

## CHROMOSOME COUNTS OF EIGHT SPECIES FROM THE FLORA OF IRAN

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Eight plant species belonging to Asteraceae, Fabaceae, and Lamiaceae were collected from Kermanshah province. The chromosome counts of *Cousinia kermanshahensis* Attar, Ghahr., & Assadi ( $2n=24$ ), *Hedysarum al-shehbazii* Ranjbar ( $2n=16$ ), *Onobrychis lunata* Boiss. ( $2n=14$ ), *Salvia sclareopsis* Bornm. ex Hedge ( $2n=20$ ) and *Phlomis anisodonta* Boiss. subsp. *anisodonta* ( $2n=20$ ) are reported for the first time, and the chromosome counts of *Anagyris foetida* L. ( $2n=18$ ), *Chesneya rytidosperma* Jaub. & Spach ( $2n=16$ ) and *Thymbra spicata* L. ( $2n=28$ ) are reported for the first time for the flora of Iran.

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شمارش‌های کروموزومی هشت گونه از فلور ایران

نسترن جلیلیان: دانشیار پژوهش، بخش تحقیقات جنگلها و مراتع، مرکز تحقیقات و آموزش کشاورزی و منابع طبیعی استان کرمانشاه، سازمان تحقیقات، آموزش و ترویج کشاورزی، کرمانشاه، ایران

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هشت گونه گیاهی متعلق به سه تیره Asteraceae، Fabaceae و Lamiaceae از استان کرمانشاه جمع‌آوری گردید. شمارش کروموزومی برای گونه‌های *Hedysarum al-shehbazii* Ranjbar ( $2n=16$ ), *Cousinia kermanshahensis* Attar, Ghahr. & Assadi ( $2n=24$ ), *Onobrychis lunata* Boiss. ( $2n=14$ ) و *Phlomis anisodonta* Boiss. ( $2n=20$ ) و زیرگونه *Salvia sclareopsis* Bornm. ex Hedge ( $2n=20$ )

*Chesneya rytidosperra* (2n=18) *Anagyris foetida* L. گونه‌های (2n=20) subsp. *anisodonta* برای اولین بار و اعداد کروموزومی گونه‌های (2n=28) *Thymbra spicata* L. و (2n=16) *Jaub. & Spach* برای اولین بار برای فلور ایران گزارش می‌گردند.

## INTRODUCTION

Chromosome number is the karyotype feature most commonly used in cytotaxonomical analyses (Guerra 2008). According to the IPCN (Index to Plant Chromosome Numbers, [www.tropicos.org/Project/PCN](http://www.tropicos.org/Project/PCN)), IFCI (The Iran Flora Chromosomal Index, <http://ifci.rifr-ac.ir/>), and Index to plant chromosome number of Iran (Ghaffari 2020), chromosome numbers have not been previously reported for eight selected endemic and rare species of the Asteraceae, Fabaceae and Lamiaceae from Iran. The present study is part of a comprehensive project to determine the chromosomal number of the flora of Iran. In this study, we report the chromosome numbers of five species for the first time, and chromosome numbers for three species are reported for the first time for the flora of Iran.

## MATERIALS AND METHODS

This study was carried out by using seeds collected from natural habitats in Kermanshah province. The vouchers are deposited in the Herbarium of Kermanshah Agricultural and Natural Resources Research and Education Center (RANK). For the cytological study, root tips were cut about 1–1.5 cm in length, from germinated seeds on wet filter paper in petri dishes at 22°C temperature. Then they were pretreated with 0.5% saturated  $\alpha$ -Bromo naphthalene at 4°C for 3–4h and fixed in 10% formaldehyde and chromium trioxide (1:1) at 4°C for 16 to 20 h. The fixed root tips were rinsed in distilled water and hydrolyzed in NaOH (1 Normal) at 60°C for 20–30 min. The specimens were washed with distilled water, stained with hematoxylin-iron for 1h at room temperature, and squashed in a droplet of 45% acetic acid. The chromosome morphology was studied based on Levan & al. (1964).

## RESULTS

Mitotic chromosome counts for examined species are presented as follows:

### Asteraceae

*Cousinia kermanshahensis* Attar, Ghahr. & Assadi (2n=24), (Fig. 1A).

