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OCCURRENCE OF STERILE PLANTS IN BENGAL GRAM (*Cicer arietinum*)

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At the Cotton Breeding Station, Coimbatore, a few sterile plants (Plate I, Fig. 1) without any pods were observed in the year 1930, among the progenies of single plant selections. During 1931, their appearance was more common, and again in the following season, their percentage occurrence was as high as fifteen in certain fields sown with unselected bulk. As the presence of such a large proportion of sterile plants would considerably reduce the yield of crop, a detailed study of these sterile plants was made with regard to the modifications of their floral parts, and the causes of their occurrence.

The sterile plants (Fig. 1) had their floral parts metamorphosed or virescent, and were distinguished by their characteristically stunted and bushier habit, by the smaller and more greenish leaflets, and by the upright gynophores with empty carpels. Sometimes a plant had only a few branches, or portions of a branch displaying this abnormality. The various monstrosities observed in the flower, might now be dealt with under the various types of floral structures.

Sepals. The gamosepalous calyx was transformed into five separate stalked leaves with entire margin (Fig. 2) inserted in a radial symmetry on the receptacle. In advanced cases, each of the sepals was modified into a pinnate leaf (Fig. 3) with long petioles and serrate edges.

Petals. The corolla lost its pink colour and showed different degrees of virescence (Fig. 3). In such cases the normal Zygomorphism, and hooded character of the standard remained unaffected. In others the differentiation between sepals and petals was lost, and both whorls were metamorphosed into pinnate leaves. In a few instances there was pelory.

Stamens. The diadelphous stamens got dissociated and remained free (Fig. 3). The filaments showed either petalody (Fig. 4), or phyllody with glandular hairs (Fig. 5). The anthers were often transformed into virescent cup-like structures, but if present, they were atrophied and non-dehiscent. In extreme cases the entire androeceum showed metamorphosis into pinnate leaves. (Fig. 7).

Pistil. The most common feature was the grooved petiole-like gynophore terminating in a partially developed carpellary leaflet with a tailed midrib corresponding to the style and stigma (Fig. 2). In some cases the entire pistil had changed into a pinnate leaf (Fig. 3). The funicle showed tendencies to form a bilobed leaflet with prominent glandular hairs. The ovule too was found to be transformed into a leaf (Fig. 6).

Fig. 2.

Fig. 1.

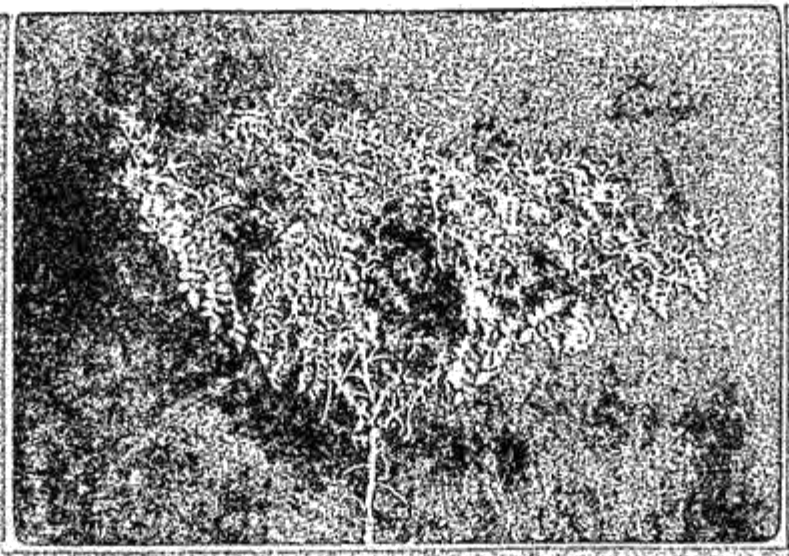

Fig. 3.

