

CHROMOSOME NUMBER REPORTS FOR SOME PLANT SPECIES FROM IRAN

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Somatic chromosome numbers of 6 species from 3 families were studied in this research. The chromosome numbers for 3 taxa including *Dicyclophora persica* $2n=22$, *Pycnocycla caespitosa* $2n=22$, and *Phlomis polioxantha* $2n=20$ are new reports. Also, the chromosome number of *Halimodendron halodendron* $2n=16$ has been reported here for the first time for the flora of Iran. The chromosome number of *Pycnocycla spinosa* and *Eremostachys macrophylla* is $2n=22$. Ideograms are depicted for each species.

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Key words: Chromosome counts; ideogram, karyotype; Iran

گزارش شمارش کروموزومی چند گونه گیاهی از ایران

سارا صادقیان: کارشناس پژوهشی بخش تحقیقات منابع طبیعی، مرکز تحقیقات و آموزش کشاورزی و منابع طبیعی استان فارس،

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احمد حاتمی: کارشناس ارشد پژوهشی بخش تحقیقات منابع طبیعی، مرکز تحقیقات و آموزش کشاورزی و منابع طبیعی استان فارس،

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عدد کروموزومی ۶ گونه متعلق به ۳ خانواده در این تحقیق بررسی گردید. شمارش کروموزومی برای ۳ گونه شامل:

Phlomis polioxantha ($2n=20$) و *Pycnocycla caespitosa* ($2n=22$), *Dicyclophora persica* ($2n=22$)

است. همچنین عدد کروموزومی گونه *Halimodendron halodendron* ($2n=16$) برای نخستین بار برای فلور ایران گزارش می‌شود. عدد

کروموزومی برای گونه های *Pycnocycla spinosa* و *Eremostachys macrophylla* نیز $2n=22$ بدست آمد. پارامترهای کروموزومی آنها

بررسی شد و ایدیوگرام هر گونه رسم گردید.

INTRODUCTION

Chromosome information is an important key for taxonomy, phylogeny and genetics in plants. Chromosome number is the karyotype feature most commonly used in cytotaxonomical analyses (Guerra, 2008). Chromosome number and karyotype of: *Dicyclophora persica*, *Pycnocycla caespitosa*, *Phlomis polioxantha*, *Eremostachys macrophylla*, *Halimodendron halodendron*, and *Pycnocycla spinosa* are investigated. Karyological data concerning

chromosome numbers have already been published for *Pycnocycla spinosa*, *Eremostachys macrophylla* and *Halimodendron halodendron*. Shnner & al. (2004) studied *Pycnocycla spinosa* from Tehran province and reported that the species was diploid with $2n=2x=22$. Yan & al. (2000) investigated chromosome number of 38 forage plants in north China and reported chromosome number of *Halimodendron halodendron* as $2n=16$. Also, Simayi (1996) investigated karyotype analysis on *Halimodendron hlolodendron* and

reported chromosome number $2n=16$. The chromosome numbers for three species (*Dicyclophora persica*, *Pycnocycla caespitosa*, and *Phlomis polioxantha*) have not been reported yet, so in this study we investigated the karyotypes for the first time.

MATERIALS AND METHODS

For cytological study, rootlets were collected from germinated seeds on wet filter paper in petri dishes at 22°C temperature, when they reached 1-1.5 cm in length, rootlets were separated. The root tips meristems were treated with 0.5% saturated of α -Bromo naphthalene at 4°C for 4-5 h. Then they were fixed in 10% formaldehyde and chromium trioxide (1:1) for 20 to 24 h at 4°C. Then the root tips were rinsed for 1 h in distilled water. Hydrolysis was carried out with NaOH (1 Normal) at 60°C for 20-30 minutes and used hematoxylin-iron for chromosome staining for 1-2 h at room temperature. Root tips were squashed in a droplet of 45% acetic acid. The best metaphase plates were selected and measured by Micromesure 3.3 software (Reeves & al. 2000). In each mitotic metaphase the arm's length of each chromosome was measured. The chromosome morphology was studied based on Levan & al. (1964). Stebbins karyotype asymmetry levels were used to define asymmetry levels (1971). Ideograms were depicted for each species. Details regarding the studied materials are presented in table 1. Vouchers are deposited in the Herbarium of Fars Agricultural and Natural Resources Research and Education Centre.

RESULTS

The chromosome counts of examined species are given below (the voucher numbers belong to the Herbarium of Fars Agricultural and Natural Resources Research and Education):

Apiaceae

Dicyclophora persica Boiss.

