

**Zeitschrift:** Bulletin de la Société Neuchâteloise des Sciences Naturelles  
**Herausgeber:** Société Neuchâteloise des Sciences Naturelles  
**Band:** 121 (1998)

**Artikel:** Chromosome studies and distribution of nine species of Cousinia section Stenocephalae (Asteraceae) in Iran  
**Autor:** Ghaffari, Seyyed Mahmood / Djavadi, S.B.  
**DOI:** <https://doi.org/10.5169/seals-89509>

### **Nutzungsbedingungen**

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

### **Conditions d'utilisation**

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

### **Terms of use**

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

**Download PDF:** 09.02.2026

**ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>**

## CHROMOSOME STUDIES AND DISTRIBUTION OF NINE SPECIES OF *COUSINIA* SECTION *STENOCEPHALAE* (ASTERACEAE) IN IRAN

SEYYED MAHMOOD GHAFARI<sup>1\*</sup> and S. B. DJAVADI<sup>2</sup>

<sup>1</sup>Institute of Biochemistry and Biophysics, University of Tehran, P.O. Box 13145-1384, Tehran, Iran.

<sup>2</sup>Plant pests and Diseases Research Institute, Section Botany, Ministry of Agriculture, Tehran, Evin, Iran.

### Résumé

Quelque 9 espèces iraniennes de *Cousinia* sect. *Stenocephalae* (Asteraceae) font l'objet d'une étude caryologique. Les nombres chromosomiques de base,  $x=13$ , et la valence diploïde paraissent homogènes. Les régions du nord-est de l'Iran constituent le centre de diversité et d'origine de la section *Stenocephalae*.

### Summary

Some nine Iranian species of *Cousinia* sect. *Stenocephalae* (Asteraceae) are the subject of a cytological study. The base chromosome number is  $x=13$ , and the diploid valence appears homogeneous. Northeastern Iran appears to be the center of diversity and origin of *Cousinia* section *Stenocephalae*.

### INTRODUCTION

*Cousinia* section *Stenocephalae* Bunge, with thirty-four species, is the third largest of the genus after sections *Cynaroideae* and *Alpinae* respectively (RECHINGER, 1972). Of these, twenty-three are endemic to Iran. To date, chromosome studies on the section have been limited to six species: CHYKASANOVA (see FEDOROV, 1974), AFZAL-RAFII (1980), GHAFARI & CHARIAT-PANAHI (1985), and TSCHERNEVA (1985). In this paper, we report on nine species that are endemic (except one) to Iran. We also present chromosome counts and notes on their meiotic behavior for the first time.

### OBSERVATIONS

The results of this study are summarized in Table 2. However, each species is dealt with in detail here.

\* Author for correspondence

*Cousinia aggregata* DC.

This species is endemic to Iran, and is found in the central and eastern parts of the country. Meiosis was observed in three collections (Table 1), with 13 bivalents, three of which were associated with the nucleolus in diakinesis (fig. 1, 2). Occasionally, in some cells, one quadrivalent was observed. Chiasma frequency was 1.86, 1.80 and 1.68 per bivalent. This is the first chromosome count for this species.

*Cousinia assyriaca* Jaub. & Spach.

This species is endemic to Iran. Meiosis in this species is regular with 13 bivalents, each of which usually had two terminal chiasmata per arm (fig. 3, 4).

The mean number of chiasmata was estimated at 1.56 for each bivalent at Metaphase I. Occasionally, in some cells, one quadrivalent was observed. This is the first chromosome count for this species.

*Cousinia calolepis* Boiss.

This species is endemic to Iran, and is found in a restricted area of the country. Meiosis in this species was regular and showed thirteen bivalents at Metaphase I, most of which appeared in a ring conformation (fig. 5, 6). The mean number of chiasmata was estimated 1.82 for each bivalent at Metaphase I. This is the first chromosome count for this species.

*Cousinia commutata* Bunge

The previous report of this species is  $2n=26$  (AFZAL-RAFII, 1980). In our study, meiosis was seen at diakinesis, Metaphase I, and Anaphase one. Thirteen bivalents were observed at Metaphase I, but also in some cells, one, two or three quadrivalents were observed. Chiasma frequency was 1.84 per bivalent. In diakinesis, three bivalents of chromosomes were associated with nucleolus (fig. 7, 8).

*Cousinia cylindracea* Boiss.

This species is endemic to Iran, and is found in many parts of the country. Meiosis in this species showed 13 bivalents at Metaphase I, but in some cells, one or two quadrivalents were observed (fig. 9, 10). The chiasma frequency determined from six cells, were 1.78 per bivalent. This is the first chromosome count for this species.

