

Specimen examined: Himachal Pradesh, Simla, Summer Hill (1983 m), on humicolous soil under *Quercus incana* Roxb., N.S. Atri, PUN 265, July 31, 1979.

This collection resembles with the description given for *R. foetens* (Pers.) Fr. by Rayner<sup>3</sup> except for the absence of dermatocystidia in the present case.

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## ACCESSORY CHROMOSOMES IN GARDEN CHRYSANTHEMUM

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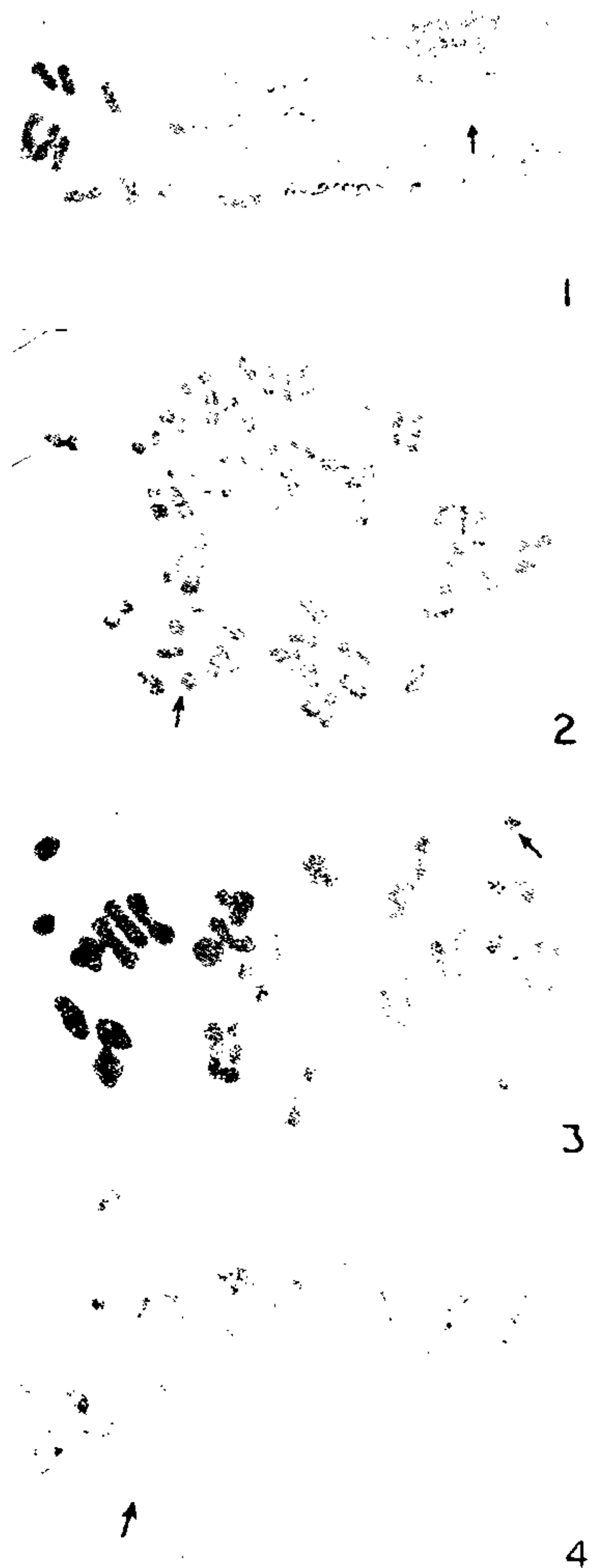
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CONTRARY to earlier observations that B-chromosomes are generally less frequent in polyploids<sup>1</sup>, recent studies have shown that they are equally prevalent in polyploid species as well<sup>2,3</sup>. This is also true of the garden chrysanthemum (*C. morifolium* Ramat.), which is an important ornamental and cytogenetically constitutes a poly-aneuploid complex, in which the majority of the taxa are hexaploid. Out of nearly 200 cultivars, 5 cultivars showed the presence of one B-chromosome each. The present communication gives a brief account of these taxa.

