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MALE STERILITY IN SUGARCANE

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DURING the flowering season (October–November) of 1980, 1981 and 1982, 150 genotypes of sugarcane were studied for pollen fertility and related characters. Anthers from mature but unopened spikelets were squashed in 1% aceto-carmine with glycerine. Pollen fertility was determined on the basis of stainability from a count of about 400 pollen grains in each genotype. Seventeen genotypes were male sterile. These genotypes had either fully sterile pollen grains or very low fertile pollen (2–18%). This character is, however, invariably associated with either non-dehiscence or non-emergence of anthers. While the genotypes showing complete sterility remained stable for the character over the years, those possessing low fertility showed variation between the years. An important characteristic of male sterile genotypes is that they produce small amounts of pollen (20–25%) as compared to highly fertile genotypes. The genotypes identified as male steriles can be classified as in table 1.

The different types of male sterility occurring in sugarcane has been classified by Dutt *et al*[1] into five groups: (a) non-dehiscence of anthers, (b) production of defective pollen, (c) agglutination of pollen grains, (d) protogyny with low pollen fertility and (e) protogyny with non-emergence of anthers. In the present study no distinct morphological association with male sterility was observed, though male sterile genotypes invariably possessed non-dehiscent or non-emergent anthers with small quantity of pollen. Non-dehiscence or non-emergence of anthers in these genotypes, may in all probability, be due to physiological causes which owing to low quantity of pollen in the anthers, fail to exert pressure sufficiently on anther walls to burst open. Even in the genotypes in which pollen fertility has been observed to be 18%, the amount of pollen produced appears to be the determining factor for non-dehiscence or non-emergence of anthers, as even male fertile genotypes with low fertility produce large amounts of pollen and the anthers are, as a rule, dehiscent and emergent. Examination of the pedigree of these genotypes shows that male sterility occurs in F_1 population following a cross in which both parents are male fertile or in which one of the parents is male sterile. The occurrence of male sterility does not follow any orderly pattern in the pedigree. It may occur in a generation in the first line or as distantly as eighth line of a cross in which male sterile genotype had been one of the parents.

Male sterile genotypes are generally high yielding. These genotypes are known to transmit traits like earliness and high yields in crops like pepper[2,3], tomato[4], sunflower[5], jute[6], etc. Although precise information on the performance of these genotypes under different agroclimatic conditions of this country is not available, all the male sterile genotypes possess attributes for yield and sugar content. Apart from the fact that these genotypes are of considerable value in breeding programmes effected by the proven cross method which aims at the production of a large amount of seedling population for selection purposes, these genotypes have by themselves contributed to the evolution of superior and useful types in the F_1 stage of selection. Table 2 shows the number of types selected in crosses in which the female parent used was male sterile.

Among the outstanding cultivars which have been occupying sizable area under cultivation of the crop both in the tropical and sub-tropical regions in this country, mention may be made of Co 740 and Co 1158 which were selections made in crosses in which one of the parents was male sterile. An observation of considerable interest and importance made during

Table 1 *Classification of male sterility*

Genotype	Pollen fertility (%)	Character associated
Co 281, Co 7201, Co 7401, Co 7629 Co 7631, Co 7651, CoA 71–1, Co74–A–96 CoC 771, Co C 779, Co S 673, Q 63	0	Non-dehiscence of anthers
Co 421, Co 7204, Co 7605, CoJ 64	2–9	Non-dehiscence of anthers
Co 603	18	Non-emergence of anthers.

Table 2 *Contribution of male sterile genotypes*

Male sterile genotype used in cross	No. of types selected from cross
Co 421	81
Co 603	76
Co 281	14
Co 7201	5
Q 63	5
CoJ 64	3
Co A 71–1	2

Table 3 *Seedlings produced by selfing male sterile genotypes*

Male sterile genotype	No. of seedlings
Co 421	150
Co 603	49
Co 7201	25
Co 7401	199
Q 63	29

germination of fluff (true seeds of sugarcane) is that some of the male sterile genotypes produce seedlings on selfing. It may be mentioned that while selfing the arrows, care had been ensured to prevent contamination from outside source. The number of seedlings obtained in the male sterile genotypes is given in table 3.

Further studies are in progress to assess the genetic and breeding value of these seedlings and their utilization in sugarcane improvement.