*Cousinia gaubae* Bornm.

This species is endemic to Iran, and is found in a restricted area of the country (Tehran, Karaj, and Qazvin). The previous chromosome count of this species is  $n=13$  (GHAFARI & CHARAT - PANAH, 1985). We found 13 bivalents of 11 bivalents and one quadrivalent at Metaphase I. Three bivalents were associated with nucleolus at diakinesis stage. The mean number of chiasmata per each bivalent was 1.86 at Metaphase I. Chromosome segregation at Anaphase I was also (13-13) (fig. 11,12).

*Cousinia glaucopsis* Bornm. & Rech.f.

This species is endemic to Iran, and is distributed in the areas of Damghan, Semnan, Firouz-kuh, and Gorgan. Meiosis in this species was regular and showed 13 bivalents at Metaphase I which most of them were in a ring conformation.

There are usually two terminal chiasma per arm. The mean number of chiasmata per each bivalent was 1.81 at Metaphase I. In diakinesis stage 3 bivalents of chromosomes were associated with nucleolus (fig. 13, 14). This is the first chromosome count for this species.

*Cousinia nekarmanica* Rech.f.

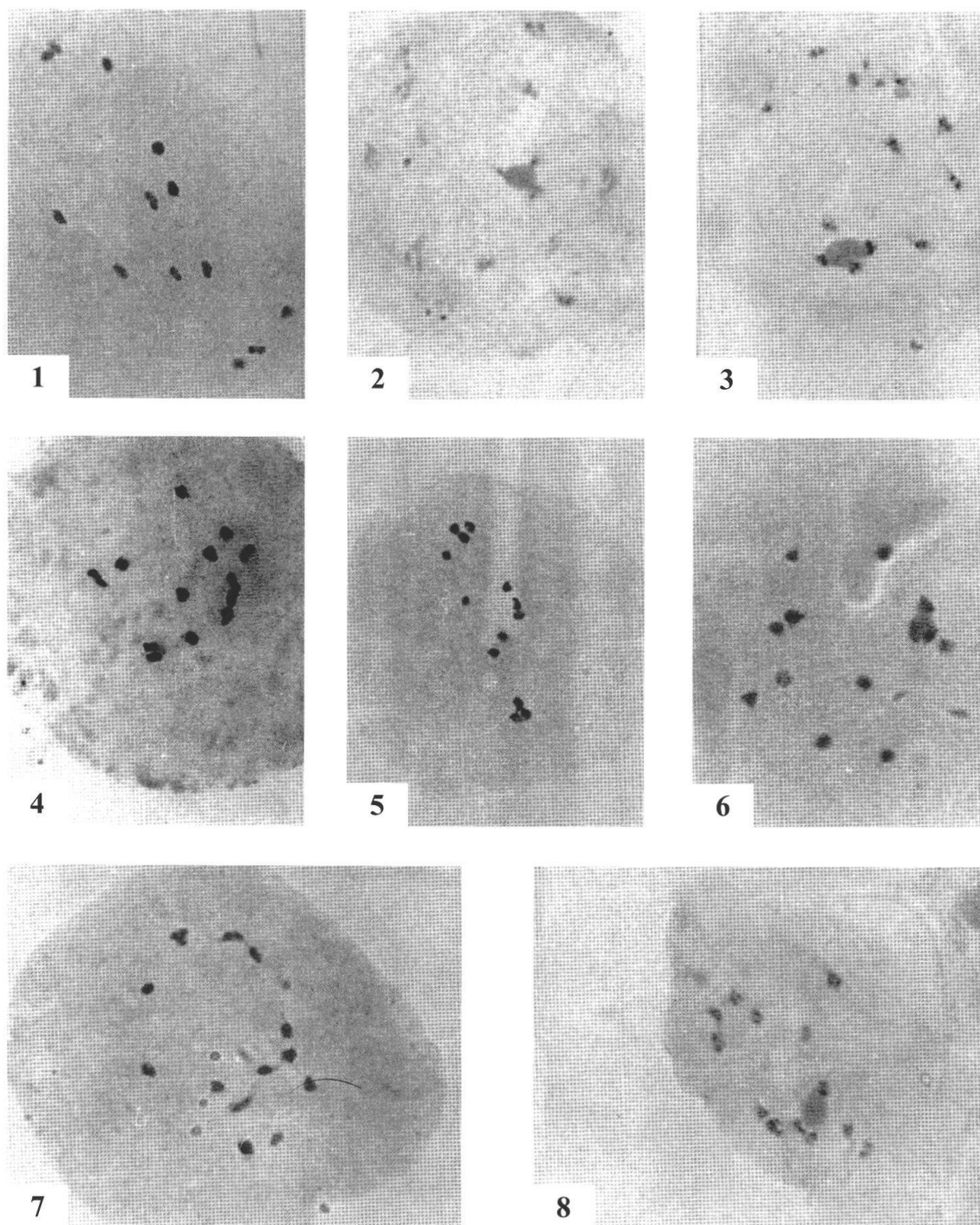
This species is endemic to Iran, and is found in a restricted area of the country (Semnan, Damghan, and Firouz-kuh). Meiosis was regular and shows 13 bivalents at Metaphase I (fig. 15, 16). Occasio-

