Karaelmas Science and Engineering Journal
Journal home page: http://fbd.beun.edu.tr
DOI: 10.7212/zkufbd.v9i1.1280

Research Article
Received / Geliş tarihi : 23.01.2018
Accepted / Kabul tarihi : 22.02.2018

Karyotype Analyses in Two Taxa of *Anchonium* DC. (Brassicaceae) from Turkey

Türkiye'den İki Anchonium DC. (Brassicaceae) Taksonunda Karyotip Analizleri

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Abstract

Karyotype analysis of two *Anchonium* DC. taxa, collected from different localities in Turkey, were determined. These taxa include *Anchonium elichrysifolium* (DC.) Boiss. subsp. *canescens* (Hausskn ex Bornm.) Cullen et Coode and *A. elichrysifolium* (DC.) Boiss. subsp. *elichrysifolium*. The diploid chromosome numbers of investigated *Anchonium* data were counted as 2n = 14. The basic chromosome number of the genus was x = 7. Karyotypes of the taxa are introduced to the scientific community for the first time and they were obtained through an Image Analysis System. The research has made contribution to the revision of the genus *Anchonium* in Turkey.

Keywords: *Anchonium*, Chromosome, Image Analysis System

Öz

Türkiye'de farklı lokalitelerden toplanan iki *Anchonium* DC. taksonunun karyotip analizi yapıldı. Bu taksonlar; *Anchonium elichrysifolium* (DC.) Boiss. subsp. *canescens* (Hausskn ex Bornm.) Cullen et Coode ve *A. elichrysifolium* (DC.) Boiss. subsp. *elichrysifolium*'dur. İncelenen *Anchonium* taksonlarının diploid kromozom sayıları 2n = 14 olarak sayıldı. Cinsin temel kromozom sayısı x = 7'dir. Taksonların karyotipleri bilim dünyası için ilk olup sonuçlar Görüntü Analiz Sistemi aracılığı ile elde edildi. Araştırma, *Anchonium* cinsinin Türkiye'deki revizyonuna katkıda bulunmuştur.

Anahtar Kelimeler: *Anchonium*, Kromozom, Görüntü Analiz Sistemi

1. Introduction

The Brassicaceae tribe of the Brassicaceae family includes many economically important species that are useful as vegetables, edible oils, crop forages, condiments and fuel crops (Zelmer and McVetty 2009, Perfectti et al. 2017). For this reason, Brassicaceae tribe has been the focus of a vast amount of genetic, agronomic, and ecological research (Gómez-Campo 1999, Gupta 2009, Kole 2011, Schmidt and Bancroft 2011, Perfectti et al. 2017).

Anchonium, a member of the Brassicaceae family, is represented by two taxa (Rechinger 1968) in Iranian Flora. The taxa represented by 1 taxon (Townsend 1980) in the Iraqi Flora and 3 taxa (Vasilchenko 1970) in the USSR Flora is represented by 6 taxa in the Turkish Flora (Davis 1965). The genus is expressed in 3 taxa in the study titled Turkey plants in 2012 (Güner et al. 2012).

The aim of this study is to make a contribution to cytology of the genus *Anchonium* in Turkey. In this study, the number of somatic chromosomes and chromosome morphology of *Anchonium elichrysifolium* subsp. *canescens* and *A. elichrysifolium* subsp. *elichrysifolium* have been determined for the first time.

2. Materials and Methods

Anchonium taxa belonging to the genus used in this study were collected from different regions of Turkey and locality information;

Anchonium elichrysifolium (DC.) Boiss. subsp. *canescens* (Hausskn ex Bornm.) Cullen et Coode B6 Sivas: Gemerek, Southern slopes of Karasivri Hill, 2 km far from Örenyurt village, rocky and stony areas, 1964 m, 23.07.2015, MİI1004, (39 27' 870" K36 05' 930" D), Figure 1.

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Anchonium elichrysifolium (DC.) Boiss. subsp. *elichrysifolium*

B7 Tunceli: Pülümür, Southern slopes of Munzur Mountain 2 km far from Sarıgül village, rocky and stony areas 28.06.2015, 2530 m, Mİ 1005, (39 23' 409" K39 38' 554" D), Figure 2.