Locality: Iran, Fars, Road of Dasht-e-Arjan to Kazeroon, before Parishan Lake. 1200 m. Hatami 15543.

Dicyclophora persica is an Iranian endemic species. Its chromosome count is reported here for the first time. This species was diploid with $2n=2x=22$ (fig. 1a). Nine pairs of chromosomes of our sample were metacentric (m) and 2 pairs were submetacentric (sm) (fig. 1a). They were categorized in type 1A (Stebbins 1971).

Pycnocycla caespitosa Boiss. & Hausskn.

Locality: Iran, Fars, Road of Dasht-e-Arjan to Kazeroon, before Parishan Lake. 1100 m. Hatami 20000.

Pycnocycla caespitosa is native to Iran. This species was diploid with $2n=2x=22$. The karyotype formulas were $3m+8sm$ (fig. 1b). Most of them were submetacentric and were categorized in type 2B. This is reported here for the first time.

Pycnocycla spinosa Decne. ex Boiss. var. *spinosa*

Locality: Iran, Fars, Neyriz, Road of Neyriz to Khajeh jamali. 2000 m. Hatami 4821.

This taxon is an endemic species to Iran. This species was diploid with $2n=2x=22$. The chromosomes were mostly submetacentric (sm) and karyotypic formula was $2m+8sm+1st$ (fig. 1c). They were categorized in type 3A. Chromosome number of *P. spinosa* was reported previously $n=11$ by Shner & al. (2004).

Lamiaceae

Eremostachys macrophylla Montbr. & Auch.

Locality: Iran, Fars, Sepidan, Margon. 2200 m. Hatami 11500.

This taxon grows in the flora Iranica area (Iran, Iraq and Turkmenistan) Turkey and central Asia. This species was diploid with $2n=2x=22$. The chromosomes were metacentric (m) and submetacentric (sm) (fig. 1d). They were categorized in type 2A. Our results were agreement with the previous reports of $2n=22$ by Ranjbar & al. (2016) under *Phlomoides macrophylla*.

Phlomis polioxantha Rech. F.

Locality: Iran, Fars, Road of Dasht-e-Arjan to Kazeroon, before Parishan Lake. 1000 m. Hatami 20001.

This species is an endemic species to the Flora Iranica area (Iran and Iraq). This species was diploid with $2n=2x=20$. Most chromosome were metacentric (m). Karyotype formula was $1M+8m+1sm$ (Fig. 1e). They were categorized in type 1A. According to the data, of our knowledge, the chromosome number of this species was not previously reported, so, here we report it for the first time.

Papilionaceae

Halimodendron halodendron (Pall.) Voss

Locality: Iran, Fars, Abadeh, Road of Dehbid to Chahsorkh. 2100 m. Hatami 1394.

This taxon grows in the north of Fars Province. It was reported $2n=2x=16$ for this species. This count is for the first time for the flora of Iran. This is in agreement with the result of the previous reports (Zhang & Ma 1989; Simayi 1996; Yan & al. 2000). Most chromosomes were metacentric (m) with karyotypic formula of $6m+2sm$ (fig. 1f). They were categorized in type 2A.