Taxon	Altitude (m)	Locality
<i>C. aggregata</i> Dc.	2320	Tehran: Damavand, between Deh-e-chenar & Daryacheh-e-Tar
<i>C. aggregata</i> DC.	1630	Tehran: kuh-Dasht
<i>C. aggregata</i> DC.	2200	Tehran: Ab-Ali
<i>C. assyriaca</i> Jaub. & Spach	1200	Karaj: Dehak
<i>C. calolepis</i> Boiss.	2220	Karaj: Shahrestanak
<i>C. commutata</i> Bunge	2300	Karaj: Chalus road, Baladeh
<i>C. cylindracea</i> Boiss.	1750	Tehran: Kuh-Dashteh
<i>C. gaubae</i> Bornm.	1770	Karaj: 20 km towards Chalus
<i>C. glaucopsis</i> Bornm. & Rech. f.	2050	Firuz-kuh: 17 km towards Semnan
<i>C. nekarmanica</i> Rech. f.	2050	Firuz-kuh: 17 km towards Semnan
<i>C. stahlia</i> Bornm. & Gauba	1750	Qazvin: between Abhar & Khorramdareh

**Table 1:** The origin of material used in chromosome studies.

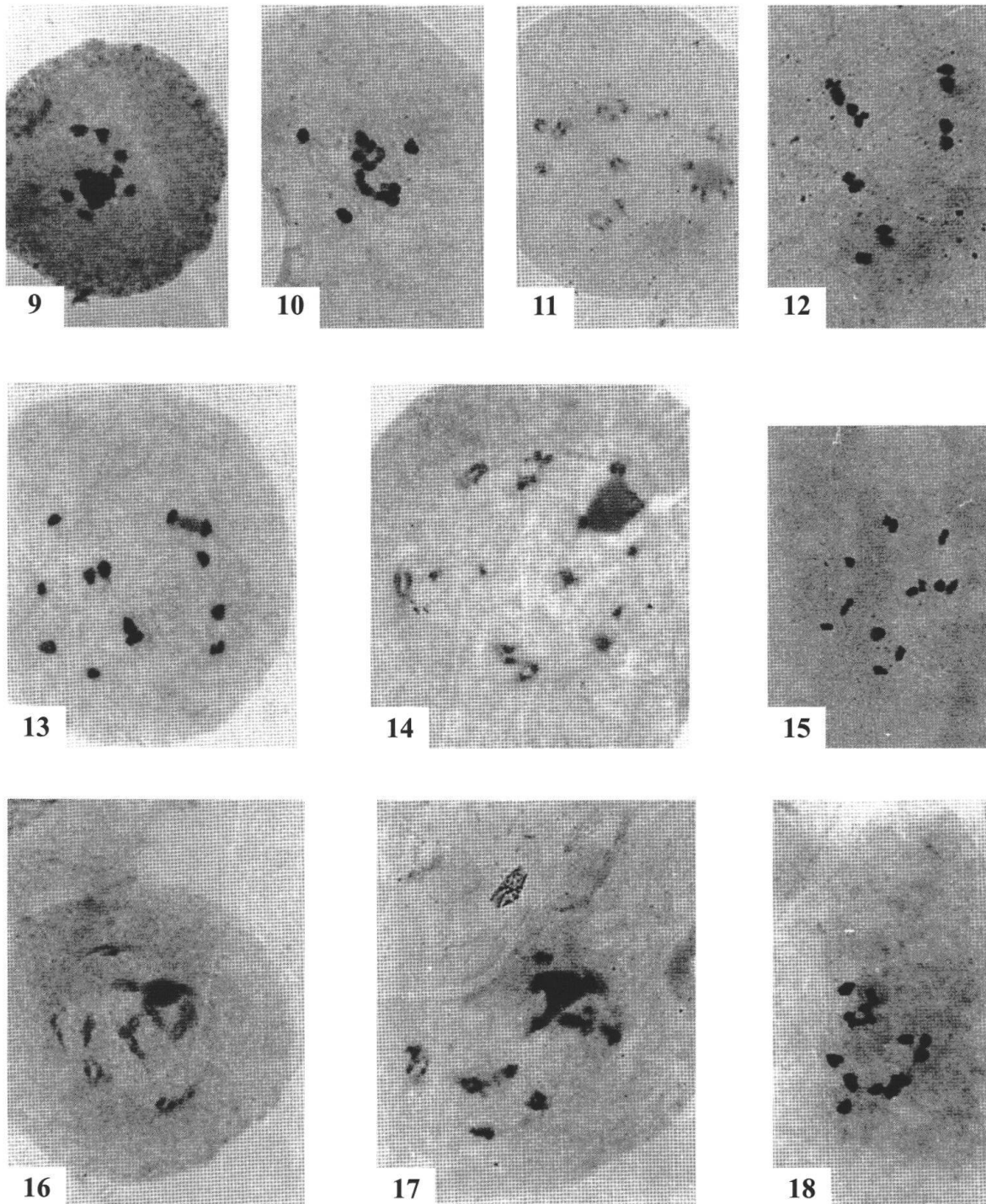
Taxon	No of cells	Mean chiasma frequency per bivalent	Present count (n)	Previous count	
				n	2n
<i>C. aggregata</i>	16	1.86	13	.	.
<i>C. aggregata</i>	14	1.80	13	.	.
<i>C. aggregata</i>	7	1.68	13	.	.
<i>C. albiflora</i>	.	.	.	.	26
<i>C. assyriaca</i>	14	1.56	13	.	.
<i>C. calolepis</i>	10	1.82	13	.	.
<i>C. commutata</i>	12	1.84	13	.	26
<i>C. cylindracea</i>	6	1.78	13	.	.
<i>C. gaubae</i>	22	1.86	13	13	.
					GHAFFARI & CHARIAT-PANAHI 1985
