvement of the crop (Kumar *et al.*, 2004) [4]. The plant breeder depends upon variability present in the material for the improvement of quantitative and qualitative characters and their mutual association with seed yield. The productivity of pea is quite low to fit the required demand and this may be mainly due to lack of good quality seed, high yielding varieties. Looking for the great potential for the increasing area, production and productivity of pea in the region, there is an urgent need to evaluation of different pea genotypes under Chhattisgarh plains.

Materials and Methods

The experiment was conducted during *Rabi*, 2021-22 at the College Instructional Farm, Rampur Nawagon, RABL College of Agriculture and Research Station Chhuikhadan, Dist-Khairagarh-Chhuikhadan-Gandai, (C.G.). Pea genotypes were grown in a Randomized Block Design with four replications. The seed are sowed in the direct field at a distance of 30 cm (row to row) and 10 cm (plant to plant) was maintained and the plot size was 1m². The recommended dose of fertilizers, Seed Treatment with carbendazim (fungicide) and Rhizobium culture (biofertilizer), and other cultural packages of practice was adopted for well-crop growth. 10 superior plants were selected randomly from each plot to record the observations parameter on various characters. The average value of each character was calculated on the basis of ten plants from; each genotype in each replication. The collected data on different observation parameters will be statistically analyzed by adopting the procedures suggested by Panse and Sukhatme (1995) [9].

Table 1: Treatments (pea genotypes) details

Tr. No.	Pea genotypes	Place of collection
T ₁	IGP – 1	Rajnandgoan
T ₂	IGP – 2	Rajnandgoan
T ₃	IGP – 3	Mahsamund
T ₄	IGP – 4	Bilaspur
T ₅	IGP – 5	Janjgir-Champa
T ₆	IGP – 6	Jagdapur
T ₇	IGP – 7	Khairagarh
T ₈	IGP – 8	Raipur
T ₉	IGP – 9	Durg
T ₁₀	IGP – 10	Dhamtari
T ₁₁	IGP – 11	Chhuhikhadan
T ₁₂	IGP – 12	Arkel (Check variety)

Results and Discussion

Data observed on parameter germination percentage ranged from 59.25-96.67% with an average of 79.84% (Table 2). The maximum value (96.66) for this parameter was observed in Treatment T1 IGP-1 which was found significant at par by T2 IGP-2 (94.25), T3 IGP-3 (88.25), T8 IGP-8 (86.75) and T9

IGP-9 (87.5). Germination percentage is determined by seed genetics composition morphological features and environmental factors. The performance of peas concerning germination was influenced by various environmental factors such as the temperature, rainfall, light, air, moisture and humidity as reported by Lopes *et al.* (1996)^[7].

Table 2: Performance of different pea genotypes with respect to growth parameters

Tr No.	Treatment Details	Germination percentage (%)	Plant height (cm)	Number of nodes per plant	No. of flowers per cluster	No. of pods per cluster
T1	IGP – 1	96.66	164.58	21.17	2.00	1.95
T2	IGP – 2	94.25	69.89	19.04	1.93	1.80
T3	IGP – 3	88.25	73.01	18.52	1.95	1.88
T4	IGP – 4	77.58	114.51	22.93	1.50	1.40
T5	IGP – 5	71.75	70.42	18.52	1.73	1.63
T6	IGP – 6	73.5	81.91	20.89	1.88	1.83
T7	IGP – 7	59.25	81.02	20.49	1.55	1.50
T8	IGP – 8	86.75	88.71	17.72	1.83	1.70
T9	IGP – 9	87.5	71.99	16.34	1.70	1.65
T10	IGP – 10	81.74	71.01	14.96	1.78	1.68
T11	IGP – 11	73.41	73.49	15.79	1.63	1.55
T12	(Check variety- Arkel)	67.41	97.73	20.76	2.55	1.80
	S.Em (±)	4.616	2.886	0.737	0.097	0.078
	CD (5%)	13.341	8.43	2.13	0.281	0.227
	CV (%)	11.564	6.544	7.787	10.602	9.253

At final stage (90 days after sowing), plant height ranged from 69.89 cm to 164.58 cm with an overall mean 88.19 cm (Table 2). The maximum plant height (164.58 cm) was recorded in T1 IGP-1, which was found significantly superior than all the treatment included under this study. Plant height is an indicator of vegetative growth that differed significantly among all genotypes. The variation in plant height and growth of different pea genotypes was also noted by Gudadinni *et al.* (2017)^[13]. On other hand the maximum number of nodes per plant (22.93) was measured in T4 IGP-4, which was found non-significant at par with T1 IGP-1 (21.17), T6 IGP-6 (20.89), T7 (20.45) and T12 IGP-12 (20.76). Number of nodes per plant also gives the information about the earliness of the genotypes. El-Beheidi *et al.* (1985)^[2] found that the growth parameters (number of nodes per plant) of pea cultivars was significantly affected by number of nodulations per plant, which is increased by inoculation treatments through organic compost.

