CHROMOSOME STUDIES IN IRANIAN COMPOSITAE

(Dedicated to prof. Dr. E. Esfandiari on the occasion of his 80th birthday).

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Ghaffari, S.M.1989 12 31 : Chromosome studies in Iranian *Compositae*. –*Iran. Journ. Bot. 4(2):* 189-196. Tehran.

Original chromosome observations including number for 28 species representing 16 genera are reported. 3 of these are endemic to Flora Iranica area and 10 species are reported for the first time. Meiotic behavior are noted in some species.

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مطالعات کروموزومی روی خانواده Compositae در ایران

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مشاهدات کروموزمی ۲۸ گونه در ۱۶ جنس گزارش می‌شود ۳۰گونه‌ازگونه‌های مذکور انحصاری منطقه فلورا ایرانیکا و ۱۰ گونه آن برای اولین بار شمارش کروموزمی شده است . رفتارهای کروموزمی در تقسیم میوز تعدادی از گونه‌ها مورد توجه قرار گرفته است .

Introduction

Although the chromosome number of some species of *Compositae* have been previously reported (Ghaffari 1984, 1985, 1986), but this is the first of a series of publications dealing with the chromosome number in *Compositae* which is reported independently. In this paper I have reported chromosome number for 28 species representing 16 genera. Counts are published here for the first time for 10 species and two genera. Chromosome studies for some species have been given from different collections. I have indicated not only collection data and number of chromosomes, but also notes on meiotic behavior and for plants in which meiosis were found to be irregular. It should be pointed out that in this publication I have used the following references: Federov 1969, Moore R.J. 1965-1974, Goldblatt, 1975-1981, Moore D. 1982. Voucher specimens are preserved in the Herbarium of Research. Institute of Forests and Rangelands (TARI).

Materials and Methods

Immature capitula were collected and immediately fixed in the field in the Piennar's fixing fluid (ethanol 95%; chloroform; propionic acid; 6; 3; 2 V/V). Floret buds were squashed and stained with Fe-acetocarmine. Chromosome counts were carried out from the meiotic microsporocytes which were prepared as mentioned above. All slides were made permanent by the venetian turpentine (Wilson 1945). Photographs of chromosomes were taken on a Wild photomicroscope at initial magnification of 400 X and 500 X.

Observation and Discussion

Achillea santolina L.; n=9.

Bodjnourd, 571.

The basic number of the genus *Achillea* is (x = 9), and many polyploid species with: (4x = 36), (6x = 54) and (8x = 72) were found (Federov 1969). In the Goldblatt (1984) index 2n=54 are reported for this species. It seems this species has both diploid and hexaploid races. This is the first diploid chromosome number report for the species. Nine bivalents at diakinesis were found (Fig. 1A).

Amberboa amberboi (L.) Tzvel.; n = 14.

Gonabad, 572.

Meiosis in this species was shown to be

regular forming fourteen bivalents at first metaphase (Fig. 1B).
This is the first chromosome number report for this taxon, and new basic number (x = 14) for the genus.

Carduus pycnocephalus L.; n=31.

Karaj: Koushk-Zar 1963.

Carduus transcaspicus Gandog. subsp. **macrocephalus** (Arenes) Kazmi; n = 17.

Bodjnourd 574.

This subsp. is endemic to Iran, and chromosome number is reported for the first time (Fig. 1C).

Carthamus lanatus L. subsp. **turkestanicus** (M. Pop.) Hamet.; n = 32.

Kashmar, 578.

Five different collections of this species were studied from: Kashmar, Bodjnourd, Nayshabour, Mashhad and Karaj. They all had n = 32 chromosomes (Fig. 1D).

Carthamus oxyacanthus M.B.; n=12.

Karaj: Koushk-Zar 5862.

This species is found almost in all areas of Iran.

Carthamus tinctorius L.; n=12.

Kashmar 577.

The chromosome number of wild and cultivated plants were n=12 (Fig. 1E).

Centaurea ammocyanus Boiss.; n = 8.

Karaj: Koushk-Zar 5662.

This is the first chromosome number report for this taxon (Fig. 1F).