<i>C. glaucopsis</i>	8	1.81	13	.	.
<i>C. hypopolia</i>	.	.	.	.	18
					CHYKASANOVA
<i>C. lucida</i>	.	.	.	.	26
					AFZAL-RAFII 1980
<i>C. nekarmanica</i>	28	1.63	13	.	.
<i>C. recurvata</i>	.	.	.	12	.
					AFZAL-RAFII 1980
<i>C. stahlia</i>	20	1.58	13	.	.

**Table 2:** Chromosome number and chiasma average in *Cousinia* section *Stenocephalae*.



**Figures 1-8:** Meiosis. 1-2 *C. aggregata*, metaphase I and diakinesis. 3-4 *C. assyriaca*, diakinesis and metaphase I. 5-6 *C. calolepis*, metaphase I and diakinesis. 7-8 *C. commutata*, metaphase I and diakinesis. All diakinesis show 3 bivalents that they are associated with nucleolus (magnification: 1320 x).





**Figures 9-18:** Meiosis. 9-10 *C. cylindracea*, diakinesis, and metaphase I. 11-12 *C. gaubae*, diakinesis and metaphase I. 13-14 *C. glaucopsis*, both are diakinesis. 15-16 *C. stahlia*, diakinesis and metaphase I. 17-18 *C. Stahlia*, diakinesis and metaphase I. All diakinesis (except one) showing e bivalents that they are associated with nucleolus. In Fig. 13 two bivalents are associated with nucleolus. (magnification: 1320 x).

nally, in some cells, one quadrivalent was observed. Chiasma frequency in 14 cells gave a mean of 1.69 per bivalent. This is the first chromosome count for this species.

