شمارش کروموزومی برخی از گونه‌های نهاندانه از ایران

Chromosome counts of some Angiosperm species from Iran (III)

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مشاهدات کروموزومی برای ۱۷ گونه متعلق به ۱۲ تیره ارایه شده است. شمارش کروموزومی گونه *Amberboa nana*, n=16 (Asteraceae) و زیرگونه *Camelina rumelica* subsp. *transcapica*, n=13 (Brassicaceae) برای اولین بار گزارش شده است. شمارش کروموزومی برای شش گونه شامل: *Rhagadiolus stellatus* (n=5), *Campanula raponcoloides* (n=34), *Campanula trachelium* (n=10), *Helianthemum salicifolium* (n=10), *Sorghum halepense* (n=20) و *Consolida orientalis* (n=8) برای فلور ایران جدید می‌باشد. همچنین سطح تتراپلوییدی n=12 برای گونه *Linaria simplex* نیز برای اولین بار ارایه شده است. متن کامل مقاله در قسمت انگلیسی ارایه شده است.

واژه‌های کلیدی: نهاندانه، شمارش کروموزومی، میوزی، میتوزی

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CHROMOSOME COUNTS OF SOME ANGIOSPERM SPECIES FROM IRAN (III)

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Abstract

Original meiotic or mitotic chromosome counts are presented for 17 species in 12 families of angiosperms from Iran. Chromosome counts for *Amberboa nana*, n=16 (Asteraceae) and *Camelina rumelica* subsp. *transcapica*, n=13 (Brassicaceae) are repoted for the first time. Chromosome numbers for six species including: *Rhagadiolus stellatus* (n=5), *Campanula raponcoloides* (n=34), *Campanula trachelium* (n=10), *Helianthemum salicifolium* (n=10), *Sorghum halepense* (n=20), *Consolida orientalis* (n=8) are new reports for the flora of Iran. Also, the tetraploid level of n=12 for *Linaria simplex* is reported here for the first time.

Key words: Angiosperm, Chromosome count, Meiotic, Mitotic

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Introduction

Chromosome number, karyotype and meiotic pairing behaviour at methaphase-I in species and hybrid can provide useful information for the assessment of taxonomic relationships (STACE 2000). The purpose of this and others (GHAFFARI & SANEI CHARIAT-PANAHI 1985, GHAFFARI 1987a, 1987b, 1988, 2006a, 2006b) coming in the same series, is to give information concerning the chromosome counts of angiosperm taxa of the Iranian flora. In the present study, chromosome counts for 17 species representing 12 families are reported.

Materials and Methods

Meiotic chromosomes were observed in pollen mother cells. Floral buds of appropriate size were fixed in absolute ethanol: chloroform: propionic acid (6:3:2) for 24 hours, transferred to 70% alcohol and stored under refrigeration until analyzed. Anthers were squashed and stained in 2% acetocarmine. Chromosome counts were carried out from microsporocytes in various stages of meiosis. For somatic chromosome study, the seeds were germinated on moist filter paper in the laboratory (ca. 21º-25º). The growing root tips of ca. 1.0-1.5 cm long were cut and pretreated in 0.002 M 8-hydroxyquinoline (3 hrs.) at 20º C. After treatment, the root tips were fixed in the above fixative for 24 hrs. The chromosomes were stained by the Feulgen method after hydrolysis in 1N HCl for 10 minutes at 60º C. root tips were then squashed in 2% acetocarmine. Voucher specimens are deposited in the Central Herbarium of Tehran University ("TUH").

Results and Discussion

Apiaceae

- *Cuminum cyminum* L.

Khorasan: Torbat-hydariyeh

Previous report for this taxon was 2n=2x=14 (SHEIDAI *et al.* 1996a) from Iran. The present count from the new locality showed seven bivalents at first metaphase and 14 chromosomes at metaphase of mitosis (Figs 1, 2). Also most of other stages of meiosis was regular and showed chromosome

segregation (10-10-10-10) at anaphase-II (Fig. 3) and seven dyads in each pole of second metaphase (Fig. 4). The only other count (2n=18) for this taxon by SUBRAMANIAN (1986), is questionable.

Asteraceae

- *Amberboa nana* (Boiss.) Iljin

Tehran: 60 km towards Qom.

Meiosis in this species was regular and showed 16 bivalents at methaphase-I (Fig. 5). According to information, this is the first chromosome count for this species.

