IRANIAN JOURNAL OF BOTANY 25 (2), 2019
DOI: 10.22092/ijb.2019.126775.1248

CHROMOSOME NUMBERS OF SOME VASCULAR PLANT SPECIES FROM IRAN

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Received 2019. 06. 23; accepted for publication 2019. 11. 20

Mirzadeh Vaghefi, S. S. & Jalili, A. 2019.12. 30: Chromosome numbers of some vascular plant species from Iran. -*Iran. J. Bot. 52 (2):140-144*. Tehran.

Somatic chromosome numbers of 14 species from 6 families were studied in this research. The chromosome numbers of *Silene viscosa* (2n=24), *Leucanthemum vulgare* (2n=18), *Odontites vernus* (2n=40), *Pedicularis sibthorpii* (2n=16) have been reported here for the first time for the flora of Iran. Ideograms were depicted for each species.

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Key words: Chromosome counts; Asteraceae; Caryophyllaceae; Fabaceae; Orobanchaceae; Poaceae; Scrophulariaceae; Iranian plants

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عدد کروموزومی غیر جنسی ۱۴ گونه از ۶ خانواده در این تحقیق بررسی گردید. عدد کروموروومی Silene viscosa (۲n=۲۴)، Leucanthemum vulgare (۲n=۱۸)، Odontites vernus (۲n=۴۰)، Pedicularis sibthorpii (۲n=۱۶) برای اولین بار برای فلور ایران گزارش شده است. ایدیوگرام برای هر گونه ارائه گردید.

INTRODUCTION

The chromosome numbers of wetland plants of Iran were counted in a project referring to a comprehensive study on Iranian wetlands. Here we report the number of chromosomes in some of the studied species. Noteworthy that some species were identified in the margin of studied wetlands that are not the typical wetland species, but due to seed dispersal and suitable soil condition have grown in wetland margin. These species were also included in our study.

MATERIALS AND METHODS

This study was carried out by using seeds collected from natural habitats in Iran. Voucher specimens are preserved in TARI. The seeds were grown in lab. Cytological studies were done by using root tips meristems. Root tips were pretreated in *alpha-bromonaphthalene* for two hours and then fixed in a cold mixture of ethanol and acetic acid (3: 1) for 4 hours. Temporary slides were made by squashing the cut and stained meristems in hematoxylin. The chromosome morphology was studied based on Levan & al. (1964). Stebbins karyotype asymmetry levels were used (1971) to define asymmetry levels.

RESULTS AND DISCUSSION

Asteraceae

Achillea filipendulina Lam., 2n=18 (fig. 1. a).

West Azerbaijan: Dalamper Village, 2266 m, 09.07.2013, 37°10'16.03"N, 44°50'48.00"E. Ashrafi

102785 (TARI).

Previous reports 2n=18, 2n=36 and 2n=54 indicate that this species has diploid, tetraploid and hexaploid races (Goldblatt & Johnson 1998).Our sample was diploid and showed 9 pairs of metacentric chromosome (fig. 1. a).

Achillea millefolium L., 2n=18 (fig. 1. b).

West Azerbaijan: Salmas, Jam Valley, 2281 m, 11.07.2013, 38°17'40.27"N, 44°34'17.51"E. Ashrafi 102760 (TARI).

The Previous chromosome counts on *A. millefolium* are: 2n=2x=18, 2n=4x=36, 2n=6x=54, 2n=8x=72 (Goldblatt 1984). The karyotype consisted of 7 metacentric and 2 submetacentric pairs (fig. 1. b). Chromosome range lengths (µm) were 1.95-3.14. It was categorized in type 1A.

Lapsana communis L., 2n=14 (fig. 1. c).

East Azerbaijan: Tabriz, Arshad chamani, 2392 m, 04.09.2015, 37°46'41.02"N, 46° 9'13.30"E. Ashrafi 101763 (TARI).

The genus *Lapsana* has one species in Iran (Naseh, 2013). Previous reports on *L. communis* were n=7, 2n= 12, 2n=14 and 2n=16 (Goldblatt & Johnson 2003). Pak and Bremer (1995) found only 2n=14 for *L.communis* in material from the United Kingdom, Sweden, the Netherlands and the United States of America, and concluded that if the deviating numbers of 2n=12 and 2n =16 were to be confirmed, they would regard them as derived, and therefore suggested that x=7. Chromosome number of our sample was 2n=14. It seems hybrids in *L.communis* occur frequently.

