A Cytogenetical Study on Some Plants Taxa in Nizip Region
(Aksaray, Turkey)

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Abstract: This cytological study was performed in 19 taxa grown naturally in Nizip region (Aksaray). These taxa are Conringia perfoliata (C.A.Mey.) Busch, Alyssum strigosum Banks & Sol. subsp. strigosum, Alyssum murale Waldst. & Kit. subsp. murale var. murale, Matthiola longipetala (Vent.) DC. subsp. bicornis (Sibth. & Sm.) P.W.Ball., Erysimum thyrsoides Boiss. subsp. thyrsoides (Brassicaceae), Silene alba (Mill.) E.H.L. Krause subsp. divaricata (Reichb.) Walters, Silene conoidea L., Silene ciliate (L.) Wibel. (Caryophyllaceae), Linum austriacum L. subsp. austriacum (Linaceae), Medicago × varia Martyn., Onobrychis argyrea Boiss. subsp. argyrea (Fabaceae), Astrodaucus orientalis (L.) Drude (Apaceae), Centaurea patula DC., Centaurea solstitialis L. subsp. solstitialis, Cnicus benedictus L. var. benedictus, Tragopogon longirostris Bisch. ex Sch.Bip. var. longirostris (Asteraceae), Paracaryum ancyritanum Boiss.. (Boraginaceae), Plantago major L. subsp. intermedia (Gilib.) Lange, Plantago lanceolata L. (Plantaginaceae), Erysimum thyrsoides subsp. thyrsoides, Paracaryum ancyritanum, and Onobrychis argyrea subsp. argyrea. Somatic metaphase chromosome numbers of Paracaryum ancyritanum, Onobrychis argyrea subsp. argyrea, Erysimum thyrsoides subsp. thyrsoides, and Alyssum murale subsp. murale var. murale were determined for the first time. Moreover, karyotype analyses of Cnicus benedictus var. benedictus, Matthiola longipetala subsp. bicornis and Medicago × varia were carried out for the first time in the present study.

Key Words: Aksaray, chromosome number, karyotype, endemic, Turkey

Introduction

Given Turkey is located in a warm climate zone, it is distinguished from many countries having similar environment by its plant diversity. The number of plant species growing in Turkey is close to Europe. The plant taxa in Turkey have reached to 12,000 by recently discovered new taxa (1). The richness of the Turkish Flora is based on geographic, climatic, topographic and edaphic factors. These factors bring about the plant formation diversity and infraspecific variations (2). Turkey is also one...
of the richest countries with more than 3000 endemic species and with an endemism ratio of 34.4% (3).

There are a few studies on plant cytogenetics in our country. The determination of somatic chromosome numbers and chromosome morphologies of taxa is important for the revision and monograph study in plant systematics. The aim of the present study is to obtain cytogenetic data from Nizip region (Aksaray, Türkiye) taxa to contribute to future plant systematics studies.

Chromosome numbers of some species were reported in previous studies (4-19). The diploid chromosome numbers of some taxa in the genus Centaurea were also reported (4, 12). The somatic chromosome number of Conringia perfoliata, Chicus benedictus var. benedictus, Asteroadaucus orientalis, Medicago × varia, Onobrychis argyrea subsp. argyrea, Plantago major subsp. intermedia, P. lanceolata and Plantago major subsp. major, subsp. intermedia, Tragopogon longirostris var. longirostris, Linum austriacum subsp. austriacum, taxa were determined (5-9, 11, 13, 15). The karyomorphological studies on some taxa in the genus Matthiola were identified. (14, 17-18). The karyological studies on some taxa of Silene were studied. (10, 16, 19).

Karyotype analyses have been conducted in recent years using similar computer programs with different names. The Image Analysis Program plays a vital role in the minimization of errors in karyotype analyses. Moreover, the use of the Image Analysis Program, compared to karyotype analyses that are performed using scales and compasses, has three chief advantages. First, the preparation of karyotypes takes less time. Second, it is more practical in the measurement of chromosomes. Third, the karyograms and ideograms are prepared automatically.

