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CHROMOSOME COUNTS REPORT OF SOME SPECIES FROM IRAN

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The chromosome number of *Ferula stenocarpa* (2n=22) and *Ducrosia flabellifolia* (2n=22) belonging to Apiaceae, *Rindera lanata* (2n=48) from Boraginaceae, and *Ziziphus spina-christi* (2n=24), *Z. nummularia* (2n=24) of Rhamnaceae and also a hybrid between them (*Z. nummularia* × *Z. spina-christi* 2n=24) from the Sahara Sindian Region (southern Iran) are reported. The chromosome numbers of *Ferula stenocarpa* and *Rindera lanata* are reported here for the first time and *Ducrosia flabellifolia, Z. nummularia, Z. spina-christi*, and *Z. nummularia* × *Z. spina-christi* are reported for the first time from the Iranian population.

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Keywords: Chromosome counts*;* Apiaceae; Rhamnaceae; Boraginaceae; Iran

گزارش شمارش‌های کروموزومی تعدادی از گونه‌های ایران

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عدد کروموزومی دو گونه Ferula stenocarpa (2n=22) و Ducrosia flabellifolia (2n=22) متعلق به تیره چتریان (Apiaceae)، گونه Rindera lanata (2n=48) از تیره گل‌گاوزبان (Boraginaceae) و دو گونه Ziziphus spina-christi (2n=24) و Z. nummularia (2n=24) و نیز هیبرید بین آنها Z. spina-christi × Z. nummularia از تیره عناب (Rhamnaceae) از ناحیه صحارا سندی (جنوب ایران) گزارش می‌شود. اعداد کروموزومی گونه Ferula stenocarpa و Rindera lanata برای اولین بار در دنیا و گونه‌های Ducrosia flabellifolia ، Z. nummularia و Z. nummularia × Z. spina-christi برای اولین بار از ایران گزارش می‌شوند.

INTRODUCTION

The present study is part of a comprehensive project to determine the chromosomal numbers of the species of the flora of Iran. According to the IPCN (Index to Plant Chromosome Numbers, www.tropicos. org/Project/ IPCN), 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 the six selected species of the Apiaceae, Boraginaceae and Rhamnaceae.

MATERIALS AND METHODS

This study was carried out using seeds collected from natural habitats in southern Iran. Voucher specimens are preserved in the Herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center. Cytological studies were performed using root tip's 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).

RESULTS

Apiaceae

Ducrosia flabellifolia Boiss**.** (2n=2x=22), (Fig. 1 a).

Specimen examined: Iran**,** Khuzestan Province, Masjed Solyman, Daer Khersoon area. 32° 1' 57.44" N, 49° 20' 46.02" E, 300m. Dinarvand and Rostami. 10919, Herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center.

Our results showed that this species is diploid with a chromosome number of 2n=2x=22. The karyotype formulas are 5m+ 6sm. Most chromosomes are submetacentric. It is categorized as type 2A (Stebbins 1971).

The chromosome number of this species is reported here for the first time from the Iranian population. The previous reports by Al-Eisawi 1989; Boulos & Al-Eisawi 1977, are in agreement with our data. The same diploid chromosome numbers were also previously reported for other congeneric species of this taxon, *D. anethifolia* (DC.) Boiss. (Obeidi & al. 2012; Ghaffari 1987, 2020).

Ferula stenocarpa Boiss. & Hausskn. (2n=2x=22), (Fig. 1b).

Specimen examined: Iran, Khuzestan Province, Masjed Solyman, Godar Landar road. 32° 0' 55.94" N, 49° 23' 36.66" E, 300m; Dinarvand and Borajea. 10323, Herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center.

Our results showed that this species is diploid with a chromosome number of 2n=2x=22. Most chromosomes are metacentric (st+4sm+6m). It is categorized as type 2A (Stebbins 1971).

The chromosome number of this species is reported here for the first time. The same diploid chromosome numbers were also previously reported for other congeneric species of this taxon, *F. persica* Willd. var. *persica* (Mirzadeh Vaghefi & Jalili 2017).

Boraginaceae

Rindera lanata (Lam.) Bunge. (2n=4x=48), (Fig. 1c).

Specimen examined: Iran, Khuzestan Province, Andica, Shimbar protected area. 800m, Dinarvand & Howeized. 10560, Herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center.

Our results showed that this species is a tetraploid with 2n=4x=48.

The chromosome number of *Rindera lanata* is reported here for the first time. The chromosome numbers that have been reported for other species of the genus are *Rindera albida*, n=12 (Ghaffari 1988), so we infer that *Rindera lanata* is a tetraploid species.

Rhamnaceae

Ziziphus nummularia (Burm. f.) Wighth & Arn. (2n=2x=24), (Fig. 1d).

Specimen examined: Iran, Ilam Province, 55 km from Shush to Dehloran. 200m, Dinarvand and Mohamadi. 5999, Herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center.

Our results showed that this species is a diploid with 2n=2x=24.

Z. spina-christi (L.) Willd. (2n=2x=24), (Fig. 1e).

Specimen examined: Iran, Khuzestan Province, Masjed Solyman to Lali, 420 m, Dinarvand, Howeizeh, and Mohamadi, 6530, Herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center.

Our results showed that this species is a diploid with 2n=2x=24.

