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Miscellaneous notes

HYACINTHACEAE

CHROMOSOME STUDIES ON AFRICAN PLANTS. 19. NEW CHROMOSOME COUNTS FOR THREE *DRIMIOPSIS* TAXA

Drimiopsis Lindl. & Paxton is a small genus of ± fifteen species, confined to Africa south of the Sahara, excluding the rain forests (Stedje 1994; Kativu 2000). Of the seven species included in the *Flora of tropical Africa* (Baker 1898), four were made synonyms by Stedje & Thulin (1995). The five southern Africa species (Arnold & De Wet 1993) have increased to nine in the most recent revision, one of which is divided into two subspecies (Müller-Doblies & Müller-Doblies 1997).

The plants have small white bulbs with loose, fleshy scales, the leaves are often spotted and the inflorescence is axillary, fleshy and mostly erect. The perianth segments are cucculate and connivent with free deltoid filaments attached basally and their colour ranges from green or white to pale pink. The gynoecium is sessile and globose with two basal ovules.

Speta (1998) places *Drimiopsis* in the subfamily Hyacinthoideae Link. where it is included in the tribe Massonieae Baker which Jessop (1975) distinguishes on the occurrence of spotted leaves, as well as seeds without a superficial cellular pattern. Based on, amongst others, the occurrence of two basal seeds in each locule, leaves without sheathing cataphylls and several inflorescences to a tuft of leaves, Müller-Doblies & Müller-Doblies (1997) recently placed *Drimiopsis* with *Resnova* Van der Merwe and *Ledebouria* Roth in the subtribe Ledebouriinae U.Müller-Doblies & D.Müller-Doblies.

Chromosome morphology and number has previously been used to infer evolutionary relationships within the Liliaceae *sensu lato* (De Wet 1957; Jessop 1972; Gibbs 1974; Sen 1975; Speta 1979; Stedje & Nordal 1987). Chromosome numbers published for *Drimiopsis* to date (Table 1) represent counts for only one-third of the genus. Matsuura & Sato (1935) published a somatic chromosome number of 80 for *D. botryoides* Baker subsp. *botryoides* and Sato (1942) a number of 64 for *D. maculata* Lindl. & Paxton, thus suggesting x = 8 (Darlington & Wylie 1956). Hybridization and allopolyploidy may have produced polyploids with x = 6, 7, 8 & 9 leading to n = 11 & 13 (De Wet 1957; Mahalakshima & Sheriff 1970).

De Wet (1957) proposed that the chromosome counts in *Drimiopsis* arose from x = 5, as is found in the tribe Scilleae *sensu* Baker. Mahalakshima & Sheriff (1970) reported gametic numbers of 32, 33 and 34, but they observed several univalents and multivalents as well as bivalents in rings and chains during diakinesis, which may explain their n = 32, 33 and 34. The $22_{II}16_{I}$ of the gametic chromosomes, 2n = 60 (Table 1), might also

TABLE 1.—Chromosome numbers in *Drimiopsis* Lindl. & Paxton. Asterisk indicates chromosome numbers derived from the present investigation. Taxa are listed alphabetically within each major geographical region

Taxon	n	2n	Source
Tropical Africa			
barteri Baker	-	20	Kootin-Sanwu 1969
	-	44	Stedje & Nordal 1987
	-	24	Oyewole 1988
	-	44	Stedje 1994
botryoides Baker			
subsp. *botryoides*	-	80	Matsuura & Sato 1935
subsp. *prostata* Stedje	-	22	Stedje 1994
	-	44, 55	Stedje & Nordal 1987
	-	44, 55, 66	Stedje 1994
kirkii Baker	$22_{II}16_{I}$	60	Fernandes & Neves 1962
	33	66	Sharma 1970
	32, 33, 34	68	Mahalakshmi & Sheriff 1970
	-	60	Vij *et al.* 1982
	30		Vijayavalli & Mathew 1988
	30		Vijayavalli & Mathew 1990
volkensii (Engl.) Baker	-	64	Gill 1978
Southern Africa			
burkei Baker			
subsp. *burkei*	-	44	*
subsp. *stolonissima* U.Müller-Doblies & D.Müller-Doblies	-	40	*
crenata Van der Merwe	-	20	De Wet 1957
maculata Lindl. & Paxton	-	64	Sato 1942
	-	60	Fernandes & Neves 1962
	15	-	Jessop 1972
maxima Baker	-	20	Jessop 1972
pusilla U.Müller-Doblies & D.Müller-Doblies	-	44	*
saundersiae Baker	-	20	De Wet 1957

suggest two different genomes of uncertain origin (Fernandes & Neves 1962). Variation in chromosome numbers listed in Table 1, suggests basic chromosome numbers of 8, 10 & 11.

