worse than that of the fasciated mutants. The third sub-group had plant heights similar to the fasciated mutants. The additional presence of gene efr for earliness did not lead to an improvement in yield. Only some genotypes of the fourth sub-group yielded more than the fasciated mutants, but they are so tall that they are not suited for field cultivation.

The findings show that the combination of gene efr for earliness and distinct genes for reduced internode length with the fasciata genes has a negative influence on the seed production of the plants. It was not possible to maintain the high yield of the fasciated mutants when otherwise desirable genes were incorporated.

A PROPOSED ASSAY FOR DETECTION OF AUXIN-SENSITIVE MUTANTS OF PISUM USING INTACT SEEDLINGS

Ingensiep, H. W. Institute of Genetics, University of Bonn
Federal Republic of Germany

Many of the morphological differences among mutants or recombinants may result from the action of genes that control plant growth regulators such as auxins. Experiments show that exogeneously applied auxins are able to induce several morphological changes in plant form and size. In such experiments different morphogenetic effects often are caused by different auxins applied under equimolar conditions, and for Pisum sativum these different effects could be correlated with differences in metabolic availability and translocation of the applied auxins (1). These studies led us to propose a simple test system to screen for mutants which affect auxin metabolism, using intact pea seedlings.

Experimental background: Our previous experiments showed that normal pea seedlings exhibit a characteristic morphogenetic effect when auxins 2,4-D, IAA, and NAA were applied via the root system (1). Seedlings treated with 2,4-D were strongly inhibited in root and shoot development, while IAA- and NAA-treated seedlings were not. This could be correlated with higher metabolic availability of the IAA and NAA molecules by different mechanisms: IAA is mainly decarboxylated or conjugated to aspartic acid; NAA is mainly conjugated; and 2,4-D is neither decarboxylated nor conjugated to any extent. In the case of IAA and NAA, these mechanisms prevent the morphogenetic alteration of the seedling by inactivating many of the free molecules. Hence, these auxins are not able to reach the vascular tissue in the root in high amounts and are not translocated into the shoot to cause morphogenetic aberrations there. On the other hand, 2,4-D does reach the vascular tissue and is actively translocated in lethal amounts into the shoot.

M

This experimental background was used for the following two-step screening system for auxin-sensitive pea mutants. It is supposed that the roots act as selective "filters" for the auxins and the shoots as visible indicators of auxin action in the plants. If the shoot of a given plant differs morphologically from the initial line, this may be a hint that the plant exhibits genetically controlled changes in auxin metabolism. For instance, if IAA-treated pea seedlings show strong inhibition compared to the control, this may be due to the lower inactivation capacity of this mutant. On the other hand, plants may occur that show normal shoot development after being treated with 2,4-D. This could be due to metabolic changes affecting the free molecule to greater extent and resulting in resistance. Between these extreme reactions other seedlings may occur which show auxin-sensitivity. These morphological deviations could be observed in the first step, where the initial line and mutants are treated with the three auxins as described. In a second step, suspicious plants could be analyzed by physiological methods to characterize quantitative changes in auxin metabolism, for instance by chromatographical analysis of labelled auxins as described (1). It must, of course, be recognized that other factors may be involved in the observed changes.

Nevertheless this assay could be of help in detecting auxin-sensitive pea mutants in those cases where auxin-dependent variations are suspected. The advantage is that the procedure is simple, inexpensive, and rapid (possible effects are detected within two weeks with a few seeds). The more involved in vitro culture methods could be applied after prescreening intact pea seedlings with this system.

1. Ingensiep, H. W., ejt_ ai- 1981. PNL 13:21-23.