A Note on the Dichotomous Branching of the Main Stem of the Tomato (Lycopersicum esculentum)

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A Note on the Dichotomous Branching of the Main Stem of the Tomato (Lycopersicum esculentum).

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With three Figures in the Text.

FOR the purposes of the investigations on Virus Diseases carried out in this laboratory it is necessary to have a continuous supply of tomato plants. These are grown from seed and the seedlings are planted out in pots as required. It has been noticed that there is a tendency for the first foliage leaves to have an abnormal structure. One type of variation is not uncommon. The distal portion of the leaf is frequently forked so that the terminal pinnae are 'double' and the rachis is usually split so that there are two equal terminal pinnae. When this is so the two sides of the leaves are quite symmetrical. Among the plants under observation in the glass-house, however, appeared the present one in which the 'dichotomous' habit was much more evident.

The occasional appearance of forked leaves suggests that there is a tendency in the case of the tomato to have abnormal cell-divisions of the apical meristem which give rise to apparent dichotomy, and the occurrence of this plant indicates that this abnormality is not impossible of occurrence even in the stem apex.

The tomato plant has normally a three-fifths leaf-divergence and the branching is monopodial. In the plant under observation the first few leaves and the lower part of the stem presented a perfectly normal appearance. Almost immediately above the fourth leaf, however, the stem divided equally and gave the appearance of a dichotomously branching plant. There was no further dichotomous branching and the normal monopodial structure was continued. An examination of the two limbs of the plant showed that they were identical as regards both the number of the lateral members and the places of their insertion on the stem. It will be seen from Fig. 1 that each leaf on one branch has its fellow on the other.

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Cases of simple dichotomy in Dicotyledons have from time to time been recorded. Worsdell (1) cites examples viz. the stems of the Jerusalem

FIG. 1. Tomato plant showing the bifurcating stem.

Artichoke (*Helianthus tuberosus*), of *Maesa ramentacea*, of Wall-flower (*Cheiranthus cheiri*) and the Stonecrop (*Sedum reflexum*).

In order to decide definitely that the present example was not merely an apparently equal development of the main stem and of an axillary shoot a study of the anatomy was made. Fig. 2 indicates the appearance of the stem at the place of forking. The leaf and its accompanying bud are clearly visible just below the region of division. This practically disposes of the possibility of one of the stems being axillary in origin. On the opposite side of each of the stems behind the rather swollen node are leaves each with an axillary bud, equal in size and corresponding in position. These represent the fifth leaf of the plant.

Further evidence that the stem was not axillary in origin was furnished by the examination of the vascular anatomy. In the tomato stem there are main groups of common bundles with connecting vascular tissue, forming a continuous stellar ring. When an axillary shoot grows out the vascular connexions are made entirely from the common bundle with which is connected the leaf in the axil of which it arises. It is thus a simple matter to recognize the out-growth of a lateral shoot from the examination of the vascular tissues of the stem.

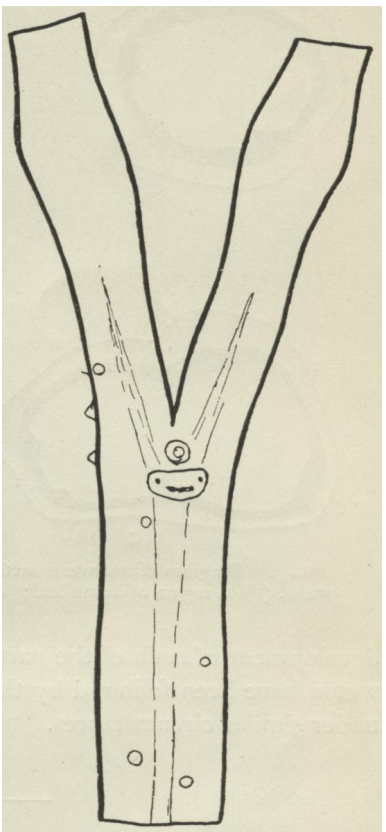

FIG. 2. Diagram of stem in region of forking.

In the present specimen there was a bud in the axil of the fourth leaf so that a few sections in this region sufficed to give examples of this type of vascular connexion. The vascular arrangement in the region of bifurcation is very different. The sections in Fig. 3 illustrate the salient features of the two types. The first section (3 *a*) was made just below the fourth leaf, the second (3 *b*) in the region of the fourth leaf, the third (3 *c*) between this leaf and the fork, and the fourth (3 *d*) at the lower end of the fork. Just above the fourth leaf the stem becomes rather flattened and increases in width in a direction at right angles to the length of the leaf. Thereafter a split appears in the vascular tissue, possibly associated with the difference in constitution of xylem tissue at this place and the initiation of the vascular tissues of two stems is evident. The point of interest is that in this case the two systems arise by the splitting of the stele of the stem. One is not formed, as in the case of an axillary shoot by the outgrowth of tissue from one of the common bundles of the main stem. Actually the division of two of the main vascular groups are to be seen in the sections. Each of the two limbs of the fork is therefore a true 'main stem'.

The evidence indicates, that in the present instance, the forking was due to a dichotomous division of the main stem and not to the over-growth of a lateral shoot with simulated dichotomy. The fact that the two stems are identical may be fortuitous or it may indicate that, the meristem having divided equally at an early stage, the resultant halves developed in exactly the same way. The latter seems the more probable explanation. The

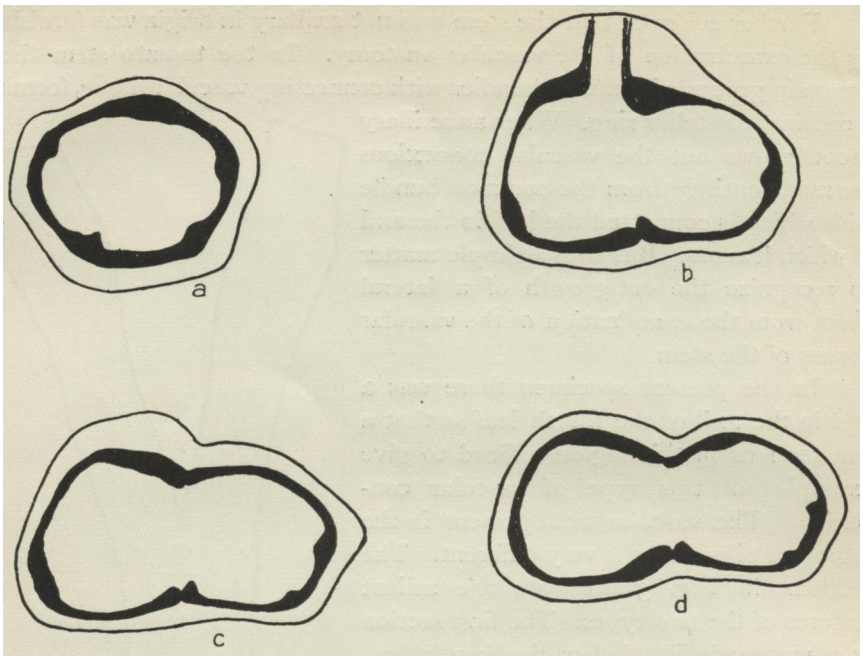

FIG. 3. Diagram of transverse section of stem at different levels. (*a*) 'Normal' main stem; ( ) in region of fourth leaf; (*c*) between fourth leaf and fork; (*d*) at base of fork.

development of each of the parts seems to have followed the same course as would have been followed by the main stem had it continued normal growth under similar circumstances.

LITERATURE CITED.

1. WORSDELL, W. C.: The Principles of Plant Teratology, pp. 38 et seq. London, 1916.