All samples were collected from wild populations from Turkey. Collected specimens were deposited in Yüzüncü Yıl University. All karyological observations were carried out on root tips. Root-tip meristems were provided from seed by germinating them on wet filter paper in Petri dishes at room temperature. Firstly root tips pretreated for 16 h in α-monobromonaphthalene at 4°C, fixed in 3:1 absolute alcohol/glacial acetic acid, then the root tips were hydrolysed with 1 N HCl for 13 min at room temperature and stained with 2% aceto-orcein for 3 h at room temperature. Stained root tips were squashed in a drop of 45% acetic acid and permanent slides were made by mounting in Depex. For karyotype analyses the photographs enlarged 10 ×100 were taken using a microscope with a camera attachment. The karyotypes were calculated by Software Image Analyses (Bs200ProP) loaded on a personal computer.

3. Results and Discussion

The number of somatic chromosomes in the *Anchonium* genus which belongs to Brassicaceae family was studied using the Image Analysis System. The somatic chromosome number was determinated as 2n = 14 all of taxa.

Our study showed that the chromosome number of *Anchonium elichrysifolium* subsp. *canescens* is new for science and 2n = 14 (Figure 3). The shortest chromosome length is 3.23 μm, the longest is 6.55 μm, and haploid chromosome length is 31.71 μm. Chromosome arm ratios are measured as 1.13–1.59. Centromeric index varies between 3.94 and 9.27 and relative lengths vary from 10.20 to 20.65. The karyotype formula of this taxon consists of seven metacentric chromosome pair (7m). The ideogram was drawn based on the centromeric index and arranged in decreasing size order (Figure 4).

Our study showed that the chromosome number of *Anchonium elichrysifolium* subsp. *elichrysifolium* is new for science and 2n = 14 (Figure 5). The shortest chromosome length is 1.96 µm, the longest is 4.81 µm, and haploid chromosome length is 23.30 µm. Chromosome arm ratios are measured as 1.23–2.04. Centromeric index varies between 2.77 and 9.25 and relative lengths vary from 8.41 to 20.63. The karyotype formula of this taxon consists of six metacentric chromosome pair, one submetacentric chromosome pair. (6m+1sm). The ideogram was drawn based on the centromeric index and arranged in decreasing size order (Figure 6).

Figure 1. *Anchonium elichrysifolium* subsp. *canescens*.

Figure 2. *Anchonium elichrysifolium* subsp. *elichrysifolium*.

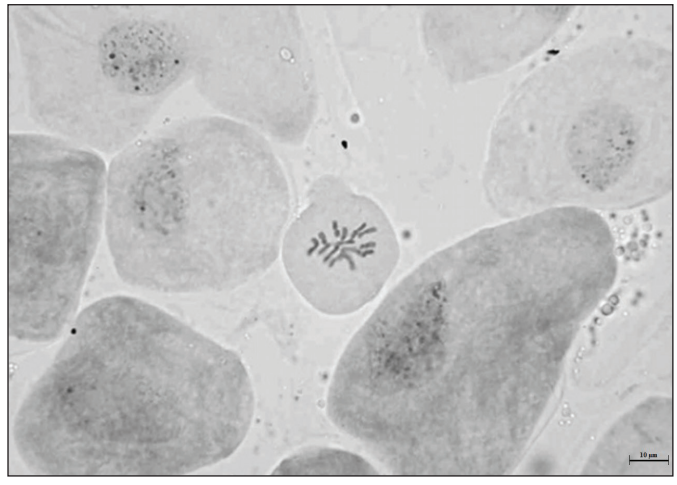

Figure 3. Somatic chromosomes of *Anchonium elichrysifolium* subsp. *canescens*.

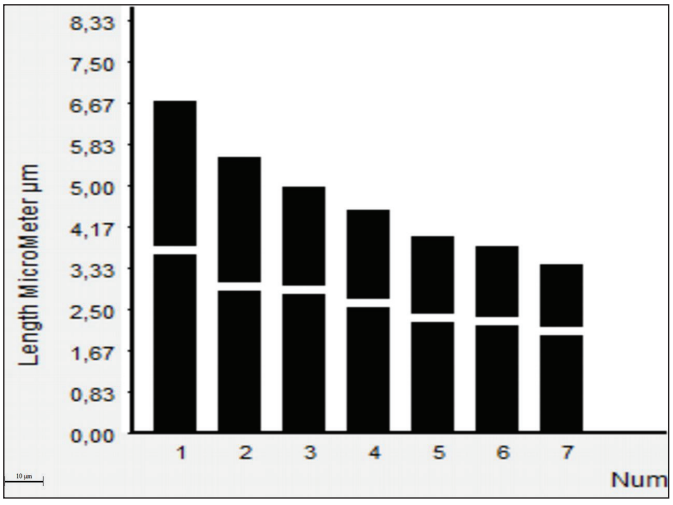

Figure 4. Ideogram of *Anchonium elichrysifolium* subsp. *canescens*.

