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Karyotype variation in *Crepis fraasii* and *C. reuteriana (Asteraceae)* in Greece

Abstract

Anagnostopoulos, A.: Karyotype variation in *Crepis fraasii* and *C. reuteriana (Asteraceae)* in Greece. – Bocconea 5: 721-726. 1997. – ISSN 1120-4060.

Crepis fraasii var. *fraasii* and var. *mungieri* as well as *C. reuteriana* have been studied karyologically. The karyotype morphology of *C. fraasii* var. *fraasii* and *C. reuteriana* is virtually constant, that of *C. fraasii* var. *mungieri* shows a slight inter-populational variation. There is no karyotype difference of note between the two varieties of *C. fraasii*. Idiograms for each taxon are shown.

Introduction

Crepis fraasii Schultz Bip. and *C. reuteriana* Boiss. are easily confused because of their morphological similarity. Kamari (1991) gives a description of *C. fraasii* and mentions the differences between it and *C. reuteriana*. The key characters are:

- *Crepis fraasii:* stems up to 50 cm high; lower cauline leaves usually well developed, resembling the basal ones; involucre glandular-pubescent; achenes up to 4 mm long, brown, 15-20 ribbed.
- *Crepis reuteriana:* stems up to 75 cm high; cauline leaves usually reduced, bract-like; involucre glabrous or eglandular pubescent; achenes up to 6 mm, straw-coloured, 12-15 ribbed.

Crepis fraasii var. *mungieri* (Boiss. & Heldr.) Hayek differs from var. *fraasii* in its shorter (up to 20 cm), usually ascending, scarcely branched stems and reduced, bract-like or absent cauline leaves.

Materials and methods

The distribution of the three taxa examined is mapped in Fig. 1. Voucher specimens are deposited at the herbarium of the Botanical Institute, University of Patras (UPA). Live material (Table 1) was cultivated outdoors in the experimental garden of the same Institute.

Table 1. Populations of *Crepis fraasii* var. *fraasii* and var. *mungieri*, and *C. reuteriana*, used to study the karyotype variation. – Collectors: *A&A = Anagnostopoulos & Athanasiou; P&K = Phitos & Kamari.* Vouchers in UPA.

Taxon	Locality	Pop.
C. fraasii var. *fraasii*	Chania: along Venizelos Gorge near the village of Theriso, 150-200 m, 35°14'N 23°59'E, 22 Nov 1988, *A&A 670.*	8
	Achaia: Mt Erimanthos above Kalendzi, alt. 1100-1200 m, 37°57'N 21°46'E, 7 May 1989, *Anagnostopoulos 829.*	12
	Fthiotis: Mt Iti, ad pagum Pavliani, alt. 900 m, 38°45'N 22°20'E, 29 May 1988, *P&K 21780*	20
	Magnisia: island Kira Panagia, Ormos Planiti, SE part of Mt. Koutouria, alt. 0-30 m, 39°21'N 24°04'N, 9 May 1988, *Anagnostopoulos, P&K 445.*	23
	Lesvos: Mt. Olimbos, above Agiassos, alt. 450-600 m, 39°05'N 26°22'E, 26 Jul 1989, *A&A 1505.*	25
C. fraasii var. *mungieri*	Chania: Lefka Ori, along the path Xiloskalo - Linoseli source, alt. 1200-1500 m, 35°18'N 23°54'E, 17 Mar 1989, *A&A 707.*	1
	Chania: Lefka Ori above Anopolis, alt. 1400 m, 35°15'N 24°05'E, 17 Mar 1989, *A&A 706.*	2
	Iraklio: Psiloritis above Kamares toward source "Mana Nerou", alt. 1100-1300 m, 35°09'N 24°49'E, 24 Nov 1988, *A&A 673.*	3
	Lasithi: W. part of the Lasithi plateau, along the path leading to Kastelli, alt. 1100 m, 35°12'N 25°25'E, 21 Mar 1989, *A&A 713.*	5
	Lasithi: Mt Prinias, small ravine N. of main summit, alt. 750 m, 35°08'N 26°08'E, 23 Mar 1989, *A&A 692.*	6
C. reuteriana	Pieria: Mt Olimbos - Xerolakki Rema, alt. 800-900 m, 40°07'N 22°19'E, 23 Jul 1988, *A&A 639.*	30
	Florina: inter pagos Pili et Vronteron (ad lacum Mikri Prespa), alt. 900 m, 40°06'N 21°00'E, *P&K 21404.*	32
	Evros: S. of Avra; ravine , alt. 280-300 m, 40°55'N 25°40'E, 7 Jun 1991, *Anagnostopoulos & al. 2033.*	33
	Kerkira: coast 1 km before Gastouri, alt. 50-150 m, 39°33'N 19°54'E, 16 Jul 1988, *Anagnostopoulos 622.*	35
	Lesvos: Above Vafios, alt. 300-400 m, 39°20'N 26°13'E, 26 Jul 1989, *A&A 1512.*	36