Karyotype of our sample consisted of seven pairs of metacentric chromosome (fig. 1. c). Chromosome range lengths (µm) were 2.82-3.52. Karyotype was mostly symmetrical and was placed in Stebbins 1A category of symmetry.

Leucanthemum vulgare Lam., 2n=18 (fig. 1. d).

West Azerbaijan: Salmas, Jam Valley, 2281m, 11.07.2013, 38°17'40.27"N, 44°34'17.51"E. Ashrafi 102806(TARI).

There are two known chromosome numbers for *L. vulgare*: 2n= 18 from Russia, Germany and 2n= 36 from Sweden (Goldblatt & Johnson 2003). Its chromosome numbers counted in root tip mitosis is reported for the first time from Iran (2n=18). The karyotype consisted of 5 metacentric and 4 submetacentric pairs (fig.1.d). Chromosome range lengths (µm) were 3.37-5.56. It was categorized in type 1A.

Tanacetum balsamita L., 2n=18 (fig. 1. e).

West Azerbaijan: Dalamper Village, 2266 m, 09.07.2013, 37°10'16.03"N, 44°50'48.00"E. Ashrafi 102737 (TARI).

In this research work, *T.balsamita* chromosome number was determined as 2n=2x=18. This consisted of 9 pairs of metacentric chromosomes (9m) (fig. 1. e). Chromosome range lengths (µm) were 5.28-6.91. Karyotype was mostly symmetrical and was placed in Stebbins 1A category of symmetry. Chromosome number of *T. balsamita* was reported previously 2n=18 by Olanj & al (2013) from Mazandaran Province.

Caryophyllaceae

Paronychia kurdica Boiss., 2n=18 (fig. 1. f).

West Azerbaijan: old road of Salmas, 1850 m, 11.07.2013, 38°15'14.83"N, 44°59'55.39"E. Ashrafi 102739 (TARI).

Chromosome number of *P. kurdica* in our study (2n=18) was in agreement with previous reports (Mirzadeh & al. 2014; Goldblatt 1984). 16 chromosomes of our sample were metacentric and 2 were submetacentric (fig. 1. f). Chromosome range lengths (µm) were 1.73-3.00. It was categorized in type 1A.

Silene swertiifolia Boiss., 2n=24 (fig. 1. g).

West Azerbaijan: Dalamper Village, 2266 m, 09.07.2013, 37°10'16.03"N, 44°50'48.00"E. Ashrafi 102764 (TARI).

S. swertiifolia was counted 2n = 2x = 24, which was confirmed by previous reports (Goldblatt 1990 & 1991; Sheidai & al. 2009). The karyotype of our sample consisted of small chromosomes with 10 metacentric and 2 submetacentric pairs (fig. 1. g). It was categorized in type 1A .Chromosome range lengths (µm) were 1.82-2.65.

Silene viscosa Schleich., 2n=24 (fig. 1. h).

West Azerbaijan: Salmas, Jam Valley, 2281m, 11.07.2013, 38°17'40.27"N, 44°34'17.51"E. Ashrafi 102795 (TARI).

The majority of the references in specialty literature show that diploid of *S. viscosa* (2n=2x=20 or 2n=2x=24) are more spread, then tetraploid forms (2n=4x=48), hexaploid (2n=6x=72) and that only some have a higher degree of polyploidy 2n=c.96, 120 and 192 (Bari, 1973).

The chromosome number of our sample was 2n=24. All of chromosomes of it were metacentric (fig. 1. h). Chromosome range lengths (µm) were 1.62-2.12. It was categorized in type 1A. This is the first chromosome number determination for Iranian population. The somatic chromosome number of our studied species is in accordance with earlier studies.

Fabaceae

Lotus angustissimus L., 2n=12 (fig. 1. i).

East Azerbaijan: Hashtroud, Saadatlou, 1643 m, 12.09.2015, 37°26'29.02"N, 46°46'25.48"E. Ashrafi 101683 (TARI).

The chromosome number of 2n=12 in *L. angustissimus* was previously reported by Sheidai & Jalilian (2008) from Mazandaran Province. Our sample had 6 pairs of metacentric chromosomes (fig. 1. i). It was categorized in type 1A. Chromosome range lengths (µm) were 1.57-2.43.

Lotus corniculatus L., 2n=12 (fig. 1. j).

East Azerbaijan: Tabriz, Arshad chamani, 2392 m, 04.09.2015, 37°46'41.02"N, 46° 9'13.30"E. Ashrafi 101679 (TARI).

