

Chromosome numbers for some *Erodium* L'Hér (Geraniaceae) species of Iran

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Abstract

Erodium (Geraniaceae) species are distributed in different habitats of Iran. Some species are of medicinal importance while some are well known weeds. There are no chromosome counts for *Erodium* species of Iran. Chromosome numbers are given for six taxa of *Erodium* (Geraniaceae) from Iran: *E. cicutarium* ($2n=36$), *E. ciconium* ($2n=18$), *E. malacoides* ($2n=20$), *E. moschatum* ($2n=20$), *E. neuradifolium* ($2n=20$) and *E. oxyrrhynchum* ($2n=20$). Chromosome numbers of six studied taxa were recorded for the first time from Iran. Dispolidy is recorded for *E. cicutarium* for the first time. Observed chromosome numbers are mainly in concordant with previous data. Different ploidy in each species was not observed.

Key words: Chromosome counts; *Erodium*; Iran

شمارش های کروموزومی برای برخی از گونه های *Erodium* L'Hér (Geraniaceae) در ایران

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چکیده

گونه های *Erodium* از تیره شمعدانی در زیستگاههای مختلفی در ایران توزیع شده اند. برخی گونه ها دارای ارزش دارویی بوده و برخی علفهای هرز شناخته شده ای هستند. هیچ گزارشی از شمارش کروموزومی این گونه ها در ایران موجود نیست. شمارشهای کروموزومی برای شش تاکسون از *Erodium* در ایران به این شرح ارائه می شود: *E. cicutarium* ($2n=36$), *E. ciconium* ($2n=18$), *E. malacoides* ($2n=20$), *E. moschatum* ($2n=20$), *E. neuradifolium* ($2n=20$) and *E. oxyrrhynchum* ($2n=20$). اعداد کروموزومی برای شش تاکسون مورد بررسی برای اولین بار از ایران گزارش می شوند. در *E. cicutarium* پدیده دیسپلوئیدی برای اولین بار گزارش می گردد. اعداد کروموزومی مشاهده شده عمدتاً در توافق با گزارشات پیشین است. تفاوتی در سطح پلوئیدی هر گونه مشاهده نشد.

واژه های کلیدی: شمارشهای کروموزومی؛ *Erodium*؛ ایران

Introduction

Genus *Erodium* L'Hér comprises 15 species in different parts of Iran (Schonbeck – Temesy, 1970). Species are classified in two sections as *barbata* Boiss and *plumosa* Boiss. And three subsections as Subsect. *Absinthioidea* Brumh, Subsect. *cicutaria* Lange and Subsect. *Malacoidea* Lange (Schonbeck - Temesy, 1970). Main center of diversification for *Erodium* is Mediterranean region with 63, 31 perennial and 12 annual species (Fiz et al., 2006, Fiz et al., 2010).

There are limited chromosome records for *Erodium* in the world. Chromosome counts as $x=9$ and $2n=18$ for *E. ciconium* (L.) L'Hér. ex Aiton, $x=10$ and $2n=20,36,40,42,48,54$ and 60 for *E. cicutarium* (L.) L'Hér. ex Aiton are observed which indicated the presence of polyploidy in these taxa. In *E. moschatum* (L.) L'Hér $x=10$ and $2n=20$, in *E. malacoides* (L.) L'Hér and *E. neuradiifolium* Delile ex Godr. $x=10$ and $2n=20$ and 40 have been recorded (Fiz et al., 2006). So there are diploid and tetraploid levels.

Mang niu er miao Shu 2008 recorded $2n=20$ for *E. oxyrrhynchum* M. Bieb. and $2n=20,36,40,48$ and 54 for *E. cicutarium* in flora of china.

