

PERFORMENCE OF PEA (*Pisum sativum* L.) GENOTYPES UNDER VALLEY CONDITION OF GARHWAL HIMALAYAN REGION

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ABSTRACT : The study was conducted at Horticultural Research Centre, H.N.B. Garhwal University, Srinagar-Garhwal, Uttarakhand, during *rabi* season 2013-14 to evaluate the performance of 12 genotypes of pea for quantitative and qualitative traits under valley condition of Garhwal Himalayan region. Among 13 quantitative and qualitative characters studied, maximum plant height was observed in Rachana (168.2 cm) followed by DMR-70 (156.53 cm). Earliest appearance of first flower was observed in DDR-25 (54.66 days) followed by P-1544 (56.33). The earliest green pod harvest (112.66 days) was observed in DMR-70. Maximum length of pod was recorded in P-1544 (10.19cm), maximum number of pods per plant (56.86) was recorded in Rachana, maximum pod yield (147.43 g/plant) was noted in PSM-32, 100 seed weight was maximum (20.22g) in DDR-62, maximum shelling percentage was recorded in DDR-62 (52.04%), and maximum protein content (9.76%) was recorded in Pusa Pragati .

Keywords: Pea, genotype, quantitative trait, qualitative trait

Pea (*Pisum sativum* L.) is a leguminous crop, belongs to family Leguminaceae which contains higher amount of carbohydrate and protein having essential amino acids particularly lysine (17 mg). Peas are very common nutritious vegetable and are mainly cultivated as winter crop throughout the world. It is predominant export and cash crop of the world constituting about 40 per cent of total trading in pulses (Ali *et al.*, 1). It is grown on an area of 528.71 thousand hectares in the world and ranks fourth in production (441.53 thousand tonnes) among grains legume after soybean, groundnut and beans (Ashraf *et al.*, 3). Peas are grown in many countries of the tropics and subtropics including India, Burma, Pakistan, Ethiopia, Morocco, Columbia, Ecuador and Peru (Javaid *et al.*, 10). In India, pea is cultivated on 421 million hectares with a total production of 4006 MT and productivity is 9.5 tones/ hectare (Anon., 2). Despite large number of cultivars in the field, pea yield per unit in India is lower than international standard due to many factors like poor cultural practices, poor weed control, pest attack, etc. Amongst these pests, incidence of diseases is a major cause of low yield. Optimum germination occurs at 16 to 18 °C. High soil temperature leads to poor emergence. Before blooming, crop can withstand some frost but flowers and pods are susceptible to freezing temperature. A regular water supply promotes high yield but excessive rainfall induces root rot (Hussain and Badshah, 8). The yield and quality of crop are very complex characteristics. The characteristics of a cultivar as well as combination of traits differ according to climatic conditions of the

localities (Khokar *et al.*, 12). The crop has promising future and attempt should be made to improve yields through the development of high yielding varieties which are adaptable to our climatic conditions. The present investigation was designed for a comparative study of pea genotypes, which would be suitable for valley condition of Garhwal Himalaya conditions.

MATERIALS AND METHODS

The materials for the present study consisted of twelve diverse genotypes of Pea (*Pisum sativum* L.) collected from IARI, Delhi and local genotype of Manipur viz., P-1544, DDR-80, DDR-62, DDR-45, DDR-27, DDR-25, DMR-70, Arkel, Pusa Pragati, PSM-32, Rachana, and Sugar Pea. The experiment was conducted in *rabi* season 2013-14 at Horticultural Research Centre of H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand. The experiment was laid out in Randomized Block Design with three replications. The entire experimental field was divided into three blocks of equal size and each block possessed 12 plots of 3 × 2m² area. The genotypes were sown at row to row 45 cm and plant to plant 8cm and seeds are sown 2 to 2.5cm deep in the soil. Farm yard manure was applied @ 25 tonnes per hectare and NPK @ 30-75-55 kg per hectare. Full dose of P, K and half dose of N were applied during the soil bed preparation while remaining half of N was applied in two equal doses at anthesis and pod formation stage. Observations were recorded from ten randomly selected plants from each plot for pod yield and other ancillary characters viz., plant height, number of

primary branches, length of internodes, days taken to first flowering, days taken to first green pod harvest, length of pod, breadth of pod, number of seeds per pod, number of pods per plant, pod yield per plant, seed yield per plant, dry weight of 100 seed, shelling percentage and protein percentage. The data obtained from selected plants under each treatment were subjected for statistical analysis as per standard procedures.

RESULTS AND DISCUSSION

Analysis of variance (Table 1) revealed highly significant differences for days to 1st flower, length of internodes, length of pod, number of seeds per pod, plant height and shelling percentage. Whereas, it was significant for number of primary branch, number of pods per plant and days to first green pod harvest, breadth of pod, pod yield per plant, dry weight of 100 seeds and protein content (%).

