The Cytology of *Brachycome lineariloba*

2. The Chromosome Species and their Relationships

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Abstract. A study of approximately 300 plants in the taxonomic species *B. lineariloba* is reported. Five biological species differing in chromosome number exist in this species complex. The species with the lowest number (species A, \( n = 2 \)) often carries B chromosomes, which may be large, or minute. It also exists in three racial forms which differ in karyotype. Observations on naturally occurring hybrids in zones of overlap show that two of the races differ by an unequal interchange. — The species with \( n = 8 \) (species C) is probably of amphidiploid origin from the cross A × B. Species B, E and D, with \( n = 6, 5 \) and 4 respectively, may represent a series of reductions in chromosome number. They show close karyotypic relationships. The relationship of species A with D, E and B is obscure. (Summary see p. 152.)

I. Introduction

*Brachycome lineariloba* (DC) Druce, as recognised by Davis (1948) is an annual ephemeral species of the arid and semi-arid regions of extratropical Australia, with a range extending over 1,000 miles east to west, from central New South Wales to Eucla, on the South Australia — Western Australia border. It is easily distinguished from other species of *Eubrachycome* on the basis of morphological characters. It is stemless, or nearly so, it generally has pinnatisect leaves with linear lobes, and its fruits have inflated wings which bear long curled glandular silky hairs. Its pappus is relatively large for the genus, and the individual pappus bristles are fused in bundles but are free at the tips.

Davis (l.c.) recognised the existence of variation in morphological characters in the species, particularly in respect to the length of the corollas of the ligulate florets. These may be as long as 10—12 mm or as short as 1 mm. From the examination of herbarium material she concluded that this variation shows a discontinuous range, but she was unable to discover other discriminant characters, and in her opinion there were inadequate grounds even for the erection of taxonomic varieties.

In the first paper of this series, Smith-White (1968) reported chromosome numbers of \( n = 2 \) and \( n = 6 \) for the species from a locality near
Port Augusta, S. A., and a count of \( n = 8 \) from a single plant from near Cockburn, S. A. He was not able to distinguish plants of the chromosome forms at that time, although it seemed likely that the \( n = 2 \) Pt. Augusta form had blue flowers, and the others had white flowers. Smith-White, Carter and Stace (1970) verified the existence of the form with \( n = 8 \), and reported additional races with \( n = 4 \) and \( n = 5 \). The present paper reports an extensive study of the cytology of the taxonomic species over the greater part of its distributional range.

Voucher specimens are reposited in the herbarium of the School of Biological Sciences, University of Sydney. Material was fixed in the field in Newcomer's fixative (Newcomer, 1953), and has been stored at approximately \(-20^\circ C\). Squashes were made in 1% orcein in 45% propionic acid. Drawings are presented at a magnification of \( \times 2,500 \), and photographs at \( \times 1,500 \).

II. The Species

Chromosome number determinations for approximately 300 plants from a wide range of localities are listed in Table 1. We recognise five distinct chromosome number species within the taxonomic complex. At the present time we do not wish to become involved in nomenclatural problems, and the five species are designated by the symbols A, B, C, D and E, in the order of their discovery. Three different races in species A are designated \( A_1 \), \( A_2 \) and \( A_3 \).

The overall geographical distribution of the taxonomic species, as determined by collections in various Herbaria in Australia, the distributional ranges of the five chromosome number species so far as at present known, and the localities studied, are shown in Fig. 1.

Like Davis, we have been unable to discover morphological differences in the leaves or fruits which would enable reliable discrimination between the species from preserved herbarium material. However, in the field, species A is readily distinguishable from the others by its growth form and by the length of its ligulate florets.

The following brief descriptions are given.

Species A. The plants may be small, with a single flowering scape scarcely 5 cm high (Fig. 2). This scape is always erect, in both flowering and fruiting stages. In such small plants the leaves are often scarcely divided, and the ligulate florets may have corollas little more than 5 mm long. Under good growing conditions, the plants are much larger, with 50 or more flowering scapes, standing 20 cm or more in height. In such plants the ligulate florets may have corollas 12 mm or more in length. In the races \( A_1 \) and \( A_2 \) flower colour varies from blue to almost white, but there is always some trace of blue on the undersides of the corollas. In the species \( A_3 \) flower colour is pure white. The involucral bracts of the capitula are green, and in all material examined lack any pigmented red or purplish margin.

Species B. The plants vary in size with environmental conditions in the same way as does species A. In the field, B is very distinct, since the flowering scapes, and especially the fruiting scapes take on a semi-prostrate to prostrate position