

NEW OR RARE CHROMOSOME COUNTS IN TEN SPECIES OF *COUSINIA* FROM IRAN-II

S.B. DJAVADI

Department of Botany, Iranian Research Institute of Plant Protection, Tehran, Iran

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Abstract

In the present study, chromosome numbers of 10 species of the genus *Cousinia* including: *C. bienerti* (n=13), *C. decipiens* (n=13), *C. deserti* (n=12), *C. esfandiari* (n=13), *C. komarowii* (n=13), *C. lepida* (n=13), *C. neurocentra* (n=12), *C. piptocephala* (n=13), *C. smirnowii* (n=12) and *C. turcomanica* (n=13) are reported from Iran. Specimens have been collected from Semnan and Khorasan Provinces. Nine of the counts are new to science and one provides confirmation of the previous report. The chromosome numbers for three sections are reported for the first time.

Key words: *Cousinia*, chromosome counts, Iran

Introduction

The chromosome studies on the genus *Cousinia* Cass. including the materials of this paper, have been done on approximately 130 species (DJAVADI 2005, GHAFFARI *et al* 2006). On Iranian materials, these types of studies are limited to only 83 species (ARYAVAND 1975, AFZAL-RAFII 1980, GHAFFARI 1984, 1986, 1987, GHAFFARI and SANEI CHARIAT-PANAHI 1985, GHAFFARI and

DJAVADI 1998, DJAVADI and GHAFARI 1999, GHAFARI *et al.* 2000, SUSANNA *et al.* 2003, SHEIDAI *et al.* 2005, DJAVADI 2005, GHAFARI *et al.* 2006). With considering the magnitude of the genus, 691 species (ATTAR & GHAREMAN, 2006), these studies are very few. In this study, meiotic chromosome numbers are reported for 10 species, in order to contribute to the knowledge of chromosome counts in this such a large genus.

Materials and Methods

The materials and methods involving acetocarmine squashes of buds for meiotic stages are the same as those mentioned in the first paper (DJAVADI 2005). Digital photographs were taken using a Canon camera mounted on a Zeiss microscope. The herbarium vouchers are preserved in the "IRAN" Herbarium. In this study, all sections and species are based on Rechinger's classification presented in Flora Iranica (RECHINGER 1972, 1979).

Results and Discussion

Cousinia sect. *Badghysia* Tscherneva

C. piptocephala Bunge

Semnan: Shahroud to Mayamey, 30 km W. Abbasabad, 1250 m. 1 June 2006, Djavadi, Eskandari & Torabi (IRAN 43520). n=13 (Fig. 1)

The only studied species of this section is *C. piptocephala* Bunge, with $2n=26$ (AFZAL-RAFII 1980). Meiosis in our sample showed 13 bivalents at metaphase I. This count which is the second report for *C. piptocephala*, agrees with the previous one.

Cousinia sect. *Kopetdagia* Tscherneva

C. smirnowii Trautv.

Semnan: Shahroud, Kalat-e Ghatri, 1650 – 2100 m, 11 June 2006, Djavadi, Eskandari & Torabi (IRAN 43494). n=12 (Fig. 2)

Meiosis showed 12 bivalents at diakinesis. According to available data, this is the first chromosome number for this species. The only other count in a species of this section was $2n=24$ in *C. botschantzevii* (TSCHERNEVA 1985).

***Cousinia* sect. *Lepidae* Bunge**

***C. lepida* (Bunge ex) Boiss.**

Khorasan: 30 km Sabzevar to Esfarayen, 1600 m. 1 June 2006, Djavadi, Eskandari & Torabi (IRAN 43523). $n=13$ (Fig. 3)

In meiosis 13 bivalents were observed at metaphase I and anaphase I. This is the first chromosome count for this species. Only other count within this section was $n=13$ in *C. raphiostegia* (GHAFARI *et al* 2006).