Material and Methods

For this research 14 populations of 6 *Erodium* species were collected during the years 2012-2013 in their natural habitats (Table 1). For somatic chromosome study, the seeds were soaked for 24 hours in running water, 1 minute in ethanol 70% and then germinated on moist filter paper in the laboratory (ca. 21°-24°). The growing root tips of ca. 1.0-1.5 cm long were cut between 9-11 AM and pretreated by 8hydroxyquinoline (5 hrs.) and fixed in a cold mixture of ethanol and acetic acid (3:1) for 24 hours (Jianquan et al., 2001). Root tips were macerated in 1N HCl for 5 minutes (Cold Hydrolysis) at room temperature. Temporary slides were made by squashing the segments and staining in 2% Fe-acetocarmin for 12 hours. Voucher specimens are deposited in the

herbarium of the Department of Biology of Alzahra University, Iran.

Results and Discussion

Results of present study showed that studied *Erodium* species have different ploidy level in Iran. Three chromosome base numbers has been recorded for *Erodium* species as 8, 9 and 10. Most *Erodium* species (almost 55 species) has $x=10$, eight species $x=9$ and only one species has $x=8$ chromosome base number. There are also three species in *Erodium* with $x=9$ and 10 from which *E. oxyrrhynchum* in Iran is compatible with this chromosome base number.

In present study 4 species were similar in $x=10$ chromosome base number (Fig 1). Only *E. cicutarium* showed $x=9$. In *E. cicutarium* as Fiz et al., 2006 pointed there is a probability of dispoloidy which is rare in other species of this genus. Our results are in concordant with this idea. Observed chromosome numbers are not in concordant with sections classifications in this genus. More variation is observed in chromosome number of *barbata* species.

This is the first chromosome study on *Erodium* species of Iran. In mitotic study of four populations of *E. cicutarium* $2n=36$ were observed that showed dispoloidy in this species. For three populations of *E. ciconium* $2x=2n=18$. Observed chromosome number for *E. malacoides*, *E. moschatum*, *E. oxyrrhynchum* and *E. neuradifolum* $2n=2x=20$ which are as same as previously recorded in the world (Fiz et al., 2006). In Iran there are a high morphological variation in populations of *E. cicutarium* and *E. oxyrrhynchum* so that in some references subspecies have been defined for these taxa but present observations show that such variations have no chromosome number differences in Iran as most morphological variations were considered from different parts of Iran for this study. Observed variations in these two species are more than what is expected from autogamy as recorded by Fiz et al. (2006).