For karyotype analysis root-tip meristems were used. They were treated as described by Kamari (1976). Micrographs of metaphase plates were made of permanent or non-permanent preparations, and were enlarged to a total magnification of 2500×. The measurements taken from these photos were used for constructing the idiograms.

The terminology for centromeric position follows Levan & al. (1965), and the arrangement of the chromosomes in the idiograms is of Babcock (1947). Measurements were made on 5 metaphase plates per population. A statistical analysis of numerical data

was carried out by means of a computer program enabling the tabulation of average values of arm ratio and relative length (Table 2). Average values for each of 5 populations of each taxon were plotted alongside in the corresponding idiograms (Fig. 2).

Results and discussion

Crepis fraasii var. ***fraasii*** ($2n = 12$).

The karyotype of *Crepis fraasii* var. *fraasii*, as reported in a previous paper (Anagnostopoulos & Kamari 1992), consists of $2n = 2x = 8m + 2m\text{-SAT} + 2sm = 12$

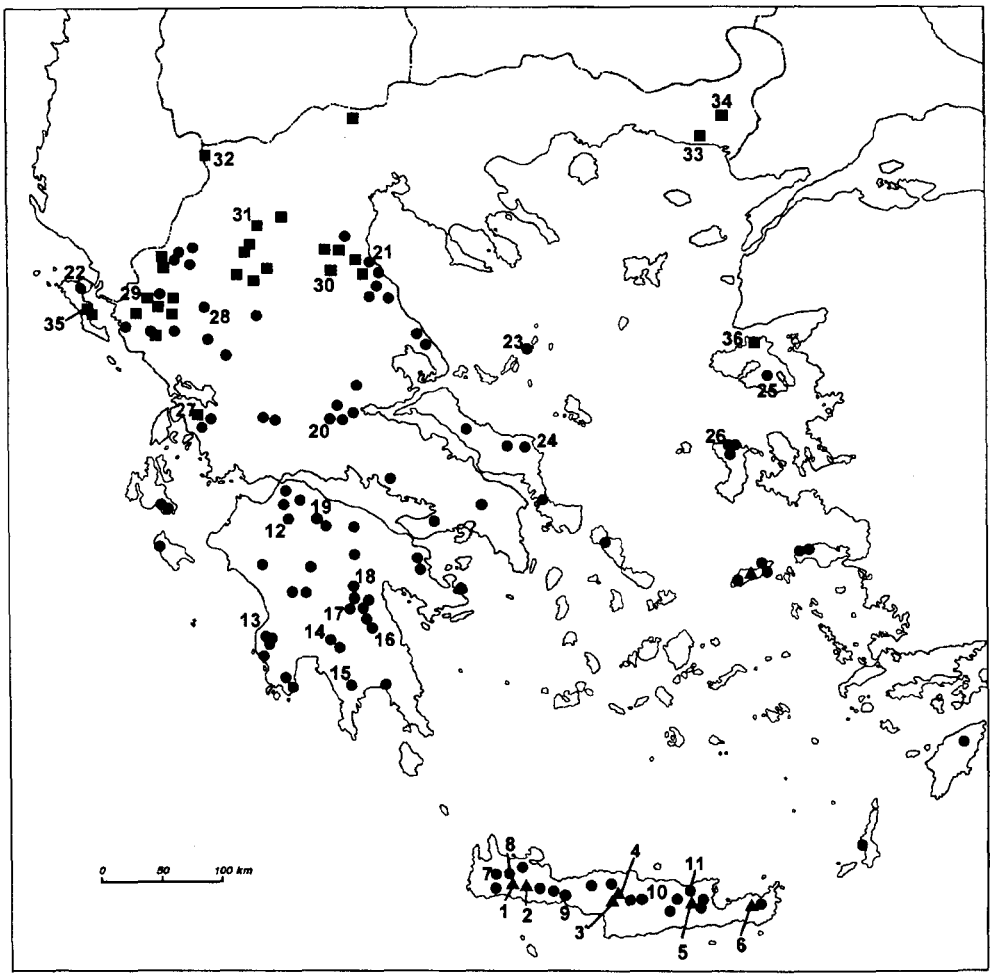

Fig. 1. Distribution of *Crepis fraasii* var. *fraasii* (●), *C. fraasii* var. *mungieri* (▲) and *C. reuteriana* (■), in Greece. Numbers indicate karyologically investigated populations.

Table 2. Variation of arm ratio (r-index) and relative length (R-length) of *Crepis fraasii* var. *fraasii* and var. *mungieri* as well as *C. reuteriana*.

		m	m	m	m-SAT	sm	m
C. fraasii var. *fraasii*	r-index:	1.09-1.21	1.26-1.48	1.09-1.20	1.28-1.44	1.70-1.90	1.26-1.50
	R-length:	24.8-25.8	22.3-23.4	12.5-14.0	13.1-13.9	10.8-12.1	10.3-11.3
C. fraasii var. *mungieri*	r-index:	1.00-1.15	1.20-1.50	1.02-1.20	1.40-1.60	1.70-1.80	1.30-1.40
	R-length:	23.8-26.0	23.1-24.6	11.9-14.2	12.6-13.3	11.4-11.7	10.1-10.8

		m	st-SAT	sm	t-SAT
C. reuteriana	r-index:	1.07-1.13	3.43-4.28	1.72-2.07	8.50-10.86
