

THE SEED PROTEIN PRODUCTION OF SOME PISUM GENOTYPES

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The seed protein production of a crop depends on some yield criteria, such as number of seeds per plant, seed size and protein content of the seed meal. Each of these traits is genetically controlled and highly influenced by environmental factors. Therefore, the character "seed protein production per plant" may be highly variable for the same genotype in successive generations.

More than a hundred genotypes of our collection of radiation-induced Pisum mutants and recombinants were investigated with regard to their protein production. So far, only a single gene of our material was found to increase the protein content of the seed flour considerably (gene *ipc*), but the seed production of the respective mutant is so low that this gene cannot at present be utilized agronomically. The protein content of the other genotypes tested so far is not significantly higher than that of the mother variety. Thus, the protein production of our genotypes can only be increased by increasing seed production. This has been done preferably by means of two groups of mutants which have a positive selection value:

- Fasciated mutants having a very high seed production as a consequence of the apical stem fasciation.
- Bifurcated mutants having two corresponding stems in the upper part of the shoot thus producing an increased number of pods per plant.

Of many fasciated genotypes studied, the best 22 for seed protein production are considered in the lefthand part of Fig. 1. For nine of them, values of several generations are available; they are listed separately in the graph. For the remaining 13 genotypes, only one generation has been evaluated so far. Their mean values are given in a summarized form under "other recombinants".

The graph shows that for quite a number of fasciated genotypes the protein production was higher than the control values of the mother variety. Furthermore, the marked variability of the mean values obtained for the same genotype in successive generations demonstrates the need for repeated evaluation over a number of generations. For example, fasciated mutant 251 (one of the donors of the three or four fasciata genes present in our fasciated genotypes) we have yield and protein determinations over 11 generations. The total mean for all generations tested was 135.5% of the corresponding value of the initial line. This presumably is attributable to a larger number of pods per plant and only a small reduction in seed size. In one generation (M17/1980), however, the number of pods per plant was only slightly increased, whereas the seed size was strongly reduced in response to the unfavorable climatic conditions during that particular season. Therefore, the seed protein production per plant was 35% lower than the control and about 50% lower than the average of the mutant over all years. All other values obtained were clearly higher than the control values. The recombinants R 849 and R 665 likewise showed a very high seed protein production, as did some of the high yielding recombinants, of which only one generation has been studied so far.

A similar situation was observed for group of genotypes showing a dichotomous stem bifurcation. This trait is controlled by gene bif-1, deriving from mutant 1201A. The mean values for seed protein per plant of this mutant were relatively clustered in 11 successive generations, the total mean being 7% higher than the control value. Some of the bifurcated recombinants also showed a high protein production.

The favorable mean values of some fasciated and bifurcated recombinants are due to an additive effect of high seed production, tallness and lateness. We currently are attempting to introduce shorter stature into these lines without reducing their yielding capacity in order to make them more suitable for cultivation in the field.

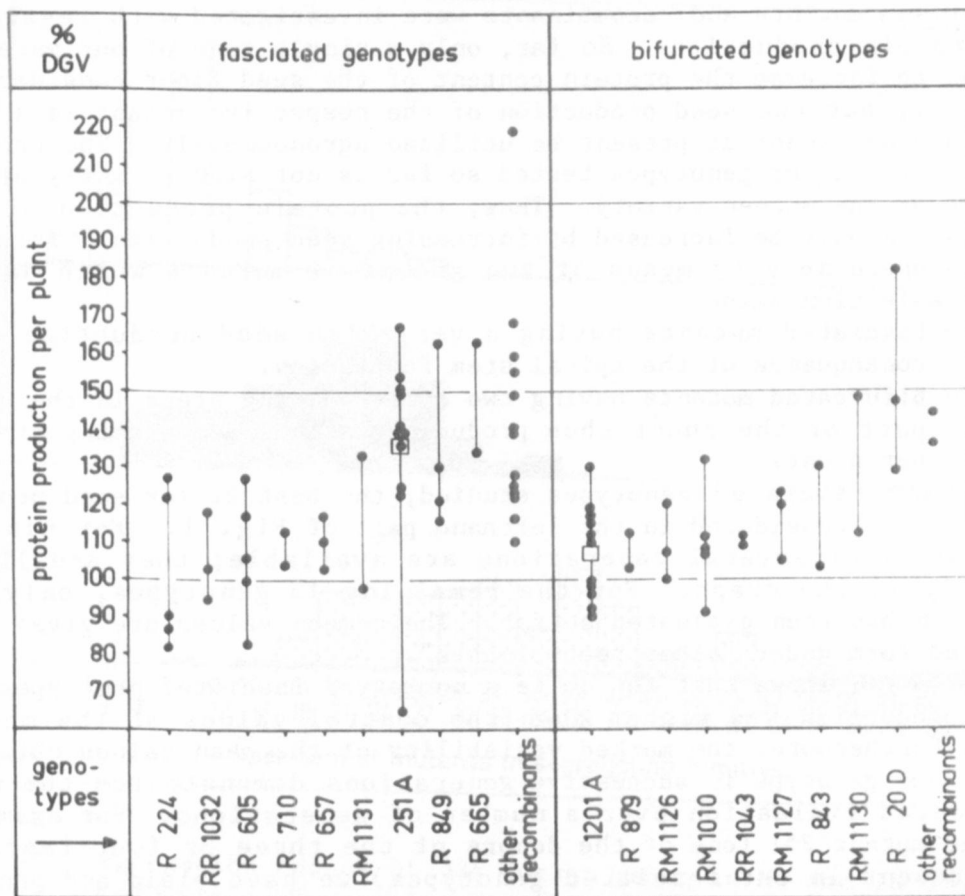


Fig. 1. The seed protein production per plant of 22 fasciated and 11 bifurcated Pisum genotypes as related to the control values of the mother variety 'Dippes Gelbe Viktoria' (DGV) = 100%. Each dot gives the mean value for one generation.