

NEW OR RARE CHROMOSOME COUNTS OF SOME ANGIOSPERM SPECIES FROM IRAN

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Original chromosome observations including 29 species from 19 families are reported. Of these, the chromosome numbers, for 6 taxa including, *Cirsium hygrophilum* (Asteraceae), *Matthiola longipetala* subsp. *bicornis* (Brassicaceae), *Dianthus orientalis* subsp. *nassireddini* (Caryophyllaceae), *Phlomis bruguieri*, *Salvia leriifolia*, *Teucrium oliverianum* (Lamiaceae) are new observations. Also, new tetraploid level of $n=24$ for *Asyneuma amplexicaule* (Campanulaceae) and new diploid level of $n=9$ for *Euphorbia microsciadia* (Euphorbiaceae) are reported here for the first time.

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شمارش کروموزومی جدید یا نادر برای بعضی از گونه‌های نهاندانه ایران

سید محمود غفاری

مشاهدات کروموزومی ۲۹ گونه متعلق به ۱۹ خانواده گزارش می‌شود. شمارشهای کروموزومی برای ۶ تاکسون شامل: *Cirsium hygrophilum* (Asteraceae), *Matthiola longipetala* subsp. *bicornis* (Brassicaceae), *Dianthus orientalis* subsp. *Nassireddini* (Caryophyllaceae), *Phlomis bruguieri*, *Salvia leriifolia*, *Teucrium oliverianum* (Lamiaceae) جدید می‌باشند. همچنین سطح تتراپلوئیدی $n=24$ برای گونه *Asyneuma amplexicaule* (Campanulaceae) و سطح دیپلوئیدی $n=9$ برای گونه *Euphorbia microsciadia* (Euphorbiaceae) برای اولین بار گزارش می‌شود.

INTRODUCTION

The purpose of this paper and others forth (Ghaffari, 1986, 1987a, 1987b, 1988) coming in the same series, is to give information concerning the chromosome counts of Angiosperm taxa of the Iranian flora. The interest of the Iranian flora is some unknown and such information would be important in our attempts to understand the richness of the flora and the distribution pattern of the plant species in the area concerned. In the present study, chromosome counts for 29 species representing 19 families are reported.

MATERIAL AND METHODS

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 microspocytes in various stages of meiosis. Chromosomes were studied under oil immersion on an Olympus microscope at a magnification of 320x. All slides were made permanent by the Ventian Turpentine (Wilson, 1945).

Somatic chromosomes were studied in standard Feulgen preparations after pretreatment with a 0.002 M solution of 8 hydroxyquinoline for 3 h at room temperature. Measurement of straight chromosomes were made under the microscope with a high power oil immersion objective using an ocular micrometer. Somatic chromosomes were classified according to centromeric positions defined with mean arm ratios (Levan et al. 1994). Voucher specimens were deposited in the Central Herbarium of

Tehran University (TUH) or in the IRAN Herbarium

RESULTS AND DISCUSSION

Alliaceae

Allium asarense R. M. Fritch et Matin

Tehran: Karaj, Asara. 1950m. Ghaffari 574. $n = 8$.

This taxon was described by Fritsch et al. (2001) as an endemic species to Iran with $2n = 16$ chromosomes. Chromosome counts in pollen mother cells showed eight bivalents at diplotene stage, which agrees with the above report (Fig. 1).

Apiaceae

Cuminum cyminum L.

Khorasan: Mashhad., 970 m, Ghaffari 1672 $n = 7$, $2n = 14$.

Meiosis in this taxon was regular and showed 7 bivalents at metaphase I (Fig. 2). Chromosome segregation at anaphase I was (7-7) (Fig. 3). Previous report of $2n = 14$ (Sheidai et al. 1996) is in agreement with the present count.

