A NOTE ON THE ANATOMY OF THE LEAF OF THE SIMPLE-LEAVED MUTANT IN GRAM (*CICER ARIETINUM* LINN.)

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DURING the last harvest season the following four mutant plants of gram of three different types were observed in two of the strains isolated from the local material in the Botanical Experiment Area at Sabour (Bihar):—

1. *One tiny-leaved mutant*, from strain No. 14, comparable with the one observed by Ekbote (1937) in I.P. Gram Type No. 25, in which the leaf is compound, pinnate, with tiny lanceolate to ovate, serrate leaflets on the secondary midribs, the primary midrib being broken into secondary branches.
2. *Two simple-leaved mutants*, from strain No. 14, showing all transitional stages between the simple leaf and compound leaf (Fig. 1) as also observed by Ekbote (1937) in I.P. Gram Type No. 17.
3. *One sterile gram plant*, from strain No. 17, which showed the transformation of various floral parts into vegetative structures (except the calyx) as observed by Ayyar (1933).

The tiny-leaved mutant and the simple-leaved mutant have been shown to behave as simple recessives to the normal compound leaved condition, which is controlled by the interaction of two factors (Vachhani, 1942). The presence of two genes *Tlv* and *Slv* produces normal leaf, whereas their presence individually gives the tiny leaved mutant and the simple leaved mutant respectively. The double recessive condition also produces the simple leaved individuals. Their breeding behaviour has been studied by Ekbote (1942) who observed the simple leaved mutant, exhibiting a frequent reversibility.

All the mutants appeared to be very different from the normal gram plants in their general appearance and were weather resistant. They could be distinguished from a distance by their fresh green colour, when the normal gram plants were almost ready for harvest. This is probably due to the preservation of energy and food by the mutants, which in normal plants are consumed in flowering and fruit-setting. All these mutants were sterile. About 90% of the pollen grains examined from one of the simple-leaved mutants were observed to be sterile and attempts to cross it with the normal plant did not succeed.

In the present investigation we made special observations on the morphology and anatomy of the leaves of the simple-leaved mutant.

The most striking feature of the simple leaved mutant is its unusual leaf form. The normal leaf in gram is pinnately compound (Fig. 1 *g*). The leaves of the mutant, on the other hand, showed different stages of fusion of the leaflets on both sides of the rachis, so that ultimately the perfectly simple lamina was formed (Fig. 1 *a–f*).

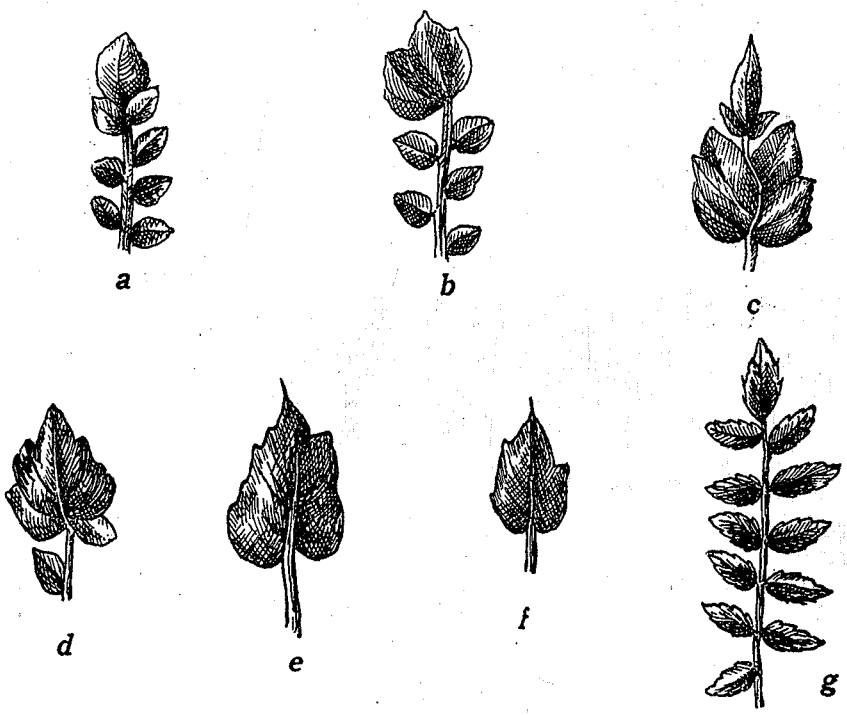

FIG. 1. *a–f*.—Leaves from the simple-leaved mutant of gram, showing various stages in the fusion of the leaflets, leading ultimately to the formation of the simple leaves *e* and *f*. *g*, A compound leaf from a normal gram plant ×1.

This type of fusion raises the question as to what happens to the vascular bundles of the leaflets. Do they fuse on both sides in the petiole-midrib axis, remain separate or do not develop at all when the simple leaf form is attained? The transverse section of the rachis of a typical compound leaf of gram shows 5–8 vascular bundles arranged in an arc. Each of these vascular bundles in the normal leaf comes from a leaflet. Therefore, the number of vascular bundles in the rachis corresponds to the number of the leaflets or pinnæ of a leaf. In the simple leaf of the mutant gram, the lateral vascular bundles were found to come together in one group on both sides of the central vascular bundle, forming compound bundles. In these, the xylem groups of the different bundles retain their individuality, as can be seen from the separate protoxylem points, whereas the phloem groups fuse

to form one mass (Fig. 2). Thus the typical arc of 5–8 vascular bundles seen in the rachis of a normal compound leaf is not maintained. Instead, there are found three very prominent vascular bundles in the

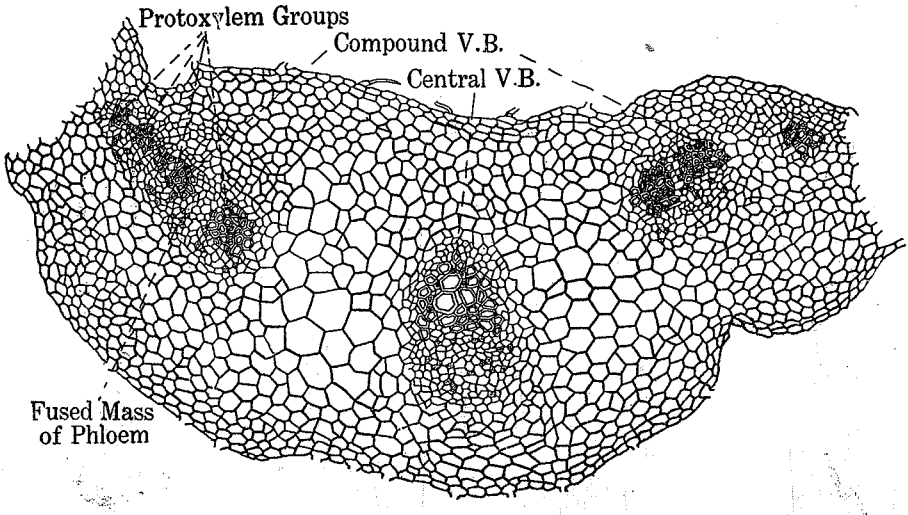

FIG. 2. T.S. of a petiole of a simple leaf of mutant gram

petiole of the mutant, the two lateral of which are compound bundles resulting from the fusion of 4 bundles on one side and 3 on the other. This shows that the process of fusion in the leaf of the mutant caused by the action of the gene *Slv* is not confined to the external form only, but affects the internal tissues as well.

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