International Journal of Science, Environment and Technology, Vol. 5, No 4, 2016, 1987 – 1992

ISSN 2278-3687 (O)
2277-663X (P)

GENETIC VARIABILITY AND ASSOCIATION STUDIES FOR GREEN POD YIELD AND COMPONENT HORTICULTURAL TRAITS IN GARDEN PEA UNDER HIGH HILL DRY TEMPERATE CONDITIONS OF TABO VALLEY OF SPITI DISTRICT OF HIMACHAL PRADESH

Seema Thakur [1], Rajesh Thakur[2] and Devinder Kumar Mehta[3]

[1]Directorate of Extension Education, Dr. Y.S Parmar University of Horticulture and Forestry, Nauni, [2]Krishi Vigyan Kendra, Kandaghat, Solan, [3]Department of Vegetable Science, Dr. Y.S Parmar University of Horticulture and Forestry, Nauni

E-mail: thakurseema76@gmail.com (**Corresponding Author*)

Abstract: Genetic variability and association studies involving 15 diverse Pea genotypes were carried out in the year 2010-11 at RHRSS, Tabo, Lahaul & Spiti, a dry temperate zone of Himachal Pradesh. The results concluded that highest pod yield per plant was recorded in Punjab-89 which can replace the existing Azad P-1 variety. Phenotypic and genotypic coefficients of variation were moderate in magnitude for most of the traits. High heritability coupled with high genetic gain were observed for plant height, pod length, number of grains per pod, shelling percentage and number of pods per plant which indicated the presence of additive gene action and thus offers more scope for reliable and effective selection. A significant positive association of pod yield was observed with number of pods per plant, pod length, pod width and number of grains per pod. Therefore, these traits may be considered as the most reliable selection indices for effective improvement in green pod yield in garden pea.

Introduction

Spiti region of Himachal Pradesh is remotest and sparsely populated picturesque valley also known as "Little Tibet" as it has similar terrain, vegetation, climate and topography as Tibet. The cold desert like conditions prevail in this region because it lies beyond the greater Himalayan region contiguous with the Tibetan plateau called the Trans-Himalayas. This region is characterized by low precipitation, long, harsh winters along with short summers. Pea *(Pisum sativum*) is the only cash vegetable crop cultivated in Spiti valley in summers due to which it becomes off-season to the plains thereby fetches remunerative prices to the farmers. Identification and development of new varieties is very important to boost the production and productivity of the crop in the valley. Evaluation of the germplasm is the first step in this direction, since the improvement in any crop is proportional to the magnitude of genetic variability (Sureja and Sharma, 2000).

*Received June 10, 2016 * Published Aug 2, 2016 * www.ijset.net*

Estimates of parameters of variability, importantly heritability and genetic gain are reliable indicators for the improvement of characters in particular genetic material through selection. Since the selection for highly heritable characters is more effective therefore, heritability along with other parameters can be used in predicting the gain for a given selection intensity and expected genetic gain gives the idea of extent of improvement in a character through simple selection. Moreover selection for yield and quality traits can be better achieved if the information with respect to correlation between such traits is also available with a better understanding of the association between the relevant characters with yield which is provided through the path coefficient analysis. The present study was planned to estimate the parameters of variability and character association in pea so that new high yielding variety can be identified and further used in breeding programme to develop a superior variety.

Materials and Methods

The present investigations were undertaken at Regional Horticultural Research Sub-station, Tabo, Spiti, Himachal Pradesh during the year 2010-11.Fifteen genotypes of pea viz.AG-6, AG-7, AG-8, AG-10,KS-205,Kinnauri, KS-230, PM-65, NDVP-8C, VL-7, VL-8, VPP-433, Punjab-89, including two checks viz., Azad P-1 and Lincoln were evaluated for yield and different horticultural traits. The site is located at an elevation of 3280 m (10760 ft.) above mean sea level. The valley has short summers growing season (April-September) and the region experiences extreme climatic conditions with temperatures dropping up to -30 degree during winter months. The area remains snowbound from October to March.