***Cousinia* sect. *Leucocaulon* Tscherneva**

***C. turcomanica* C. Winkl.**

Khorasan: Khaf to Taybad, 50 km to Taybad, 1200 m. 3 June 2006, Djavadi, Eskandari & Torabi (IRAN 43518). $n=13$ (Fig. 4)

Meiosis in this species showed 13 bivalents at metaphase I. According to literature, there is no prior record of the chromosome number for this section. Therefore, this count is the first report for this section.

***Cousinia* sect. *Neurocentrae* Bunge**

***C. deserti* Bunge**

Semnan: Shahroud to Mayamey, 30 km W. Abbasabad, 1250 m. 1 June 2006, Djavadi, Eskandari & Torabi (IRAN 43542). $n=12$ (Fig. 5)

Meiosis showed 12 bivalents at metaphase I. This is the first chromosome report for this species.

***C. neurocentra* Bunge**

Semnan: Shahroud to Mayamey, Biarjomand road, 1200 m, 1 June 2006, Djavadi, Eskandari & Torabi (IRAN 43539). $n=12$ (Fig. 6)

Meiosis in this species also showed 12 bivalents at metaphase I. This report is the first chromosome count for this species.

According to the literature, our chromosome counts on the two species of this section, is also the first chromosome reports for this section.

***Cousinia* sect. *Stenocephalae* Bunge**

***C. decipiens* Boiss. & Buhse**

Semnan: Shahroud, Abr, 1650 m, 11 June 2006, Djavadi, Eskandari & Torabi (IRAN 46006). $n=13$ (Fig. 7)

According to the Literature, there are 15 chromosome counts for the section *Stenocephalae* Bunge, all indicate the same basic chromosome number of $x=13$ (AFZAL-RAFII 1980, GHAFARI & SANEL CHARIAT-PANAHI 1985, TSCHERNEVA 1985, GHAFARI 1986, GHAFARI & DJAVADI 1998, DJAVADI 2005, GHAFARI *et al* 2006). The other count within this section was $n=12$ and $2n=24$ in *C. recurvata* DC. (AFZAL-RAFII 1980), which opposed with other results and needs confirmation. Also, there is an old different count of $2n=18$ in *C. hypopolia* Bornm. & Sint. by CHUKSANOVA (see FEDEROV 1969), that have never been confirmed.

According to SUSANNA *et al* (2003), the chromosome numbers of $2n=18$ and 20 reported in the early studies should be disregarded. Therefore, it seems that there is only one base chromosome number in section *Stenocephalae* Bunge, i.e. $x=13$. Chromosome studies of pollen mother cells in *C. decipiens* Boiss. & Buhse showed 13 bivalents at metaphase I. As far as we know, this is the first chromosome count for this species.

***C. esfandiarii* Rech. f. & Aell.**

Semnan: Shahroud, Kalat-e Ghatri, 1650-2100 m, 11 June 2006, Djavadi, Eskandari & Torabi (IRAN 37937). $n=13$ (Fig. 8)

Meiosis in *C. esfandiarii* Rech. f. & Aell. showed 13 bivalents at metaphase I. This chromosome count is the first report for this species.

Since the base chromosome number in section *Stenocephalae* Bunge follows a general trend of stability, we can conclude that, these cytological affinities of the species verify the morphological affinities and the placement of these species in one section based on Rechinger classification (RECHINGER 1972, 1979). With these two new reports, the chromosome number of 17 species of this section have been ascertain.