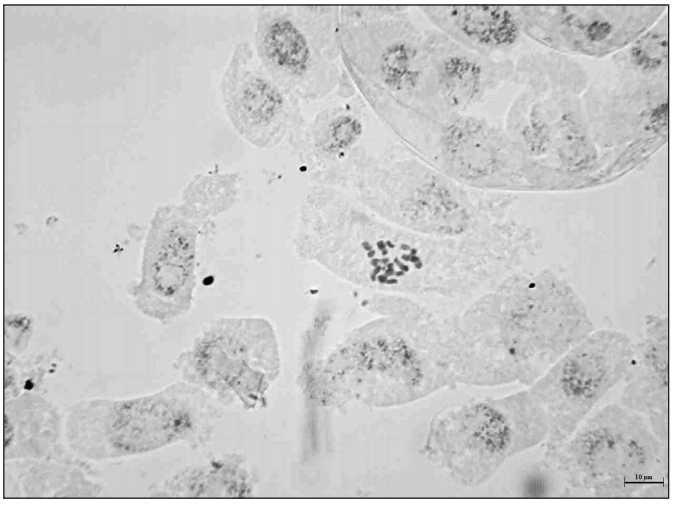

Figure 5. Somatic chromosomes of *Anchonium elichrysifolium* subsp. *elichrysifolium*.

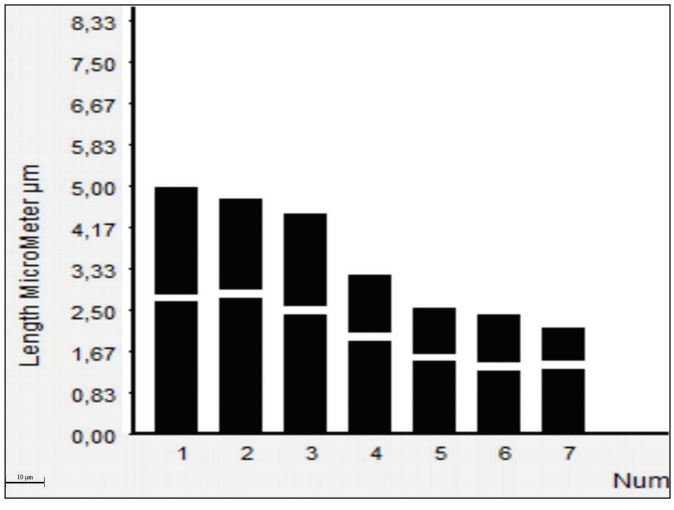

Figure 6. Ideogram of *Anchonium elichrysifolium* subsp. *elichrysifolium*.

In two taxa in the genus *Anchonium* examined, the somatic chromosome number were observed as 2n = 14. These findings are in agreement with the somatic chromosome numbers given for the *Anchonium* genus taxa in the previous research (Maassoumi, 1980). In this study, the karyotypes of the three taxa belonging to the genus *Anchonium* studied were determined by Image Analysis System for the first time. Ideograms of these taxa were arranged in order of decreasing lengths. The chromosome morphologies of the genus *Anchonium* taxa studied are slightly different from each other. The length of the smallest chromosome was 1.96 µm and found in *Anchonium elichrysifolium* subsp. *elichrysifolium*. The length of the largest chromosome was found as 6.55 µm in *A. elichrysifolium* subsp. *canescens*. The smallest relative length (8.41) in *A. elichrysifolium* subsp. *elichrysifolium* and the largest arm ratio (2.04) in *A. elichrysifolium* subsp. *elichrysifolium* were observed. According to the centromeric index, *A. elichrysifolium* subsp. *elichrysifolium* taxon has the smallest (2.77 µm) and *A. elichrysifolium* subsp. *canescens* taxon has the largest (9.27 µm) centromeric index values. The total haploid chromosome length is the shortest in *A. elichrysifolium* subsp. *elichrysifolium* (23.30 µm) and the longest in *A. elichrysifolium* subsp. *canescens* (31.71 µm).

The present study effectively determined the karyotype analysis of two *Anchonium* taxa that are naturally distributed in Turkey. This study expanded the range of chromosomal number in *Anchonium* and also recorded the cytological features of two *Anchonium* taxa.

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