The experiment was laid out at the Experimental Farm of Regional Horticulture Research Sub station, Tabo (H.P), Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni in the polytunnel. The experiment was planted in Randomized Complete Block Design with three replications. The pea seeds were sown at a spacing of 30x10 cm in a plot size of 2x2 m^2. The recommended packages and practices of UHF, Nauni were followed for the healthy growing of pea. The observations were recorded on five randomly taken competitive plants for the characters like Node at which first flower appear, plant height (cm), Number of pods per plant, pod yield/plant (g) pod length (cm), pod width (cm), number of grains /pod and shelling percentage. The data were analyzed as per the standard procedure for the analysis of variance (Panse and Sukhatme, 1984), correlation coefficients (Dewey and Lu,1959).

Results and Discussion

The analysis of variance indicated significant differences among the genotypes for all the traits except pod width. Earliness is one of the major objectives in the breeding of present day cultivars. Node at which first flower appear is a well known pointer of maturity period in pea. Lower the number of node earlier is the maturity of the genotype.VL-8 genotype produced the flower at lowest node (8.30) and it was significantly superior to all the genotypes understudy. Plant height is the most important factor determining the harvest duration of any crop. Longer harvest duration is generally preferred in the present marketing system under Indian conditions because it not only avoids the glut in the market but off-season value of the crop is also maintained due to prolonged availability of green pods. Maximum plant height (130 cm) was observed in Kinnauri which showed superiority among all other genotypes understudy. Number of pods per plant was found highest in genotype Punjab-89 (46.66) followed by Azad P--1(43.33). However maximum pod yield /plant (143.33g) was observed in Punjab-89.Hence Punjab-89 can replace the dominating Azad P-1 variety in Spiti valley.

The difference between PCV and GCV of various characters was very little indicating the greater role of genetic factors in the expression of characters with less influence of environment thus offering the ample scope for the improvement. The Phenotypic coefficient of variation (PCV) and Genotypic coefficient of variation (GCV) were found moderate for most of the traits except for pod width. This reflects genetic variability among all the genotypes for these characters. Burton (1952) suggested that GCV together with the heritability estimates would give the clear picture of extent of advance to be expected by selection. The estimates of high heritability (broad sense) were found high for the traits viz., plant height, pod length, Number of grains per pod, shelling percentage and number of pods per plant. High heritability coupled with high genetic gain were observed for plant height, pod length, number of grains per pod, shelling percentage and number of pods per plant which indicated the presence of additive gene action and offers more scope for reliable and effective selection. The results are in consonance with the findings of Rai et al (2006) and Guleria et al (2009).

The study of the correlations between different characters is more important in improving the section. Characters of economic characters like yield are complex in inheritance and a product of action and interaction among several traits. Galton (1889) developed the basic concept of correlation among various traits. The correlation studies

indicated the greater magnitude of genotypic correlation with pod yield than the phenotypic ones. (Table 4), thus revealing the inherent relationship among these traits. A significant positive association of pod yield was observed with number of pods per plant, pod length, pod width and number of grains per pod. Thus it may be suggested to improve the pod yield in pea through selection based on these traits. These results are in tune with the findings of Gupta at al (1998).

References

[1] Burton, G.W.1952. Quantitative inheritance in grasses. *Proceeding of 6th International Grassland Cong*.**1**:227-83.

[2] Dewey, D.R., Luk.H.1959. A correlation and path analysis of components of crested wheat grass seed production. *Agron .J*. **51**:515-18.

[3] GaltonF.1889. Natural inheritance. Mac Milan Publishers, London.

[4] Guleria, S., Chontham Nirmala and Dua Saroj. 2009. Genetic variability, correlation and path analysis in pea (*Pisum sativum* L.). *Crop Research*. ***38(1/3***):179-83.

[5] Gupta, M.K., Singh J.P., MishraV.K.1988. Heritability, genetic advance and correlation analysis in pea. *Crop Res. Hisar*. **16**:202-04.

[6] Panse, V.G., SukhatmeP.V.1984. *Statistical Methods for Agricultutal Workers*. ICAR, New Delhi.347 p

[7] Rai, M., Verma, A., Kumar R and Vishwanath. 2006. Multivariate genetic analysis of pea (*Pisum sativum L.*). *Vegetable Science*. **33(2)**:149-54.