- *Rhagadiolus stellatus* (L.) Gaertn.

Flora of Iran posses only this species of the genus (GHAHREMAN & ATTAR 1999). First previous count for this taxon is 2n=10 (STEBBINS 1953), which agrees with the present count of n=5 (Fig. 6). This count is new for the flora of Iran.

Boraginaceae

- *Arnebia decumbens* (Vent.) Coss. & Kral. subsp. *decumbens*

Tehran: 60 km towards Qom

Previous count for this diploid subspecies is n=11 (2n=2x=22) (GHAFFARI 1996), from Iran which agrees with the present count of n=11 from new locality (Fig. 7). Also, chromosome segregation at anaphase-I was 11-11 (Fig. 8).

Brassicaceae

- *Barbarea plantaginea* DC.

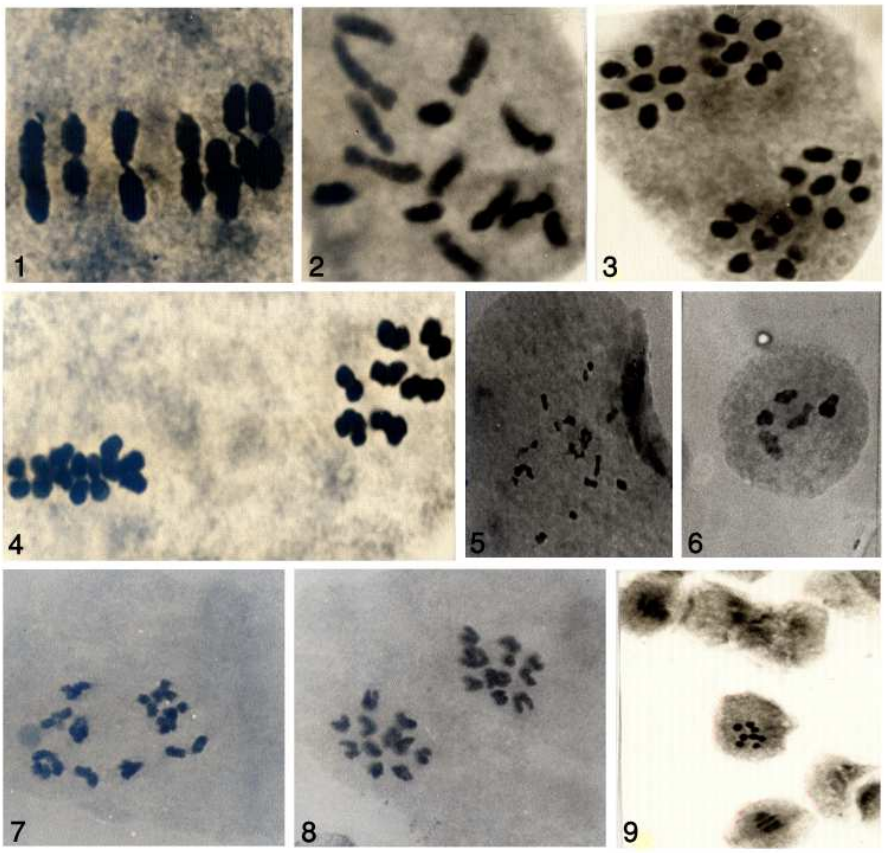
Tehran: Karaj, Asara

Previous count for this taxon is n=8 (ARYAVAND 1975), from Kouh-rang which agrees with the present count of n=8 (Fig. 9).

- *Camelina rumelica* subsp. *transcapica* (Fritsch) Hedge

Tehran: Kouh-dashteh

Previous counts for *C. rumelica* are 2n=12 (See FEDOROV 1974), 2n=26 (STRID & FRANZEN 1981) and 2n=40 (PODLECH & DIETERLE 1969). This taxon has two subspecies in Iran, namely, *rumelica* and *transcapica*.



Figs 1-9: Figs 1-4. *Cuminum cyminum*. Fig. 1. Metaphase-I, showing seven rod bivalents. Fig. 2. Metaphase of mitosis (2n=14). Fig. 3. Anaphase-II, showing (7-7-7-7) segregation. Fig. 4. Metaphase-II. Fig. 5. *Amberboa nana*, metaphase-I (n=16). Fig. 6. *Rhagadiolus stellatus*, metaphase-I (n=5). Fig. 7. *Arnebia decumbens*, diakinesis (n=11). Fig. 8. Anaphase-I, showing (11-11) segregation. Fig. 9. *Barbarea plantaginea*, metaphase-I (n=8).