Table 2 exhibited that the maximum number of flowers per cluster (2.55) was found in T12 IGP-12, whereas maximum number (1.95) for pods per cluster was observed in T1 IGP-1. Significantly higher number of flowers/pods per cluster reported in the genotypes, which may be genetic characteristics of different genotypes. It was observed in several legumes species that high temperature enhance flower in legumes and peas, reported by Kaushal *et al.* (2016)^[3] and Sita *et al.* (2017)^[12].

The data from Table 3 revealed that the maximum number of flowers per plant (55.00) was recorded in T12 IGP-12, which was found statically similar with T1 IGP-1 (51.80), while the highest number of flower cluster per plant (25.88) were found in T1 IGP-1, which was found statistically similar with T12 IGP-12 (21.64) and T8 IGP-8 (20.28). The maximum production of pea depends on the number of flowers produced and pods developed as reported by Kaushal *et al.* (2016)^[3].

Table 3: Performance of different pea genotypes for flowering and pod characteristic

Tr No.	Treatment Details	No. of flowers per plant	No. of flower clusters per plant	1 st flowering	50% flowering	pod length (cm)	No of pods per plant
T1	IGP – 1	51.80	25.88	48.50	64.00	8.90	50.64
T2	IGP – 2	36.95	19.23	35.75	48.00	10.37	34.55
T3	IGP – 3	37.79	19.38	46.50	55.00	9.44	36.32
T4	IGP – 4	21.07	14.10	55.50	61.25	7.85	19.72
T5	IGP – 5	32.38	18.78	40.00	51.25	10.25	30.43
T6	IGP – 6	37.52	19.95	47.50	56.00	9.88	36.52
T7	IGP – 7	29.98	19.25	36.00	47.25	9.50	29.03
T8	IGP – 8	37.00	20.28	47.75	59.25	8.87	34.61
T9	IGP – 9	31.74	18.73	40.75	48.25	9.83	30.81
T10	IGP – 10	34.01	19.15	42.50	52.50	10.28	32.01
T11	IGP – 11	29.62	18.25	43.25	49.75	10.41	28.26
T12	(Check variety- Arkel)	55.00	21.65	52.25	60.00	8.13	38.80
	S.Em (±)	2.517	1.026	2.64	2.223	0.195	2.358
	CD (5%)	7.274	2.965	7.63	6.423	0.563	6.713
	CV (%)	13.892	10.497	11.816	8.175	4.111	14.086

The data observed on first flowering ranged from 35.70 to 55.50 days with an average 44.46 days. The earlier flowering (35.75) days was observed in T2 IGP-2. Days to flowering has positive relation with days to first pod picking. These results are supported with those of Sharma *et al* (2020) [10]. The genotypes taking minimum days to flowering are comparatively early maturing than other genotypes, from the farmers point of view such genotypes seems to be more desirable because early flowering means early crop maturity. Similairly days to 50 percent flowering indicates earliness which is a most desirable trait in garden pea to fetch high market prices. Also, it could influence the other important traits like pod setting and pod maturity. Data recorded on days to 50% flowering ranged from 46.50 to 64.00 days with an average of 55.38 (Table 3). The earliest 50% flowering (47.25 days) was observed in T7 IGP-7. Singh and Dhall (2018) [11] also reported similar finding in his studies.

Pod length is an important trait in garden pea as the pods with longer length and with maximum number of seeds are

regarded as desirable. Table 3 presented the highest pod length (10.41 cm) was measured in T11 IGP-11, which was found significant at par with T2 IGP-2 (10.37), T5 IGP-5 (10.25) and T10 IGP-10 (10.28). Similar result was reported by Kumar *et al.* (2019) [5]. Onother hand, number of pods per plant is also an important yield contributing trait which affects the final yield of the genotypes. The maximum number of pods per plant (50.64 pods) were found in T1 IGP-1 which was found superior among all treatments (Table 3). The mean square due to genotypes was significant in green pod number per plant. The number of pods per plant is a variable trait and this result is in agreement with the results of Lakic *et al.* (2017) [6].

Table 4 showed that the significant variation was recorded for number of seeds per pod and seed diameter amongst the genotypes included in this study. Maximum number of seeds per pod (9.09 seeds) were recorded in T11 IGP-11 and the highest seed diameter (39.43 mm) was measured in T7 IGP-7. Similar finding was observed by Kumar *et al.* (2019) [5].

Table 4: Evalatuion of different pea genotypes for various seed characterstic and pod yield.

