

APOGAMY IN THE MAIZE PLANT.

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The behavior of some of the varieties of Indian corn, from Mexico and Central America, with which the Department of Agriculture is experimenting, exemplifies the tendency of plants to develop abnormally when placed under new and unusual conditions. Among the large number of abnormalities which have come under observation a case of apogamy appears worthy of special mention, since this phenomenon seems not to have been reported in *Zea mays*.

The abnormality here described was first observed by Mr. R. M. Meade at Victoria, Texas, in a variety from Tuxtla Gutierrez, Chiapas, Mexico. Briefly described, it consists in the production of branches or young plants in the place of the spikelets of the male inflorescence or tassel. Of this variety, which was grown only at Victoria, practically all the plants exhibited this character in a greater or less degree. In other varieties, both at Victoria and elsewhere, a few individual plants were subsequently found that showed a tendency in this direction. The production of these apogamous plants is doubtless a manifestation of the excessive vegetative growth shown by most of the tropical varieties of corn when grown for the first time in the United States. While not as prevalent as the branched ear, staminate flowers in the ear, and other common eccentricities, these apogamous inflorescences are still of sufficiently frequent occurrence to indicate a definite tendency which if properly interpreted might throw light on the development of the corn plant.

Plants with this peculiarity have the tassel unusually large. The lower spikelets are replaced by small plants or branches, many of which have leaves 20 cm. long. The first leaf of these young plants or branches is undoubtedly a transformed outer glume. Though considerably enlarged, in some cases 20 mm. long, it is still easily recognizable as a glume. The next organs are similar to the early leaves of normal corn plants. Following 7 or 8 of these leaves a terminal female inflorescence can be made out, in most cases distinctly 8-rowed, but in some cases with 4-rowed branches after the manner of the monstrous ears occasionally produced at the ends of basal branches or suckers.

In passing upward from the base of the tassel the leaves of these abnormal branches gradually decrease in size, and about midway on the tassel there is only a rather unusual development of the lemma (flower-

^a Bureau of Plant Industry, U. S. Department of Agriculture.

ing glume) and palet, these inclosing normal stamens. At the tips of most of the branches of the tassel the spikelets are normal. While there is a gradual reduction in the size of the branches (see Pl. LXXXV) there is a very abrupt transition from the last of the pistillate inflorescences to the male flowers with three apparently normal stamens. It would seem from this that the abnormality is not due merely to a gradual transformation of the individual floral primordia into leaves (phyllody), but rather that a change affecting the entire bud takes place early in its history, causing the young bud to develop as a branch or young plant instead of producing a normal staminate spikelet. Furthermore, the number of primordia required for one of these growths is vastly greater than the number required in a normal spikelet.

That the inflorescences that terminate these branches or plants should be pistillate is to be expected from their position on the upper part of the plant. Branches from the lower nodes of ordinary plants are the so-called "suckers," which terminate in staminate inflorescences. Branches from the nodes farther up have the terminal inflorescence pistillate, forming the ears, while branches from the intermediate nodes, below the normal ears, usually bear terminal inflorescences that contain both staminate and pistillate flowers.

In the axils of the first leaves, which correspond to the outer glumes, small roots could be seen (see Pl. LXXXIV), and when separated from the tassel and placed in the ground these apogamous plants took root and made considerable growth. Though none lived to maturity, they continued to grow in an apparently normal manner for nearly two months and produced roots over 1 foot in length.

The production of roots enabling these branches to maintain an independent existence would seem to make this a true case of apogamy similar to that in onions, *Agave vivipara*, and the Arctic species of saxifrage. It would only remain for these apogamous plants to effect a natural separation from the parent plant to make the agreement perfect.^a

^aThe definition of apogamy given by Winkler in his "Parthenogenesis und Apogamie im Pflanzenreiche," as reviewed in *Nature* for March 18, 1909, would seem to exclude all observed cases. The definition is given as follows: "Apogamy is the apomictic formation of sporophytes from vegetative cells of the gametophyte."

Apomixis is previously defined as the production of a new individual not preceded by fusion of nuclei. Hence apogamy is restricted to the formation of a new individual with cells containing the double number of chromosomes (sporophytes) from cells containing the single number of chromosomes (gametophytes) without any union of nuclei.

Even Yamonouchi's case of a plant of *Nephrodium molle* developing from the prothallus and retaining the single number of chromosomes could not be included, since Leavitt's interpretation of this phenomenon as a case of homocosis seems well taken and the plant can hardly be considered as a sporophyte.

It seems desirable to retain the term apogamy with its more general application to cases where a new plant is produced asexually from tissues which normally give rise to sexual organs.



YOUNG PLANTS AND SPIKELETS OF APOGAMOUS MAIZE.



BRANCH OF TASSEL OF APOGAMOUS MAIZE.

While these young plants, being produced in the place of regular sexual organs, may properly be called apogamous, yet the phenomenon is closely related to the common forms of asexual reproduction, particularly to that observed in some of the small varieties of maize that produce ears at the surface of the ground. Several such cases have been observed in which roots were developed on the lower nodes of these ear-bearing branches and the ear was able to continue an independent existence after the main plant was dead, the husk leaves acting as assimilating organs. This, it will be noted, exactly parallels the present example even to the pistillate terminal inflorescence, the only difference being that of location.

The development of these apogamous plants seems to prove that even the most highly specialized organs of the corn plant still retain in latent form the characters of the other parts of the plant.

EXPLANATION OF PLATE LXXXIV.—Young plants and spikelets from the tassel. Roots can be seen on the larger plants. Natural size.

EXPLANATION OF PLATE LXXXV.—Branch of tassel showing gradual transition from young plants to normal spikelets. Natural size.