

cessation of growth, while still attached to the parent plants. The factors involved in this phenomenon are still not adequately known.

In maize (Zea mays L.) both "true vivipary" and "proliferation" may occur. The case in this species is much more interesting because the plant is monoecious, male and female sexes being present at different locations on the plant body. In maize "proliferation" is expressed only at the location of male flowers in tassels and "true vivipary" occurs only in the cobs, where female flowers are formed.

Umesh C. Banerjee
Els0 S. Barghoorn

4. Factors controlling "true-vivipary" in maize (Zea mays L.)

As we have indicated above, "true-vivipary" in maize is restricted to the cobs or female flowers. It has been recorded in the earlier literature that the sprouting of kernels occurs while they are still attached on the ear enclosed inside the husk. This condition has been considered as a "primitive character". But such premature sprouting of the kernels under natural conditions proves disadvantageous because of an insufficient water supply to maintain growth during unfavorable periods.

Various causative factors were suggested for such sprouting in maize. Weatherwax (1923) reported that environmental conditions such as warm, moist weather are responsible for premature germination. Lindstrom (1923) and Mangelsdorf (1923) considered that this phenomenon is associated with defective endosperm. Eyster (1924) suggested that a "primitive sporophyte" in maize occurs when the fertilized egg continues to grow into the new plant without going through a period of dormancy. He also proposed that the character is inherited as a simple Mendelian recessive. Further, he indicated that it appears to be associated with factors for pale yellow endosperm and albino seedlings. Mangelsdorf (1926) again reported that a number of genetic factors are involved in the inheritance of premature germination and these factors operate at various stages of endosperm development and differ in some of their effects. In a recent publication on maize by Neuffer et al. (1968), chromosome numbers 1, 2, 3, 5, and 7 are assigned for the viviparous condition. But it is still not clearly established whether vivipary in maize is entirely controlled by environmental

factors, by the genetic make-up of the sporophyte, or by both.

During early September 1970, unusually warm, humid weather conditions prevailed in Cambridge, Massachusetts, for over 10 days. A corn type (#16 (UCB); a dent corn variety with the 4th chromosome from Nobogame teo-sinte) was found producing viviparous seedlings in several cobs. On close examination of these viviparous cobs, a few sprouted kernels were also found associated with fungus growth, but no albino seedlings were observed in these propagules. The association of fungus growth with viviparous kernels was also recorded by Dr. Walton C. Galinat (personal conversation with UCB). He believes that the breakdown of endosperm by fungal growth initiates viviparous growth in maize. We have also examined plants of the other maize types grown during the 1970 crop year and found no sign of vivipary.

During the 1971 crop year, we have replanted a few seeds of the maize type #16 (UCB) along with the other types. No viviparous cobs were observed on these plants this year, a situation correlated with the absence of the prolonged warm humid weather of the preceding year. However, when we enclosed a few cobs of type #16 within plastic bags, while the cobs were still enclosed in the husks and attached to the parent plants, we found that most of the kernels on such cobs germinated, simulating the case of "true-vivipary". This experiment was further extended by using the other corn types. We have also found that juvenile kernels, with endosperm at a milky-stage, fail to germinate in plastic bags; hence it seems that complete maturation of the endosperm (cellular stage) is required for such sprouting. Apparently the endosperm must retain sufficient moisture in the cells to help sprouting when cobs are covered with plastic bags.

In conclusion, it may be suggested that environmental factors are more important or at least dominate under natural conditions in inducing vivipary in maize.

We are thankful to Dr. W. C. Galinat of the University of Massachusetts, Waltham Field Station and to Dr. H. G. Wilkes of the University of Massachusetts, Boston Campus, for their help in locating several of the older references on vivipary.

Umesh C. Banerjee
Elsó S. Barghoorn