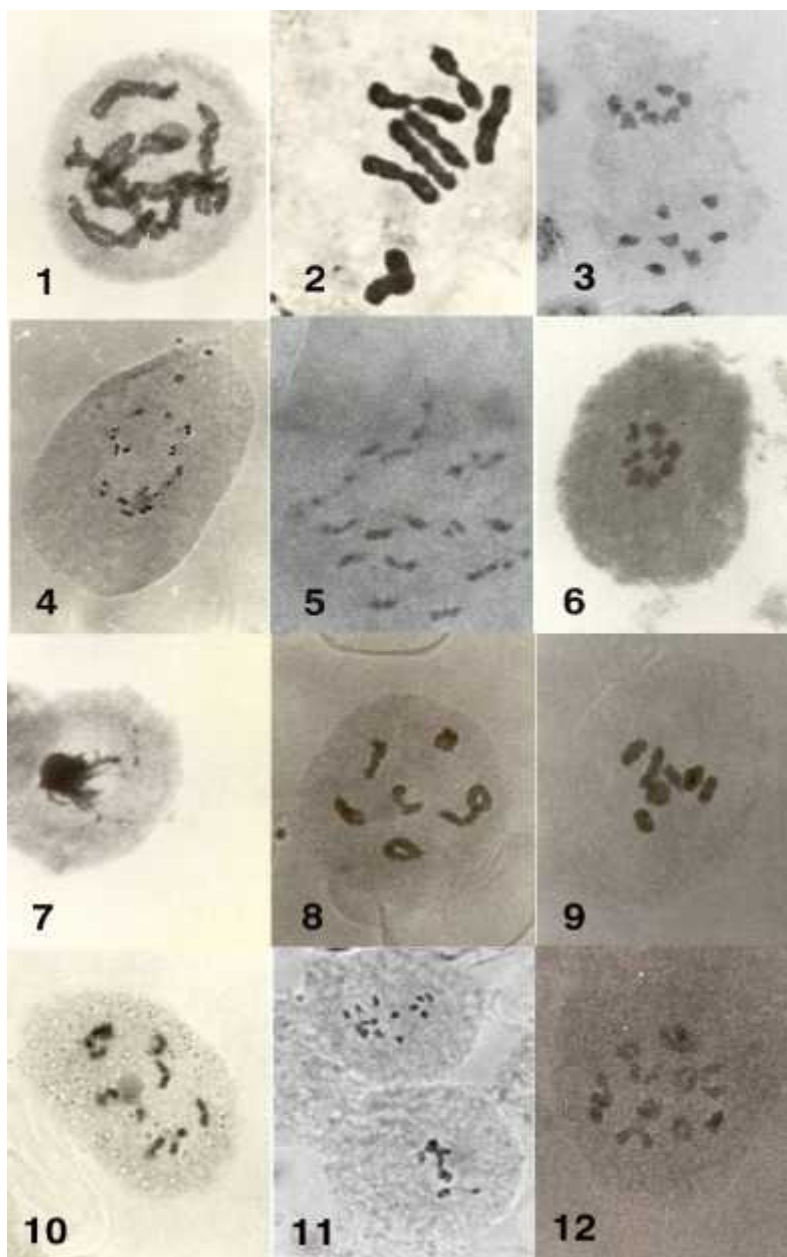
Asteraceae

Callicephalus nitens (M. B. ex Willd) C. A. Mey.

Mazandaran: Kelardasht, Roudbarak, 800 m. Ghaffari 7577. $n = 14$.

Previous reports for this species is $2n = 28$ (see Fedorov 1974). Meiosis in our sample was regular and showed 14 bivalents at diakinesis, which two of them were attached with the nucleolus (Fig. 4). Chromosome count of $2n = 32$ by (Tonjan, 1968) is questionable.

Figures 1-12. Microphotographs of meiotic divisions. Fig. 1. *Allium asarense*, diakinesis ($n=8$). Fig. 2, 3. *Cuminum cyminum*, metaphase I and anaphase I respectively ($n=7$). Fig. 4. *Callicephalus nitens*, diakinesis ($n=14$). Fig. 5. *Cirsium hygrophilum*, metaphase I ($n=17$). Fig. 6. *Heliotropium suaveolens*, metaphase I ($n=8$). Fig. 7. *Fibigia suffruticosa*, leptotene, showing synzetic knot. Fig. 8, 9. *Matthiola longipetala* subsp. *bicornis*, diakinesis and metaphase I respectively ($n=7$). Fig. 10. *Cleome iberica*, diakinesis ($n=10$). Fig. 11. *Dianthus orientalis* subsp. *nassireddini*, metaphase I ($n=15$). Fig. 12. *Silene schafta*, metaphase I ($n=12$).



Cirsium hygrophilum Boiss.

Mazandaran: slopes of Kandavan Mountain. 2520m., Ghaffari 8767 n = 17.

Seventeen bivalents were observed at metaphase I (Fig. 5). Chiasma frequency obtained from 9 cells were 1.10 per bivalent. This seems to be the first first chromosome count for this species.

Boraginaceae

Heliotropium suaveolens M. B.

