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Brief Report
Speckled fluorescent banding pattern in *Scorzonera* (Asteraceae)

GIOVANNI D'AMATO

Dipartimento di Biologia Vegetale, Università La Sapienza, P.le ALDO MORO 5, 00185 Roma. E-mail: elettra.damato@uniroma1.it

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In a study on chromosome banding in species of *Tragopogon* L. and in *Geropogon glaber* L., two members of the *Scorzonerinae* subtribe, the existence of a distinctive pattern of quinacrine bands consisting of clusters of dots displaying bright fluorescence was discovered (D'AMATO et al. 1975). The pattern was characteristic for each species analysed, moreover a different heterochromatic "structure" characterized the two genera (in *Geropogon* there were also regions of dim fluorescence and the bright spots were less definite than in *Tragopogon*). A model of a disrupted banding pattern was proposed.

After the application of Giemsa C-banding to *Tragopogon* and *Geropogon* chromosomes, no cluster bands were observed, while the Feulgen banding affected their differentiation, although to a limited extent (D'AMATO 1986).

In the present report, two species of *Scorzonera* L. i.e.: *S. rosea* W. et K. and *S. cana* (C.A. Meyer) O. Hoffm. were tested by fluorochrome banding, to verify if the unusual heterochromatic band appearance could represent a karyotype marker of this group of plants. Both species are included in the same genus, but in separate subgenera, by CHATER (1976), while the Italian Flora published by PIGNATTI (1982) considers *S. cana* as a member of a distinct genus: *Podospermum*. However the genus *Podospermum* is not recognized by BREMER (1994) who reports seven genera and about 300 species in this subtribe.

MATERIAL AND METHODS

Samples of *S. rosea* were collected in Central Italy at Forca Canapine, near Norcia (Perugia). Plants of *S. cana* were collected at Lucoli (L'Aquila). All the specimens were cultivated in pots.

Root tips pretreated in a 0.3% colchicine solution for three hours and fixed in ethanol-acetic acid (3:1) mixture overnight were then squashed in 45% acetic acid and the slides after removing the coverslip with dry ice were analized after fluorochrome treatment either in 5% ethanol solution of quinacrine dye or after DAPI/chromomycin A_3 double staining according to SCHWEIZER (1976).

The ideogramatic representation of *S. rosea* was obtained by measurements of six metaphase plates of Feulgen stained meristematic cells.

OBSERVATIONS AND DISCUSSION

Both the species analized showed a chromosome number $2n = 14$, but the karyotype structure was different. According to the nomenclature of LEVAN et al. (1965), *S. rosea* had the following karyotype: 8 m + 2 m sat + 2 sm + 2 sm sat + 2 st. In *S. cana* the karyotype formula was: 6 m + 2 m sat + 4 sm + 2 st. In this last plant, two large satellites were observed. The quinacrine staining of *S. rosea* metaphases revealed a speckled heterochromatin pattern in almost all the chromosomes of the set. In one pair only (the pair number 2, in Fig. 7; and in Fig. 4, the chromosomes at the top right- and left-hand corners), the heterochromatic region consisted of a thin faintly visible and apparently linear band on both arms. The rest of the chromosomes were characterized by a series of dots clustered near the centromere or distributed mainly in one of the two arms (Fig. 1, Fig. 4). An ideogramatic representation of the banding pattern is proposed in Fig. 7. Interphase nuclei presented a cap of several fluorescent spots of different size (Fig. 2).

The DAPI and chromomycin A_3 patterns were not much different: DAPI stained bands were similar to quinacrine bands but the intensity of the fluorescence was lower and sometimes almost undetectable. The pattern of chromomycin A_3 consisted of bands of intense fluorescence at the nucleolar organizer regions of the two satellited chromosome pairs, the 5 and 6 pairs (Fig. 3).

No quinacrine bands or dots were observed in *S. cana* (Fig. 5). The fluorescence of interphase nuclei

Fig. 1. Fig 1–4. *S. rosea.* **1** Prometaphase stained by quinacrine. **2** Interphase nucleus stained by quinacrine. **3** Metaphase, stained by chromomycin. **4** Metaphase plate, stained by quinacrine. **Fig 5–6.** Quinacrine staining in *S. cana.* **5** Metaphase chromosomes. **6** Interphase nucleus. **Fig. 7.** Ideogramatic representation of the karyotype and quinacrine banding pattern in *S. rosea.* Bar: Fig. 1–6 = 17 μm; Fig. 7 = 5 μm.