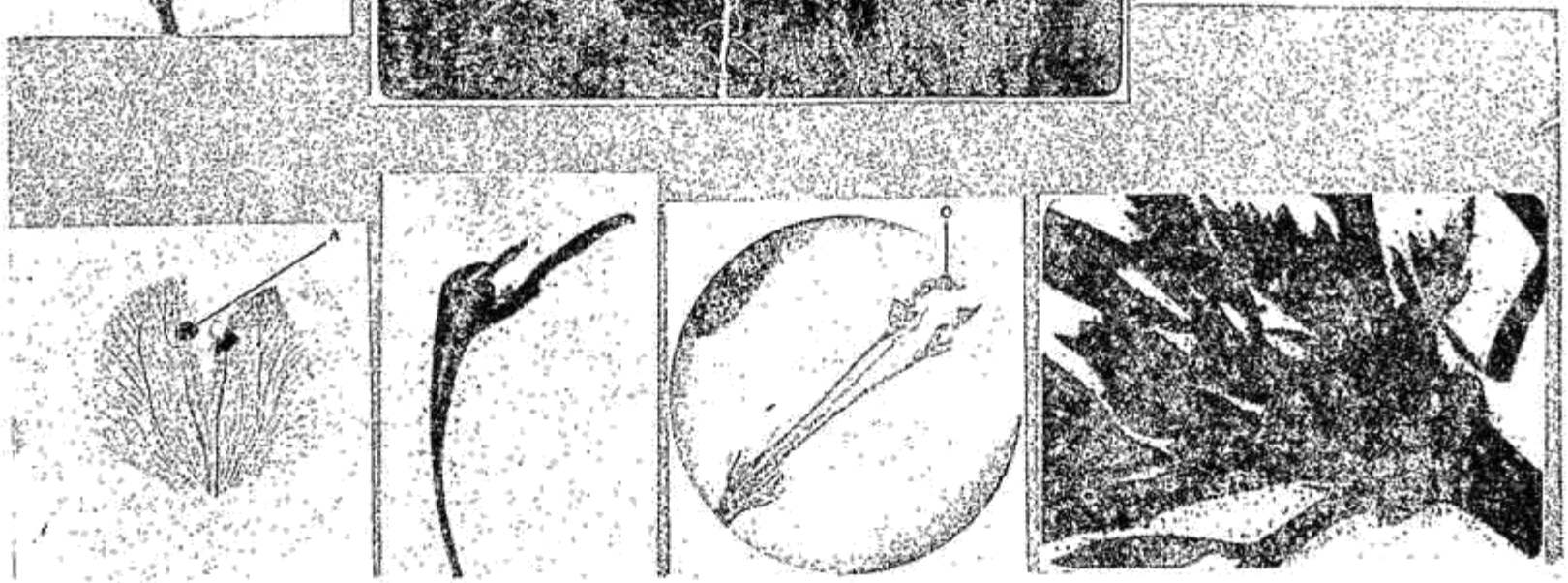

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Plate I. Fig. 1 — An abnormal plant with prominent gynophores.

Fig. 2. Longitudinal section of an abnormal flower. — Sepals changed to stalked leaflets, stamens free, Fistil, turned to leaf.

Fig. 3. Do. Do — (S) Sepals; modified into pinnate leaves. (P) Petals. Stamens free. (G) Pistil turned to a pinnate leaf. Shows axillary profiforation.

Fig. 4. — Petalody of the filaments opposite to the standard. (A) Anther.

Fig. 5. — Stamens exhibiting leafy nature: anthers showing cup-like modifications and development of glandular hairs.

Fig. 6. — (O) Ovules and funicles showing leafly transformations.

Fig. 7. — All floral members transformed to leaves.

In one plant an interesting monstrosity with all the various floral whorls converted into pinnate leaves (phyllomania) was met with (Fig. 7). In this case a vegetative shoot was found in the axil of the carpel, thus showing axillary proliferation.

Causes. Worsdell (1916) stated that the phenomenon of abnormalities is generally caused "under certain unfavourable conditions of climate, nourishment, or the influence of 'parasitism" of a fungus or an insect. Janse (1928) explains the same to be due to the disturbances produced in the quality or quantity of the growth enzymes occurring in the plant. The abnormal plants were examined by the Government Mycologist and the Entomologist, Coimbatore, and no sign of fungus or insect attack was detected. Seeds collected from such plants when sown did not produce a greater number of abnormal plants (11·7%) than was noted in the adjoining control area. The continued presence of sterile plants in crops raised during all the three years under observation, precludes one from declaring the climate as the causal factor, as the three years were varied in their characteristics. By elimination, the stimulus responsible for this phenomenon may either be the presence of any virus or purely physiological. Cross inoculations were tried on a small scale, but they failed to produce any results. Further studies into the causes of this transformation are in progress.

It may be mentioned here, that the abnormal plants bore a larger number of root nodules. It is very likely that this feature is the sequel of protracted vegetative phase exhibited by these plants. The presence of an excess of carbohydrates might have stimulated the bacteria to become more active and to produce more nodules.

Worsdell, after an elaborate presentation of teratological data, concludes that the process of Differentiation of floral members is a reversionary phenomenon while their Simplification is an evolutionary event. If the teratological features portrayed above are analysed, the dissociation of the calyx and androeceum will be grouped under dialysis. The production of gynophores and the development of shoot at the carpellary axil are only examples of median and axillary proliferations. The phyllody of the calyx, corolla, pistil, funicle and ovule, and petalody of the stamens are different types of metamorphosis. As these are only different phases of Differentiation, they are to be interpreted that they are reversionary in character, and that they go to prove the foliar origin of the several floral members.

References.

Duthie J. F. (1903). Flora of the Upper Gangetic Plain and of the adjacent Siwalik and Sub-Himalayan tracts. P. 256. Janse J. M. (1928). A natural system of classification of monstrosities. *Annales Du Jardin Botanique De Buitenzorg* 40 Penzig J. O. (1890). *Pflanzenteratologie.* Vol. 1. Worsdell W. C. (1904). 'T' Structure and Morphology of the 'Ovule'. Annals of Botany. 18. p. 737. dell W. C. (1916). The Principles of Plant Yeratoloy, Vol. II.