*Specimen examined*: Iran, Kermanshah province: Islam abad-e gharb, Qaleh Chehr, 1525m, Jalilian 10426 (RANK).

*Cousinia kermanshahensis* is an endemic species of Iran. This species was diploid with  $2n=2x=24$ . The karyotype formula was  $7m+5sm$ . This is the first report of the chromosome count for this species.

### Fabaceae

*Anagyris foetida* L. (2n=18), (Fig. 1B).

*Specimen examined*: Iran, Kermanshah province: Gilan-e Gharb, Kasegaran, 990–1100m, Jalilian & Nemati 9904 (RANK).

This species showed a diploid chromosome number of  $2n=2x=18$ . The karyotype formula was  $3m+6sm$ . This is the first report of the chromosome count of this species for the flora of Iran. The chromosome number  $2n=18+0-4B$  was counted for this species by other researchers from the Mediterranean area (Cusma Velari & al. 2012).

*Chesneya rytidosperra* *Jaub. & Spach* (2n=16), (Fig. 1C).

*Specimen examined*: Iran, Kermanshah province: Paveh, Bayangan, 947–980m, Jalilian 10081 (RANK). Our results showed that this species is diploid with a chromosome number of  $2n=2x=16$ . The karyotype formula was  $3m+5sm$ . The number of chromosomes in the present study is consistent with the previous report of  $2n=16$  by Sepet & al. (2011) on populations of Turkey. This is the first chromosome number report for this species in the flora of Iran.

*Hedysarum al-shehbazii* Ranjbar (2n=16), (Fig. 1D).

*Specimen examined*: Iran, Kermanshah province, Paveh, Hajj, 1326m, Jalilian 9849 (RANK).

*Hedysarum al-shehbazii* is an endemic perennial herbaceous species. Our results showed that this species is diploid with a chromosome number of  $2n=2x=16$ . The karyotype consisted of eight pairs of metacentric (m) chromosomes. This is the first report on the chromosome number of this species.

*Onobrychis lunata* Boiss. (2n=14), (Fig. 1E).

*Specimen examined*: Iran, Kermanshah province, Sahneh, Bid Sorkh, Jalilian, 9762 (RANK).

*Onobrychis lunata* is an endemic species of Iran. Our results showed that this species is diploid with a chromosome number of  $2n=2x=14$ . The karyotype in this species consisted of four pairs of metacentric (m) and three submetacentric (sm) chromosomes. This is the first report on the chromosome number of this species.