The chromosome number 2n = 12 in *L. corniculatus* found in the population studied here is in accordance with the two given by (Goldblatt & Johnson 1994; Goldblatt 1985). In some another literature was reported 2n=24 (Goldblatt & Johnson 1990 & 2010; Sheidai & Jalilian 2008).

Karyotype analysis of *L. corniculatus* with 2n=12 revealed that most of them had a rather symmetrical 1A karotype and can be generalized as 2n=12= 8m+4sm (fig. 1. j). Chromosome range lengths (µm) were 2.27 - 3.19.

Trifolium hybridum L., 2n=16 (fig. 1. k).

Ardebil: Neor Lake, 2400 m, 10.07.2013, 37°59'31.30"N, 48°33'25.33"E. Ashrafi 101682 (TARI).

The present observation in *T. hybridum* well agreed with previous data (2n=16)((Hesamzadeh Hajazi & Ziaei Nasab 2009; Javadi & Hesamzadeh Hejazi 2008). The karyotype formula of it consisted of five median pairs (m) and three submedian pairs (sm) (fig. 1. k). Chromosomes varied in size between 3.83 and 2.25 µm. It was categorized in type 1A.

Poaceae

Dactylis glomerata L., 2n=28 (fig. 1. n).

Ardebil: Neor Lake, 2500 m, 10.07.2013, 37°59'31.30"N, 48°33'25.33"E. Ashrafi 102792 (TARI).

The chromosome number of *D. glomerata* was reported previously as 2n=28 (Sakamoto & Muramatsu, 1963). The metaphase chromosome complement of 2n=28 consisted of 20 median-centromeric chromosomes and 8 submedian-centromeric chromosomes (fig. 1. n), ranging in size between 2.64 and 3.58 µm. It was categorized in type 1A.

Scrophulariaceae

Odontites vernus (Bellardi) Dumort., 2n=40 (fig. 1. o).

West Azerbaijan: Dalamper Village, 2266m, 09.07.2013, 37°10'16.03"N, 44°50'48.00"E. Ashrafi 102725 (TARI).

The chromosome number of our sample was in accordance with previous studies (2n=40) (Goldblatt 1985; Goldblatt & Johnson 2003). The karyotype of the population studied was symmetrical, with mostly metacentric chromosomes (19m+sm) (fig. 1. o). The size of the chromosomes ranged from 3.24 to 2.22 µm. It was categorized in type 1A. For the first time, information on its chromosome number was provided of Iranian population.

Orobanchaceae

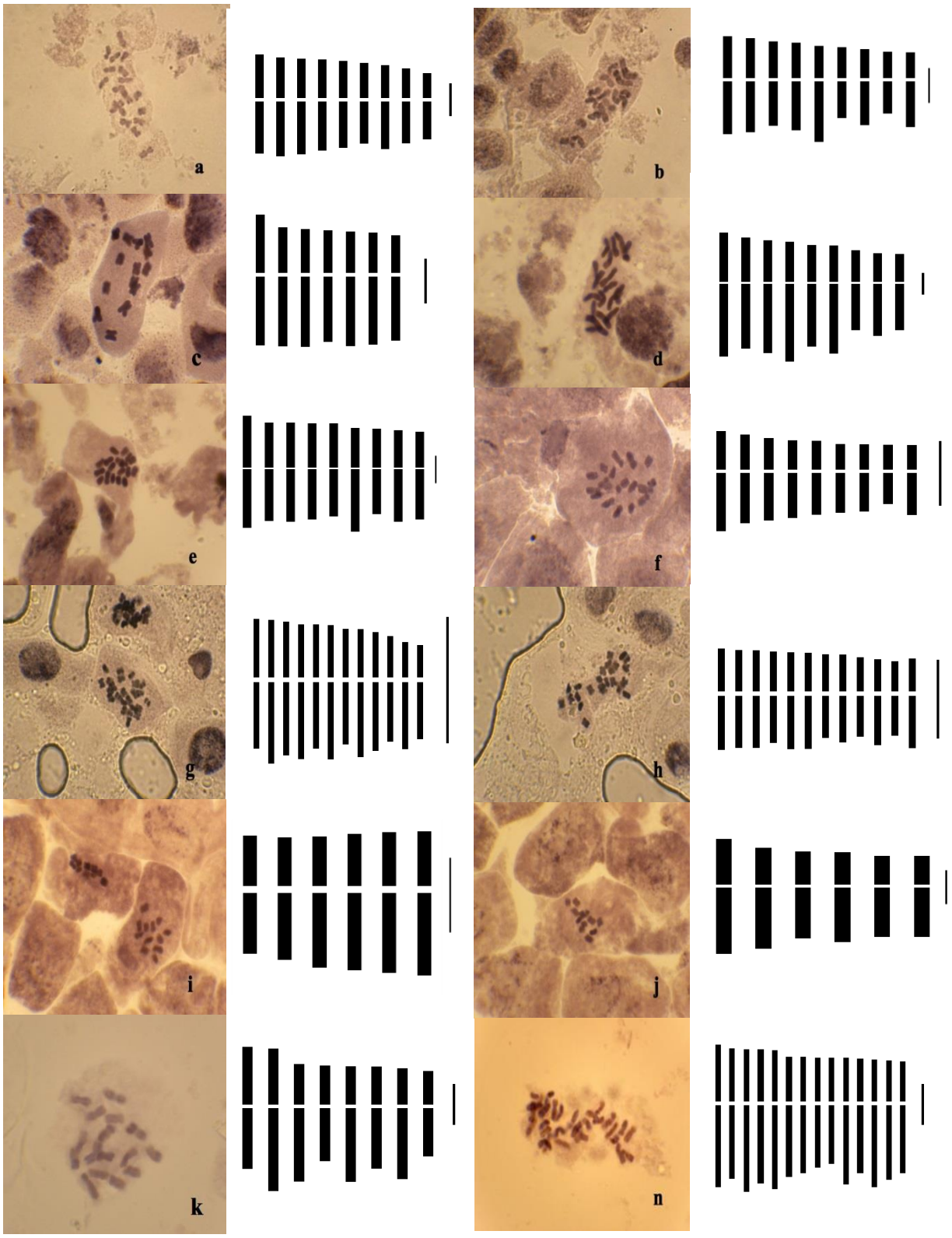
Pedicularis sibthorpii Boiss., 2n=16 (fig. 1. p).

