THE BEHAVIOR OF A "MICROMUTANT" IN THE PHYTOTRON

Gottschalk, W.
Institute of Genetics, University of Bonn, Federal Republic of Germany

Plants of the X-ray induced mutant 37C of our collection are morphologically so similar to the initial line that they cannot be classified reliably in segregating families. Under the climatic conditions of West Germany, they began flowering a few days later than the mother variety and had a somewhat higher seed production in all the generations tested so far. Thus, mutant 37C is a typical micromutant in the sense of Gaul's definition (1).

The mutant was tested in our phytotron under long- and short-day conditions where they were found to behave markedly differently from the non-mutated control plants. Under long-day conditions (17 hrs light, 1 hr "dawn", 6 hrs darkness), they began flowering about 4 weeks later. The entire plant type was altered. In contrast to the initial line, the lateral branches were well developed. The most conspicuous character, however, was the increased number of internodes, the length of which was considerably shortened. For the initial line the mean internode number per plant was 19.8, and the mean internode length was 3.4 cm. For mutant 37C the mean internode number was 32.0 and the mean internode length was 2.6 cm.

Under short-day conditions (11 hrs light, 1 hr dawn, 12 hrs darkness), the plants of genotype 37C showed a somewhat different behavior in the two trials in which it was evaluated. In the first trial, all 8 plants cultivated remained vegetative up to the age of 93 days when the trial was terminated. In the second trial, 6 out of the 8 plants grown remained vegetative whereas the other two developed abortive flower buds very late. The strongly increased number of internodes per plant was also observed in short-day as follows: For the initial line the mean internode number per plant was 24.9 and the mean internode length was 4.0 cm. For mutant 37C the mean internode number was 28.2 and the mean internode length was 2.3 cm.

These findings demonstrate the questionableness of the term "micromutant". Under West German long-day field conditions, the mutant behaves like a micromutant. Under the long-day phytotron conditions, however, the plants differ strongly from the control material with regard to both flowering time and shoot structure. The differences cannot be due to the photoperiod alone because day length was similar in both cases. More likely, the differences were due to temperature which was considerably higher in the phytotron than in the field.

In one of my papers published in this issue (p. 14), the action of gene fis, controlling the response to photoperiod, is described. Plants homozygous for fis need long-day for flowering; they do not flower under short-day conditions. This gene obviously is not present in the genome of mutant 37C. The plants did likewise not flower in short-day, but in at least some of them the initiation of flower formation occurred. This was never observed in the fasciated genotypes homozygous for fis. It is more probable that the specific short-day conditions combined with the relatively high temperature was responsible for the extreme lateness of mutant 37C. Had we cultivated the plants even longer, all of them would probably have formed the tiny buds observed in two of them.

1. Gaul, 11. 1965. The concept of macro- and micro-mutations and results on induced micro-mutations in barley. Suppl. Rad. Bot. 5:407-428.