Tr No.	Treatment Details	No. of seeds per pod	Seed diameter (mm)	Fresh 100 seed weight (gm)	Dry 100 seed weight (gm)	Fresh pod weight per plant(gm)	Fresh pod yield (qt/ha)
T1	IGP – 1	6.33	33.66	31.16	19.57	130.61	182.85
T2	IGP – 2	7.12	30.40	30.40	17.63	87.23	122.12
T3	IGP – 3	7.45	26.64	22.89	13.73	81.33	113.86
T4	IGP – 4	4.31	38.17	38.17	23.66	80.60	112.84
T5	IGP – 5	7.44	37.14	37.14	22.28	85.39	119.54
T6	IGP – 6	7.86	34.87	31.12	18.67	108.58	152.01
T7	IGP – 7	8.16	39.43	39.43	23.65	89.51	125.31
T8	IGP – 8	5.90	33.07	33.07	19.84	90.84	127.17
T9	IGP – 9	7.45	34.02	22.52	13.06	87.04	121.85
T10	IGP – 10	8.15	29.43	17.43	10.11	68.54	95.96
T11	IGP – 11	9.09	28.98	19.73	11.44	64.51	90.31
T12	(Check variety- Arkel)	4.76	30.34	29.84	17.90	108.46	151.84
	S.Em (±)	0.131	1.644	0.866	0.521	2.107	2.951
	CD (5%)	0.379	4.751	2.502	1.506	6.09	8.527
	CV (%)	3.743	9.961	5.888	5.913	4.676	4.672

The data recorded under the treatments included in this study for fresh and dry 100 seed weight has been presented in Table 4. The maximum fresh 100 seed weight (39.43 gm) was measured in T7 IGP-7, which was found non significant with T4 IGP-4 (38.17 gm) and T5 IGP-5 (37.14 gm), whereas the maximum dry 100 seed weight (23.66 gm) was measured in

T4 IGP-4, which was found statistically at par with T5 IGP-5 (22.28 gm) and T5 IGP-5 (22.28 gm). Nausherwan *et al.* (2008) [8] has also observed significant differences for 100 seeds weight along with other parameters in their experiment conducted on genotypes.

Genotypes showed the significant variation in fresh pod

weight per plant and green pod yield per plant which indicates differential response of genotypes of this character (Table 4). The maximum fresh pod weight per plant (130.61 gm) and maximum yield per hectare (182.85 q) was recorded in T1 IGP-1. Similar results were reported by previous researchers Kumar *et al.* (2019)^[5].

Data recorded on stover weight per plant revealed that the higher stover weight per plant (5.01 gm) were noted in T1 IGP-1 (Table 5). This might have increased number of pods per plant, seeds per pod, seed, straw and biological yield.

These results confirm with the earlier finding by Rao *et al.* (2017)^[12]. Table 5 also exhibited that the maximum harvest index (22.46) was recorded in T10 IGP-10. Similar findings have been reported by Munakamwe *et al.* (2012)^[14]. Whereas the maximum shelling percentage (98.41) was recorded in T5 IGP-5. Shelling percentage is another yield contributing trait as the pods with high shelling percentage are preferred. Similar findings have also been reported by Agarwal *et al.* (2006)^[1].

Table 5: Performance of different pea genotypes with respect to stover weight, harvest index and shelling percentage

Tr No.	Treatment Details	Stover weight (gm/plant)	Harvest index (%)	Shelling percentage (%)
T1	IGP – 1	5.01	15.76	76.28
T2	IGP – 2	2.32	18.50	95.16
T3	IGP – 3	3.28	20.04	82.06
T4	IGP – 4	3.79	18.31	34.11
T5	IGP – 5	2.15	19.09	98.41
T6	IGP – 6	3.49	17.35	88.57
T7	IGP – 7	2.20	17.78	97.96
T8	IGP – 8	3.03	18.48	78.32
T9	IGP – 9	2.71	16.49	66.25
T10	IGP – 10	2.04	22.46	66.28
T11	IGP – 11	2.15	20.73	78.32
T12	(Check variety- Arkel)	4.38	15.51	46.67
	S.Em (±)	0.193	0.33	6.54
	CD (5%)	0.557	0.955	18.90
	CV (%)	12.663	3.596	17.279

Conclusion

The growth parameters was found significantly superior in treatment T1 IGP 1 for the traits i.e., germination percentage, plant height, number of nodes per plant, number of flowers per plant, number of flower clusters per plant, days to 1st flowering, days to 50% flowering, number of pods per cluster and stover weight, while the yield parameter was also found significantly superior in treatment T1 IGP-1 for the characters i.e., number of pods per cluster, number of pods per plant, fresh pod weight per plant, fresh pod yield, harvest index and shelling percentage.

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