

COLCHICINE INDUCED TETRAPLOIDS IN THE ARECA PALM *ARECA CATECHU* L.

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ABSTRACT

Tetraploids have been induced in two cultivars of *Areca catechu* L. by treating the sprouts with aqueous colchicine.

INTRODUCTION

INDUCTION of polyploidy through colchicine treatment has been reported in a number of crop plants, though the successful commercial exploitation of this breeding method has been limited to a few crops like rye (Muntzing,

1951), water melon (Shimotsuma, 1962), sugar beets (Matsumura, 1953), grapes (Olmo, 1952), and ornamental plants like snapdragon and zinnia (Emsweller, 1948) only. In this communication, we report, for the first time, the successful induction of tetraploids by colchicine in two cultivars of arecanut, *Areca catechu* L.

TABLE I

Morphological and anatomical characters of diploid and tetraploid A. catechu
(Nine months old seedlings)

Colchicine	Mangala				VTL-11					
	Diploid	Tetraploids		Diploid	Tetraploids					
		0.1% aqueous colchicine, 24 hr	0.5% aqueous colchicine 72 hr		0.1% aqueous colchicine 24 hr	0.1% aqueous colchicine 72 hr	0.2% aqueous colchicine 48 hr	0.5% aqueous colchicine 72 hr		
		Plant No. 1	Plant No. 2		Plant No. 1	Plant No. 2				
Plant height in cm	116.5	80.0	65.5	28.5	28.5	92.5	61.0	65.0	61.5	
Girth in cm	1.6	1.8	1.4	1.8	0.7	1.7	1.3	2.1	1.6	
Number of leaves	6	4	4	6	3	4	4	6	5	
Length of longest leaf in cm	69.5	61.5	53.0	76.5	25.5	75.0	51.0	45.0	27.0	
Length of longest leaflet in cm	36.5	31.0	27.0	37.0	..	38.0	30.5	26.5	26.5	
Breadth of middle leaflet in cm	4.1	5.4	3.3	6.4	..	5.4	5.0	3.1	7.4	
Number of epidermal cells/unit area	43.0	32.4	37.2	43.0	..	43.2	26.3	39.4	39.9	
Length of epidermal cells in μ	46.9	57.0	56.6	45.8	..	47.2	69.7	59.6	58.1	
Breadth of epidermal cells in μ	21.1	22.9	23.1	18.6	..	21.6	20.5	22.7	21.3	
Number of stomata/unit area	3.5	2.6	2.7	3.3	..	3.3	2.0	2.6	2.3	
Length of guard cells in μ	29.9	35.3	31.0	28.3	..	34.5	35.6	27.4	27.8	
Breadth of guard cells in μ	10.5	13.0	12.8	10.3	..	13.1	12.9	13.9	10.6	

MATERIALS AND METHODS

Ripe nuts of two cultivars, Mangala and VTL-11, were sown in sand. The emerging sprouts were treated with 0.1, 0.2, and 0.5% aqueous colchicine or lanoline paste of colchicine for 24, 36, 48, 72, and 84 hr. The aqueous colchicine was applied by either wetting the growing point by means of cotton wads kept in position or keeping the germinating nuts inverted in small glass vials containing the solution. Subsequently, the nuts were washed thoroughly in running water and planted along with controls.

RESULTS AND DISCUSSION

All the treated seedlings grew more slowly as compared to the controls. They bore crinkled and dark green leaves to varying degrees. Their morphological characters were recorded at the end of ninth month. Leaf samples and root tips were also collected at the time, to study the leaf anatomy and to determine the chromosome numbers, respectively.