Meiosis in our sample indicates 13 bivalents at both diakinesis and first metaphase (Figs 10 & 11). According to our data, this is the first chromosome count for this subspecies.

- *Chorispora tenella* (Pall.) DC.

Tehran: Kouh-dashteh

Previous count for this taxon is 2n=14 from Esfahan (Ghameshlou) by ARYAVAND (1975), which agrees with the present count of n=7 (Fig. 12).

- *Eruca sativa* Miller

Khuzestan: Dezful

Previous report for this species is 2n=22 from Esfahan (Roshan-dasht) by ARYAVAND (1975), which agrees with the present count of n=11 from Dezful (Fig. 13).

- *Matthiola longipetla* (Vent.) DC.

Saveh: towards Qom

Meiosis in this species was regular and showed seven bivalents at diakinesis (Fig. 14), which agrees with the previous report by ARYAVAND (1977) from Lorestan (Khorram-abad).

Campanulaceae

- *Campanula rapuncoloides* L.

Azarbaijan: Ardabil, Heyran

Previous report for this species are 2n=20, 68 and 102 (WCISLO 1983, FEDOROV 1974). Present count indicated 34 bivalents at first metaphase (Fig. 15). This count is new for the flora of Iran.

- *Campanula trachelium* L.

Between Khalkhal and Asalem

Previous report for this species is 2n=34 (ABOU-EL-ENAIN 2006). Meiosis in our sample showed 10 bivalents at diakinesis (Fig. 16). This is the new different chromosome number for this taxon. MABBERLEY (1987) and LAMMERS (1993) reported the presence of the polymorphism and different cytotypes in many *Campanula* species, specially those occupying slightly disturbed habitats as a result of different sympatric events.

Cistaceae

- *Helianthemum salicifolium* (L.) Miller

Kuzestan: Dezful, 5 km towards Bisheh-bozan

Karaj: Kushk-zar

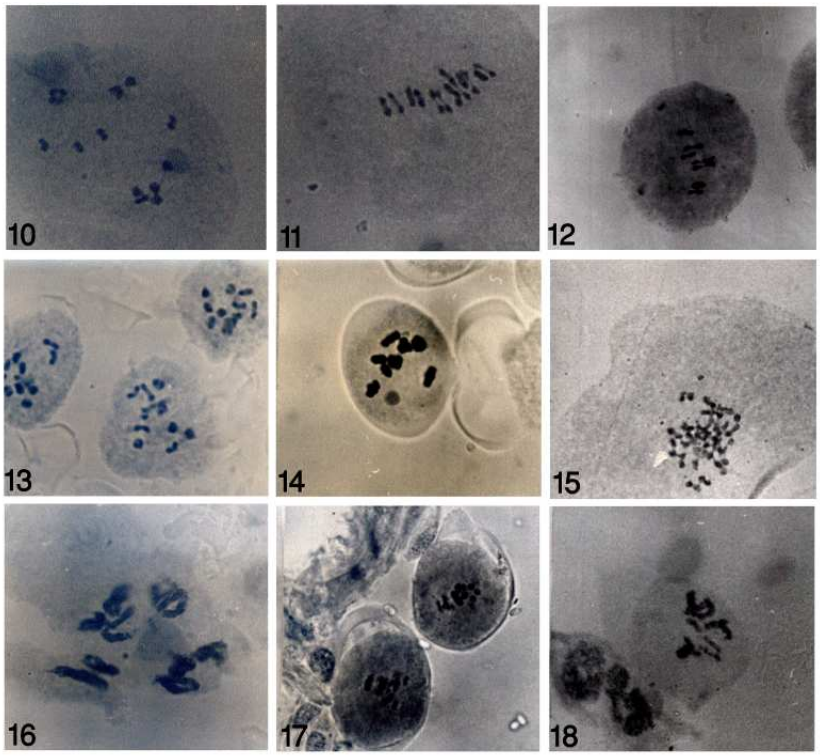
Two studied collections of this species were diploid with n=10 (Fig. 17) which are in agreement with the previous report (see FEDOROV 1974).

Liliaceae

- *Aloe vera* (L.) Bum.f.

