A GENIC DISTURBANCE OF MEIOSIS IN ZEA MAYS

DURING and following the summer of 1927, a collection of maize carrying factors for male sterility (Eyster)[1] was made for the purpose of genetical and cytological investigation. The occurrence of male-sterile plants in material from thirty or more unrelated cultures suggests the possibility of several genetic factors causing such sterility.

In segregating material obtained from I. F. Phipps, it has been found that sterility is due to a recessive mendelian factor causing irregular meiosis. In a count of 144 plants the observed ratio was 109 normal to 35 sterile plants, a deviation from the calculated ratio of but one plant.[2] The cytological behavior in these sterile plants has been determined by studies of the meiotic divisions in the microsporocytes.

Early stages of microsporogenesis in the male-sterile plants have not been extensively studied. During the stages just previous to and during diakinesis there is observed a partial or complete failure of synapsis. Because of this lack of synapsis and the consequent presence of a large number of univalents, metaphases are characteristically irregular. Microsporocytes most frequently show twenty univalents. Progressively fewer cells show one bivalent and eighteen univalents, two bivalents and sixteen univalents, and so on, cells with ten bivalents rarely being observed. Some anthers show a high percentage of sporocytes containing some bivalents while other anthers show a high percentage of sporocytes containing twenty univalents.

Irregularity in the appearance of metaphase *I* increases with an increase in the number of univalents. A microsporocyte with ten bivalents in metaphase *I* appears normal. When univalents are observed they do not always lie in one spindle. Usually there is one major spindle containing the several bivalents, when present, plus some of the univalents, and one to several minor spindles containing one or more univalents (Fig. 1). In consequence of the presence of several spindles, the sporocyte is divided into a number of unequal cells after the first meiotic mitosis. Each cell contains one or more nuclei and each nucleus contains one or more chromosomes. These cells undergo a second division to form microspores. It is obvious that most of these microspores and the pollen grains formed from them do not contain a normal haploid set of chromosomes, and they are probably non-functional under ordinary conditions.

[1] L. A. Eyster, *Journal of Heredity*, 12: 138–141.

[2] Data partly from I. F. Phipps.

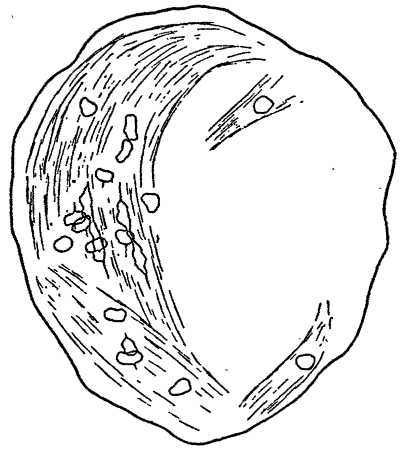

FIG. 1

This particular type of male sterility is accompanied by a certain amount of female sterility. Several pollinations have given only sparsely-filled ears. Female sterility has been observed in male steriles from a few of the other sources also. Megasporogenesis remains to be studied in these cases.

With regard to at least one male-sterile culture, it may be stated that male sterility is due to a simple mendelian gene affecting synapsis and consequent meiotic behavior, the result being the formation of gametes containing varying chromosomal complements, only a few of which are viable.

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THE ELIMINATION OF CARBON DIOXIDE IN THE INSECTA

WHILE carrying out experiments recently on the respiration of some of the apneustic and atracheate types of larvae found among parasitic and aquatic insects, results have been obtained which throw some light on the general subject of respiration in the Insecta, a subject as yet so imperfectly understood.

The carbon dioxide output can be studied by means of a suitable pH indicator, the larva being held motionless in a film of the fluid under a raised coverslip. The indicator must have a color change in the region of pH 7.0, easily visible, even in dilute solutions, in the thin layer underneath the coverslip. Owing to its intense color and very strongly marked change from blue to pink at about pH 6.0–6.2, a .1 per cent. solution of o-chlorophenol indophenol was found to be almost ideal and was the indicator most frequently used, the results obtained being, however, confirmed by means of phenol red, cresol red and brom-cresol purple.