Centaurea behen L.; n=18.

Karaj: Samgh-abad 7762.

Previous reports for this taxon are 2n=26 and 2n=36 + 3B. Occasionally in some cells multiple of chromosomes at first metaphase were observed, but B-chromosomes were not observed (Fig. 1G).

Centaurea brugueriana (DC.) Hand-Mazz. subsp. **belangeriana** (DC.) Bornmm.; n=10.

Torbat-Jam. 579.

Meiosis in this species was regular and showed ten bivalents at diakinesis. Chromosome segregation at first anaphase was also (10 -- 10) (Fig. 1H--I).

This is the new chromosome number report for this subspecies. Podlech, D. et A. Dieeterle (1969)

reported 2n=22 for this subspecies. It seems that their plant has been an aneuploid.

Centaurea depressa M.B.; n=8.

Karaj: Mard-abad 3462.

Previous reports for this taxon are 2n=16 and 2n=18. I have studied four different collections of this species from: Karaj, Kashmar, Ghouchan and Nayshabour. It indicates that meiosis in this species regularly exhibits eight bivalents at diakinesis and (8—8) chromosome segregation at first anaphase (Fig. 1 J—K).

Centaurea hyalolepis Boiss.; n=11.

Dezful: NE 2—1062.

In the Goldblatt (1981) Index 2n=20 has been reported for the *C.hyalolepis* subsp. *hyalolepis* (Fig. 2A).

Centaurea iberica Trev.; n=10.

Bodjnourd 5712.

Previous reports for this taxon are 2n=20 and 2n=16, but I found n=10 chromosome in six different collections including: Bodjnourd, Ghouchan, Sarakhs, Gonabad, Torbat-Hydari and Kashmar for this species (Fig. 2B).

Centaurea repens (L.) DC. ; n=13.

Karaj: Mard-abad 4462.

This agrees with previous reports.

Centaurea sintenisiana Cand.; n=10.

Bodjnourd 5711.

Meiosis in this species was regular and showed ten bivalents at first metaphase. There was usualy one chiasma per arm and these were terminally located (Fig. 2C). This is the first chromosome number report for this taxon.

Centaurea solstitialis L.; n=8.

Karaj: Minavand 9962.

Previous reports for this taxon are 2n=16 and 18.

Centaurea virgata Lam. subsp. **squarrosa** (Willd.) Boiss.: n=18.

Karaj: Mard-abad 17163.

Previous report for this subspecies. is n=18 (cf. Moore, R.J. 1977).

Cichorium intybus L.; n=9.

Karaj: Mard-abad 5262.

Cnicus benedictus L.; n=11.

Mashhad: 50 km. to Nyshabour 5735.

Echinops ritro L.; n=16.

Karaj: Minavand 862.

Previous reports for this taxon are 2n=30 and 2n=32. Occasionally in some cells multiple of chromosomes at first metaphase and (15—17) chromosome segregation at first anaphase were observed (Fig. 2D—E). The resutlts indicated that this plant might be an aneuploid.

Helichrysum rubicundum (C. Koch) Bornm.; n=14.

Karaj: Minavand 8662.

This is the first chromosome number report for this taxon.

Lapsana communis L.; n=7.

Karaj: Valian 15363.

Previous reports for this species are 2n=16 and 14 (Fig. 2H).

Leontodon asperrimus Boiss. ; n=4.

Karaj: Minavand 8862.

This agrees with previous reports.

Onopordum leptolepis DC.; n=17.

Mashhad, 5744.

Previous report for this species is 2n=34. (cf. Moore, R. j 1977).

Scariola orientalis (Boiss.) Sojak. subsp. **orientalis**; n=18.

Firouz-Kouh: 40 km. to Damavand 17264.

Occasionally in some cells multiple of chromosomes at first metaphase and laggard chromosome at anaphase II were observed (Fig. 2F—G). This is the first chromosome number report for this species, x=18 for the genus.

Serratula latifolia Boiss.; n=15.

Ghaen: 20 km. to Birjand 5747.

This species is endemic to Flora Iranica area (Rechinger, K.H. 1980) and Its chromosome number is reported for the first time (Fig. 2I).