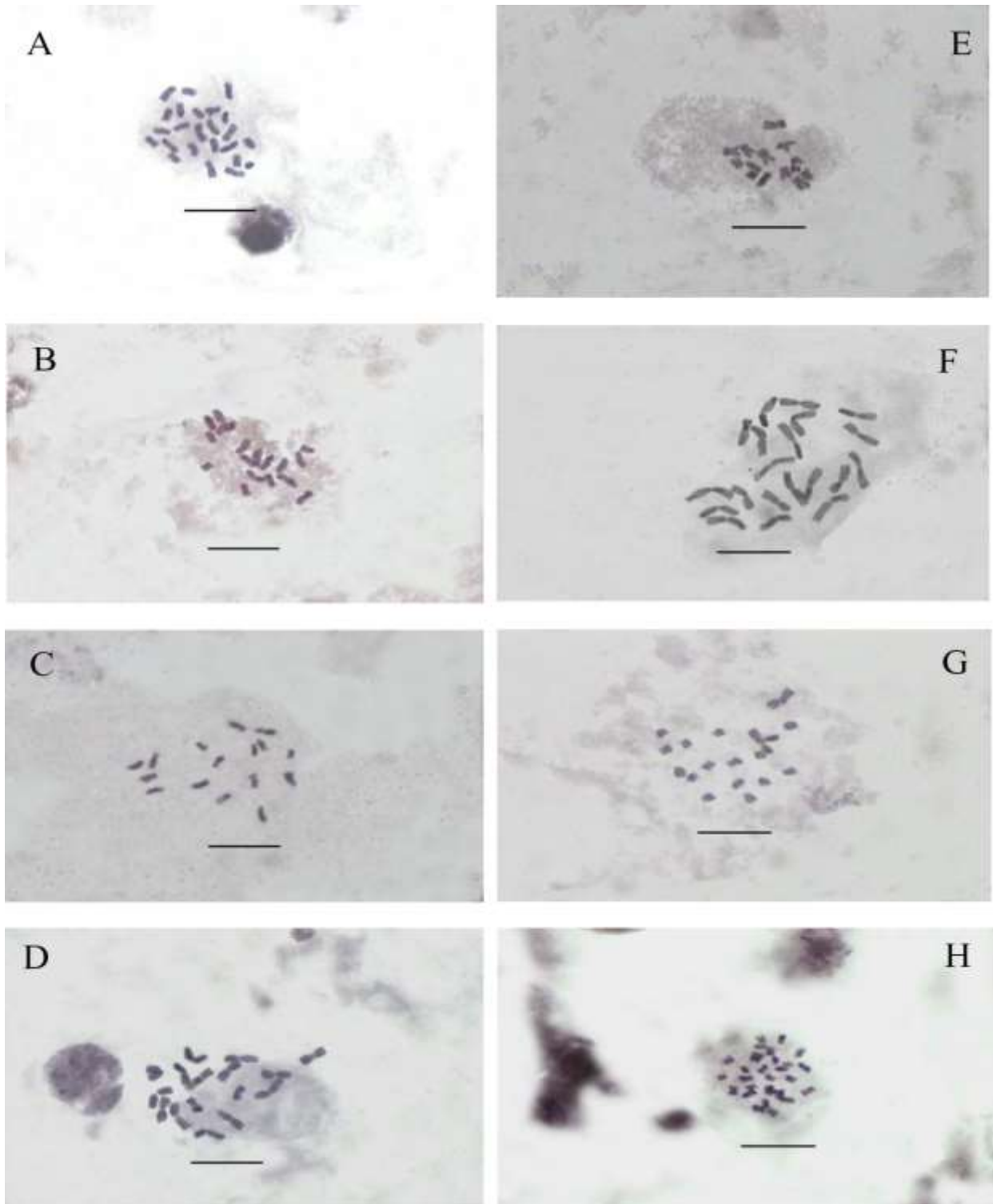


Fig. 1. Somatic metaphases of the studied species. A, *Cousinia kermanshahensis* ( $2n=2x=24$ ); B, *Anagyris foetida* ( $2n=2x=18$ ); C, *Chesneya rytidosperra* ( $2n=2x=16$ ); D, *Hedysarum al-shehbazii* ( $2n=2x=16$ ); E, *Onobrychis lunata* ( $2n=2x=14$ ); F, *Phlomis anisodonta* subsp. *anisodonta* ( $2n=2x=20$ ); G, *Salvia sclareopsis* ( $2n=2x=20$ ); H, *Thymbra spicata* ( $2n=2x=28$ ). Scale bars=10 $\mu$ m.

**Lamiaceae**

***Phlomis anisodonta*** Boiss. subsp. *anisodonta* (2n=20), (Fig. 1F).

*Specimen examined:* Iran, Kermanshah province, Paveh, Saryas, 3000m, Jalilian 10777 (RANK).

*Phlomis anisodonta* subsp. *anisodonta* is an endemic species of Iran. This species showed a diploid chromosome number of  $2n=2x=20$ . The karyotype formula was 10m. This is the first report on this subspecies, which is the same as the previous report on the *P. anisodonta* subsp. *occidentalis* populations collected from Fars province (Sadeghian & al. 2021).

***Salvia sclareopsis*** Bormm. ex. Hedge (2n=20), (Fig. 1G).

*Specimen examined:* Iran, Kermanshah province: Gilan-e Gharb to Qasr-e shirin, 370-400 m, Jalilian 9820 (RANK).

*Salvia sclareopsis* is a regional endemic species of Iran and Iraq. This species showed a diploid chromosome number of  $2n=2x=20$ . The karyotype formula was 4m+6sm. This is the first report on this species.

***Thymbra spicata*** L. (2n=28), (Fig. 1H).

*Specimen examined:* Iran, Kermanshah province: Gilan-e gharb, Vizhenan, 950m, Jalilian & Nemati 9784 (RANK).

This species showed a diploid chromosome number of  $2n=2x=28$ . Morales (1987) reported  $2n=30$ , in the

Turkey population. This is the first report on the chromosome number of this species in Iran. The karyotype formula was 9m+5sm.

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