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MULTINUCLEATE CONDITION IN THE DIFFERENTIATING SECONDARY XYLEM VESSEL ELEMENTS OF *DALBERGIA SISSOO* ROXB.

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CONSIDERABLE changes in volume, structure, ploidy and histone level in the nucleus of differentiating primary and secondary xylem elements are recorded.[1,2] Increase in nuclear number in differentiating vessel elements has been recorded till now only in four cases: *Ricinus communis*[3], two species of *Dioscorea*[4,5] and *Marsilea quadrifolia*[2]. All these reports concern only the differentiating primary xylem vessel elements.

During the study of vascular cambium and its activity in some tropical trees, differentiating secondary xylem vessel elements of *Dalbergia sissoo* containing more than a single nucleus were observed (figure 1). The multinucleate condition is due to the mitotic divisions of the nucleus of the mother cell as reported in *D. alata*[5] and *M. quadrifolia*[2] and not due to the obliteration of the transverse and lateral walls of the elements differentiating adjacent to one another as recorded by Hill and Freeman[4] in *Dioscorea prehensilis*. The coenocytic condition in the present

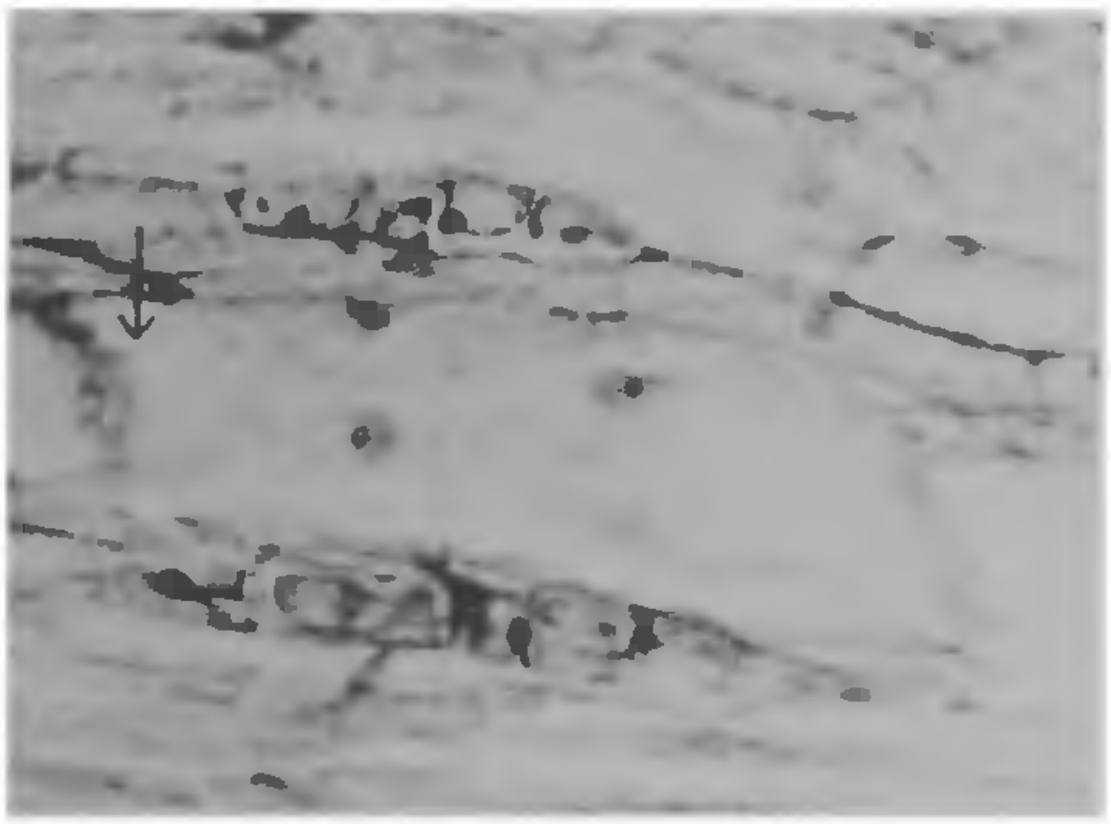

Figure 1. Tangential longitudinal section of differentiating secondary xylem region of *Dalbergia sissoo* showing multinucleate condition (three nuclei) in the developing xylem vessel element. Note also the swollen wall in the prospective perforation plate (see arrow). × 833.