	R-length:	31.3-32.4	25.5-26.6	18.8-19.5	22.6-23.1

chromosomes. Their size varies from 5.6 μm to 1.6 μm. The longest metacentric pair has a secondary constriction, that is not always visible, on its short arm, close to the telomere. The marker chromosome pair has a satellite almost half as long as the short arm, showing only minimal variation in size. The populations studied showed no significant inter-populational karyotype variation (Fig. 2a).

Crepis fraasii var. ***mungieri*** ($2n = 12$).

The karyotype of *Crepis fraasii* var. *mungieri* is similar to that of var. *fraasii*. The marker chromosome (m-SAT) has a satellite similar to that of the corresponding chromosome of var. *fraasii*, i.e., almost half as long as the short arm.

No karyotype variation of note was found, except for a small length deviation of the long arms of the second and third longest metacentric chromosomes, in population No. 3 (Fig. 2b). Also, the arm ratios and the relative lengths, as seen in the plotted idiograms (Fig. 2a-b), show no significant difference between the two varieties of *C. fraasii*.

Crepis reuteriana ($2n = 8$).

In all populations examined, the karyotype of *Crepis reuteriana* consisted of $2n = 2x = 2m + 2st\text{-SAT} + 2sm + 2t\text{-SAT} = 8$ chromosomes, as reported in a previous paper (Anagnostopoulos & Kamari 1992). No plants were found to confirm the number $2n = 6$ given by Rosenberg (1918, 1920). The sizes range from 12.8 μm for the longest pair to 5.4 μm for the shortest pair. The two marker chromosome pairs (st-SAT and t-SAT) have satellites that are not always visible on both homologous chromosomes. For this reason, and also due to the fact that the size of the satellites is too small to affect total chromosome length, no measurements of their length have been taken.

No significant intra- or inter-populational karyotype variation has been observed (Fig. 2, Table 2).

