REGENERATION OF PEA GENOTYPES FOLLOWING EXPOSURE TO SUB-LETHAL HIGH TEMPERATURES

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During a long day (18 h light 6 h dark) phytotron trial with 15°C during night and 40°C during day, the equipment got out of control and the 12 day-old-plants were exposed to a temperature of 48.5°C for a period of about 2 h. Immediately afterwards, the temperature fell to 8°C whereas the humidity rose to 80%. After repairing the fault, we changed the phytotron conditions to the normal thermoperiod of 15°C night/25°C day in order to give those plants which might have survived, a better chance for regeneration.

A few hours after the collapse of the phytotron, the plants of all genotypes tested withered but there were clear differences among the genotypes in the speed of this process. The recombinant line R 650A showed the highest degree of resistance and the 17 plants grown collapsed about half a day later than the plants of all the other genotypes tested. R 650A is homozygous for the following genes:

– af (from Goldenberg's spontaneous afila mutant),
- a gene for apical stem fasciation (from our fasciated mutant 489)
- a gene for longer internodes (from line 489),
- a gene for extreme lateness (hypostatic in line 489).

Unexpectedly, 112 of the 542 plants grown, belonging to 27 different genotypes, regenerated a few days later, mostly from basal axillary buds. Some genotypes failed to survive including all plants of recombinant R 650A just mentioned. However, a high recovery rate was observed in some genotypes. This was particularly true for the following lines with narrow leaflets and stipules:

– mutant 176A: 16 plants grown, 10 regenerated
– mutant 112G: 18 plants grown, 10 regenerated
– mutant 120ID: 19 plants grown, 10 regenerated
– recombinant R 427: 20 plants grown, 11 regenerated. Mutant 176A is homozygous for gene dim-1 and mutants 112G and 1201D are either identical or allelic homozygous for alleles of dim-1. Recombinant R 427 is derived from crosses between lines 176A, 123 and R 46C, and likewise contains gene dim-1. From 73 plants of these 4 genotypes, 41 plants regenerated, (a proportion of 56.2%). It can be concluded from these observations that the capacity for regeneration under these unfavourable conditions is to some extent attributable to gene dim-1 and to other recessive alleles of the Dim locus. Also mutant 46A and recombinant R 46C, both containing gene lf^a for earliness, were found to have a good regeneration capacity.

Other investigations have shown that some fasciated mutants and recombinants of our collection display a high degree of tolerance to day temperatures up to 35°C (mutants 107D, 251, 489, and recombinants R 176X, R 338, R 665A). Their regeneration rate following 48.5°C, however, was not better than that of the mother variety "Dippes Gelbe Viktoria" or of most of the other genotypes tested. From 129 plants grown of these 6 genotypes, only 12 plants regenerated (= 9.3%). Thus, heat tolerance and regeneration capacity following exposure to sublethal temperatures are two traits which are obviously governed by different genetic mechanisms.