



A karyological study on *Iberis attica* Jord. (Brassicaceae)

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Abstract

In this study, it was determined the chromosome number and karyotype analyses of *Iberis attica* Jord. This species belongs to the Brassicaceae that is widely distributed in Turkey. The somatic chromosome number was determined as $2n = 14$ in *I. attica*. The basic chromosome number was observed as $x = 7$. The karyotype formula of this species consists of seven median chromosome pairs. The somatic chromosome length between 1.80-2.63 μm . Total haploid chromosomes length was measured as 14.87 μm . The karyogram and ideogram of this species was illustrated based on centromeric index and put chromosome pairs in the decreasing size order.

Key words: *Iberis attica*, chromosome number, karyotype, Turkey

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Iberis attica Jord. (Brassicaceae) türünde karyolojik bir çalışma

Özet

Bu çalışmada *Iberis attica* Jord.'nın kromozom sayısı ve karyotip analizi belirlenmiştir. Bu tür, Türkiye'de geniş yayılışa sahip olan Brassicaceae familyasına aittir. *I. attica*' da somatik kromozom sayısı $2n = 14$ olarak belirlenmiştir. Temel kromozom sayısı ise $x = 7$ olarak gözlenmiştir. Bu türün karyotip formülü 7 çift median kromozom tipinden oluşmaktadır. Somatik kromozom boy uzunluğu 1.80-2.63 μm arasındadır. Toplam haploid kromozom boy uzunluğu ise 14.87 μm olarak ölçülmüştür. Bu türün karyogram ve idiyogramı sentromerik indeks temel alınarak ve kromozom çiftlerinin büyükten küçüğe sıralanması ile çizilmiştir.

Anahtar kelimeler: *Iberis attica*, kromozom sayısı, karyotip, Türkiye

1. Introduction

Brassicaceae is represented worldwide by 338 genera and 3700 species and it is stated major scientific and economic importance as a large family (Bailey et al., 2006). In terms of the number of species of the Brassicaceae family, Turkey is one of the richest countries in the world, with 607 species, 39 subspecies, 18 varieties, and 226 endemics (Al-Shehbaz et al., 2007; Al-Shehbaz, 2010; Mutlu, 2012; Mutlu and Karakuş, 2015). Also it was reported that this number of species as published new species, belonging to the family Brassicaceae in Turkey has continued to increase (Mutlu and Karakuş, 2015).

Iberis L., a genus belonging to the Brassicaceae family, is known 20 species in Europe (Da Silva and Franco, 1993), 15 species in Flora Iberica (Moreno, 2003), 6 species in Flora Hellenica (Tan, 2002), and 10 species in the Flora of Turkey and the East Aegean Islands (Hedge, 1965; Yıldırım, 2000; Dirmenci et al., 2005; Vural et al., 2012).

Iberis was arranged firstly by Hedge for Flora of Turkey and the East Aegean Islands (Hedge, 1965). Also Hedge was stated that the need for revision of this genus in Flora of Turkey. When we look at the studies in the literature, there was not a lot of study related to the genus *Iberis* especially with regard to cytological studies. The number of chromosome between species of *Iberis* on the distribution in Turkey is the only known *Iberis spruneri* as $2n = 14$. The number of somatic chromosomes of taxa belonging to different species of Brassicaceae is reported some studies in Turkey recently

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(Yıldız and Gücel 2006; Martin et al., 2007; Martin et al., 2011). But there is need for more studies due to complete lack of knowledge about cytology or karyomorphology of the genus *Iberis* and other genus in Brassicaceae.

The aim of the present work was to give the numbers of chromosomes and karyotype analyses of *Iberis attica*.

2. Materials and methods

Iberis attica collected natural habitat from Spil mountain in Manisa at the west of the Turkey in 2011 (Figure 1). Plant material is registered as (D.OSKAY 1359), is dried according to standart herbarium techniques and stored properly in Biology department of Celal Bayar University. The species was defined according to Flora of Turkey (Hedge, 1965).