Z. nummularia (Burm. f.) Wighth & Arn. × ***Z. spina-christi*** (L.) Willd. (2n=2x=24), (Fig. 1f).

Specimen examined: Iran**,** Hormozgan Province, Bandar Abbas to Hajiabad, Aliabad village, 1000m, Dinarvand and Zaeifi, 6546 Herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center.

Our results showed that this species is a diploid with 2n=2x=24.

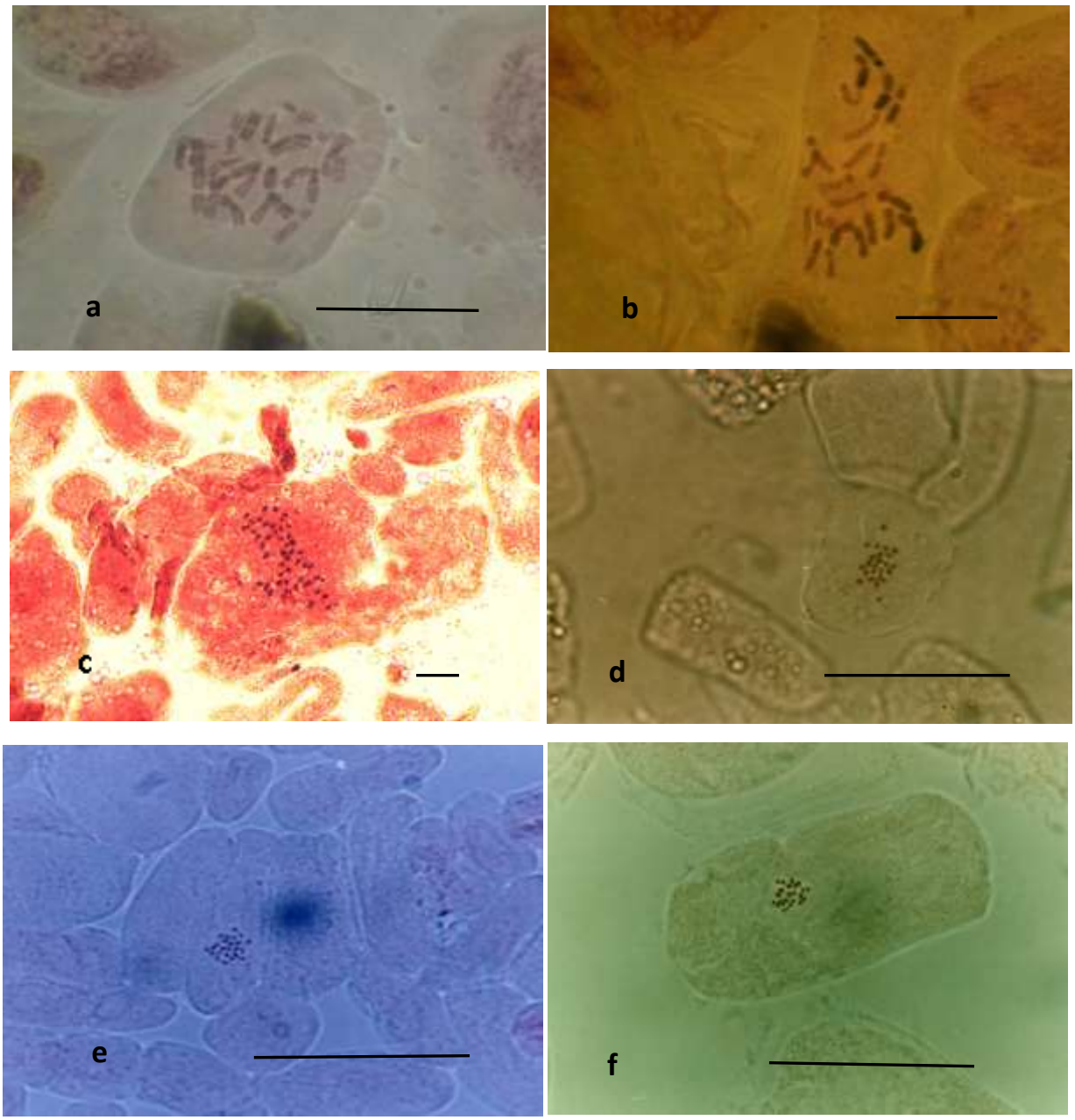

Fig. 1. Somatic metaphases of the studied species. a, *Ducrosia flabellifolia* (2n=22); b, *Ferula stenocarpa* (2n=22); c, *Rindera lanata* (2n=48); d, *Z. nummularia* (2n=24); e*: Z. spina-christi* (2n=24); f, *Z. nummularia* × *Z. spina-christi* (2n=24). Scale bars= 10µm.

The chromosomes in the genus *Ziziphus* are very small (Nehra & al. 1983). Previous chromosome counts on *Ziziphus* species indicate that this genus has various chromosome numbers of 2n= 20, 24, 26, 40, 48, 60, 72, and 96 (Goldblatt 1981-1988; Goldblatt & Johnson 1990-2003, Ghaffari 2008; Ghaffari 2020). The previous report of chromosome counts for the *Ziziphus spina-christi* var. *aucheri* (Boiss.) Qaiser & Nazim is n=36 from Pakistan by Khatoon and Ali (1993). All species of the genus *Ziziphus* in our study are diploid (2n=24). The chromosome counts for *Ziziphus nummularia* and *Z. nummularia* × *Z. spina-christi* are reported here for the first time for the flora of Iran.

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