DIFFERENTIAL RESPONSE OF POLYGENIC TRAITS TO MUTAGENIC TREATMENT IN PEAS

Singh, N.P. and B. Sharma Division of Genetics
Indian Agric. Res. Institute, New Delhi, India

The five polygenic traits of pea (days to flowering, pods/plant, seeds/pod, seed size and yield/plant) studied in the present investigation showed different degrees of response to treatment with gamma-rays, ethylene imine (EI), and N-nitroso ethyl urea (NEU) in respect of magnitude of induced variability (Table 1). Seed yield showed the most induced variation, followed by pods/plant. The remaining three characters, seeds/pod, seed weight and flowering time, showed less mutability. Therefore, the two major traits of economic importance, i.e. pods/plant and yield/plant, are highly amenable to mutational manipulation. Interestingly, these two traits showed more induced variability in a positive direction. Therefore, this variability can be exploited through effective selection.

Despite the similar pattern of variability in M2 and M3 for all five characters, they differ in the transmission of variability over generation (Table 1). The increase in polygenic variability in M3 over M2 often has been referred to as "release of additional variability". Perhaps, such is the mechanism of induction and inheritance of micromutations. However, it was higher for pods/plant, seeds/pod and yield/plant. It seems that such differential behavior of various characters has not been reported earlier in peas. It is still not clear whether the character-to-character differences can be attributed to the intrapopulational structure or previous selection history of different varieties (1). However, such an assumption cannot explain the present situation, because the untreated material of the same variety did not show a regular increase in variance with advancing generation.

These results clearly demonstrate that some characters have a tendency to stabilize sooner than others. This may be related partly to the number of polygenes controlling them. From the present discussion, it can be expected that selection for some characters (e.g. days to flowering and 1OO-seed weight) could be confined to M2 alone, as much advantage is not expected by advancing the mutagenized population. At least for these and other such characters both time and labor can be saved, and only M2 selections need be advanced to M3 generation for confirmation, further selection, preliminary testing and multiplication.

The same rule can also be applied to other characters as well, even though their variance increased appreciably in M3 over M2. The M2 progenies can be classified as promising on the basis of higher CV and shift in mean in the desired direction than the highest values of these parameters in the control, and only these selected progenies may be advanced for a second cycle of intensive selection. Therefore, irrespective of whether a character shows increase in variance with generation advancement or not, preliminary screening in early generations would be of great help in reducing the volume of work and saving time.

1. Sharma, B. 1986. Indian J. Genet. 46:88-100.

Table 1. Effect of mutagenic treatment on induced variability (CV%) for different polygenic characters in M2 and M3 generations.

Character	M2 generation			M3 generation (unselected)		
	Gamma rays	EI	NEU	Gamma rays	EI	NEU
Days to flowering	7.8	8.1	8.4	8.0	8.5	9.0
Pods/plant	34.7	34.4	35.4	36.5	45.5	50.0
Seeds/pod	22.6	23.5	24.8	27.0	27.5	28.0
100-seed weight	15.1	16.4	17.0	16.5	18.0	20.0
Seed yield/plant	36.1	40.1	44.8	42.5	45.0	47.0