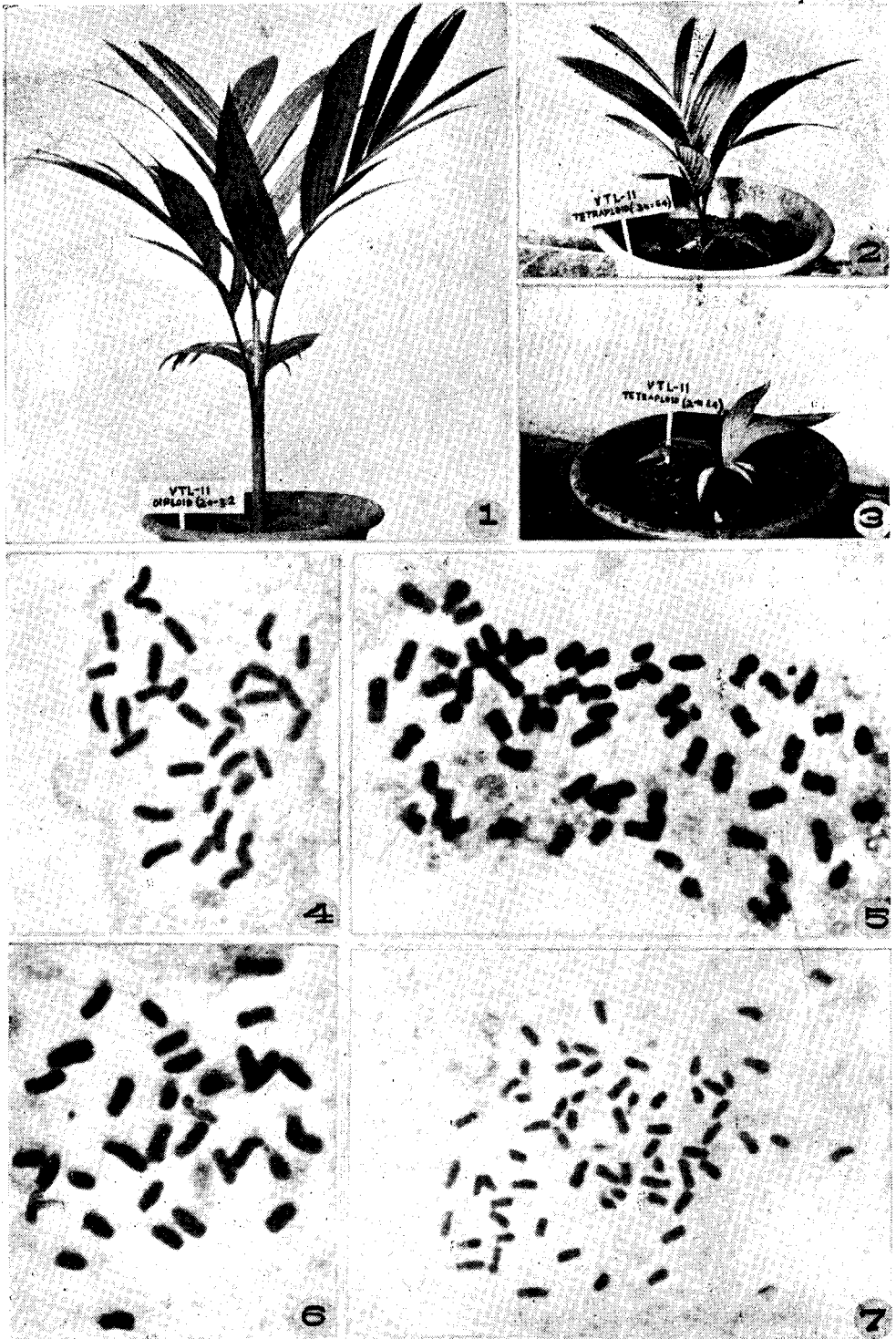
Among the 72 nuts each of Mangala and VTL-11 treated with aqueous colchicine, two in the former cultivar and five in the latter were tetraploids. In addition, there were two mixoploids in Mangala and three in VTL-11. The treatment of dipping the sprouts in 0.1% aqueous colchicine for 24 hr produced more tetraploids than the other treatments (Table I). None of the seedlings raised from nuts treated with colchicine-lanoline paste produced either polyploids or mixoploids.

The comparative morphological data and measurements of leaf epidermal cells and stomata of the tetraploids and their respective diploids are given in Table I.

The tetraploid seedlings were stunted in growth as compared to the diploids. This was reflected in reduced plant height, and number, length and breadth of leaves (Table I; Figs. 1-3). The first few leaves were thick, crinkled, and dark green, but later ones appeared normal. The tetraploids had fewer epidermal cells and stomata per unit area. The somatic chromosome complements of the diploids and tetraploids are shown in Figs. 4-7. Arecanut seedlings normally take four to five years to commence flowering and so the study on meiosis and fertility of the tetraploids will have to wait till then.

REFERENCES

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FIGS. 1-7. Fig. 1. VTL-11, diploid plant. Fig. 2. VTL-11, tetraploid plant (0.2% aq. colchicine, 72 hr). Fig. 3. VTL-11, tetraploid plant (0.1% aq. colchicine, 24 hr). Fig. 4. Somatic chromosomes in diploid Mangala, $2n=32$. Fig. 5. Somatic chromosomes in tetraploid Mangala, $2n=64$. Fig. 6. Somatic chromosomes in diploid VTL-11, $2n=32$. Fig. 7. Somatic chromosomes in tetraploid VTL-11, $2n=64$.