***Cousinia* sect. *Stenoloma* Juz.**

***C. komarowii* (O. Kuntze) C. Winkl.**

Khorasan: 70 km Dargaz to Ghouchan, 1650 m, 8 June 2006, Djavadi, Eskandari & Torabi (IRAN 43545). n=13 (Fig. 9)

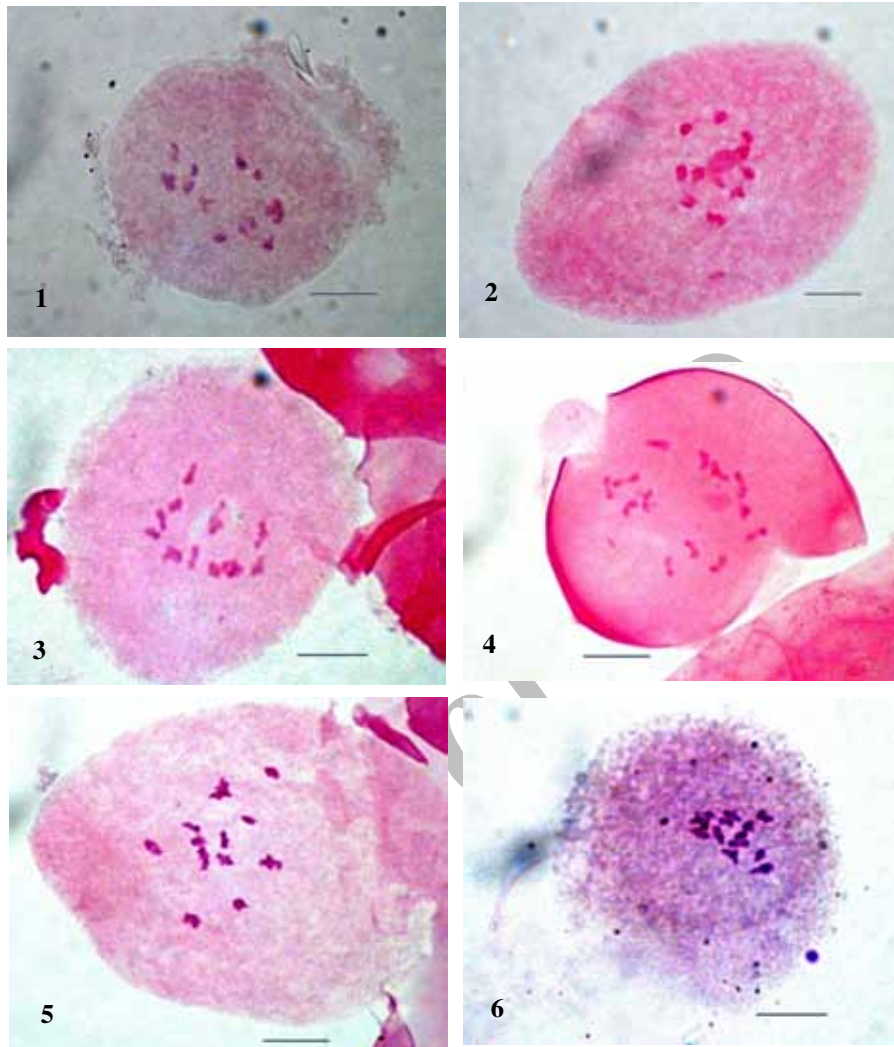
There is no prior record of the chromosome number for the section *Stenoloma* Juz. Our count of n=13 in *C. komarowii* (O. Kuntze) C. Winkl. is the first chromosome record of the section. Besides of 13 bivalants, two B- chromosome are observed in Fig. 9.