The objective of this study is to determine the chromosome numbers of three *Drimiopsis* taxa, i.e. *D. burkei* Baker subsp. *burkei*, *D. burkei* Baker subsp. *stolonissima* U.Müller-Doblies & D.Müller-Doblies and *D. pusilla* U.Müller-Doblies & D.Müller-Doblies.

MATERIALS AND METHODS

The following plant material was collected in the field and cultivated in the glasshouse in the Potchefstroom University Botanical Garden:

1. *Drimiopsis burkei* subsp. *burkei*. North-West.—2627 (Potchefstroom): hill in Potchefstroom University Botanical Garden, (–CA), *Lebatha 009* (PUC).

2. *Drimiopsis burkei* subsp. *stolonissima*. Limpopo.—2430 (Pilgrim's Rest): Strydom Tunnel, (–BC), *Lebatha 037* (PUC).

3. *Drimiopsis pusilla*. Swaziland.—2631 (Mbabane): 4 km from Mbabane on the Usutu Road, (–BD), *Lebatha 078* (PUC).

Fresh root tips were harvested from bulbs from 8:00–11:30 a.m. The root tips were placed in water at 4°C in a refrigerator for 24 hours to stop cell activity (Kleynhans & Spies 1999). The root tips were then hydrolysed in hot (60°C) 1N HCl for 10 minutes, then stained with leuco basic fuchsin at 4°C in the dark for 24 hours. Stained root tips were then squashed in aceto-orcein and left to stain for 20 minutes (Darlington & LaCour 1976; Kleynhans & Spies 1999). Meanwhile, coverslips were prepared with Mayer's albumin and placed on the squashes. The slides were then placed between three filter papers folded in half, then squashed.

The slides were made permanent using the float-off method in 45% acetic acid, dehydration in a series of alcohol, and mounting in Euparal (Darlington & LaCour 1976).

RESULTS

Drimiopsis burkei subsp. *burkei* possesses a somatic chromosome number of 44 (Figure 1A). The chromosomes are large and mostly telocentric. Asymmetry of the karyotype is evident. The larger chromosome pairs are up to five times larger than the smallest.

The somatic chromosome count of *Drimiopsis burkei* subsp. *stolonissima* is 40 (Figure 1B). The larger chromosome pairs are three times larger than the smaller ones.

The somatic chromosome count of *Drimiopsis pusilla* is 44. The telocentric chromosomes are comparatively smaller (Figure 1C) than those of *D. burkei* subsp. *burkei* and *D. burkei* subsp. *stolonissima* (Figure 1A, B).

DISCUSSION

Two basic chromosome numbers exist in the *Drimiopsis* taxa investigated, i.e. x = 11 for *D. burkei* subsp. *burkei* and *D. pusilla*, and x = 10 for *D. burkei* subsp. *stolonissima*. This data, combined with recently published data (Stedje & Nordal 1987; Stedje 1994), suggests that the majority of *Drimiopsis* species appear to have a basic chromosome number of x = 11 (Table 1). Tetrapolyploids are common but pentaploids and hexaploids seem confined to tropical Africa.

The somatic chromosome numbers reported for *Drimiopsis botryoides* subsp. *botryoides*, 2n = 80 (Matsuura & Sato 1935) and *D. maculata*, 2n = 64 (Sato 1942), suggesting x = 8, are the only ones with this karyotype known so far in this group.

Chromosome counts of *Drimiopsis crenata* Van der Merwe and *D. saundersiae* Baker, 2n = 20 (De Wet 1957); *D. maculata*, n = 15 (Jessop 1972) (Table 1), together with the latest results (*D. burkei* subsp. *stolonissima*, 2n = 40) support x = 10. *D. crenata* and *D. saundersiae* were placed in synonymy under *D. burkei* subsp. *burkei* (Jessop 1972), 2n = 44. *D. volkensii* (Engl.) Baker, 2n = 64 (Gill 1978) and *D. kirkii* Baker, 2n = 60 (Fernandes & Neves 1962; Vij *et al.* 1982), n = 30 (Vijayavalli & Mathew 1988, 1990) and 2n = 68 (Mahalakshima