*Cousinia stahlia* Bornm. & Gauba

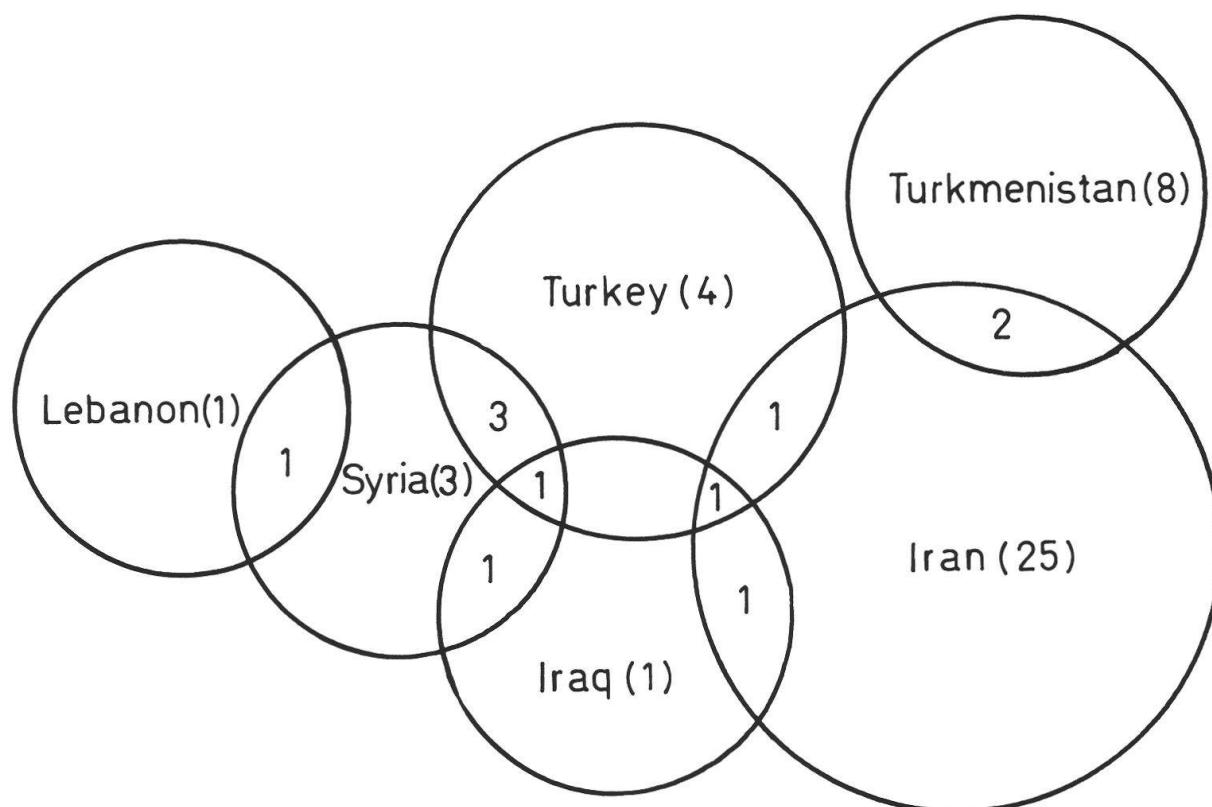
This species is endemic to Iran and Turkmenistan. Eleven bivalents and one quadrivalent were observed at Metaphase I. Three pairs of chromosomes were associated with the nucleolus at diakinesis (fig. 17, 18). Chiasma frequency was 1.58 per bivalent. This is the first chromosome count for this species.

#### DISCUSSION

RECHINGER (1986) reported that *Cousinia* with 662 species is the third largest genus in the Asteraceae, and is also the lar-

gest in the tribe *Cynareae*. The distribution of *Cousinia* overlaps the Irano-Turkmenistanian region, but most of the species are concentrated in the mountains of Iran and Turkmenistan (KNAPP, 1987).

*Cousinia* section *Stenocephalae* is one of the largest sections of the genus, and is distributed in southwestern Asia (fig. 19). It appears that northeastern Iran is the center of diversity and origin of this section because of the 34 species in the section, 22 of the 25 species that occur in Iran are endemic. Iran shares 2 species with Turkmenistan (*Cousinia stahlia* and *C. hypopolia* Bornm. & Sint.) and one each with Iraq, Syria, and Turkey (*C. stenocephala*). Turkmenistan (Kopetdagh region) has 8 species, of which 6 are endemic (*C. oreoxerophila*, *C. mucida*, *C. leptcephala*, *C. albiflora*, *C. chejra-*



**Figure 19:** Distribution of different species of the section *Stenocephalae*. Overlapping areas show the common species.

*densis* and *C. chaetocephala*). *Cousinia stenocephala* Boiss. is the only species native to Iraq that ranges to Turkey and Syria. Turkey has 4 species, of which one (*C. davisiana* Hub.-Mor.) is endemic (HUBER-MORATH, 1975). Syria has 3 species, namely, *C. foliosa* Boiss. & Bal., *C. stenocephala*, and *C. ramosissima* Boiss., the former of which ranges to Lebanon (POST, 1933). As is shown in fig. 19, the density and variation of the section decreases from east to west where only a single species occurs in Lebanon.

