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New chromosome numbers in *Alchemilla* L. (*Rosaceae*) from Turkey**Abstract:**

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The chromosome numbers of six *Alchemilla* species from NE Anatolia, Turkey, belonging to *A. sect. Alchemilla* ser. *Calycinae* and ser. *Elatae*, respectively, are presented for the first time. *Alchemilla ancerensis* has $2n = 86–96$, *A. cimilensis* $2n = 64–75$, *A. elevitensis* $2n = 84–102$, *A. hemsinica* $2n = 72–80$, *A. ikizdereensis* $2n = 101–108$, and *A. kackarensis* $2n = 66–76$.

Introduction

The genus *Alchemilla* L., which is distributed mainly in the Holarctis but occurs also on the mountains of E and S Africa as well as of Madagascar, S India, Sri Lanka and Java (Izmailow 1981), comprises more than 1000 species. In Turkey the genus is, according to Pawłowski & Walters (1972), represented by some 50 species belonging to three subsections and six series of *A. sect. Alchemilla*. More recently, further six species have been described by Kalheber (1994).

Although the intricate taxonomy of *Alchemilla* has received much attention, karyological data are very scarce. Following a recent contribution to the karyology of *A. sect. Alchemilla* subsect. *Chirophyllum* ser. *Sericeae* and subsect. *Heliodrosium* ser. *Pubescentes* in Turkey (Hayırlioğlu-Ayaz & Beyazoğlu 1996), the chromosome numbers of the six species of *A. sect. Alchemilla* subsect. *Calycanthum* ser. *Calycinae* Buser and ser. *Elatae* Rothm., recently described by Kahlheber (1994) from NE Anatolia, are presented here for the first time.

Material and methods

The plants investigated in this study were collected by the first author in July and August 1994 and 1995. Voucher specimens are deposited in the herbarium of the Biology Department of the Karadeniz Technical University, Trabzon (KTUB), duplicates in the Berlin herbarium (B).

The chromosomes were counted in metaphase plates of root tip mitoses. The root tips were pretreated with 0.5 % colchicine for 3 h (Beyazoğlu & al. 1994), fixed in ethanol acetic acid (3:1) for at least 24 h at 4 °C, hydrolyzed in 1 N HCl at 60 °C for 15 min, rinsed with water for a minimum of 2–3 min, and then stained in Feulgen for 1.5 h. Permanent slides were taken from at least ten well-spread metaphase plates using an Olympus BH-2 camera. The slides are deposited in the Department of Biology, Karadeniz Technical University, Trabzon.

Results

Alchemilla ser. *Elatae* Rothm.

Alchemilla cimilensis Kalheber

2n = 64–75

TURKEY: A8 Rize, İkizdere, above Cimil, Başköy, Kalçarak yay., 2100–2400 m, 19.7.1995, S. Hayırhoğlu-Ayaz 201.

The investigated plants were collected at the locus classicus (Kalheber 1994). The species grows in wet meadows and grassland. Somatic chromosome numbers ranging from 64–75 were found in 14 metaphase plates (Tab. 1).

Alchemilla elevitensis Kalheber

2n = 84–102

TURKEY: A8 Rize, Çamlıhemşin, Elevit, Cevizli valley, 2000–2100 m, 8.8.1995, S. Hayırhoğlu-Ayaz 214.

The investigated plants were collected at the locus classicus (Kalheber 1994), where the species grows on stream banks. Somatic chromosome numbers ranging from 84–102 were found in 18 metaphase plates (Tab. 1).

Alchemilla hemsinica Kalheber

2n = 72–80

TURKEY: A8 Rize, İkizdere, Cimil başköy, Kalçarak yay., 2450–2500 m, 18.7.1995, S. Hayırhoğlu-Ayaz 200.

The species grows alongside of small alpine streams and basins, and has also been reported from Rize, Çamlıhemşin, Ortaköy, Vercenik dağı at 2700 m (Kalheber 1994). Somatic chromosome number ranging from 72–80 were found in 12 metaphase plates (Tab.1).

Alchemilla ikizdereensis Kalheber

2n = 101–108

TURKEY: A8 Rize, between Ovit Pass and İspir, 1700 m, 5.8.1994, S. Hayırhoğlu-Ayaz 142.

