

Karyomorphological Study in *Nepeta viscida* Boiss. (Lamiaceae) from Turkey

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Abstract

Chromosome morphology of *Nepeta viscida* Boiss. (Lamiaceae) naturally in Turkey was analyzed in detail. Squash preparation method was used for chromosome study in this species. The somatic chromosome number was counted as $2n=18$ in *Nepeta viscida*. The basic chromosome number of the genus was $x=9$. The shortest chromosome length is 1.03 μm , the longest is 1.68 μm , and haploid chromosome length is 12.41 μm . Chromosome arm ratios are measured as 1.07–1.71. Centromeric index varies between 3.71 and 5.14, and relative lengths vary from 8.34 to 13.54. The karyotype was determined using Image Analysis System (Bs200Pro). The karyotype formula of this species consists of eighth median chromosome pairs and one submedian chromosome pairs. The ideogram was drawn based on centromeric index and arranged in the decreasing size order. The karyotype was determined for the first time in this study, respectively.

Keywords: Chromosomenumber, Karyotype, *Nepetaviscida*

INTRODUCTION

Lamiaceae (the mint family) has a cosmopolitan distribution consisting of about 7200 species organized into 236 genera, including many well-known plants, herbs, shrubs and trees of horticultural, economic and medicinal significance. The best part of species of Lamiaceae family have economic value due to the essential oil production. Lamiaceae was divided into seven subfamilies: Symphorematoideae, Viticoideae, Ajugoideae, Prostantheroid-oideae, Nepetoideae, Scutellarioideae and Lamioideae [1]. It is the third largest family in Turkey with 45 genera and 574 species, 256 of which are endemic. The rate of endemism is 44.5% in this family [2, 3, 4].

Nepeta L. (catmint) genus belonging to Lamiaceae family and Nepetoideae subfamily [5] is one of the largest (ca. 300 spp.) and economically important genera. *Nepeta* species are widely distributed in Eurasia, North Africa, North and Central America and Canary Islands. The

greatest diversity and species richness with in the genus are found in two regions: South Western Asia and the Western Himalayas, including the adjacent Hindu Kush [6, 7, 8]. According to recent studies on the Turkish *Nepeta*, it is represented by 44 taxa of which 22 are endemic to Turkey [4, 9, 10]. *Nepeta viscida* Boiss. is endemic taxon to Turkey.

Endemic and non-endemic species mostly grow in east Anatolia and the Taurus Mountains. *Nepeta* species are widely used in folk medicine because of their antispasmodic, expectorant, diuretic, antiseptic, antitussive and antiasthmatic activities. The flowering tips of the plant have also been used as a sedative drug [11, 12]. Some of the *Nepeta* species are used by bees as a source of pollen and nectar [13].

The reported chromosome numbers are $2n=14, 16, 18, 34, 36$ and 54 in the genus *Nepeta* [14-39].

The purpose of this study to report the somatic chromosome number and karyotype of this species for the first time.

MATERIALS AND METHODS

Plant material

Nepeta viscida samples were collected during the field studies Balıkesir: Dursunbey, Alaçam Da., Gölcük Forest Sub-district, Karaveli region, 1539 m, 39 0 25.619 N, 28 0 31.840 E, 10.09.2013 in Turkey (Figure 1).

Perennial; stems several, sturdy, 35-60 cm, unbranched, villous with eglandular and glandular hairs, denser above. Leaves ovate-oblong, (2-) 4-6.5 x (1-) 1.5-3 cm, sessile, \pm crenate, glandular-villous and with many sessile glands, cordate, merging into bracts. Verticillasters c. 30-flowered, distant below, approximating above. Bracteoles linear-oblong, \pm equalling calyx. Calyx tubular, c. 10 mm, scarcely curved, mouth suboblique, glandular-villous; teeth

\pm equalling tube, linear, 4-5 mm. Corolla palevioletto white, c. 15 mm; tube clearly exerted from calyx teeth. Nutlets not known. Fl. 5-7. Rocky slopes and screes, 740-1800 m [40], (Figure 2).

