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CHARACTER ASSOCIATIONS FOR YIELD AND ITS COMPONENTS IN GRASSPEA (*LATHYRUS SATIVUS* L.) UNDER DIFFERENT BREEDING METHODS

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ABSTRACT

Two crosses of grasspea, viz., RED × P 28 and RED × EC 242692 were advanced through single seed descent, random bulk and pedigree methods to assess the nature of character associations for yield and its components in F_4 and F_5 generations under these three breeding methods. Single seed descent method showed a higher number of significant correlation as compared to random bulk and pedigree methods. Correlation only between pods per plant and yield per plant was consistent over breeding methods and generations. The inconsistency of other correlations over breeding methods and generations may be due to differential changes in gene and genotypic frequency associated with different breeding methods and genotype × environment interaction, respectively.

Key words : Grasspea, correlation, single seed descent, random bulk, pedigree

The nature of associations among yield and its components in advanced generations would be of practical value to the breeder for exercising selection. However, when the segregating generations are handled by different breeding methods, the character associations are likely to be changed. The information on the influence of different breeding methods on associations may be useful in planning a breeding programme and also in determining the efficiency of breeding method. Again, no report on generation advancement through any breeding method in grasspea is available. In view of this, the present experiment was carried out to comprehend the character associations for yield and its components in two crosses of grasspea advanced by three breeding methods viz., single seed descent, random bulk and pedigree.

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MATERIALS AND METHODS

The F_2 generations of two crosses of grasspea, namely, RED × P 28 and RED × EC 242692 were advanced up to F_5 generation by following single seed descent, random bulk and pedigree methods during the period from 1992-93 to 1994-95 at Indian Agricultural Research Institute (IARI), New Delhi and IARI off season nursery, Dharwad, Karnataka. All the three breeding methods were started from the same F_2 population of 500 genotypes in each cross. Single seed descent method was followed by collecting a single pod from each of the 500 space-planted F_2 plants to raise F_3 generation. The two crosses were advanced up to F_5 following the same procedure. In pedigree method, exercising 10% selection pressure on the F_2 population, 50 phenotypically superior plants were selected to raise the individual plant progenies in F_3 generation. In F_3, family size was kept at 10 plants and between family and within-family selection were exercised with selection intensity of 50% and 20%, respectively which amounted to a selection intensity of 10% on population basis. Thus, 25 superior families and two superior- most plants in each superior family were chosen, thereby making a total of 50 plants. The same procedure was followed upto F_5 generation. The one-half of seeds harvested from all the F_2 individual plants including those selected for pedigree method was composited and a random sample of seeds was taken to raise F_3 generation in random bulk method. This procedure was repeated to advance the two crosses to F_5 generation. However, a population of 500 plants was maintained in each generation for each method. The data recorded on all 500 single plants for yield and its components in F_4 and F_5 populations in each breeding method were subjected to estimation of correlation coefficient [1].

RESULTS AND DISCUSSION

Single seed descent method showed a higher number of significant correlations in both F_4 and F_5 generations of the two crosses as compared to random bulk and pedigree methods (Table 1). Brar *et al.* [2] also reported superiority of single seed descent to random bulk and pedigree in this regard. F_5 generation established more number of significant correlations than F_4 generation in both the crosses. Again, the magnitude of correlation coefficient was, in general, higher in F_5 than in F_4 generation indicating that correlations were established better in later generation because of increase in homozygosity.

A comparison of the three breeding methods for associations among yield and its components in both F_4 and F_5 generations indicated the changes in direction and magnitude of some correlations from one breeding method to the other. Most of the correlations were found to have fluctuated from generation to generation and/or

Table 1. Correlation coefficients among yield and its components in F_4 and F_5 populations of two crosses of grasspea advanced by three breeding methods

Character-pairs	Single seed descent		Random bulk		Pedigree	
	F_4	F_5	F_4	F_5	F_4	F_5
CROSS : RED × P 28						
Pods/plant and seeds/pod	–0.03	–0.19*	–0.14	–0.07	–0.03	0.05
Pods/plant and 100-seed weight	–0.16	0.06	–0.04	–0.02	–0.02	–0.04
Pods/plant and yield/plant	0.49**	0.62**	0.39**	0.52**	0.31**	0.46**
Seeds/pod and 100-seed weight	0.04	–0.16*	–0.06	–0.17*	–0.05	–0.07
Seeds/pod and yield/plant	0.15*	–0.05	–0.02	–0.02	0.05	0.13*
100-seed weight and yield/plant	0.03	0.21*	0.01	0.06	0.02	0.06
CROSS : RED × EC 242692						
Pods/plant and seeds/pod	–0.03	0.06	–0.02	0.07	–0.04	0.05
Pods/plant and 100-seed weight	–0.19*	–0.22*	–0.04	–0.14*	–0.19*	–0.27**
Pods/plant and yield/plant	0.38**	0.43**	0.62**	0.67**	0.53**	0.59**
Seeds/pod and 100-seed weight	–0.06	–0.17*	–0.21*	–0.29**	–0.23*	–0.24*
Seeds/pod and yield/plant	0.15*	–0.06	–0.01	0.20*	–0.01	0.06
100-seed weight and yield/plant	0.18*	0.04	0.02	0.03	0.01	0.01

*, ** : Significant at 5% and 1% levels of significance, respectively

from one breeding method to other. One of the reasons for inconsistency of correlation over generations may be genotype × environment interaction as F_4 and F_5 populations were grown in different places and in different seasons. (F_4 was grown during *rabi* of 1993-94 in New Delhi, whereas F_5 was grown during *kharif* of 1994-95 in Dharwad). Again, the nature of population itself could influence the association [3]. The inconsistency may, also, occur because of severe amount of genetic drift due to sampling in case of random bulk, change in gene and genotypic frequency in desirable direction as a result of directional selection in pedigree and operation of natural selection through intergenotypic competition and fecundity in single seed descent method. However, the changes in correlations from one breeding method to other may be due to differential changes of gene and genotypic frequency associated with different procedures of generation advancement in different breeding methods.

Correlation between pods per plant and yield per plant showed consistency in magnitude and direction over generations and breeding methods in both of the crosses. Similar findings were reported by Gowda [4]. The correlation should be fairly high (significant) and reasonably consistent over breeding methods and generations in order to be useful parameter and to have significance in a crop improvement programme. Selection for pods per plant would definitely influence the correlated trait, yield per plant. Again, single seed descent method showed superiority to other two methods in having more number of significant correlations among yield components. Thus, it may be inferred that single seed descent method would give higher response to selection for pods per plant to result in genetic improvement of yield.

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