Figure 1. *Iberis attica* in natural habitat

Root tips were derived from seeds germinated for caryological study. α -monobromonaphthalene is used as the pretreatment agent at room temperature for 2 h. Root tips were fixed with carnoy at room temperature for 1 h. The root tips removed from carnoy were washed three times with distilled water and excess water has been moved in contact with the blotting paper. Then the root tips were stained with 2% acetic orcein by heating three times. Squash preparation method was used for chromosome study in this species. Photographs of slide were taken with digital camera of Nikon Coolpix 5000 connected to the Nikon SE model light microscope. The ideogram was prepared with measurements taken on enlarged micrographs of five well spread metaphase plates. The classification of chromosomes, the length of long and short arm, arm ratio, centromeric index and relative chromosomal length were carried out according to Levan et al. (1964).

3. Results

The chromosome number of *Iberis attica* was determined to be $2n = 14$ (Figure 2). Measurements and classification of the chromosome pairs were given Table 1. The species have seven pairs of metacentric chromosomes in karyotype. Centromeres of all chromosomes were at median region and no satellite was observed. The length of the chromosomes varies between 1.80 μm to 2.63 μm . Total haploid chromosome length was 14.87 μm (Table 1). Karyogram and ideogram of this species were arranged in decreasing size length of the chromosomes (Figures 3-4).

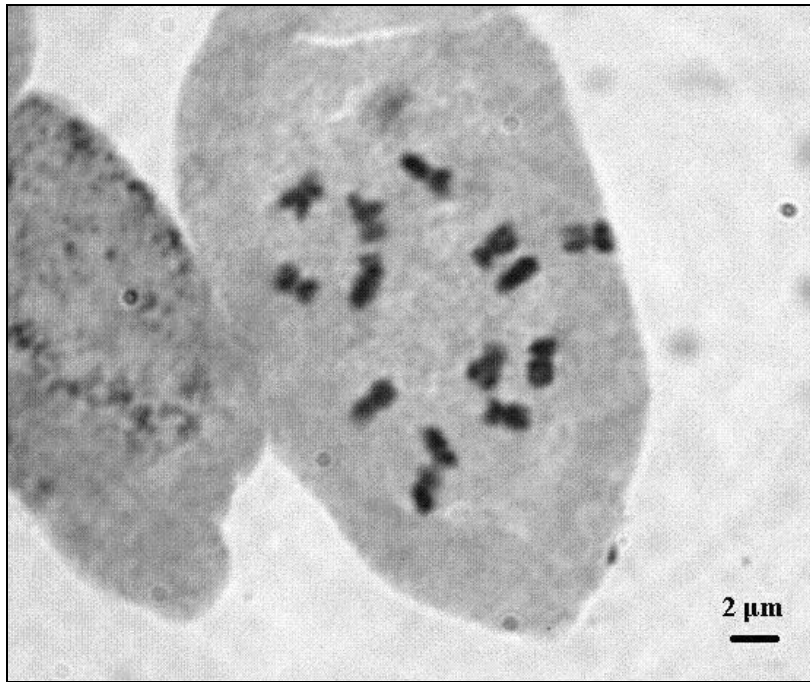


Figure 2. Somatic chromosomes in *Iberis attica*

Table 1. Measurements and classification of the chromosome pairs in *Iberis attica*

Chromosome Pair Number	Long arm (L)	Short arm (S)	Total length (L+S=T)	Arm ratio (L/S)	Relative length (T/H ×100)	Centromeric Index (S/T ×100)	Chromosome Morphology
1	1,45	1,18	2,63	1,23	17,68	44,86	Median
2	1,33	0,94	2,27	1,41	15,26	41,40	Median
3	1,27	0,93	2,19	1,36	14,72	42,46	Median
4	1,20	0,85	2,04	1,41	13,71	41,66	Median
5	1,20	0,83	2,02	1,44	13,58	41,08	Median
6	1,06	0,86	1,92	1,23	12,91	44,79	Median
7	1,07	0,73	1,80	1,46	12,10	40,55	Median