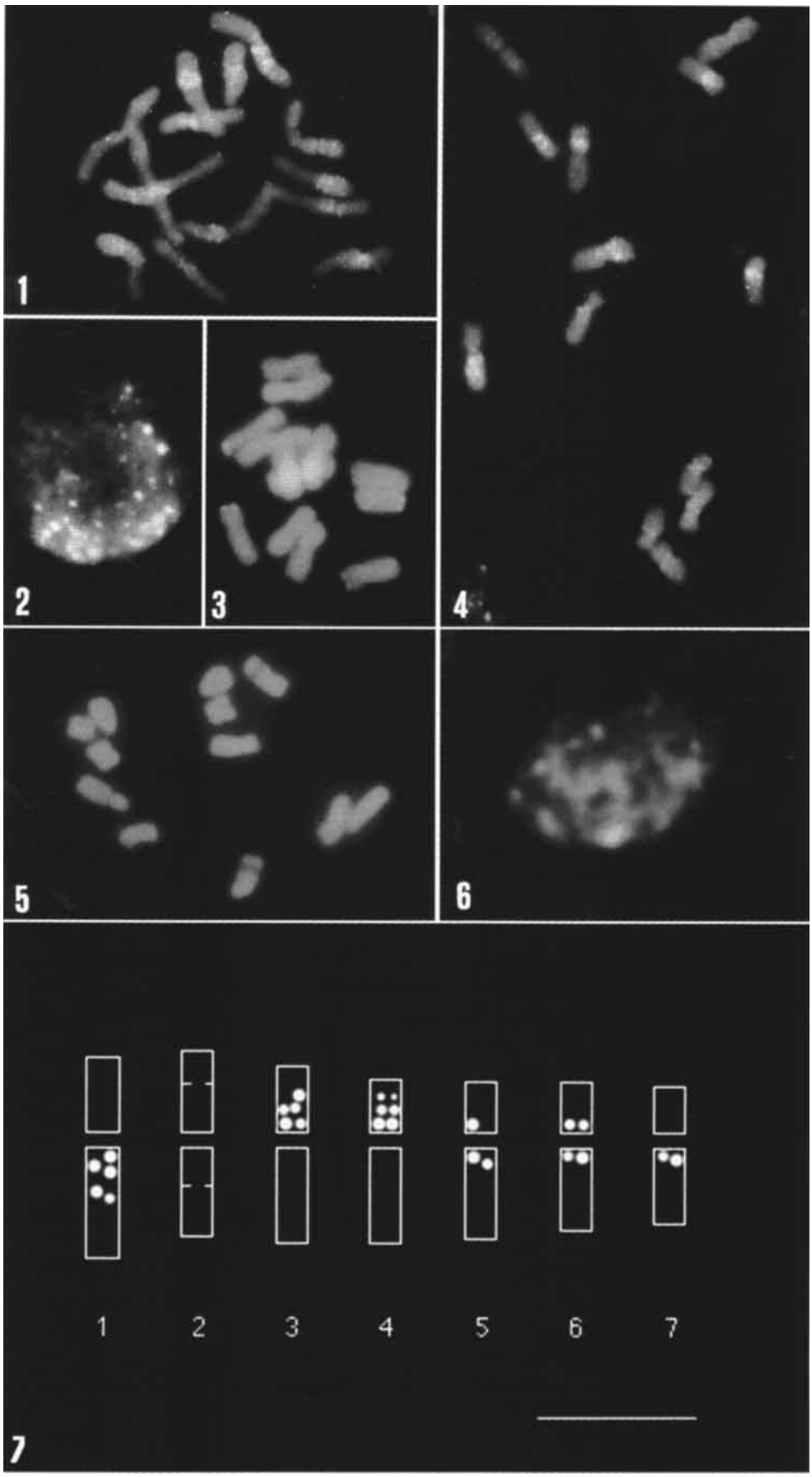

Fig. 1.

was fairly uniform and the chromocenters observed displayed the same intensity as the euchromatin (Fig. 6). These chromocenters may represent the heterochromatic regions visible in the nuclei of this plant after treatment with Giemsa banding. The pattern of heterochromatin in Giemsa C-banded metaphases will be a matter for further investigation throughout this group of plants, however our preliminary observations have shown the occasional presence of telomeric and centromeric C bands.

In conclusion, even though the general similarity of the unusual fluorescent pattern found in *Tragopogon*, *Geropogon* and *S. rosea* could emphasize a close systematic relationship between them, the lack of fluorescent bands in *S. cana* could support its placement in a different genus. The karyotype and heterochromatin evolution in the members of *Scorzonerinae* group deserves more extensive analysis.

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