Hormozgan: Bandar-abbas

This taxon is endemic to north of Africa and then introduced to many countries. Previous count for this species are 2n=14 and n=7 (VIJAYAVALLI & MATHEW 1990), which is in agreement with the present count of n=7 and 2n=14 (Figs 18 & 19).



Figs 10-18: Figs 10 & 11. *Camelina rumelica* subsp. *transcapica*, Fig. 10. Diakinesis (n=13). Fig. 11. Metaphase-I (n=13). Fig. 12. *Chorispora tenella*, metaphase-I (n=7). Fig. 13. *Eruca sativa*, diakinesis (n=11). Fig. 14. *Matthiola logipetala*, diakinesis (n=7). Fig. 15. *Campanula raponcoloides*, metaphase-I (n=34). Fig. 16. *Campanula trachelium*, diakinesis (n=10). Fig. 17. *Helianthemum salicifolium*, metaphase-I (n=10). Fig. 18. *Aloe vera*, Metaphase-I (n=7).

Malvaceae

- *Gossypium herbaceum* L.

Khuzestan: Ahwaz

Most of the pollen mother cells analyzed had shown the gametic number n=13 (Fig. 20) and showed mixture of ring and rod bivalents. Previous report for cultivars of this species is 2n=26 by SHEIDAI (1996b).

Poaceae

- *Sorghum halepense* (L.) Pers.

Karaj: Shah-dasht

Flora of Iran possesses only one species (*S. halepense*) of the genus *Sorghum.* Our sample was tetraploid and showed 20 bivalents at methaphase-I (Fig. 21). Both diploid (2n=2x=20) and tetraploid (2n=4x=40) levels are reported previously (see FEDOROV 1974). This count is new for the flora of Iran.

Ranunculaceae

- *Consolida orientalis* Gay) Schrod.

Karaj: towards Eshtehard

Previous report for this species is 2n=16 (DEMIRIZ 1980), which is in agreement with the present count of n=8 (Fig. 22). This count is new for the flora of Iran.

Scrophulariaceae

- *Linaria simplex* Desf.

Tehran: Kouh-dashteh

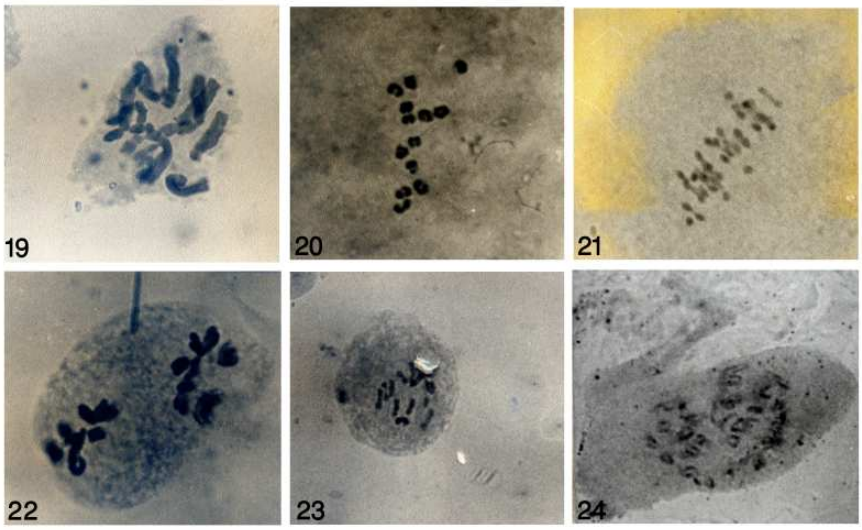
Previous report for this taxon is 2n=12 (SNOGERUP 1985). Meiosis in our sample was regular and showed 12 bivalents at first metaphase (Fig. 23). According to information, this is the first tetraploid chromosome count for this species.

Solanaceae

- *Solanum nigrum*

Tehran: Campus of the University of Tehran

Gametic chromosome number in this taxon was n=24 (Fig. 24).



Figs 19-24: Fig. 19. *Aloe vera*, metaphase of mitosis (2n=14). Fig. 20. *Gossypium herbaceum*, metaphase-I (n=13). Fig. 21. *Sorghum halepense*, metaphase-I (n=20). Fig. 22. *Consolida orientalis*, metaphase-II (n=8). Fig. 23. *Linaria simplex*, metaphase-I (n=12). Fig. 24. *Solanum nigrum*, diakinesis (n=24).

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