Silybum marianum (L.) Gaertn.; n=17;

Bodjnourd 5748.

This agrees with previous reports.

Sonchus asper (L.) Hill.; n=9

Mashhad: 53 km. to Ghouchan 5749.

Previous reports are 2n=18 and 36 which indicate that the species has both diploid and tetraploid races.

Acknowledgements

I should like to thank Dr. E. Esfandiari and Dr. M. Iranshahr for identification of the plants.

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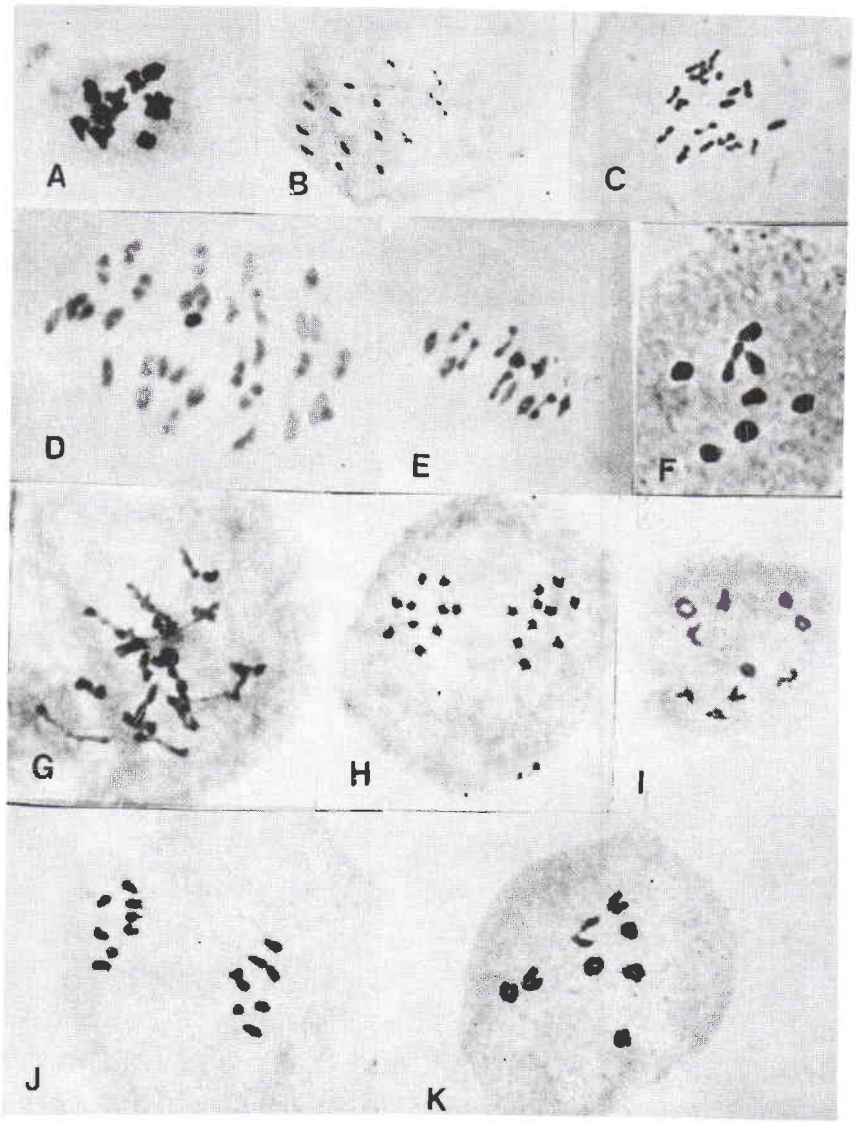

Fig. 1. Meiosis in *Compositae* species. -- A: *Achillea santolina*, n=9. — B: *Amberboa amberboi*, n=14. —C: *Carduus transcaspicus*, n=31. — D: *Carthamus lanatus* subsp. *turkestanicus*, n=32. —L: *Carthamus tinctorius*, n=12. —F: *Centaurea ammocyanus*, n=8. —G: *Centaurea behen*, n=18. —H & I: *Centaurea brugueriana* subsp. *belangeriana*, n=10; H: Anaphase I. I: Diakinesis: — K: *Centaurea depressa*, n=8, J: Anaphase I.K: Diakinesis