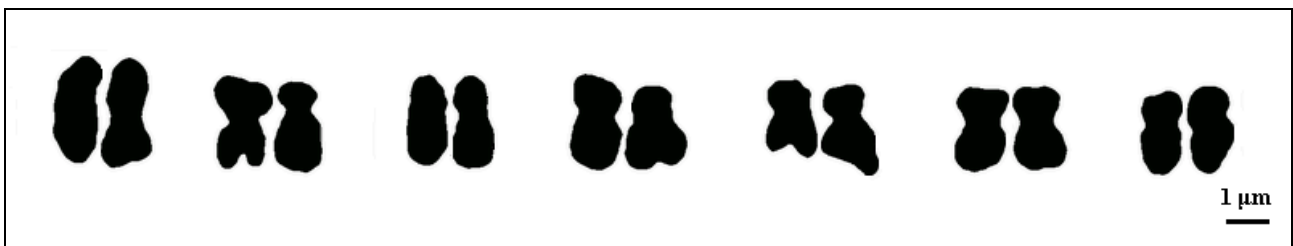


Figure 3. Karyogram of *Iberis attica*

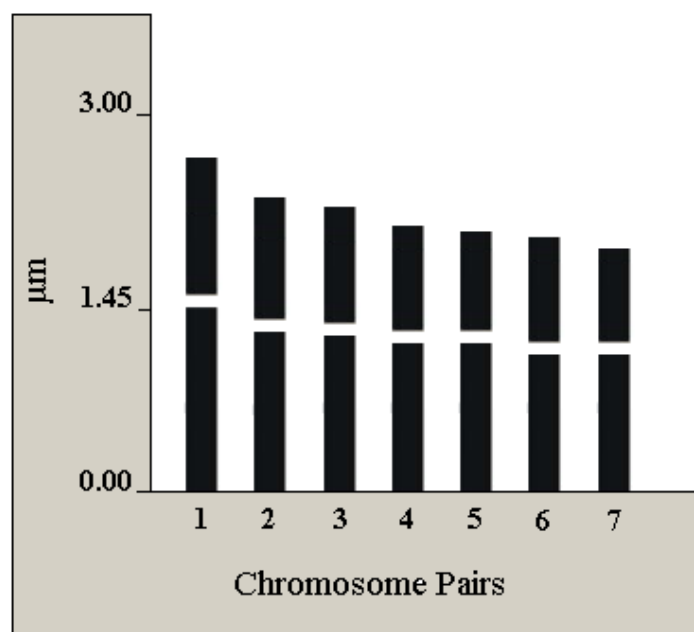


Figure 4. Ideogram of *Iberis attica*

4. Conclusions and discussion

Considering the studies in the literature, there are not enough data about karyology of *Iberis* species. It is seen that the data on the number of chromosomes found in much more flora resources. The reported chromosome numbers are $2n = 14, 16, 18, 22, 50$ in the genus *Iberis*. (Darlington and Wylie, 1955; Da Silva and Franco, 1993; Moreno, 2003; Warwick and Al-Shehbaz, 2006). The chromosome number of *Iberis attica* was determined $2n = 14$. It is seen that basic chromosome number $x = 7$. The findings in this study are consistent with previous studies. *Iberis attica* have seven pairs of metacentric chromosomes in karyotype. The length of the chromosomes varies between $1.80 \mu\text{m}$ to $2.63 \mu\text{m}$ while total haploid chromosome length was $14.87 \mu\text{m}$. In a study by Datta (1974), seven taxa belonging to two species of *Iberis*, *I. amara* L. and *I. umbellata* L. have been included that it was found the somatic complements of all the varieties of a species have a remarkable constancy in chromosome number, however, differ in the details of chromosome morphology. It was found $2n=14$ chromosomes in all the varieties of *I. amara* while it was found $2n=18$ chromosomes all the varieties of *I. umbellata*. Also, it was stated that total haploid chromosome length varies between $17.98 \mu\text{m}$ to $19.96 \mu\text{m}$ in varieties of *I. amara* while total haploid chromosome length varies between $12.04 \mu\text{m}$ to $21.28 \mu\text{m}$ in varieties *I. umbellata*. When we look at the variety of *I. amara* with chromosome number 14, the length of the chromosomes varies between $1.98 \mu\text{m}$ to $2.63 \mu\text{m}$ and total haploid chromosome length was $17.98 \mu\text{m}$. It is observed that these values are quite compatible with *I. attica*. And it was suggesting that structural alteration of chromosomes has also been an important factor in diversification of the genus (Datta, 1974). This shows that studies for identification of karyological properties would play a positive role in elucidation taxonomic distinction. In the present study the chromosome number, karyogram and ideogram of *I. attica* were given for the first time. It will be contribute to the future karyological studies about the genus *Iberis*.

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