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SEX DIFFERENCE AND CHROMOSOMES IN *PUTRANJIVA ROXBURGHII* WALL.

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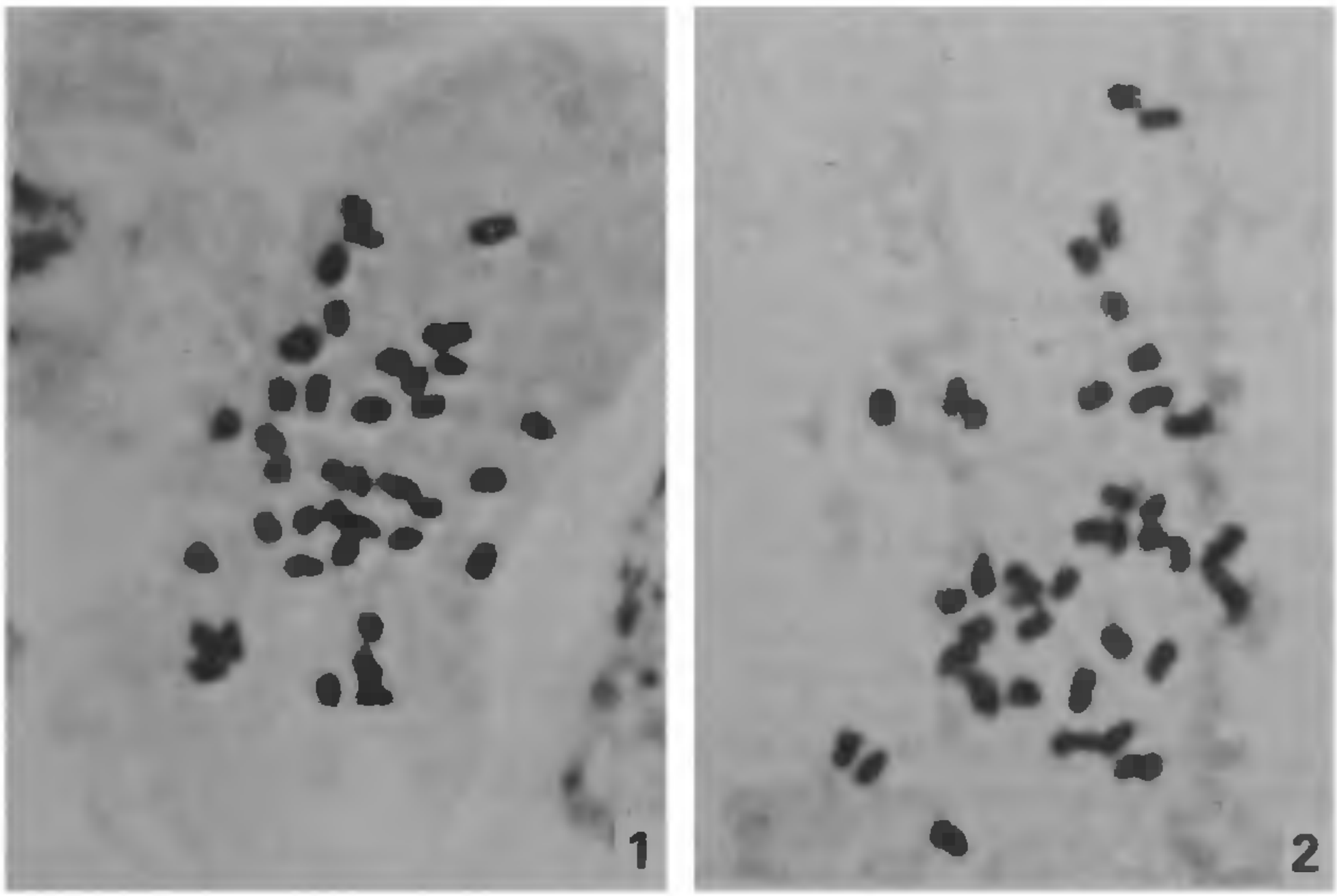
THE family Euphorbiaceae is characterized by both monoecious and dioecious representatives. The chromosome number of several of the dioecious species has earlier been worked out[1-10], but no data on the sex chromosome mechanism, if any, or karyotype analyses of the different sexes are available. *Putranjiva roxburghii* Wall., one of the dendroid representatives of the family is dioecious, has high medicinal value and widely cultivated as roadside tree in India, specially in the Indogangetic belt. In view of its importance as well as factors like the discrepancy in the number (n = 7, 19, 21 and $2n$ = 14 40 chromosomes) by different authors[1,6-9], and the lack of detailed chromosome analysis, the present study on the chromosomes and amount of DNA in both sexes was undertaken.

