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INDUCTION OF AUTOTETRAPLOIDY IN LEMONGRASS

Indian lemongrass (*Cymbopogon flexuosus* Stapf.) is the chief source of lemongrass oil of commerce. The oil is extensively used in the manufacture of cosmetics and synthesis of vitamin A. The cultivated species is a diploid and this provides scope for induction of autotetraploidy for increasing the quantity of essential oil. An attempt was made to induce autotetraploidy in lemongrass variety, OD-19 with colchicine treatment.

Seeds of the lemongrass variety OD-19, a high yielding variety released from the Lemongrass Research Station, Odakkali was utilised for the study. Colchicine was used for inducing autotetraploidy. The doses of colchicine for treatments were standardised based on the preliminary trials. The doses for the experiment were fixed in the range of 0.00 to 0.25%. Two series of experiments (A and B) were conducted. In series A, presoaking was followed by an interval of four hours before colchicine treatment whereas in series B, no interval was given.

Series A	
Presoaking	4 hours
Interval	4 hours
Treatment	4 hours

Series B	
Presoaking	4 hours
Treatment	4 hours

In each treatment 1 g fluff (seeds) was treated with 40 ml of solution. The treated seeds were sown in pots and 60 day old seedlings were transplanted in singles in the main field at a spacing of 50 x 15 cm. Observations were made on survival, early deformity, height of plants, number of tillers, length and breadth of stomata, days to flowering and pollen fertility.

Plants suspected as polyploids based on increased vigour, larger size, reduced number of stomata and reduced pollen fertility were subjected to detailed morphological study in respect of height of plants, numberof tillers, vigour of plant, colour of leaves, nature of leaves, stomatal observations, delay in flowering and pollen fertility.

The survival of plants was low in the treatments. The reduced survival in the treated seeds could be due to the toxic effect of colchicine. Observations on growth of plants at different stages revealed that the plants in general had an initial slower but subsequent faster rate of growth. Drastically stunted growth resulted in seedling mortality of three plants, at the age of three months. Such early mortality could be attributed to the arrest of growth by colchicine (Krishnaswamy *et al.*, 1950)

Colchicine had significant effect on height of plants. The height increase was maximum at higher concentrations and minimum at lower concentrations and the increased height may be the manifestation of gigas expression. Early tillering observed could be attributed to the lesser competition because of the reduced survival in treated populations. Increase in tiller number could be due to the inactivation of the apical meristem by the toxic effect of colchicine resulting in activation of axillary buds.

Table 1. Morphological characters of suspected polyploids

Plant No.	Concentration (%)	Height (cm)	No. of tillers	Mean no. of stomata per microscope field	Mean length of stomata (µm)	Mean width of stomata (µm)	Days to flowering	Pollen fertility (%)
Control		111	44	39.1	69.3	55.4	138	82.8
Series A								
1	0.05	200	68	30.2	93.8	64.4	165	76.5
2	0.10	190	60	30.4	86.8	63.0	167	75.8
3	0.15	195	65	32.2	91.6	64.4	171	74.5
4	0.20	208	56	30.5	85.4	60.2	173	74.0
5	0.20	188	58	30.0	85.4	58.8	175	74.2
Series B								
6	0.15	194	62	30.3	86.8	63.0	173	74.0
7	0.15	205	60	29.5	88.2	64.4	167	73.2
8	0.20	198	58	30.0	86.8	64.4	176	73.1

In both the series and at all the concentrations, the mean number of stomata per microscopic field was on par with the control. Individual plants with reduced number, increased length and breadth of stomata were identified. This could be an indication of polyploidy.

Mean number of days to flowering and pollen fertility recorded in comparison with the control revealed that the treated plants flowered later than control by 18 to 51 days in the different treatments. The delay in flowering in the treated population may be due to the prolonged vegetative growth period.

The reduction in pollen fertility observed may be due to meiotic irregularities as opined by Bose and Sharma (1970). Chin (1946) suggested that high pollen sterility in tetraploids may be due to irregular segregation of some of the multivalents at meiosis. According to Stebbins (1950) genetically controlled physiological factors may cause sterility. In the present investigation the reduced pollen fertility might be due to any of the above reasons. Eight plants which showed expressions characteristic of polyploidy such as robust vegetative growth, reduced number of stomata, increased size of stomata, delayed flowering and reduced pollen fertility were selected as suspected polyploids. The morphological characters of each of these plants are given in Table 1. They could be utilised in crop improvement programmes after cytological confirmation.

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