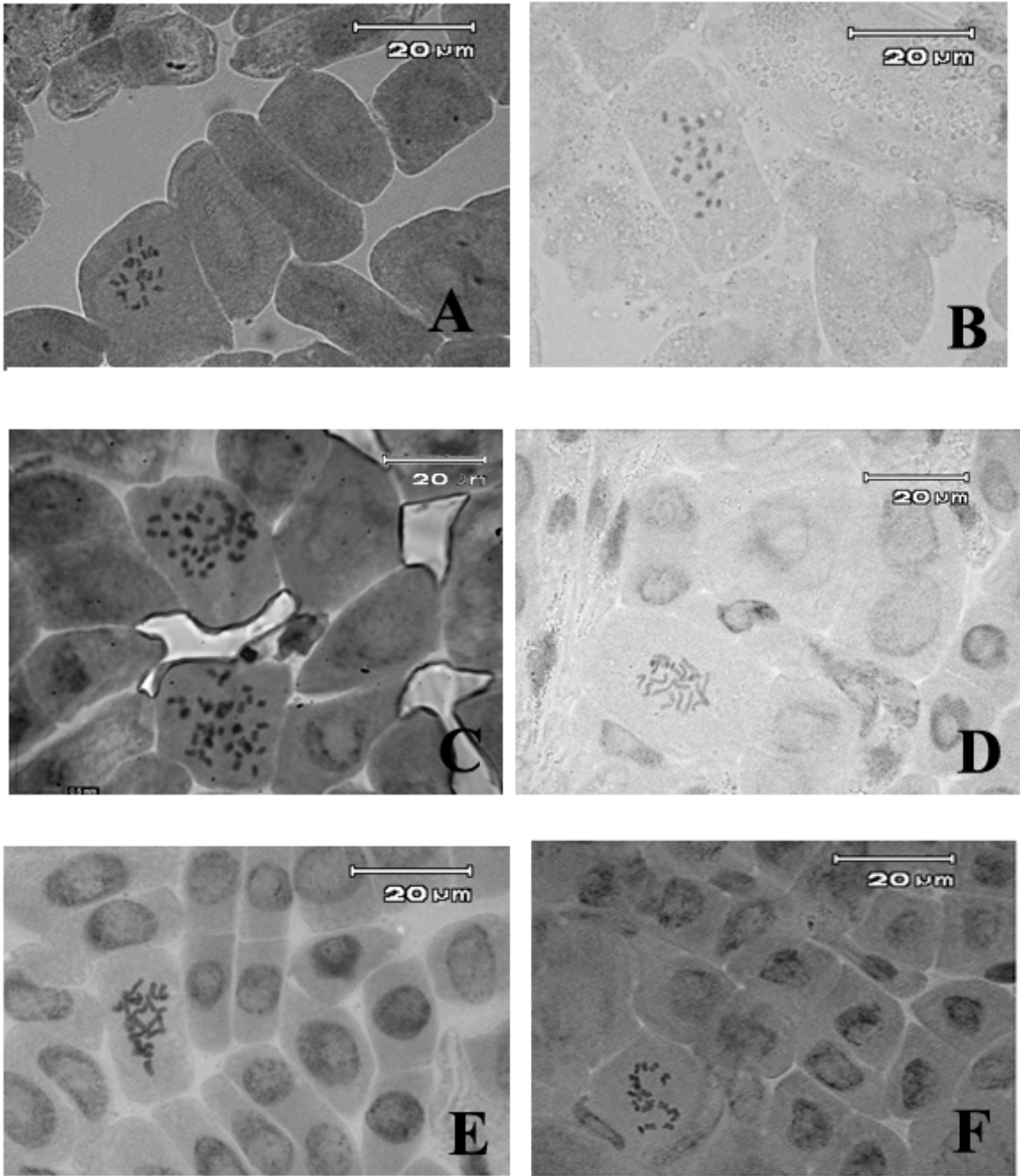


Figure 1. Micrographs of chromosomes of root tips in studied *Erodium* species (A); *E. neuradifolium* (B); *E. ciconium* (C); *E. cicutarium* (D); *E. malacoides* (E); *E. moschatum*, *E. oxyrhynchum* (F).

Table 1. Chromosome numbers of six studied *Erodium* species from Iran.

Species	Locality	Previous ch. No.	replications	Present ch. no
<i>E. cicutarium</i>	Theran, Velenjak, Najafian, 911	40,20,42,	12	36
	Albourz, Karaj, Botanical Garden, Taghipour, 912	36,48,54,6		
	Kermanshah, Ghelajeh Mount, Najafian 921	0	10	36
	Kermanshah, Latechagha Village, Najafian, 922		15	36
			15	36
<i>E. ciconium</i>	Albourz, Karaj, Baghestan, Mosaferi, 923	18,20	15,10,	18
	Albourz, Karaj, Agheli & Tavakoli, 82		10	
	Albourz, Karaj, Ardalan, Taghipour, 923			
<i>E. malacoides</i>	Fars, Kazeroun, Behtash, 822	20, 40	12	20
	Khuzestan, Ramhormoz, 823			
<i>E. moschatum</i>	Kohgiluyeh and Boyer- Ahmad, Gachsaran, Ghorak Village, 85	20	10	20
<i>E. neuradifolium</i>	Qom, Hoze sultan salt lake, Kazemzadeh, 824	20, 40	16	20
<i>E. oxyrrhynchum</i>	Tehran to Qom, Irani, 826		18	20
	Albourz, Jahanshahr, 926			
	Albourz, 200 m to National Botanical Garden, Taghipour 927	20,36,40,48,54		

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