Table 1: Analysis of variance (ANOVA) for thirteen characters in pea (*Pisum sativum* L.).

| Source | | Rep. | Treatment. | Error |
|--------------------------|---|--------|------------|--------|
| Degree of Freedom (d.f.) | | 2 | 11 | 22 |
| Mean Squares | Plant height (cm) | 422.54 | 4294.08** | 415.38 |
| | Number of primary branches | 0.28 | 0.84 | 0.34 |
| | Length of internodes (cm) | 0.64 | 9.75** | 0.62 |
| | Days to 1 st flower appearance | 17.68 | 285.23** | 31.08 |
| | Days to first green pod harvest | 55.53 | 74.35** | 75.92 |
| | Length of pods (cm) | 0.20 | 5.69** | 0.34 |
| | Breadth of pods (cm) | 1.64 | 2.49* | 1.47 |
| | Number of pods /plant | 436.32 | 392.14** | 167.79 |
| | Pod yield/plant (g) | 435.68 | 1537.63** | 922.36 |
| | Number of seeds/ pod | 0.23 | 1.99 | 0.32 |
| | Dry weight of 100 seeds (g) | 0.45 | 11.55* | 6.03 |
| | Shelling (%) | 12.30 | 120.31** | 34.82 |
| | Protein content (%) | 14.16 | 22.68** | 33.95 |

*Significant at P = 0.05; ** – significant at P = 0.01

A perusal of Table 2 revealed that among all the genotypes variety Rachana showed maximum plant height (168.2cm) followed by DMR-70 (156 cm) and Sugar pea (143.13cm). Genotype DDR-27 showed minimum plant height (65.4 cm) followed by Pusa Pragati (67.86 cm) and P-1544 (70.13 cm). Similar

results have also been reported by Bozoglu *et al.* (6). Hussain Badshah (8) and Hussain *et al.*, (9).

The maximum number of primary branches per plant (3.66) was recorded under genotype Pusa Pragati followed by Sugar Pea (3.40) and DMR-70 (3.33). The lowest number of primary branches was observed in genotypes PSM-32 (1.86), followed by DDR-25 (2.13), P-1544 and DDR-27 (2.4 each) and Arkel (2.53) confirming to the reports of Hussain and Badshah (8).

The maximum internodel length of 9.56 cm was recorded in Rachana followed by DMR-70 (9.33 cm), Sugar Pea (9.26 cm) and DDR-80 (7.23). Whereas minimum internodel length was recorded in Pusa Pragati (4.4 cm) followed by DDR-25 (4.96cm) DDR-45 (4.73 cm), , DDR-27 (5.3cm) and DDR-62 (5.53 cm).

Significantly the earliest flowering was recorded in DDR-25 (54.66 day) followed by DDR-27 and Arkel (55.66 each) (56.33) day and DDR-62 and PSM-32 (59 day each), and maximum days taken to appearance of first flowering was day recorded in DDR-45 (79 day) followed by Rachana (77.33 day), Sugar Pea (77), DMR-70 (74.66) and DDR-80 (70.66). This finding was agreement with those of Schmdex (12 & 13) and Ware *et. al.* (16).

The minimum days taken to first green pod harvest were in DMR-70 (112.66 days) and followed by DDR-27 (119 day), P-1544 (119.33 day), Pusa Pragati (120.33 day) and Arkel (122 day). The maximum days taken to first green pod harvest was noted in DDR-80 and DDR-62 (128 day each) followed by DDR-45 and Rachana (127.66 each), PSM-32 and Sugar Pea (127 day) and DDR-25 (126 days).

Genotype P-1544 had the longest pod (10.19 cm) followed by Arkel (10.12 cm), PSM-32 (8.94 cm), DDR-80 (7.68 cm) and DDR-62 (7.24 cm). DMR-70, Sugar Pea, DDR-27 and DDR-45 showed slightly less pod length than DDR-25. However, the shortest pods length were (6.11 cm) observed in genotype Rachana. In general, pod size is a varietal character, but it is also affected by vigour of plant. Present findings are in consonance with Shah *et al.* (14).

The maximum breadth of pod was recorded in the Genotype DDR-62 exhibited (1.68 cm) followed by Arkel (1.64 cm), DDR-80 (1.61 cm). The minimum breadth of pod (1.4 cm) was recorded in Rachana followed by DDR-45 (1.44 cm), Pusa Pragati (1.45 cm), DDR-25 and DMR-70 (1.46 cm each).

Maximum number of seeds per pod (7.0) was observed in genotype P-1544 followed by PSM-32

Table 2: Mean performance of thirteen characters in pea (*Pisum sativum* L.).

