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Diverse Plasmons in Male-sterile Sorghum*

by

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Synopsis: To find out the identity or not of the genes and cytoplasms determining male-sterility in two types of *Sorghums* of different origin, crosses were made and the results discussed. The possibility of occurrence of diverse plasmons, analogous to *Zea mays* is suggested.

Introduction: Cytoplasmic-genic male-sterility in *Sorghum* was first reported by Stephens and Holland (1954). Maunder and Pickett (1959) found that male sterility in the male-sterile combine Kafir-60 was conditioned by a recessive gene from Kafir interacting with a specific cytoplasm (that of milo). The gene has been designated as msc which was found not to be linked with awning. Maunder (1960) further studied the fertility restoration in the male-steriles and confirmed that a single recessive (msc) produced male-sterility in the presence of a specific cytoplasm. A hypothesis based on two epistatic restorers plus three additional modifiers was presented to explain the test cross results. In India a cytoplasmic-genic male-sterile line of independent origin was reported to have been spotted out at the Indian Agricultural Research Institute, New Delhi, (Mital *et al* 1958). Another cyto-sterile has been isolated from strain G. 1 *(S. durra)* at Guntur, Lam Farm which is designated G. 2-S. The inheritance of malesterility in G. 2-S. was also reported to be monogenic, the homozygous recessive interacting with a specific cytoplasm, resulting in pollen abortion. (Sreeramulu, 1961).

With a view to find out whether the recessive msc of the male-sterile Combine Kafir-60 is identical with, or allelic or non-allelic to that of G. 2-S, crosses were effected and the preliminary results are presented below.

Materials and Methods: M. S. 1601-A, a cytoplasmic-genic male-sterile *Sorghum* which is maintained by Combine Kafir-60 was supplied by the PIRRCOM Centre at Coimbatore and G. 2-S with its maintainer G. 1 was received from the Millet Specialist, Andhra State. The Anthers of M. S. 1601-A are very much reduced in size, pale or brown in colour and seldom contain pollen. It is difficult to squeeze out the pollen from the anthers as they are agglutinated and do not separate from anther tissues (Fig. 1). On the other hand the anthers of G. 2-S look well developed and have a bright yellow colour. They, when squeezed yield numerous pollen grains all of which are completely devoid of contents. (Fig. 3). The pollen grains do not get stained with 1:1 glycerine-aceto-carmine. Both the sterile types do not dehisce pollen. Pollen from G. 1 was dusted on to the stigma of M. S. 1601-A, while that from Combine Kafir 60 was dusted on to that of G. 2-S. The hybrids were raised in adjacent plots and studied.

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Results and Discussion: It was noted that the hybrid G. 2–S × Combine Kafir-60 cosisted of plants all of which proved to be completely male-sterile. The anthers resembled those of G. 2–S, containing pollen grains all of which were devoid of contents (Fig. 4). There was no seed setting in selfed ear-heads. But the hybrid M. S. 1601–A × G. 1. was completely fertile. The anthers were like those of G. 1 and were full of stainable pollen (Fig. 5). The grain set was good in selfed earheads.

Fig. 1
M.S. 1601-A Anther

Fig. 2
Combine Kafir 60 Anther

Fig. 3
G. 2-S. Anther

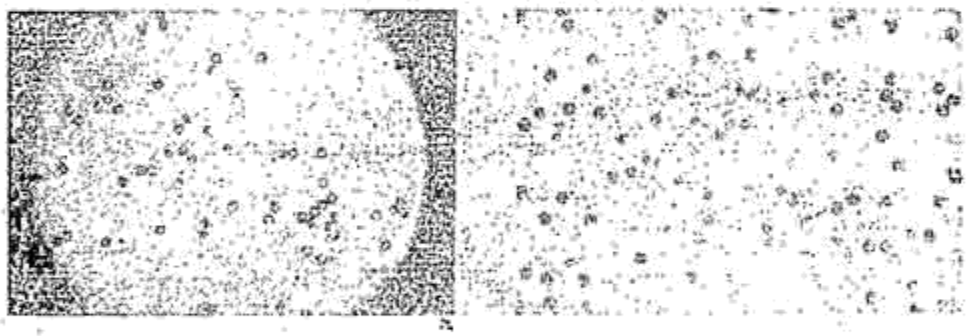

Fig. 4
G.2 -S×Combine
Kafir 60 Pollen

Fig. 5
M. S. 1601-A×G. 1
Pollen

From the above observations it is apparent that the genes determining male-sterility in M. S. 1601–A and G. 2–4 are not identical, as otherwise the hybrids would not differ in their fertility. It appears that the cytoplasm of G. 2–S is stronger in its effect of producing male-sterility as the gene from G. 1 is not able to restore fertility in G. 2–S, while it restores fertility in M. S. 1601–A. Confirmatory evidence are sought to be obtained from the study of the following hybrid progenies.

1. G. 2–S x (M. S. 1601–A x G. 1)
2. M. S. 1601–A x (M. S. 1601–A x G. 1)
3. (G. 2–S. x CK 60) x G. 1

4. (G. 2-S. x CK 60) x CK 60
5. (G. 2-S. x CK 60) x (M. S. 1601-A x G. 1)
6. (M. S. 1601-A x G. 1) x CK 60.

The segregations in the above hybrid progenies would reveal the true nature of inheritance of the genes determining male-sterility in the two types under study. Jones (1956) gave evidence that differences in the cytoplasm of maize exist and persist indefinitely in many species, and that the same genomes react differently in these diverse plasmons. That such a phenomenon occurs in *Sorghum* also, is clear from the hybrids studied. Further study of the above mentioned six hybrid progenies will confirm the cytoplasmic-genic relationships in the two cyto-steriles under study.

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