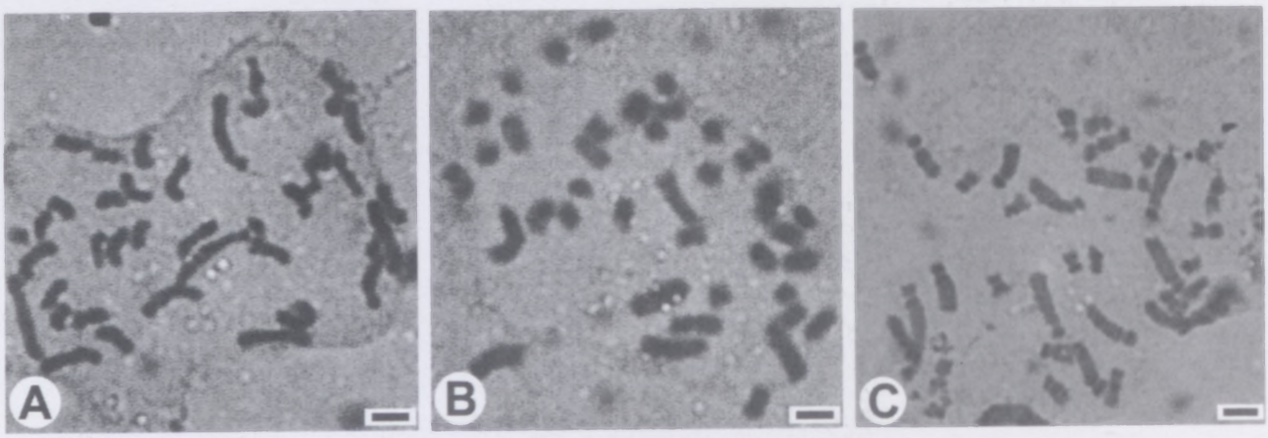

FIGURE 1.—Somatic (2n) chromosome numbers of three *Drimiopsis* taxa: A, *D. burkei* Baker subsp. *burkei*, *Lebatha 009*, somatic chromosome number = 44; B, *D. burkei* Baker subsp. *stolonissima* U.Müller-Doblies & D.Müller-Doblies, *Lebatha 037*, somatic chromosome number = 40; C, *D. pusilla* U.Müller-Doblies & D.Müller-Doblies, *Lebatha 078*, somatic chromosome number = 44. Scale bar: A–C, 60 μm.

& Sheriff 1970), are synonyms of *D. botryoides* subsp. *botryoides* (Stedje 1994) with 2n = 80 (Matsuura & Sato 1935), 2n = 44, 55 (Stedje & Nordal 1987; Stedje 1994) and 66 (Stedje 1994).

Because the counting of large chromosome numbers can be tricky, some of the aforementioned synonyms and chromosome counts need re-evaluation: present and previous karyological studies, for example, do not support the synonymy of *Drimiopsis crenata* and *D. saundersiae*, x = 10, under *D. burkei* subsp. *burkei*, x = 11. *D. crenata* and *D. saundersiae* instead share the same basic number with *D. burkei* subsp. *stolonissima*. Chromosome numbers of *D. kirkii*, x = 10, and *D. volkensii*, 2n = 64 also cast doubts on their synonymy with *D. botryoides* subsp. *botryoides*, x = 11. Yet, aneuploid series are known to exist and could account for the above observations.

The present study confirms that *Drimiopsis* possesses a basic chromosome number of at least x = 10 or 11, the former being a character state predominant in southern African taxa and the latter is predominant in tropical African taxa. Higher chromosome numbers in the 60s and 80s, appear to be confined to tropical Africa (Table 1). The southern African taxa are to date, diploids or tetraploids.

Additional chromosome counts are needed not only to verify published data but also to clarify issues raised in this paper. In particular, attention needs to be given to the case of *D. barteri* Baker 2n = 24 (Oyewole 1988), suggesting x = 12.

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P.D. LEBATHA*[1], J.J. SPIES** and M.H. BUYS*

* A.P. Goossens Herbarium, School for Environmental Sciences and Development: Botany, Potchefstroom University for CHE, 2520 Potchefstroom.

[1] Corresponding author, e-mail: plbpdl@puknet.puk.ac.za

** Department of Plant Sciences: Genetics, University of the Free State, P.O. Box 339, 9300 Bloemfontein.

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