Azərbaycan – Şərqi: Xoy, 25 km towards Salmas, 1460m, Ghaffari 18371. n = 8.

Previous reports for this taxon are $2n = 48$ by Murin & Sheikh (1971) and $n = 16$ by Ghaffari (1996). In the present study we found 8 bivalents at first metaphase (Fig. 6). Therefore this taxon has diploid, tetraploid and hexaploid levels of chromosome complement. This diploid cytotype is reported here for the first time.

Brassicaceae

Fibigia suffruticosa (Vent.) Sweet

Tehran: slopes of Sorkheh-hesar Mt., 1450 m Ghaffari 2666, n = 8.

Previous reports for this species are $2n = 16$ (Aryavand 1975a) and $n = 8$ (Ghaffari 1986). Chromosome count in this study obtained from a new locality and was $n = 8$. In early prophase synizetic knot were observed (Fig. 7).

Matthiola longipetala (Vent.) DC. subsp. *bicornis* (Sibth. et Sm.) P. W. Ball.

Khuzistan: Dezful, Sardasht, 520m, Ghaffari 771. n = 7.

Previous count of $2n = 14$ was reported by Aryavand (1978) for the species. Also, chromosome count of $2n = 14$ for *M. longipetala* subsp. *pumilio* (Sm.) P.W.Ball is reported by Tiniakou (1996) from

Figures 13-28. Microphotographs of meiotic or mitotic divisions. Fig.13,14. *Convolvulus stachydifolius*, metaphase I and anaphase I respectively ($n=9$). Fig.15. *Elaeagnus angustifolia*, metaphase II ($n=14$). Fig.16. *Euphorbia microsciadia*, metaphase I ($n=9$). Fig.17. *Alhagi persarum*, metaphase I ($n=8$). Fig.18. *Astragalus candulleanus*, mitotic metaphase ($2n=16$). Fig.19,20. *Vicia sativa*, diakinesis and metaphase I respectively ($n=5$). Fig.21. *Phlomis bruguieri*, diplotene ($n=10$). Fig.22. *Salvia leriifolia*, mitotic metaphase ($2n=22$). Fig.23. *Teucrium oliverianum*, diakinesis ($n=13$). Fig.24. *Tulipa montana* var. *chrysantha*, mitotic metaphase ($2n=24$). Fig.25. *Tulipa polychroma*, mitotic metaphase ($2n=24$). Fig.26. *Primula auriculata*, metaphase I ($n=11$). Fig.27. *Citrus limonum*, metaphase II ($n=9$). Fig.28. *Linaria chalepensis*, diakinesis ($n=12$).

Mediterranean region. My sample indicates the 7 bivalents at diakinesis and metaphase I (Figures 8,9). This is the first chromosome count for this subspecies

Campanulaceae

Asyneuma amplexicaule (Willd.) Hand.- Mzt. subsp. *amplexicaule*

Mazandaran: Chalus valley, Elika, 1500m Ghaffari 2776. n = 24.

Previous report for this taxon is $2n = 24 + 0 - 1B$ by Contandriopoulos (1980) from Iran. We found the new tetraploid level of $n = 24$ for this taxon.

Capparaceae

Cleome iberica DC.

Tehran: Karaj, Asara, 1450m. Ghaffari 16064. n = 10.

Previous report for this taxon are $n = 10$ (Aryavand 1983), $2n = 20$ (Caristrom 1984), which are in agreement with the present count of $n = 10$ from new locality (Fig. 10).