| Treatment | Plant height (cm) | No. of primary branches plant | Length of internodes (cm) | Days to appearance of 1 st flower | Days to 1 st green pod harvest | Length of pod (cm) | Breadth of pod (cm) | No. of pods per plant | Pod yield per plant (g) | No. of seeds per pod | Dry weight of 100 seed | Shelling % | Protein % |
|--------------|-------------------|-------------------------------|---------------------------|--|---|--------------------|---------------------|-----------------------|-------------------------|----------------------|------------------------|------------|-----------|
| P-1544 | 70.13 | 2.40 | 6.76 | 56.33 | 119.33 | 10.19 | 1.59 | 21.06 | 92.60 | 7 | 19.23 | 45.78 | 9.50 |
| DDR-80 | 98.56 | 3.06 | 7.23 | 70.66 | 128 | 7.68 | 1.61 | 43.53 | 97.86 | 5.98 | 15.57 | 40.86 | 9.63 |
| DDR-62 | 71.46 | 2.86 | 5.53 | 59.00 | 128 | 7.24 | 1.68 | 49.33 | 118.16 | 4.52 | 20.22 | 52.04 | 6.99 |
| DDR-45 | 70.46 | 3.06 | 4.73 | 79.00 | 127.66 | 6.84 | 1.44 | 51 | 69.46 | 5.57 | 14.51 | 40.95 | 7.91 |
| DDR-27 | 65.40 | 2.40 | 5.30 | 55.66 | 119 | 6.74 | 1.48 | 25 | 81.26 | 5.18 | 17.81 | 46.60 | 7.32 |
| DDR-25 | 75.06 | 2.13 | 4.96 | 54.66 | 126 | 7.09 | 1.46 | 39.06 | 73.66 | 5.19 | 16.27 | 48.51 | 8.90 |
| DMR-70 | 156.53 | 3.33 | 9.33 | 74.66 | 112.66 | 6.30 | 1.46 | 56.20 | 81.36 | 4.68 | 16.59 | 39.14 | 9.17 |
| Arkel | 72.73 | 2.53 | 6.36 | 55.66 | 122 | 10.12 | 1.64 | 27.60 | 115.86 | 6.33 | 18.63 | 51.94 | 6.59 |
| Pusa Pragati | 67.86 | 3.66 | 4.40 | 66.66 | 120.33 | 7.03 | 1.45 | 39.40 | 88.03 | 6.05 | 14.23 | 45.82 | 9.76 |
| PSM-32 | 93.06 | 1.86 | 6.53 | 59.00 | 127 | 8.94 | 1.58 | 51.86 | 147.43 | 6.98 | 15.28 | 49.59 | 6.89 |
| Sugar Pea | 143.13 | 3.40 | 9.26 | 77.00 | 127 | 6.30 | 1.50 | 55.13 | 87.03 | 5.92 | 14.96 | 34.75 | 9.50 |
| Rachana | 168.20 | 2.86 | 9.56 | 77.33 | 127.66 | 6.11 | 1.40 | 56.86 | 106.73 | 5.12 | 17.88 | 33.02 | 7.78 |

(6.98), Arkel (6.33) and Pusa Pragati (6.05). Genotype DDR-62 contained minimum number of seeds per pod (4.52) followed by DMR-70 (4.68), Rachana (5.12) and DDR-27 (5.18) which are in line of findings observed by Arshad *et al.* (4).

Maximum pods per plant were found in Rachana (56.86) followed by DMR-70 (56.20), Sugar Pea (55.13) and PSM-32 (51.86). The genotypes P-1544 remained at the bottom (21.06) for number of pods/plant followed by DDR-27 (25.00), Arkel (27.6), Pusa Pragati (39.4) and DDR-25 (39.06). More number of pods per plant may be due to small pod size as less nutrient are required for small pods compared with larger pods (Baginsky *et al.*, 5; Qasim *et al.*, 15). Number of pods per plant also correlates plant height. Vigorous varieties produced more pods while number of pods decreased with decrease in plant height, which might be attributed to genetic makeup of the plants (Khokar *et al.*, 11). Pods per plant have significant and positive correlation with biological yield, grain yield and harvest index.

Maximum pod yield per plant (147.43 g) was recorded in PSM-32 followed by DDR-62 (118.16 g), Arkel (115.86 g), Rachana (106.73 g) and DDR-80 (97.86 g). The lowest pod yield per plant was recorded in DDR-45 (69.46 g) followed by DDR-25 (73.66 g), DDR-27 (81.26 g), DMR-70 (81.36 g) and Sugar Pea (87.03 g). Similar results have also been reported by (Chadha *et al.*, 7)

Dry weight of 100 seed (g)

Dry weight of 100 seeds was noted maximum in DDR-62 (20.22 g) followed by P-1544 (19.23 g) and Arkel (18.63 g). Pusa Pragati resulted in minimum dry weight seed of 100 (14.23 g).

DDR-62 exhibited maximum shelling percentage (52.04 %) followed by Arkel (51.94 %) and PSM-32 (49.59 %). The lowest shelling percentage was recorded in genotype Rachana (33.02 %) followed by Sugar Pea (34.75 %), DMR-70 (39.14 %) and DDR-80 (40.86 %). Reports of Chadha *et al.* (7) confirms present findings.

Maximum protein content was recorded in Pusa Pragati (9.76 g) followed by DDR-80 (9.63 g), P-1544 and Sugar Pea (9.50 g each) and DMR-70 (9.17 g). Minimum protein content was recorded in Arkel (6.59 g) followed by PSM-32 (6.89 g), DDR-62 (6.99 g), DDR-27 (7.32 g) and Rachana (7.78 g).

CONCLUSION

It can be concluded that PSM-32, DDR-62, Arkel and Rachana performed best for the most of the traits studied and they may be recommended for Garhwal Himalaya regions.

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