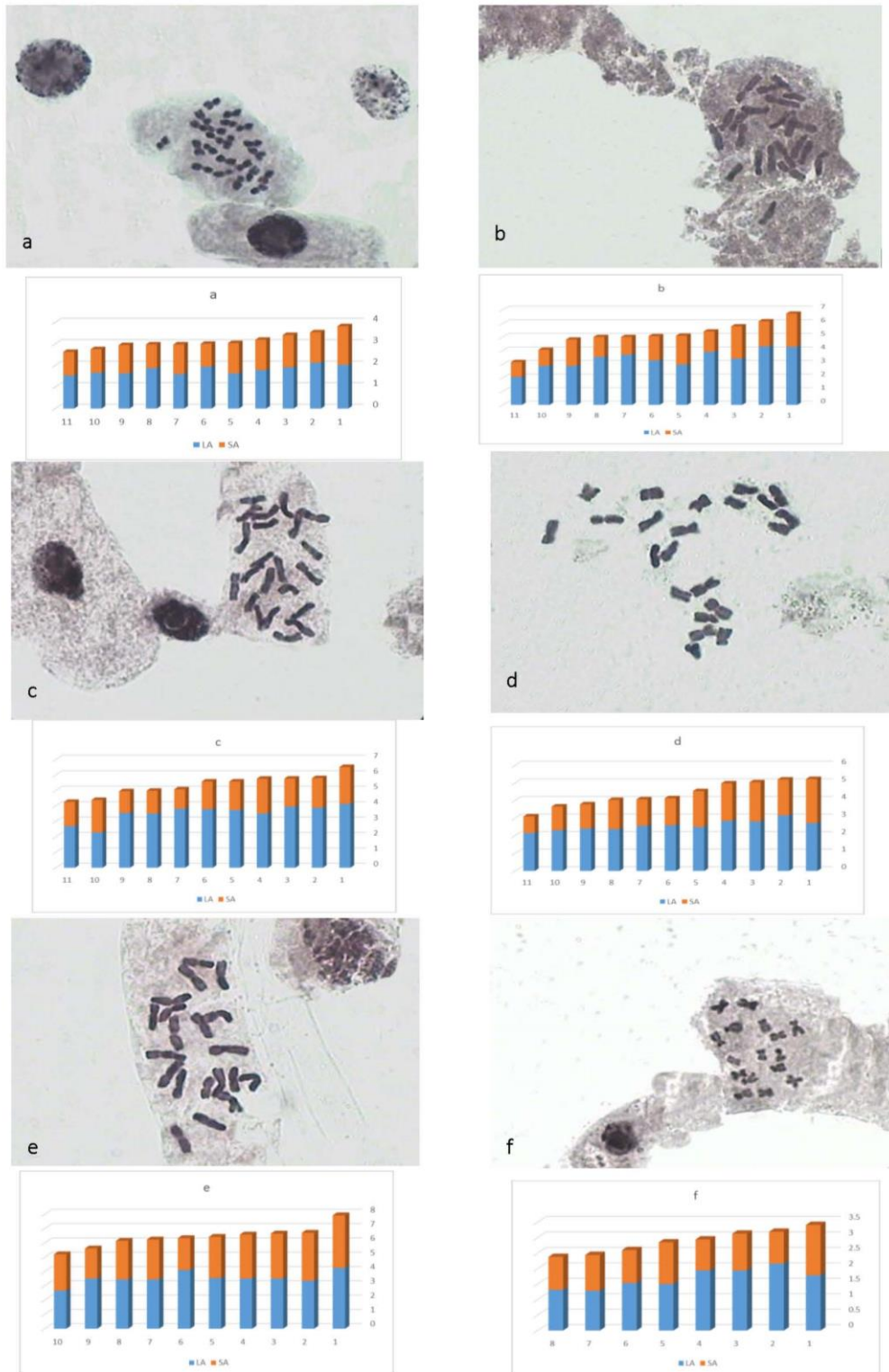


Fig. 1. Somatic metaphases and Ideograms of, a, *Dicyclophora persica* (2n=22); b, *Pycnocycla caespitosa* (2n=22); c, *Pycnocycla spinosa* (2n=22); d, *Eremostachys macrophylla* (2n=22); e, *Phlomis polioxantha* (2n=20); f, *Hlimodendron halodendron* (2n=16).

Table 1. Karyotype characters of six studied species. Abbreviations: 2n: Diploid chromosome numbers; TL: total length of chromosome; LA: long arm; SA: short arm; AR: arm ratio; DRL: difference of relative length; CI: centromeric index; A₁: intra-chromosome asymmetry index; A₂: inter-chromosome asymmetry index; VRC: value of relative chromatin; TF%: total form percentage; SC: symmetry classes of Stebbins and K.F.: karyotype formula.

species	2n	TL	LA	SA	AR	DRL	CI	A ₁	A ₂	VRC	%TF	SC	K.F.
<i>Dicyclophora persica</i>	2x=22	3.12	1.79	1.32	1.38	3.47	0.42	0.26	0.11	3.12	42.46	1A	9m+2sm
<i>Pycnocycla caespitosa</i>	2x=22	5.13	3.39	1.74	2.03	6.33	0.34	0.48	0.19	5.13	33.89	2B	3m+8sm
<i>Pycnocycla spinosa</i>	2x=22	5.33	3.53	1.80	2.03	3.85	0.34	0.47	0.12	5.33	33.75	3A	2m+8sm+1st
<i>Eremostachys macrophylla</i>	2x=22	4.35	2.59	1.75	1.55	4.45	0.40	0.33	0.16	4.35	40.37	2A	7m+4sm
<i>Phlomis polioxantha</i>	2x=20	6.38	3.54	2.85	1.27	4.27	0.44	0.19	0.11	6.38	44.60	1A	1M+8m+1sm
<i>Halimodendron halodendron</i>	2x=16	2.87	1.68	1.19	1.46	4.50	0.41	0.27	0.13	2.87	41.34	2A	6m+2sm

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