West Azerbaijan: Dalamper Village, 2266m, 09.07.2013,, 37°10'16.03"N, 44°50'48.00"E. Ashrafi 102748 (TARI).

The karyotype of our sample was formulized as: 5sm+3m (fig. 1. p). The chromosome size ranged from 3.39 to 2.24 µm. It was categorized in type 2A. It was reported for the first time for Iranian population and confirmed the numerous counts in literature (Goldblatt & Johnson 2010; Goldblatt 1988).

ACKNOWLEDGE

I would like to thank Dr. Ghaffari and Dr. Jamzad for their valuable comments and advices. The present work has financially supported by the research Institute of Forests and Rangelands of Iran.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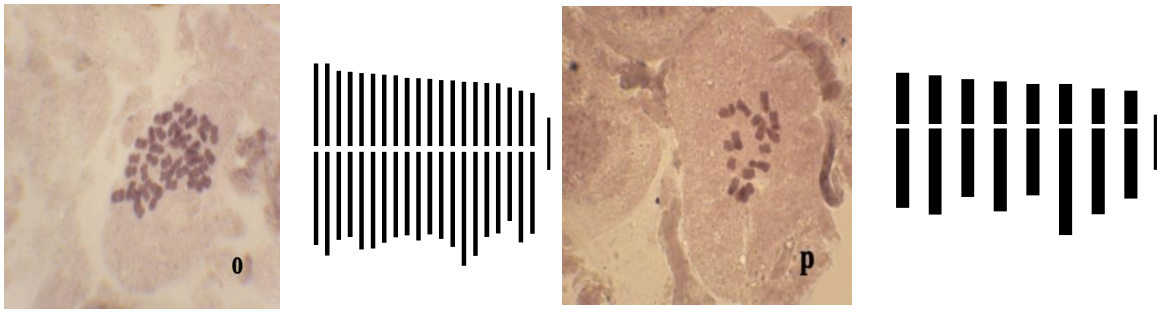

Fig. 1. Somatic metaphases (left) and Ideograms (right) in a, *Achillea filipendulina* (2n=18); b, *Achillea millefolium* (2n=18); c, *Lapsana communis* (2n=14); d, *Leucanthemum vulgare* (2n=18); e, *Tanacetum balsamita* (2n=18); f, *Paronychia kurdica* (2n=18); g, *Silene swertiifolia* (2n=24); h, *Silene viscosa* (2n=24); i, *Lotus angustissimus* (2n=12); j, *Lotus corniculatus* (2n=12); k, *Trifolium hybridum* (2n=16); n, *Dactylis glomerata* (2n=28); o, *Odontites vernus* (2n=40); p, *Pedicularis sibthorpii* (2n=16). Scale Bar=1 µm.

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