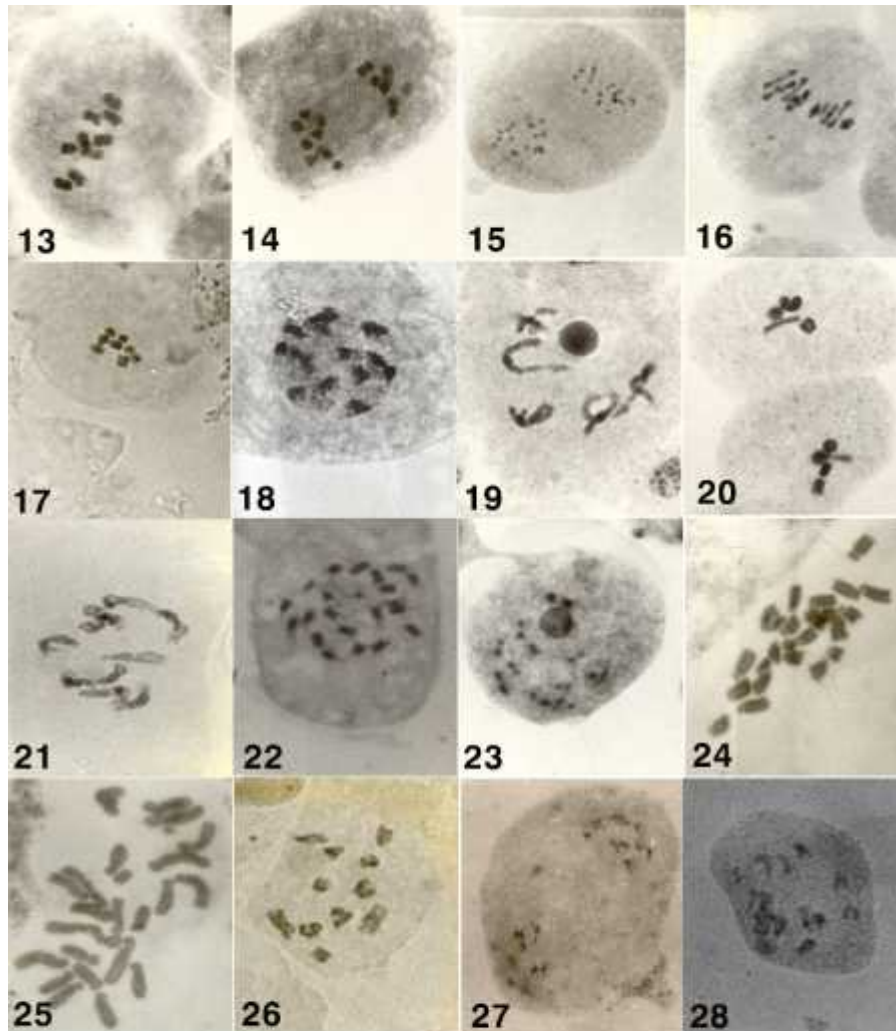
Caryophyllaceae

Dianthus orientalis Adams subsp. *nassireddini* (Stapf) Rech. f.

Loristan: Shoul – Abad, Eushtoran kouh, 2350m, Ghaffari 6777. n = 15.

This taxon has 9 subspecies in Iran, which 6 of them are endemic (Ghahreman & Attar, 1999). Meiosis in this subspecies was regular and showed 15 bivalents at metaphase I (Fig.11). My earlier chromosome count for *D. orientalis* subsp. *obtusisquameus* (Boiss.) Rech. f. was $n = 30$ (Ghaffari 1987). The present and previous works indicates that this taxon has both diploid and tetraploid levels.

Silene schafta Gmel. Jun. ex Hohen.



Mazandaran: Kelardasht, Roudbarak, 800m
Ghaffari 1670. $n = 12$.

Meiosis in this taxon was regular and showed 12 bivalents at metaphase I (Fig. 12), which agrees with previous report of $2n = 24$ (Degraeve 1980). This count is new for the flora of Iran.

Spergularia marina (L.) Griseb.

Khusistan: Dezful, Safidabad, 138m. Ghaffari 1464. $n = 9$.

Present count of $n = 9$ agrees with previous report of $2n = 18$ (Amin 1973). This count is new for the flora of Iran.

Convolvulaceae*Convolvulus stachydidifolius* ChoisyKhuzestan: Dezful, Shayoon, 1450m, Ghaffari 274. $n = 9$.

Meiosis in this species was regular and showed 9 bivalents at metaphase I and (9-9) chromosome segregation at anaphase I (Figs. 13,14), which agrees with the previous report by Aryavand (1980).

Elaeagnaceae*Elaegnus angustifolia* L.Markazi: Arak, Toureh, 1870 m, Ghaffari 777. $n = 14$.

Previous reports for this species are $2n = 14$ and $2n = 28$ (see Fedorov 1974). It seems that this taxon has two diploid and tetraploid levels of chromosome numbers. Our sample showed tetraploid race of $n = 14$ (Fig. 15).

Euphorbiaceae*Euphorbia microsciadia* Boiss.Khusistan: N of Andimeshk, 160 m Ghaffari 375. $n = 9$.

Zehzad (1980) reported tetraploid level of $2n = 36$ for this taxon. My sample was diploid with 9 bivalents at first metaphase (Fig. 16).

Fabaceae*Alhagi persarum* Boiss. & BuhseTehran: Varamin 915m. Ghaffari 4581. $n = 8$.