The materials were collected from the University Campus and other parts of the city and suburbs. Somatic chromosomes were studied from shoot-tip cells following acetic-orcein (2%) staining schedule after pretreatment and fixation in saturated para-dichlorobenzene : 0·002 M 8-hydroxyquinoline (1:1) mixture for 90 min and acetic-ethanol (1:3) mixture respectively. For feulgen cytophotometric estimation of *in situ* DNA the pretreated and fixed shoot-tip cells of both male and female plants were subjected to feulgen staining. Microspectrophotometric analysis was carried out in Leitz Wetzlar Aristophot with microspectrophotometer and single wavelength (550 nm) method was followed[11]. The data on DNA value were worked out from the unit of absorbance with the help of the standard curve



Figures 1 and 2. Somatic metaphase showing normal chromosome numbers in male and female plants of *Putranjiva roxburghii* Wall. (×2300). **1.** *Putranjiva roxburghii* Wall. (male, $2n$ = 40), and **2.** *Putranjiva roxburghii* Wall. (female, $2n$ = 40).

using *Allium cepa* as the standard[12].

Studies on the chromosomes of both male and female plants of this species showed similarity in their number, size and morphology of chromosomes. Both contain $2n = 40$ chromosomes in their complements (figures 1 and 2). The chromosome size ranges from 1.74 μm to 0.87 μm in both cases. The total chromosome length is 53.04 μm and 52.40 μm and total TF% 36.68 and 36.71 in female and male plants respectively. The chromosomes were classified into four types according to the position of centromere and secondary constrictions (figure 3). There are two pairs of chromosomes with secondary constrictions in both the sexes. The 4C DNA values as calculated from 50 metaphase plates are 5.61 pgs and 5.73 pgs in female and male respectively (table 1).

The present investigation on male and female plants of *P. roxburghii* having $2n = 40$ chromosomes does not reveal any marked difference between the two sexes. The chromosome complements show similarity including the number of secondary constrictions. The amount of DNA also shows no significant differences between the two sexes. The slight differences in chromosome morphology may be due to the differential condensation. The chromosomes could be grouped in pairs without any heteromorphicity in both sexes (figure 3). The feulgen staining does not reveal any special heteropycnosity of the chromosomes in metaphase. All these factors indicate that determination of sex in *P. roxburghii* is not associated with identifiable sex chromosomes. However, refined methods of banding technique may reveal whether there are any differentiated chromosome segments associated with sex.

