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THE CHROMOSOMES OF BRETSCHNEIDERA HEMSL.

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ABSTRACT. A karyotypic analysis of *Bretschneidera sinensis* Hemsley of the monotypic family Bretschneideraceae was carried out for the first time. The chromosome number was found to be 2n = 18 and the karotypic formula 8m + 6sm + 4sm (SAT).

The genus *Bretschneidera* consists of the single species *B. sinensis* Hemsley native to montane forests of southern China. It was described and placed originally in the Sapindaceae by Hemsley (1901), but its taxonomic position and affinities have always been, and still are, uncertain. Radlkofer (1908) related it to Moringaceae and proposed to establish a monotypic family Bretschneideraceae (validated by Engler & Gilg, 1924) basing his decision on the presence of such non-Sapindaceous characters as perigynous flowers, papillae on the underside of the leaves, and especially myrosin cells as in *Moringa*. In the same year (1908, p. 171), Hallier, placing great weight on the pinnate leaves, pentamerous flowers, hairy filaments and the curved style, regarded *Bretschneidera* as a primitive tricarpellate form of Caesalpinoideae (Leguminosae), and later agreed with Radlkofer in taking *Bretschneidera* as well as *Moringa* to be intermediates between Capparaceae and Leguminosae. Hutchinson has considered *Bretschneidera* both as a member of the Hippocastanaceae (1969) and of the Sapindaceae (1959, 1973).

The present situation seems to be that the monotypic family Bretschneideraceae is widely accepted, but there is no general agreement whether it should be placed with the Capparaceae and Moringaceae of Engler's Rhoeadales or with the Sapindales. Clearly to gain a better insight into this interesting plant further information is needed, and this communication reports the first observations on its karyotype.

MATERIAL AND METHODS

The study was made from root-tips of seedlings grown from seeds collected near Bei-Gang forest station, NW Jiangxi, China. The root-tips were pretreated for five to six hours with 0·002M 8-hydroxyquinoline at 16–20°C, fixed overnight in 1:3 acetic alcohol, hydrolysed in HCl/95% ethanol (1:1) for 10 minutes, and stained with carbol fuchsin for five hours, after which they were squashed. Slides were made permanent (voucher *D. Q. Yang* C.8309-1) and deposited in the chromosome slide collection of Lushan Botanic Garden. Drawings were made using a camera lucida.

Karyotypic data were based on average measurements from 10 well-spread metaphase plates. Length of long arms (L) and short arms (S) were measured, and the arm-ratio and relative chromosome length (RCL) were calculated. Classification of chromosomes in relation to their centromeric

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position was made according to the scheme proposed by Levan et al. (1964).

Results and Discussion

The chromosome number observed in the root-tip cells was $2n = 18$ with chromosome lengths ranging from 2·0–3·9μm at metaphase. Three chromosome pairs are distinctly larger than the rest. The karyotype consists of four pairs of m-type, three pairs of sm-type and two pairs of sm(SAT)-type. Chromosomes No. 8 and 9 each possess secondary constrictions and globular satellites on their short arms. The karyotypic formula is therefore $2n = 18 = 8m + 6m + 4sm(SAT)$ (Table 1 and Fig. 1).

The Bretschneideraceae has been regarded by systematic bontanists as an interesting relict, showing affinities with primitive Capparacea, Leguminosae (Caesalpinioideae) and possibly Sapindaceae or Hippocastanaceae (see p. 347), but it seems that the evidence from chromosomes cannot help confirm the supposed relationship. So far no chromosome counts of $2n = 18$ or of the base number $x = 9$ have been reported in the Hippocastanaceae, Sapindaceae, Moringaceae and Caesalpinoideae; and although there are a few records of $2n = 18$ in the genera *Cadaba, Capparis* and *Cleome* of the Capparaceae, these genera are quite different in other characters from *Bretschneidera*. On the other hand, $x = 9$ is the most frequent basic chromosome number of Rutaceae, also a member of Cronquist's Sapindales; whether, however, this indicates relationship or only coincidence ($x = 9$ after all is a common number in angiosperms) deserves further investigation.

Table 1
Measurements of the nine chromosomes pairs of *Bretschneidera sinensis*

No.	Chromosome length in μm long arm	short arm	total	RCL	Arm ratio (L/S)	Centromere position
1	2·5	1·4	3·9	16·05	1·79	sm
2	2·0	1·4	3·4	13·99	1·43	m
3	1·7	1·5	3·2	13·17	1·13	m
4	1·9	1·0	2·9	11·93	1·90	sm
5	1·5	1·1	2·6	10·70	1·36	m
6	1·1	0·9	2·0	8·23	1·22	m
7	1·5	0·5	2·0	8·23	3·00	sm
8	1·8	0·5	2·3	9·47	3·60	sm(SAT)
9	1·6	0·4	2·0	8·23	4·00	sm(SAT)

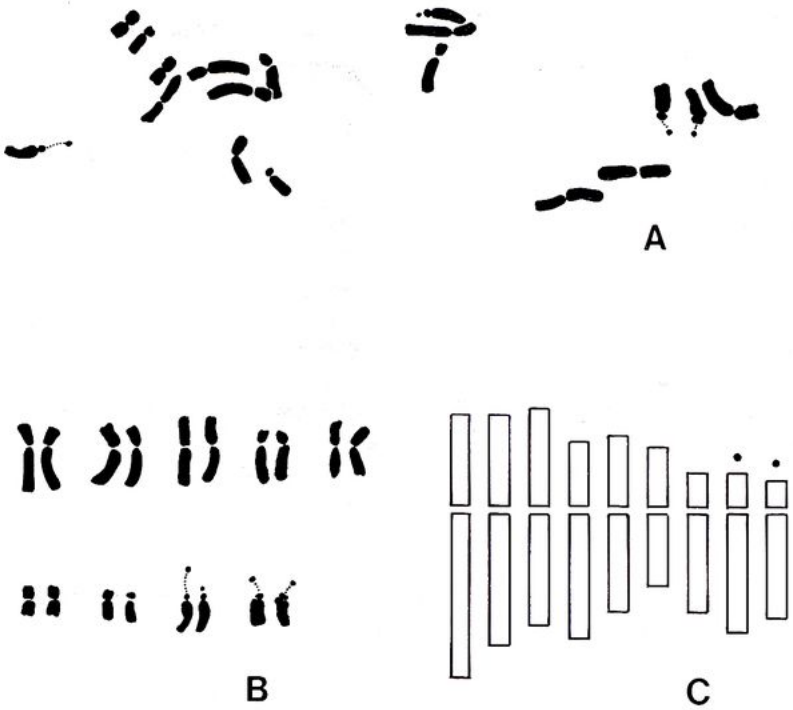

FIG. 1. Chromosomes of *Bretschneidera sinensis*: A, Mitotic chromosomes ×2700; B, Karyotype ×2700; C, Idiogram.

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