Karyotypic and meiotic studies were made following the usual Feulgen and iron-acetocarmine squash methods, respectively. Root tip mitosis in cultivars like "Nigeria", 'Red Princess Anne', Cv. W1 (all  $2n = 6x = 54$ ) and 'Innocence' ( $2n = 6x + 2 = 56$ ) revealed the presence of one small accessory chromosome (Figs. 1 and 2), whose size in all the cases was

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nearly one half of the smallest chromosome in the complement. The centromere in B-chromosome of



FIGS. 1-4. Figs. 1 and 2. Somatic metaphase of *C. morifolium* cultivars. Fig. 1. cv. 'Red Princess Anne'— $2n = 54 + 1B$ . Fig. 2. cv. 'Innocence',  $2n = 56 + 1B$  (Note the telocentric B). Figs. 3 and 4. Meiotic metaphase. Fig. 3. MI in cv. 'Innocence',  $1IV + 24II + 4I + 1B$ . Fig. 4. MII in cv. 'Ghenghiskhan',  $1IV + 1III + 29II + 7I + 1B$ .

cv. WI and 'Red Princess Anne' was at the median, that of 'Nigeria' at the subterminal and cv. 'Innocence' at the terminal position (Fig. 2). Karyotype in cv. WI and 'Innocence' was symmetrical (2A category of Stebbins<sup>4</sup>) and can be resolved into 9 more or less homomorphic sets with the varying number of chromosomes in each set. Out of the 30 pollen mother cells (PMCs) studied in 'Innocence', nearly 80 per cent had one B-chromosome (Fig. 3). In cv. 'Ghenghiskhan' (Fig. 4) only 44% of the PMCs contain 1B-chromosome, which could not be located in root mitoses. In both the cultivars meiosis was characterised by the presence of multivalents, bivalents, univalents, etc. The B-chromosome was never found to pair with any A-chromosomes and during anaphase I it was either found to disjunct normally or get included in one of the poles without undergoing division. Though pollen stainability was appreciably high (60 to 65%), there was no seed formation.

The occurrence of one or two fragments or small odd chromosomes in cultivars of *Chrysanthemum morifolium* have been reported by various workers<sup>5-8</sup>. However, the exact nature of these chromosomes was not ascertained. In the present study, one telocentric B was observed in cv. "Innocence" ( $2n = 56$ ). It is possible that this might have originated as a result of misdivision of an iso-B-chromosome, as was observed by Dowrick<sup>10</sup> in *Chrysanthemum* species like *C. corymbosum* var. *poterifolium* and *C. millefolium* (both  $2n = 18$ ). The subsequent loss of one of the telocentrics could result in the occurrence of one B-chromosome in the somatic complement. The presence of one B-chromosome in the germ cells of 'Ghenghiskhan' ( $2n = 72$ ) and its complete elimination from the root tip cells may be attributed to its unstable nature. In such case, the B-chromosome will be ultimately eliminated due to lagging at anaphase or non-disjunction. The presence of B-chromosome did not affect the pollen fertility, which may be due to the polyploid nature of the taxa *per se*. Though the exact nature of the origin and mode of their transmission is not known, they are maintained in the cultivars through vegetative propagation.

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## LEAF DICHOTOMY IN *CODIAEUM VARIEGATUM* BLUME

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LEAF tetatology has been reported in several plants by several workers. Banerjee<sup>1</sup> enlisted plants showing leaf forking. As far as the authors are aware no attempt has been made to study how forking occurs in leaves. The present investigation has been undertaken to throw light on this point. During our observations in the gardens of the university campus, we have come across an interesting case of dichotomous, rarely trichotomous forking of leaf lamina in addition to normal simple leaves in clones of *Codiaeum variegatum*. In clones out of many plants, only one plant manifested such leaves. Worsdell<sup>2</sup> stated that forked leaves occur perhaps most commonly in plants with their leaves arranged in an opposite decussate manner, but this is not true in this case. The leaves are simple, pinnate, univeined and alternately arranged on the axis in *Codiaeum variegatum* (Fig. 1 D). The dichotomous incision of the lamina starts from apex, gradually extends to base, associated with the forking of the primary vein resulting in the formation of two separate "leaflets" with a common petiole (Fig. 1 : B, D). Dichotomous forking of the lamina does not change only the leaf morphology but increases the total leaf area also. Sometimes the apex shows trichotomous incision (Fig. 1 C). Such forking is not restricted to young leaves only, but has been observed in fully matured leaves also (Fig. 1 E). The compound leaf as an advanced type, is believed to have arisen by evolutionary dissection of the simple leaf. In ontogeny, the leaflets develop as do the lobes of a simple leaf—by the development of lateral primordia on the median axis. The development of the compound leaf of the palms is wholly different—by an ontogenetic splitting of the primordium (Eames<sup>3</sup>). But here the compound leaf has arisen by the dichotomous or trichotomous forking of the simple young mature leaves. The abnormality found in this plant also