[8] Sharma, A., Sood, M., Rana, A. and Singh Y.2007. Genetic variability and association studies for green pod yield and component horticultural traits in garden pea under high hills dry temperate conditions. *Indian Journal of Horticulture*. **64(1)**: 98-00.

[9] Sureja A.K., Sharma R.R. 2000. Genetic variability and heritability studies in garden pea (*Pisum sativum* L.). *Indian J. Hort*. **57**:243-47.

Table 1: Mean performance of various genotypes with respect to different horticultural traits

Genotype	Node at which first flower appear	Plant height (cm)	Number of pods/plant	Pod yield/plant (g)	Pod length (cm)	Pod width	Number of grains/pod	Shelling percentage
AG-6	12.26	116.66	33.00	100.00	6.33	1.18	5.50	46.33
AG-7	12.30	87.00	30.00	94.00	7.06	1.11	6.03	43.33
AG-8	10.00	80.00	27.66	106.00	6.90	1.08	5.46	46.00
AG-10	10.06	110.00	40.00	80.00	7.16	1.50	6.16	51.00
KS-205	9.82	83.00	38.00	92.66	7.23	1.20	6.50	54.33
Kinnauri	18.02	130.00	38.00	90.00	6.33	1.30	6.86	61.33
KS-230	10.20	83.00	38.00	96.66	7.23	1.09	5.00	42.66
PM-65	10.15	72.00	30.00	80.00	5.70	1.25	6.06	41.66
NDVP-8C	12.19	110.00	30.00	90.00	6.03	1.16	5.36	48.00
VL-7	7.60	59.00	20.00	75.00	5.36	1.08	5.20	52.00
VL-8	8.30	53.00	24.66	60.00	6.00	1.05	5.03	58.66
VPP-433	9.24	55.33	23.00	80.00	5.06	1.06	5.06	60.66
Punjab-89	13.08	120.00	46.66	143.33	10.18	1.40	9.93	70.33
Azad P-1	11.34	120.00	43.33	91.66	9.23	1.26	7.90	64.33
Lincoln	10.13	120.00	37.33	81.667	9.10	1.12	7.16	61.66
$CD_{0.05}$	1.49	5.24	5.98	21.79	0.61	NS	0.825	5.11

Table 2: Coefficients of variability, heritability and genetic advance for various traits understudy

Trait	Genotypic coefficient of variation	Phenotypic coefficient of variation	Heritability	Genetic Advance	Genetic Gain
Node at which first flower appear	22.05	23.50	88.08	4.68	42.64
Plant height (cm)	28.17	28.37	98.59	53.75	57.63
Number of pods/plant	22.24	24.70	81.07	13.74	41.26
Pod yield/plant (g)	18.54	23.45	62.52	27.41	30.21
Pod length (cm)	20.90	21.56	93.99	2.92	41.74
Pod width	7.70	15.69	24.09	0.09	7.70
Number of grains/pod	21.22	22.19	91.42	2.60	41.80
Shelling percentage	16.35	17.32	89.13	17.01	31.80

Table 3: Phenotypic (P) and genotypic correlations (G) for different horticultural traits

Trait	Plant height (cm)	Number of pods/plant	Pod yield/plant (g)	Pod length (cm)	Pod width	Number of grains/pod	Shelling percentage
Node at which first flower appear	P 0.751** G 0.698**						
Plant height (cm)	P 0.542** G 0.413**	0.818** 0.721**					
Number of pods/plant	P 0.511** G 0.333*	0.543** 0.400**	0.604** 0.560**				
Pod yield/plant (g)	P 0.229^{NS} G 0.200^{NS}	0.633** 0.612	0.861** 0.773**	0.666** 0.549**			
Pod length (cm)	P 0.776** G 0.164^{NS}	0.887** 0.609**	1.012** 0.530**	0.490** 0.319	0.599** 0.327*		
Pod width	P 0.449** G 0.405**	0.641**	0.830** 0.696**	0.761** 0.528**	0.880** 0.792**	0.958** 0.399**	
Number of grains/pod	P 0.213^{NS} G 0.195^{NS}	0.319* 0.305*	0.423** 0.338*	0.235^{NS} 0.176^{NS}	0.532** 0.496**	0.398** 0.194^{NS}	0.705** 0.628**