***Cousinia* species of undetermined section**

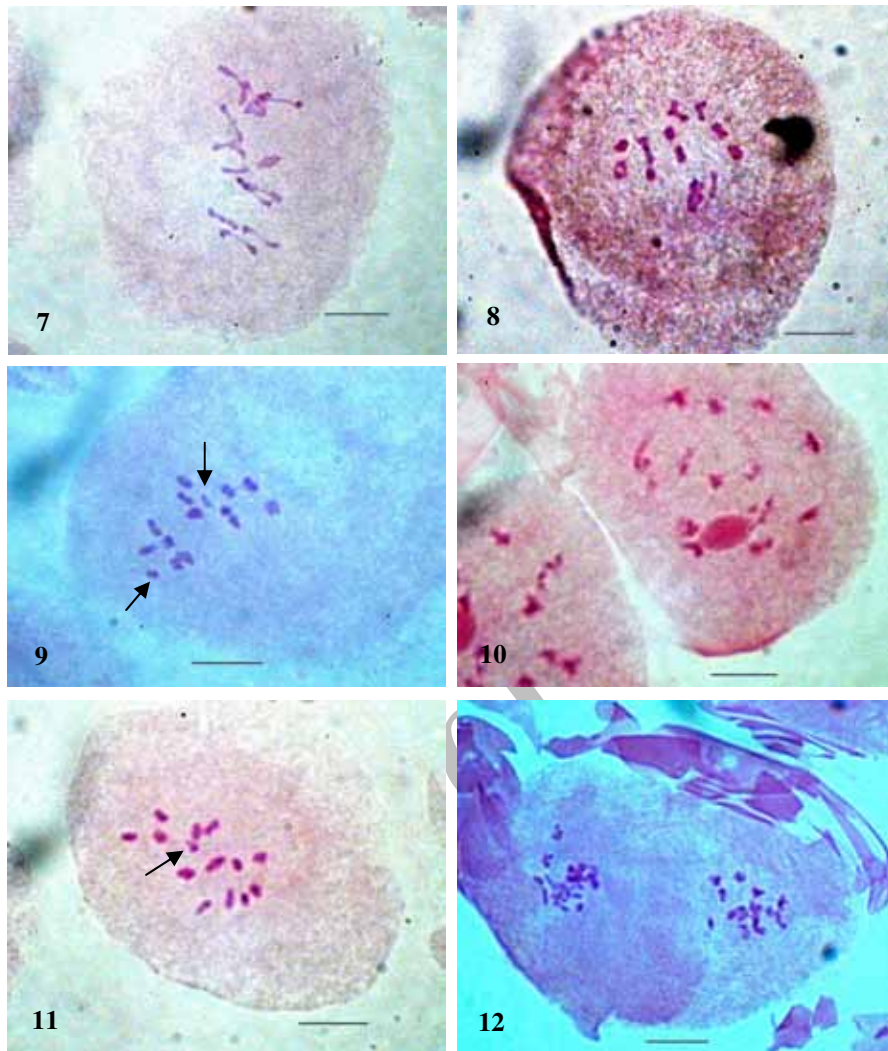
***C. bienerti* Bunge**

Khorasan: 30 km Sabzevar to Esfarayen, 1600 m, 1 June 2006, Djavadi, Eskandari & Torabi (IRAN 43523). n=13 (Figs 10, 11 & 12)

In diakinesis stage, 13 bivalants were observed. In addition to 13 bivalants, one B-chromosome were found at metaphase I of meiosis stage (Fig. 10). Chromosome segregation at metaphase II was also 13:13 (Fig. 12). According to our data, this is the first chromosome count for this species.



Figs 1-6. Meiosis in *Cousinia* ssp. Fig. 1. *C. piptocephala* (n=13), metaphase I. Fig. 2. *C. smirnowii* (n=12), diakinesis I. Fig. 3. *C. lepida* (n=13), metaphase I. Fig. 4. *C. turcomanica* (n=13), metaphase I. Fig. 5. *C. deserti* (n=12), metaphase I. Fig. 6. *C. neurocentra* (n=12), metaphase I (bar 10 μ m).



Figs 7-12. Meiosis in *Cousinia* ssp. Fig. 7. *C. decipiens* (n=13), metaphase I. Fig. 8. *C. esfandiari* (n=13), metaphase I. Fig. 9. *C. komarowii* (n=13), metaphase I, showing B-chromosome (arrows). Figs 10-12. *C. binerti* (n=13); 10. diakinesis, 11. metaphase I, showing B-chromosome (arrow). 12. metaphase II (bar 10 μ m).

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Address of the author: S.B. DJAVADI, Department of Botany, Iranian Research Institute of Plant Protection, P.O. Box 1454, Tehran 19395, Iran.

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