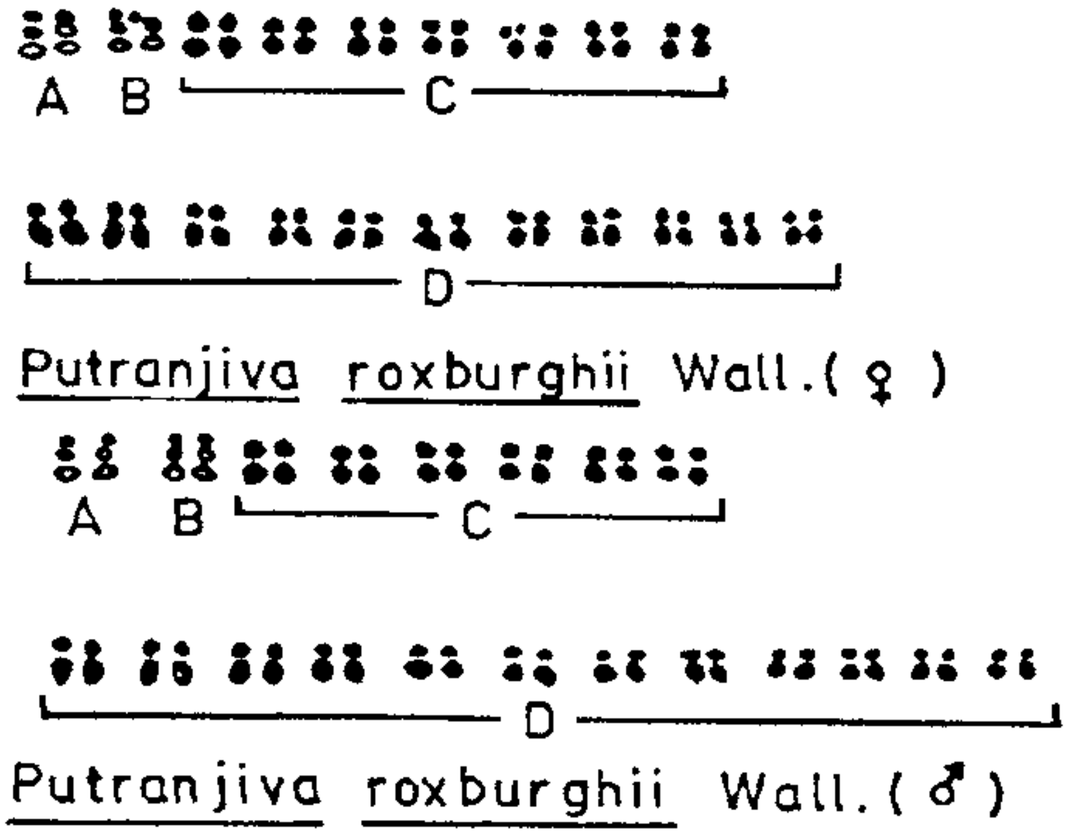


Figure 3. Comparative representation of karyogram in female and male plants of *Putranjiva roxburghii* Wall. (Ca × 2300).

Table 1 *Comparative representation of different chromosomal parameters and 4C nuclear DNA content in female and male plants of Putranjiva roxburghii Wall.*

	Female plant	Male plant
Somatic chromosome number ($2n$)	40	40
Karyotype formula	$A_2B_2C_{14}D_{22}$	$A_2B_2C_{12}D_{24}$
Range of chromosome length (μm)	1.74–0.87	1.74–0 87
Total chromosome length (μm)	53 04	52.40
Total TF%	36.68	36.71
Number of chromosomes with secondary constrictions	4	4
4C DNA content (10^{-12} g)	5.612 ± 0.1559	5.734 ± 0 1405

It is likely that the earlier report of discrepant numbers[6,7,9] (n = 19, 20, 21) may be due either to the observation on meiosis or to the presence of cytotypes. However, the occurrence of $2n = 14$ chromosomes as reported earlier[1] may suggest the presence of a very low base number in the genus. The need for an intensive population survey in the species is indicated.

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SEED YIELD AND OIL CONTENT OF MUSTARD SOMACLONES (*BRASSICA JUNCEA* (LINN., CZERN. AND COSS.)

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VARIATION among plants regenerated from cultured cells or tissues is termed somaclonal variation[1]. Such variation in the progenies of tissue culture raised plants is likely to adversely affect the yield[2]. The objective of the present study was to evaluate the yield potential and oil percentage in the progenies of mustard somaclones.

These somaclones were obtained from mustard cultivar Rai-5 plants raised from cotyledon explants[3]. The first generation somaclones were designated as SC-1[1] and the subsequent progenies were named SC-2, SC-3 etc. Initially 92 somaclones were obtained in the SC-1 generation. The plants which showed maximum seed yield in the SC-1 were selected for evaluation in the SC-2 to SC-4 generations. Two separate yield trials were concluded one for the black seeded and the other for the yellow seeded selections. Over a period of three years, the trials were conducted in isolated plots to avoid any outcrossing as in a practical breeding programme. Each plot (3.6 m^2) had three rows, 4 m long with 30 cm spacing between rows and 10 cm between plants. The oil content was estimated in the seeds harvested from 1986–1987 experiments using pulsed NMR method[4].

The yield for three years and the oil content of the somaclones for one year are given in table 1. The main interest was to compare the yields of somaclones with respect to the yield of Rai-5, the parent, in the respective trials. The yields of all the six somaclones with yellow seed coat were statistically equal to that of Rai-5 in one year while the yields of black seeded ones were in general inferior to that of Rai-5. Similarly, in the yellow seeded Y-2, oil content was significantly higher than in Rai-5. The oil content in all the black seeded somaclones was lower than the parent and it was significantly lower in C-49.

Table 1 *Yield and oil content of mustard somaclones*

	Yield			Oil content
Cultivar	1984–85 (g/m^2)	1985–86 (g/m^2)	1986–87 (g/m^2)	1986–87 (%)
Rai-5 (parent) Black seed	98	–	221	32.8
C26–78	141	47	171	30.5
C27–78	107	43	163	30.1
C31–78	123	62	146	32.3
C43–78	109	70	158	31.2
C49–78	140	60	151	27.6
C51–78	132	42	146	30.6
C61–78	122	58	163	30.0
L.S.D. (5%)	38.6	21.6	33.3	0.42
Rai-5 (parent) Yellow seed	54	58	96	32.2
Y–1	94	42	75	30.9
Y–2	104	47	100	33.4
Y–3	75	36	71	31.7
Y–4	116	53	79	30.7
Y–5	90	53	104	31.4
Y–7	77	67	108	31.4
L.S.D. (5%)	21.4	13.9	25	0.78

Reduced yield in the *in vitro* regenerated plant progenies in other crops has been reported[5,6]. However, somaclones could be a source of new genetic variability. In the present study, six out of 92 (6.5%) somaclonal progenies were equal in yield to their parental cultivar and the remaining ones were inferior.

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