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Miscellaneous notes

VARIOUS AUTHORS

ASTERACEAE

CHROMOSOME COUNTS FOR SEVEN SPECIES OF *CINERARIA* (SENECIONEAE)

Cineraria L. belongs to the 'senecioid' genera in the tribe Senecioneae of the family Asteraceae, which have the basic chromosome number of x = 10 (Nordenstam 1977). Grant (1971: 228) notes that 533 taxonomic species in the Dicotyledonae have the gametic (haploid) chromosome number of 10.

Counts for only two species of *Cineraria* have been published in the chromosome indices of Moore (1973) and Goldblatt (1981): *C. aspera* Thunb. 2x = 20 and 4x = 40 (Nordenstam 1969); *C. grandiflora* Vatke (now *C. deltoidea* Sond.) 2x = 20 (Turner & Lewis 1965) and 4x = 40 (Hedberg & Hedberg 1977).

MATERIALS AND METHODS

Mitotic counts were made from root tips of germinated seeds. Standard methods of pretreatment in 0.2 M 8-hydroxyquinoline for four hours at room temperature (± 19°C) (Darlington & La Cour 1976), storage in Carnoy's fixative (absolute alcohol: glacial acetic acid : chloroform: formalin in the ratio 5:1:1:0.5), and staining in lacto-propionic orcein (Dyer 1963) were used. The root tips were hydrolysed in 5N HCl for 35–40 minutes at room temperature, followed by two rinses in distilled water.

Meiotic counts were made from young anthers following the method described by Turner & Lewis (1965). The buds were collected in the field and placed in a freshly mixed solution of chloroform : absolute alcohol : glacial acetic acid (4 : 3 : 1), and then processed through a graded alcohol series and stored in 70% alcohol. Staining was achieved using acetocarmine and iron acetate (Darlington & La Cour 1976).

As the chromosomes were very small (1.5–4.0 µm), repeated counts of pollen mother cells and of root tips were made to ensure accuracy. Voucher specimens, as listed in Table 1, are housed in the C.E. Moss Herbarium (J), University of the Witwatersrand.

RESULTS AND DISCUSSION

The results of the chromosome counts from mitotic and meiotic preparations are summarised in Table 1. They corroborate the published chromosome numbers for *Cineraria*. The most common chromosome number in the species investigated was a diploid number of 20. Three of the species show evidence of polyploidy with 2n = 40. *C. grandibracteata* possibly has both levels of ploidy within one population. There is no evidence of aneuploidy in any of the species investigated thus far.

The population of *C. deltoidea* from the Natal Midlands (*Cron & Scott-Shaw 11*) was found to have a chromosome number of n = 20, the same as that of the populations from Kenya and Tanzania examined by Turner & Lewis (1965), and by Hedberg & Hedberg (1977).

Polyploidy is common in the Asteraceae (Grant 1971) and it is evident that further sampling of populations of the different species is required to ascertain whether diploidy and polyploidy exist in the same populations and/or species. This would also be a prerequisite before differences in chromosome number could be used to distinguish different species.

The frequency of polyploidy in higher plants has been positively correlated with increase in latitude and altitude (Grant 1971; Löve & Löve 1967). *C. albicans* and *C. grandibracteata* are both frequently found at high altitudes, the latter species often in the mist belt of mountain tops. The fact that polyploidy does exist in *C. albicans* indicates that speciation may occur more rapidly in this species than in those species shown thus far to be diploid. Stebbins (1950: 359) notes that polyploidy is 'widely

TABLE 1.—The chromosome numbers obtained from root tips and pollen mother cells for species of *Cineraria*

Species	Voucher specimens	Locality	Mitotic counts	Meiotic counts
albicans N.E. Br.	Cron 3 (J)	Umtamvuna Nature Reserve	2n = ± 40	n = ± 20
atriplicifolia DC.	Cron 7 (J)	Montesseel, Inchanga	2n = 20!	n = 10!
decipiens DC.	Cron & Brummer 5a (J, K, MO, NU)	Oribi Gorge	2n = ± 20	
deltoidea Sond.	Cron & Scott-Shaw 11 (J)	Karkloof Nature Reserve		n = ± 20
dieterlenii Phill.	Cron *et al.* 1 (J, K, MO)	Kamberg Nature Reserve	2n = 40!	
geraniifolia DC.	Cron & Ching 2 (J, K, MO, NU)	Mooi River	2n = 20!	n = 10!
grandibracteata Hilliard	Cron & Scott-Shaw 10 (J, K, MO)	Karkloof Nature Reserve	2n = 20!, ± 40	
sp. nov. ined.	Cron 19 (J, K, MO, PRE)	Linksfield Ridge	2n = 20!	

recognised as one of the principal methods for the formation of new species among higher plants', but that the species originating from this process are usually 'very similar to their diploid ancestors in external morphology and ecological preferences'. *C. albicans* is a highly variable species (Hilliard 1977; Cron 1991) and may well be a species complex or in the process of speciating (Cron 1991). Characters such as the size and persistence of the petiolar auricles, the glabrescence of the involucral bracts and the indumentum of the cypselae show great variation. (Note: the 'species A' of Hilliard (1977) is here considered to be part of *C. albicans*.) Apparent isolation of populations of *C. albicans* in the gorges comprising valley bushveld in the Natal midlands and coastal areas, and in Transkei has evidently resulted in variability becoming fixed in certain areas (Dubinin 1940). Similarly, isolation on mountain tops in Lesotho, Natal and in the eastern Cape has resulted in marked variation in the features noted above.

C. deltoidea, as described by Jeffrey (1986), is the most wide-ranging of the species, occurring in the eastern highlands of Ethiopia, Kenya, Tanzania, and Malawi, the Zoutpansberg in the Transvaal, and the Natal midlands and coastal regions of Natal and the Transkei. It is a very variable species, with especially distinctive variants occurring on some mountain massifs (Jeffrey 1986) and it is therefore not surprising that polyploid populations exist.

The presence of polyploidy in the genus *Cineraria* is thus confirmed, with a diploid chromosome number of 20 in six species and a polyploid chromosome number of 40 in three species.

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