Acknowledgements

I would like to express many sincere thanks to Prof. G. Kamari (Patras) for her comments on and criticism of the manuscript.

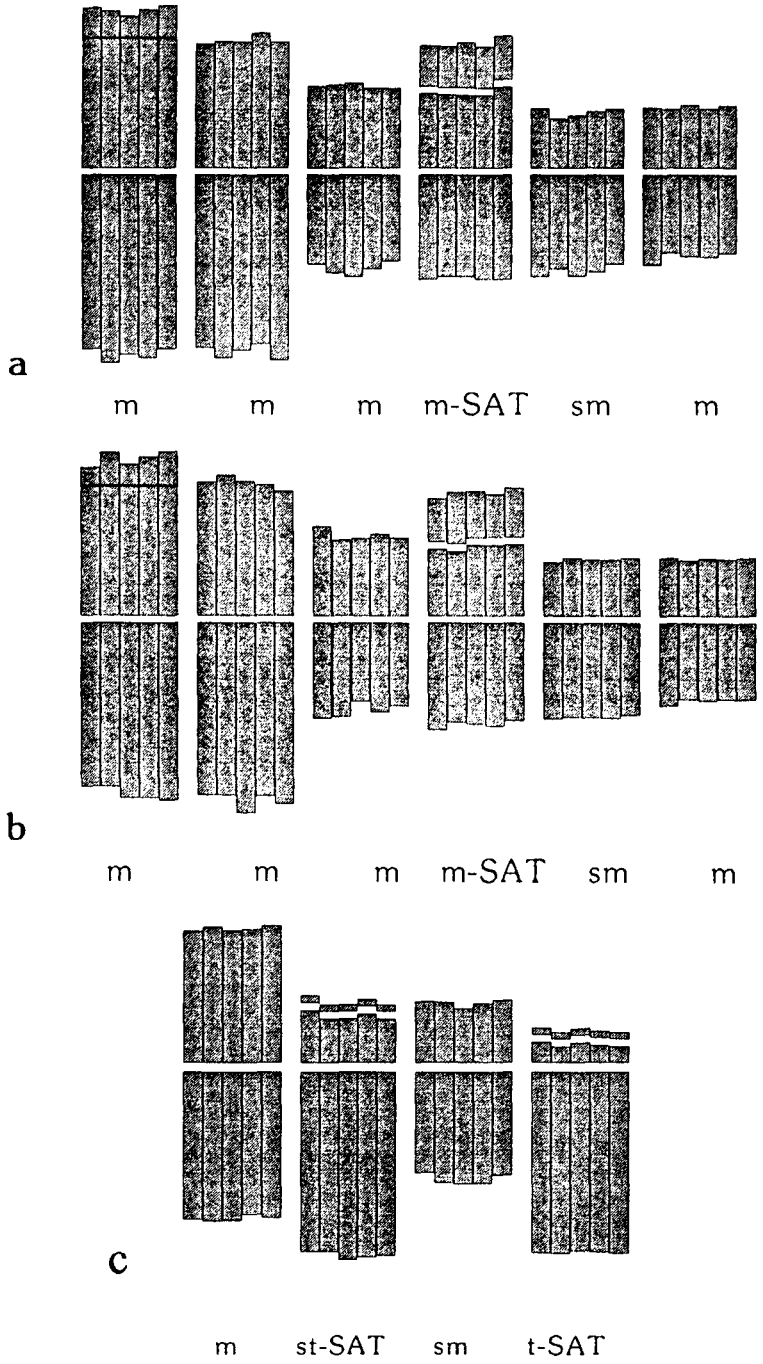

Fig. 2. Variation in the chromosome complement of: **a**, *Crepis fraasii* var. *fraasii* from populations No. 8, 12, 20, 23 and 25 (see Fig. 1); **b**, *C. fraasii* var. *mungieri* from populations No. 1, 2, 3, 5 and 6 (see Fig. 1); **c**, *C. reuteriana* from populations No. 30, 32, 33, 35 and 36 (see Fig. 1).

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