Morphologically, this species is similar to *A. bursensis* B. Pawl. and *A. dura* Buser. It has also been reported from Rize, İkizdere, Dereköy-Yerelma, 1000 m (Kalheber 1994). The species grows in meadows and roadsides. Somatic chromosome numbers ranging from 101–108 were found in 12 metaphase plates (Tab. 1).

Alchemilla kackarensis Kalheber

2n = 66–76

TURKEY: A8 Rize, Çamlıhemşin, Yukarı kavran, Kaçkar dağı at 2350 m, 17.7.1994, S. Hayırhoğlu-Ayaz 119.

The investigated plants were collected at the locus classicus (Kalheber 1994), where it grows in *Nardus stricta* tufts. Somatic chromosome numbers ranging from 66–76 were found in 11 metaphase plates (Tab. 1).

Alchemilla ser. *Calycinae* Buser

Alchemilla ancerensis Kalheber

2n = 86–96

TURKEY: A8 Rize, Ballıköy (Anzer), 2150 m, 21.7.1995, S. Hayırhoğlu-Ayaz 205.

The investigated plants were collected at the locus classicus (Kalheber 1994). Somatic chromosome numbers ranging from 86–96 were found in 13 metaphase plates (Tab. 1).

Tab. 1. Chromosome counts in *Alchemilla* from Turkey.

Species	Number of metaphase plates counted	Somatic chromosome numbers	min–max
<i>A. ancerensis</i>	13	86–88, 86–88, 86–88, 86–88, 87–88, 88, 88, 88–90, 88–90, 88–90, 96, 96, 96	86–96
<i>A. cimilensis</i>	14	64, 64, 64, 64–66, 64–66, 64–66, 64–66, 65, 65, 65–66, 68–75, 68–75, 68–75, 75	64–75
<i>A. elevitensis</i>	18	84, 84, 94, 94, 94, 94, 94–96, 94–96, 94–96, 94–96, 94–96, 96–98, 96–98, 98–102, 98–102, 98–102, 98–102, 98–102	84–102
<i>A. hemsinica</i>	12	72–74, 72–74, 73, 73, 73, 74, 78–79, 78–79, 78–79, 78–80, 78–80, 80	72–80
<i>A. ikizdereensis</i>	12	101, 101, 103–104, 103–104, 103–108, 103–108, 103–108, 107–108, 107–108, 107–108, 108, 108, 108	101–108
<i>A. kackarensis</i>	11	66–68, 66–68, 66–68, 66–68, 68–72, 68–72, 74, 74, 74–76, 74–76, 76	66–76

Discussion

The problems in determining the exact chromosome numbers, the basic number and karyograms in *Alchemilla* (Izmailow 1982) make the taxonomic evaluation of karyological data rather difficult. As far as the basic number of *Alchemilla* is concerned, $x = 7$, being also the basic number of the *Rosoideae*, has been suggested earlier (see, e.g., Gentcheff & Gustafsson 1940). Löve & Löve (1956, 1975) and Raven (1975), in contrast, assumed a basic number of $x = 8$, and this number has been accepted by most authors since.

Previous karyological studies in representatives of *Alchemilla* sect. *Alchemilla* revealed the existence of series of high-polyploid cytotypes with somatic numbers ranging from 64 to c. 224, whereby about 75% of the species have $2n = 96–110$ (Turesson 1957, Wegener 1967, and Izmailow 1981).

Izmailow (1981, 1982) reported the somatic chromosome numbers of eleven species of *A. ser. Calycinae*. Compared to his results ranging from $2n = 98–176$, the single species of this series counted in the present study shows the rather low numbers of $2n = 86–96$.

Karyological data for *A. ser. Elatae* are still more scarce than for *A. ser. Calycinae*. Six species studied by Wegener (1967) have somatic chromosome numbers ranging from 101 to 108. Whereas our counts in *Alchemilla ikizdereensis* revealed the same and those in *A. elevitensis* slightly lower numbers, the chromosome numbers found in *A. cimilensis*, *A. kackarensis*, and *A. hemsinica*, are, in contrast, distinctly lower, corresponding to a ploidy level of $8x$ to $10x$.

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