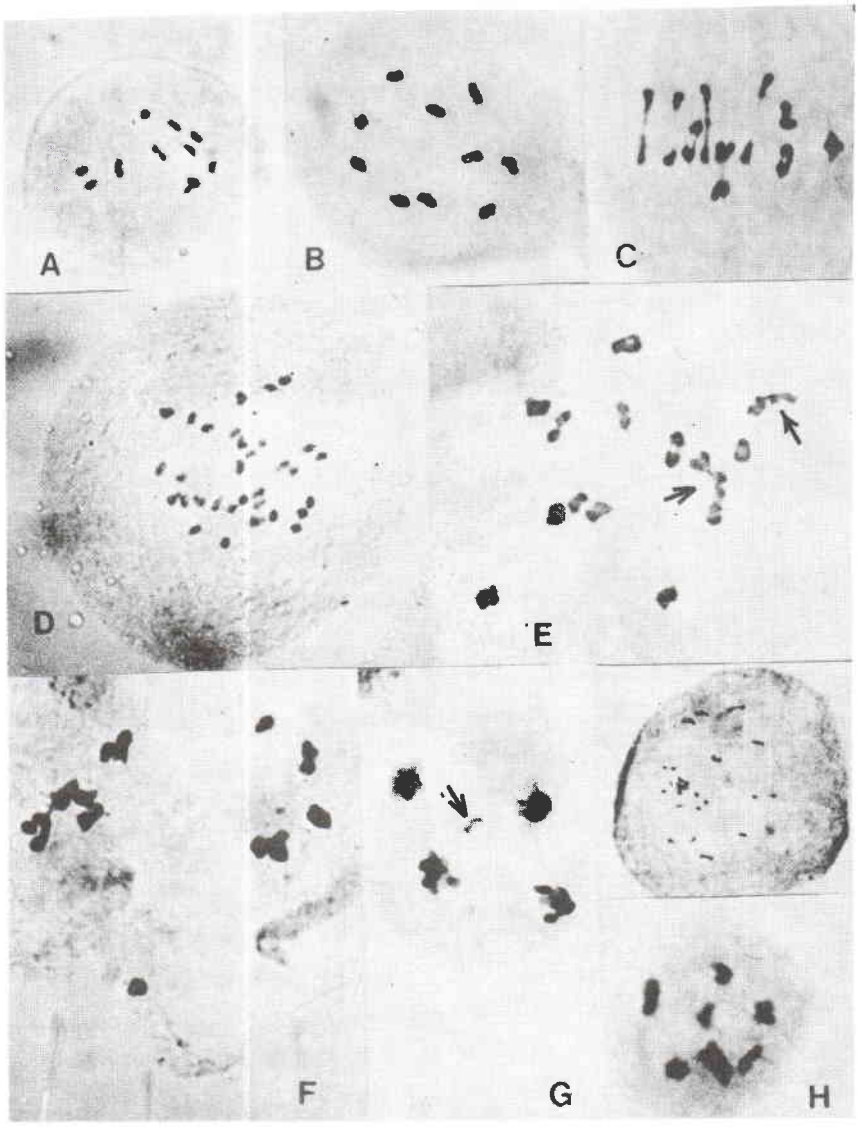

Fig. 2. Meiosis in *Compositae* species. —A: *Centaurea hyalolepis*, n=11. —B: *Centaurea iberica*, n=10. —C: *Centaurea sintenisiana*, n=10. —D & E: *Echinops ritro*, n=16, D: Anaphase I, showing (15—17) segregations. E: Methaphase I, showing 11 II+ 1IV+1VI. —F & G: *Scariola orientalis*, n=18, F: Metaphase I, showing multiple of chromosomes. —G: Late anaphase II, showing laggard chromosome (arrow). — H: *Lapsana communis*, , n=7. — I: *Serratula latifolia*, n=15.