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Short Communication

Assessment of ploidy behaviour in doubled diploid wild species of *Gossypium*

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Gossypium L. is an important genus and it includes 46 wild species. Use of wild species in crop improvement programme at a stage is inevitable where the use of available cultivar variability is found ineffective for further improvement in productivity, quality or survival against pest and diseases. In such situation, the plant breeder has to resort to wider crosses such as interspecific or intergeneric ones for expanding the gene pool and its further utilization in crop improvement programme.

The genus *Gossypium* is the potential source of species providing desirable genes from its diploid and tetraploid species for transference into cultivated species. The genus includes 35 diploid and six allotetraploid species [1]. Although, extensive work has been done by the cotton workers to improve various character such as productivity, earliness, ginning percentage, fiber qualities and resistance to pest and diseases by selection and intervarietal hybridization. Cotton improvement through interspecific hybridization did not keep pace, due to various factors that include sterility, differences in genomic numbers, differences in style length, collapse of hybrid embryo at various stages of development, which is due to difference in ploidy level. Hence an attempt was made to double the chromosome number of diploid wild species *viz.*, *G. thurberi*, *G. davidsonii* and *G. triphyllum* to transfer the desirable characters to cultivated species.

The present study was conducted at the Cotton Breeding Station, Tamil Nadu Agricultural University, Coimbatore. The experimental material consisted of three wild species *viz.*, *G. thurberi*, *G. davidsonii* and *G. triphyllum*. The seeds were sown in pots and seedlings were obtained. For chromosome doubling, colchicine treatment was given at two leaf stage, for 5 days @ 3 times/day. Two concentrations of colchicine *viz.* 0.5 per cent and 1.0 per cent were applied in two replications. The doubled plants were confirmed by counting the stomata per microscopic field at 400 × magnification.

Colchicine treatment with one per cent concentration showed 100 per cent doubling in *G. davidsonii* and *G. thurberi*, however it was highly ineffective in *G. triphyllum* (0 per cent). At 0.5 per cent concentration 80 per cent doubling was found in *G. davidsonii* and *G. thurberi*. In the present study, the suitability of stomatal density as criteria for the distinction between diploids and tetraploids was also tested. The results revealed that, in *G. davidsonii* stomatal density ranged from 15 to 24, where as the control recorded a number of 41 (stomatal density/microscopic field). The plants, which were not doubled, exhibited the stomatal density of 33. In one per cent concentration of colchicines, the stomatal density ranged between 14 and 18. In *G. thurberi*, the stomatal density exhibited a variation of 12 to 19 in doubled plants with 0.5 per cent concentration, hi this species, the plant no. 2 and 4 had a stomatal density of 25 and 28 indicating a subtle difference from control (30). With one per cent concentration of colchicine all the plants were doubled with the stomatal density ranging from 13 to 19. In *G. triphyllum* none of the plants were doubled.

Induction of polyploidy in Gossypium was reviewed by Harland [2]; Beasley [3] and Stephens [4]. The

Table 1. Doubling percentage of different wild species of *Gossypium*

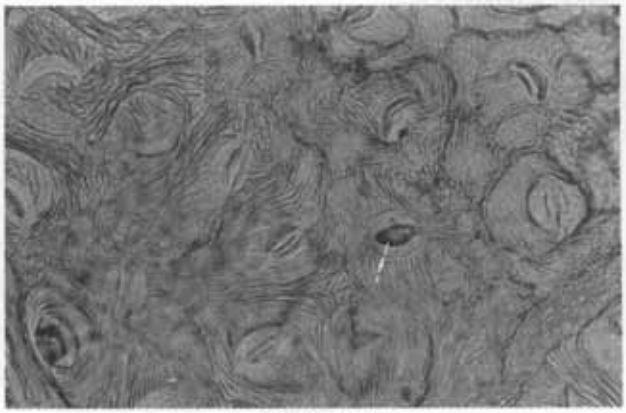
Species	Treatment (per cent)	Replication	Percentage of doubling	Mean
Gossypium davidsonii	0.5	R I	100	
		R II	60	80
	1.0	R I	100	
		R II	100	100
Gossypium thurberi	0.5	R I	100	
		R II	60	80
	1.0	R I	100	
		R II	100	100
Gossypium triphyllum	1.0	R I	-	-
		R II	-	-

Table 2. Stomata number/microscopic field in different wild species of *Gossypium*

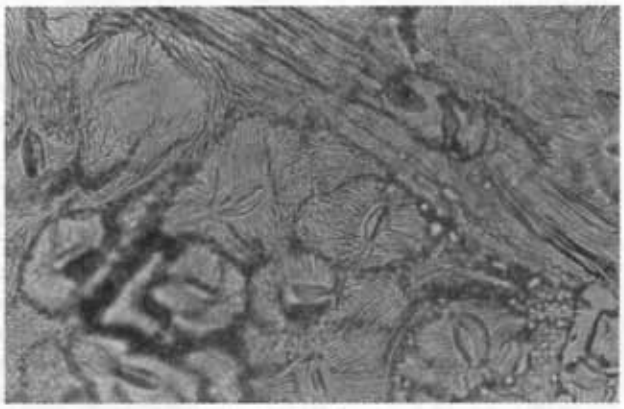
Species	Concentration (per cent)	Plant No.	R I	R II	Control
Gossypium davidsonii	0.5	1	21	17	41
		2	24	33	
		3	18	15	
	1.0	1	18	17	
		2	19	16	
		3	15	14	
		4	17	15	
Gossypium thurberi	0.5	1	14	19	30
		2	19	28	
		3	15	17	
		4	12	25	
		5	15	16	
Gossypium triphyllum	1.0	1	15	17	18
		2	16	15	

above studies in cotton revealed the polyploidization through cytological studies. But in banana, earlier studies revealed that, stomatal densities were used to screen the progenies ploidywise. Simmonds [5] and Borges [6] observed that stomatal size was proportional to ploidy in banana, while stomatal density had expected complementary relationship in Jamaican breeding programme. Sathiamoorthy [7] also assessed the stomatal densities of Indian bananas of various ploidy levels and genomic constitutions. In banana, a high degree of reliability in adopting stomatal traits as a method for detecting polyploids has also been reported by many other earlier workers [8, 9]. Beck *et al.*, [10] reported that stomatal length and stomatal frequency are rapid indirect methods to identify ploidy level in black Wattle (*Acacia mearnsii*).

In the present study, the colchicine level with 1 per cent concentration proved to be effective in doubling the chromosome complement of two diploid wild species *viz.*, *G. davidsonii* and *G. thurberi*. The stomata on the adaxial leaf surface in the tetraploids showed a reduction in number than their respective diploids. Similar results were also obtained by Zaffar *et al.*, [11] in Saffron. Thus the results suggested that tetraploid plant could be identified with a fair amount of certainty when the screening was based on the density of stomata.



A. Control



B. Doubled

Fig. 1. Stomatal number per microscopic field in *Gossypium davidsoni*

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