Somatic metaphase chromosome numbers of Paracaryum ancyritanum, Onobrychis argyrea subsp. argyrea, Erysimum thyrsoidem subsp. thyrsoidem and Alyssum murale subsp. murale var. murale were determined for the first time. Moreover, karyotype analyses of three taxa (Cnicus benedictus var. benedictus, Matthiola longipetalasubsp. bicornis and Medicago × varia) were performed for the first time in the present study.

Results

In this study, 19 taxa belonging to 8 families were studied. These families are Cruciferae (5 taxa), Asteraceae (4 taxa), Fabaceae (2 taxa), Caryophyllaceae (3 taxa), Linaceae (1 taxa), Apiaceae (1 taxa), Boraginaceae (1 taxa), and Plantaginaceae (2 taxa). The somatic chromosome numbers of Paracaryum ancyritanum, Onobrychis argyrea subsp. argyrea, Erysimum thyrsoidem subsp. thyrsoidem, and Alyssum murale subsp. murale var. murale were determined for the first time.

The somatic chromosome numbers observed in Conringia perfoliata is 2n = 14, in Alyssum strigosum
subsp. *strigosum* is $2n = 16$, in *A. murale* subsp. *murale* var. *murale* is $2n = 16$, in *Matthiola longipetala* subsp. *bicornis* as $2n = 14$, in *Erysimum thyrsoides* Boiss. subsp. *thyrsoidum* is $2n = 14$, in *Silene alba* subsp. *divaricata* is $2n = 24$, in *S. conoidea* is $2n = 20$, in *S. otites* is $2n = 24$, in *Linum austriacum* subsp. *austriacum* is $2n = 18$, in *Medicago × varia* is $2n = 32$, in *Onobrychis argyrea* subsp. *argyrea* is $2n = 16$, in *Astrodaucus orientalis* is $2n = 20$, in *Centaurea patula* is $2n = 14$, in *C. solstitialis* subsp. *solstitialis* is $2n = 16$, in *Cnicus benedictus* var. *benedictus* is $2n = 22$, in *Tragopogon longirostris* var. *longirostris* is $2n = 12$, in *Paracaryum ancyritanum* is $2n = 24$, in *Plantago major* subsp. *intermedia* (19). *P. lanceolata*.
= 24, in *Plantago major* subsp. *intermedia* is \(2n = 12\) and in *P. lanceolata* is \(2n = 12\) (Figure 2).

Karyotype analyses of *Cnicus benedictus* var. *benedictus*, *Matthiola longipetala* subsp. *bicornis* and *Medicago × varia* were performed for the first time in this research. Details of karyotypes in these taxa are given below:

**Matthiola longipetala** subsp. **bicornis**

The somatic chromosome number was observed as \(2n = 14\). Two pairs of chromosomes are metacentric, 4 chromosome pairs are submetacentric, and 1 chromosome pair is subtelocentric. Total chromosome length is 1.34-2.86 mm, while the total haploid chromosome length is 13.58 mm (Table 2, Figure 3).

**Medicago × varia**

The somatic chromosome number was observed as \(2n = 32\). Karyotype of this species is given for the first time. The karyotype formula is 7m + 4sm. Total chromosome length is 0.69-1.55 mm and total haploid chromosome length is 11.38 mm (Table 2, Figure 5).

**Discussion**

In this cytological study of 19 taxa growing in Nizip region of Aksaray revised previous knowledge in literature providing the somatic chromosome numbers of four taxa for the first time. In addition, chromosome morphologies of the 3 taxa are given for the first time.

The chromosome number of \(2n = 14\) for *Conringia perfoliata* literature supports an earlier report (5). In this study, chromosome numbers of the 2 taxa, which belong to the genus *Alyssum*, were inspected. Somatic chromosome numbers of both taxa were determined as \(2n = 16\). The chromosome number of *A. strigosum* subsp. *strigosum* was given previously as \(2n = 16\) (22). Our karyological results show similarities with this taxon. Chromosome numbers of *A. murale* subsp. *murale var. murale* were given in this study for the first time.