Gametic chromosome number in this species was $n = 8$ (Fig. 17), which agrees with the previous report (Fedorov 1974 and Sheidai et al. 2001).

Astragalus candolleanus Boiss.Tehran: Chitgar, 1310 m, Ghaffari 1766. $2n = 16$.

Previous report for this species is $n = 8$ from Esfahan by Aryavand (1975b), which agrees with the present count of $2n = 16$ from Tehran (Fig. 18).

Vicia sativa L.Khuzestan: Dezful, 5 km towards Safiabad, 138m, Ghaffari 764. $n = 5$.

Our Previous count for this taxon was $n = 6$ from Tehran (Ghaffari & Chariat-Panahi 1985). In this study we found five bivalents at diakinesis and metaphase I (Fig. 19, 20). According to information this taxon has three different chromosome complements of $2n = 10, 12,$ and 14 . (Goldblatt & Johnson 2003).

Lamiaceae*Phlomis bruguieri* Desf.Lorestan: Khorramabad, Keshvar, pass of Nojan, 2050 m, Ghaffari 5277. $n = 10$.

This species was diploid and showed 10 bivalents at prophase I (Fig. 21). According to the present information, this is the first chromosome count for this species.

Phlomis cancellata BungeMazandaran: Kandavan Mt. 2800 m, Ghaffari 1676. $n = 10$.

Previous report for this species is $2n = 20$ (Chuksanova & Kaplanbekov 1971). I found 10 bivalents at first metaphase. This count is new for the flora of Iran.

Salvia leriifolia Benth.Khorasan: Sabzevar 1010m, Ghaffari 8977. $2n = 22$.

Metaphase of mitotic showed chromosome complement of $2n = 22$ in this species (Fig. 22). Karyotype formula in this taxon was $2m + 9sm$. According to information, this is the first chromosome count for this species.

Teucrium oliverianum GinginsBushehr: between Daylam and Genaveh, 10 m, Ghaffari 875. $n = 13$.

In our sample, thirteen bivalents at diakinesis were observed (Fig.23). As far as we know, this is the first report for this species.

Liliaceae*Tulipa montana* Lindl. var. *chrysantha* (Boiss.) Wendelbo ex Rech. f.

Mazandaran: Kandavan Mt. 2670 m, Ghaffari 972. $2n = 24$.

Chromosome count in root tip cells showed $2n = 24$ (Fig. 24), which agrees with a previous one from Iran by Sheidai et al. (2002).

Tulipa polychroma Stapf

Tehran: Shemshak, 2850 m, Ghaffari 572. $2n = 24$.

Previous report for this species is $2n = 24$ (Fedorov 1974), which agrees with present count (Fig. 25). This count is new for the flora of Iran.

Pimulaceae

Primula auriculata Lam.

Tehran: Shemshak, 2700 m, Ghaffari 672. $n = 11$.

Meiosis in our sample showed 11 bivalenys at metaphase I. (Fig. 26). Previous reports for this taxon are $n = 11$ (Aryavand 1975, Kupfer 1980) and $2n = 44$ (Kress 1969, Gvinianidze & Avaznli 1982). The results indicate that this species has both diploid and tetraploid levels of ploidy.

Rosaceae

Potentilla recta L.

Mazandaran: slopes of Kandavan Mt. 2500 m. Ghaffari 2376. $n = 21$.

Previous report for this species is $2n = 42$ (Fedorov 1974), which agrees with the present count of $n = 21$. This count is new for the flora of Iran.

Rubiaceae

Phuopsis stylosa Benth. & Hook. f.

Kurdistan: Divandareh. 800 m, Ghaffari 1770, $n = 11$, $2n = 22$.

Only one previous report for this taxon is $2n = 20$ and $2n = 22$ (Fedorov 1974). Chromosome count of our sample was $n = 11$ and $2n = 22$. This count is new for the flora of Iran.

Rutaceae

Citrus limonum Risso

Khuzestan: Dezful, Safiabad, 138 m, Ghaffari 3176. $n = 9$.

Gametic chromosome number in this taxon was $n=9$ (Fig. 27).

Scrophulariaceae

Linaria chalepensis (L.) Mill.

Khuzistan: Dezful, Shayoon, 1450 m, Ghaffari 174. $n = 12$.

Previous report for this specie is $2n = 24$ (Fedorov 1974), which agrees with present count of $n = 12$ (fig. 28). This count is new for the flora of Iran.

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