Chromosome analysis

Cytological observations were made on metaphase cells of root tips obtained from germinating seeds. Root tips were pretreated for 16 h in α -monobromonaphthalene at 4 °C and washed and fixed in Carnoy solution (3:1 absolute ethanol:glacial acetic acid) overnight. The root tips were hydrolyzed for 9 min in 1 N HCl at room temperature, washed and stained in 2% aceto-orcein for 2 h. Karyotype Analysis was made using Bs200Pro Image Analysis Software [41-44].

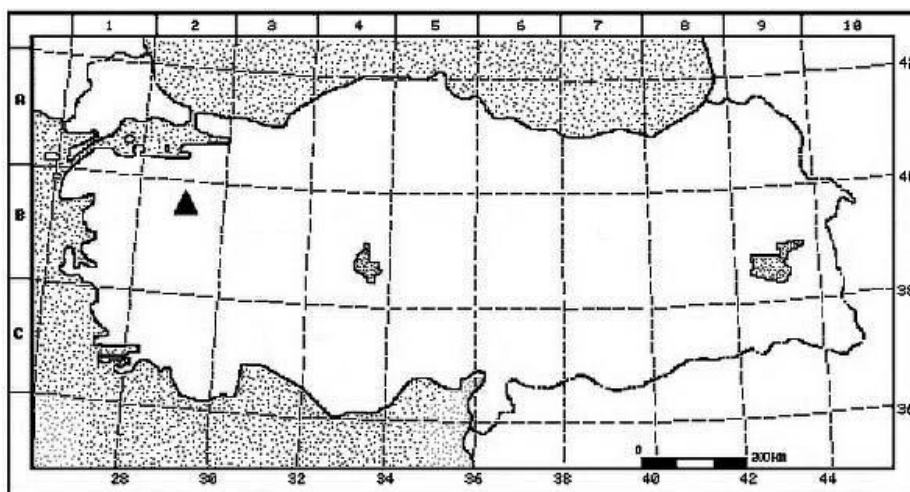


Figure 1. The distribution map (▲) of *Nepeta viscida* in Turkey



Figure 2. General appearance of *Nepeta viscida*

RESULTS AND DISCUSSION

Karyotype analysis of *Nepeta viscida* was determined. The mitotic metaphase chromosome number was counted as $2n=18$ in *Nepeta viscida* (Figure 3a). The shortest chromosome length is $1.03 \mu\text{m}$, the longest is $1.68 \mu\text{m}$, and haploid chromosome length is $12.41 \mu\text{m}$. Chromosome arm ratios are measured as 1.07-1.71. Centromeric index varies between 3.71 and 5.14, and relative lengths vary from 8.34 to 13.54. The karyotype formula of this species $8m+1sm$ (Table 1). The ideogram was drawn based on centromeric index and arranged in the decreasing size order (Figure 3b). The mitotic metaphase chromosome number and chromosome morphologies were determined for the first time in this research, respectively.

The reported chromosome numbers are $2n=14, 16, 18, 34, 36$ and 54 in the genus *Nepeta*. When the results provided from this study are compared with previous studies of the chromosome numbers of the *Nepeta* genus, previous reports show that investigated members of *N. septemcrenata* Ehrenb. was reported $2n=14$ [27]. *N. spruneri* Boiss., *N. transcaucasica* Grossh., *N. sphaciotica* P. H. Davis, *N. parnassica* Heldr. & Sart., *N. schirasiana* Boiss., *N. czegemensis* Pojark., *N. deflersiana* Schweinf. ex Hedge, *N. dirphyia* Heldr. ex Hal., *N. leucostegia* Boiss. & Heldr., *N. camphorata* Boiss. and *N. apuleji* Ucria, were reported $2n=16$ [14-24, 29-38].

Also, *Nepeta racemosa* Lam., *N. ruderalis* Buch.-Ham. ex Benth., *N. cantabrica*, *N. clarkei* Hook. f., *N. cataria* L., *N. erecta* (Royle ex Benth.) Benth., *N. gracilis* Benth., *N. grandiflora* M. Bieb., *N. leucophylla* Benth., *N. bucharica* Lipsky, *Nepeta nepetella* L. *N. beltranii* Pau were determined $2n=34, 36$ and 54 [16-21, 23- 32, 35- 39].