The somatic chromosome number of *Matthiola longipetala* subsp. *bicornis* was identified as \(2n = 14\). Our results are similar to those given in the literature (14).
Figure 2.
Figure 2.
Figure 2.
Furthermore, the karyotype of this taxon was studied differently compared to the literature. The karyotype formula was determined as 2m + 4sm + 1st. Total chromosome length was 1.34 - 2.86 mm. Total haploid chromosome length was 13.58 mm. The karyological data of M. longipetala subsp. bicornis showed varying differences from M. trojana T.Dirmenci, F.Satılı & G.Tümen. The chromosome number of M. trojana was

### Table 2. Karyological properties of the taxa studied. Abbreviations: AR (arm ratio); CI (centromeric index); THC (total length of haploid complement); M (metacentric chromosomes); SM (submetacentric chromosomes); ST (subtelocentric chromosomes).

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Zn</th>
<th>Chromosomes size difference (μm)</th>
<th>AR</th>
<th>CI</th>
<th>THC (μm)</th>
<th>M</th>
<th>SM</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matthiola longipetala subsp. bicornis</td>
<td>14</td>
<td>1.34-2.86</td>
<td>2.28</td>
<td>4.94</td>
<td>13.58</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Medicago × varia</td>
<td>32</td>
<td>0.85-1.90</td>
<td>1.46</td>
<td>2.53</td>
<td>17.94</td>
<td>11</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Cnicus benedictus var. benedictus</td>
<td>22</td>
<td>0.69-1.55</td>
<td>1.61</td>
<td>3.49</td>
<td>11.38</td>
<td>7</td>
<td>4</td>
<td>-</td>
</tr>
</tbody>
</table>
reported as 2n = 12. The karyotype formula was determined as 4m + 2sm. Total chromosome length was 2.44-4.27 mm (17). Although the karyotype of M. longipetala subsp. bicornis has 2 subterminal chromosome pairs, M. trojana was not observed. The chromosome length of M. longipetala subsp. bicornis was smaller than M. trojana. M. odoratissima (Pall.) R.Br. was similar to M. trojana. The somatic chromosome number of M. trojana was reported as 2n = 12. The karyotype formula was determined as 4m + 2sm. The total chromosome length was much longer than M. longipetala subsp. bicornis (6.06-2.85 μm). In this study, another Brassicaceae member is Erysimum thyrsoideum subsp. thyrsoideum. This taxon is endemic for Turkey. Diploid chromosome number of Erysimum thyrsoideum subsp. thyrsoideum (2n = 14) was counted for the first time.

Somatic chromosome numbers of Silene alba subsp. divaricata and S. otites were observed as 2n = 24. Our results are similar to those given in the literature (10, 16, 19).

Somatic chromosome number of Linum austriacum subsp. austriacum was observed as 2n = 18 and showed parallelism with the literature (13).

This study consists of 2 taxa belonging to Fabaceae (Medicago × varia and Onobrychis argyrea subsp. argyrea). Medicago × varia is one of the natural hybrid and somatic chromosome number is the same as in literature 2n = 32 (8).

Chromosome morphology of Medicago varia was observed as 11m + 5sm. The total chromosome length was of 0.85 - 1.90 mm. Total haploid chromosome length was 17.94 mm. Onobrychis argyrea subsp. argyrea is endemic for Turkey. The chromosome number was counted (2n = 16) for the first time.

The somatic chromosome number of Astrodaucus orientalis was identified as 2n = 20 and showed parallelism with the literature (7).

Regarding the 2 taxa C. patula and C. solstitialis subsp. solstitialis, belonging to Asteraceae family and Centaurea genus, diploid chromosome numbers were observed as 2n = 14 and 2n = 16, respectively. Diploid chromosome numbers of taxa were in line with the literature. (4, 12).

Somatic chromosome number of Cnicus benedictus var. benedictus was observed as 2n = 22 in the literature (6). Furthermore, the karyotype of this taxon was studied differently compared to the literature. Chromosome morphology of Cnicus benedictus var. benedictus was 7m + 4sm. Total chromosome length was 0.69 - 1.55 μm. Total haploid chromosome length was measured as 11.38 μm. Diploid chromosome number (2n = 12) of Tragopogon longirostris var. longirostris was observed to be the same as in the literature (11).

Paracaryum ancyritanum is endemic for Turkey and its chromosome number (2n = 24) is reported for the first time.

Diploid chromosome numbers of Plantago major subsp. intermedia and P. lanceolata taxa in this study were observed to be the same as in the literature (9, 15).

This is the only study to date utilizing cytological methods in floristic research.

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