The conclusions obtained from the chromosome studies on pollen mother cells, show the same base chromosome number ( $x=13$ ) in all species. From a cytological point of view, the presence of three chromosomes associated with the nucleolus in diakinesis stage, quadrivalent combinations, and eventually the similarity of chiasma frequency average for each bivalent, verify the affinity of these species to another (table 2). Therefore, it appears that the placement of these species in section *Stenocephalae* based on Rechinger classification (RECHINGER, 1972) is in accordance with their cytological affinities. There is only one base chromosome number in section *Stenocephalae*, i.e.  $x=13$ . The presence of  $x=9$  and  $x=12$  seems to be contradictory (table 2).

In a cytological investigation of *C. recurvata* DC., AFZAL-RAFFII (1980) reported its chromosome number as  $n=12$ . Since quadrivalent combination in meiosis of the species under this section were observed in plenty, the error in the chromosome counts

is related to one tetravalent instead of one bivalent (l.c.). CHYKASANOVA (see FEDOROV, 1974) gave the chromosome count of *C. hypopolia* as  $2n=18$ . In this species, it seems that the error in the chromosome count is either due to the misidentification of the species or simply a wrong chromosome count. Besides, in the other cases on chromosome reports, the writer (l.c.) disagrees with other investigator's opinions. For example, the chromosome complement in *C. karatavia* Regel & Schmalh. was reported by him as  $2n=26$ , was also counted as  $2n=36$  (TSCHERNEVA, 1985). Also,  $2n=18$  for *C. bekeri* Trautv. which belongs to the section *Cynaroideae*, seems to be erroneous, because according to the other workers (GHAFFARI, 1984, 1986 and 1987; ARYAVAND, 1975; AFZAL-RAFFII, 1980 and TSCHERNEVA, 1985), the base chromosome number in this section was reported as  $x=12$ . Consequently, the base chromosome number in section *Stenocephalae*, follows a general trend of stability. It also appears that an important role was played by the heterozygotic translocation in the evolution of this section.

#### ACKNOWLEDGEMENTS

Research was supported by the Plant Pests and Diseases Research Institute (Section Botany), Ministry of Agriculture, and Institute of Biochemistry and Biophysics, University of Tehran. We thank Prof. M. Iranshahr for his help and identification of the plants.

#### REFERENCES

- AFZAL-RAFFII, Z. 1980. Contribution à l'étude cytotaxonomique de quelques *Cousinia* d'Iran. *Rev. Biol. Ecol. Medit.* 7: 6-14.
- ARYAVAND, A. 1975. Contribution à l'étude cytotaxonomique de quelques Angiospermes de l'Iran. *Bot. Notiser* 128: 299-311.



- FEDOROV, A.A. (ed.) 1974. Chromosome numbers of flowering plants. *Königstein*.
- GHAFARI, S.M. 1984. Chromosome counts LXXXIII. *Taxon* 33: 353.
- GHAFARI, S.M. 1986. Chromosome counts XCIII. *Taxon* 35 (4): 907.
- GHAFARI, S.M. 1987. Chromosome studies in some flowering plants of Iran. *Rev. Cytol. Biol. Veget-Bot.* 10: 3-8.
- GHAFARI, S. & CHARIAT-PANAHI, S. 1985. Chromosome count of some Angiosperms from Iran. *Iran. J. Bot.* 3 (1): 67-73.
- HUBER-MORATH, A. 1975. *Cousinia* Cass. In: DAVIS, P.H. et al. *Flora of Turkey and the East Aegean Islands* 5: 329-353. *Edinburgh*.
- KNAPP, H.D. 1987. On the distribution of the genus *Cousinia* (Compositae). *Pl. Syst. Evol.* 155: 15-25.
- POST, G.E. - (1933). *Flora of Syria, Palestine and Sinai*, II: 84-87. American University of Beirut.
- RECHINGER, K. H. 1986. *Cousinia* - morphology, taxonomy and phytogeographic implications. *Proc. Royal Soc. Edinburgh*, 89 B: 45-58.
- TSCHERNEVA, O.V. 1985. Chromosome numbers in the species of the genus *Cousinia* (Asteraceae) in the flora of the USSR. *Bot. Zurn. SSSR.* 70 (7): 856-857. (in Russian).
- WILSON, G.B., 1945. The Venetian turpentine mounting medium. *Stain Technology* 20: 133-135.
-