N. raphanorhiza Benth., *N. transiliensis* Pojark., *N. tythantha* Pojark., *N. spicata* Wall. ex Benth., *N. sulphurea* C. Koch, *N. sibirica* L., *N. sibthorpii* Benth., *N. nuda* L., *N. olgae* Regel, *N. pamirensis* Franch., *N. pannonica* L., *N. multibracteata* Webb, *N. mussinii* Spreng., *N. podostachys* Benth., *N. heldreichii* Halácsy, *N. hindostana* (Roth) Haines, *N. juncea* Benth., *N. laevigata* (D. Don) Hand.-Mazz., *N. lamiopsis* Benth. ex Hook. f., *N. distans* Royle ex Benth., *N. elliptica* Royle ex Benth., *N. eriostachys* Benth., *N. fissa* C.A. Mey., *N. floccosa* Benth., *N. glutinosa* Benth., *N. govaniiana* (Wall. ex Benth.) Benth., *N. graciliflora* Benth., *N. linearis* Royle ex Benth., *N. manchuriensis* S. Moore, *N. melissifolia* Lam., *N. mollis* Benth., *N. leucolaena* Benth. ex Hook. f., were reported in the literature [14-24, 29-38]. In our study, the diploid chromosome numbers of *Nepeta viscida* was found to be $2n=18$ as in the literature.

By determining karyotype analysis of the species of *Nepeta viscida*, this study lights the way for future studies.

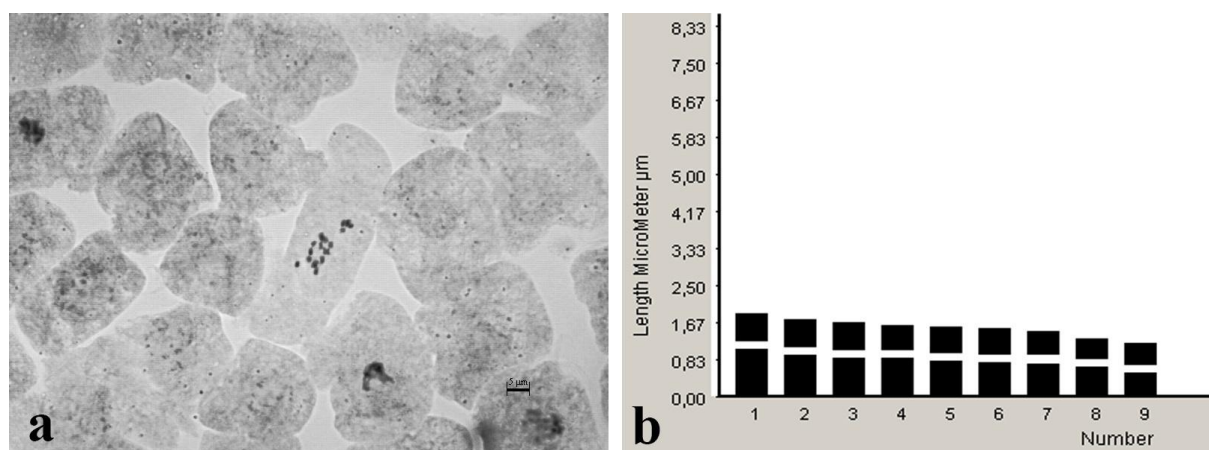


Figure 3. a) Somatic metaphase in *Nepeta viscida* ($2n=18$). Scale bars: $5 \mu\text{m}$, b) Ideogram for *N. viscida*

Table 1. Detailed measurement data of the chromosomes of *Nepeta viscida*

Chromosome Pairs	Chromosome arms (μm)		Total Length (μm)	Arm Ratio (L/S)	Centromeric Index	Chromosome Type	Relative Length
	Long arm (L)	Small arm (S)					
1	1.06	0.62	1.68	1.71	5.00	sm	13.54
2	0.94	0.64	1.58	1.48	5.14	m	12.73
3	0.88	0.63	1.51	1.41	5.06	m	12.17
4	0.88	0.57	1.45	1.54	4.59	m	11.65
5	0.79	0.61	1.40	1.29	4.94	m	11.30
6	0.76	0.59	1.34	1.29	4.74	m	10.82
7	0.75	0.54	1.29	1.38	4.37	m	10.40
8	0.66	0.46	1.12	1.44	3.71	m	9.05
9	0.53	0.50	1.03	1.07	4.03	m	8.34

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