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## ***NONEA PALLENS (BORAGINACEAE), A NEW ADDITION TO THE FLORA OF TURKEY***

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*Nonea pallens* was recently collected by the authors in the Yildiz mountain region in Turkey-in-Europe. The species is new for the Turkish flora and the population marks the southern limit of the species range. Geographical and ecological details are given about the record locality, along with an original description and iconography of the Turkish specimens. Original material of *N. pallens* was traced in G, W and FI, allowing a lectotype to be selected. Finally, a karyological analysis provided new data about the systematic position of this poorly known species within the genus.

*Keywords.* *Boragineae*, karyology, *Nonea*, taxonomy, Turkish flora.

### INTRODUCTION

Along with *Anchusa*, *Pulmonaria* and *Symphytum*, *Nonea* Medicus is one of the largest genera of *Boraginaceae* tribe *Boragineae* with about 35 taxa showing a great diversity of forms, often of difficult taxonomic interpretation. The genus has a major diversity centre in the Anatolian and Irano-Turanian highlands and a second one in the south-eastern and African countries of the Mediterranean basin. It shows several evolutionary lines with distinct morphological, palynological and karyological features, that might be associated with a polyphyletic origin or with the presence of hybridization phenomena with other *Boragineae* genera in the evolutionary history of the group (Luque, 1995; Bigazzi & Selvi, 1998). This heterogeneity, the remarkable phenetic plasticity of several species, and the difficulty in the study of herbarium material, partly explain the reason for which this genus is one of the few of the European and Mediterranean flora still waiting for some systematic comparative studies or taxonomic revisions.

According to the taxonomic arrangement by Baytop (1979), the Turkish flora includes 19 species of *Nonea*, of which two (*N. flavescens* and *N. anomala*) are of uncertain taxonomic status. During a scientific trip to Turkey in June 1997, we collected some specimens of a *Nonea* species whose identity was not possible to ascertain using the identification key in the standard *Flora of Turkey* (Baytop, 1979). On the basis of wider literature studies and of herbarium investigations, we discovered this plant to be *Nonea pallens*, a poorly known species described by the Serbian botanist Sava Petrović (Petrović, 1885) from the surroundings of the town of Nyš. In this paper, we report the geographical and ecological details of the new record, a description of the species based on the type specimen and on the Turkish popu-

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lation, an original iconography, and the results of a karyological analysis. A lectotype is also selected.

## RECORD

NW Turkey A1(E) Kirklareli: between the villages of Üsküpdere and Kaynarca, at the margins of a track crossing an open *Quercus frainetto* grove in the valley of the Kaynarli Deresi, brown forest soil, 200m, 12 vi 1997, Selvi & Bigazzi s.n. (FI, E).

The population was formed by about twenty individuals distributed over an area of a few square metres and was therefore extremely localized. *N. pallens* was part of a marginal herbaceous community dominated by grasses of the genera *Bromus*, *Aegilops* and *Phleum*, and herbs of the genera *Trifolium*, *Medicago* and *Anthemis*. This community was developed in partial shade of oak canopy, on sandy soil with a superficial brown forest horizon. The individuals were in fruiting phase but many of them still had the terminal flower of the inflorescence in full anthesis.

The distribution range of *N. pallens* is centered in the central part of the Balkan peninsula and stretches eastwards to the Dnepr region in southern Ukraine (Popov, 1953). The species was previously known from the following countries: Albania, Serbian part of former Yugoslavia, Republic of Macedonia, Romania, Bulgaria and Ukraine (Hayek, 1931; Popov, 1953; Chater, 1972; Josifović, 1974; Demiri, 1981; Greuter *et al.*, 1984). The finding of *N. pallens* in the Yildiz area of Turkey-in-Europe, therefore, is quite plausible from a phytogeographical viewpoint, as the record locality is only about 40km south of Bulgaria, where the species is widely distributed (specimens in FI).

From a geomorphological viewpoint, the Yildiz mountains represent the south-easternmost part of the Balkan peninsula. This region is characterized by the typical undulate geomorphology and the cool climate of the countries surrounding the western Black Sea (Webb, 1966). At present, therefore, the Turkish population marks the southern limit of the species' range. The presence of other small populations in Turkey-in-Europe is quite possible, though the species has not been reported in the recent floristic study of the Demirkoy area (Yarcý, 1997).

This new record further increases the knowledge of *Nonea* taxa occurring in the Turkish territory. This richness results from the fact that it represents both a primary speciation centre of the genus and a 'meeting' area of distinct biogeographical elements, such as the Irano-Turanian, the Euxine-Caucasian, the Mediterranean and the Balkan-European.

## DESCRIPTION

(based on the type specimen and on the Turkish specimens)

***Nonea pallens*** Petrović, *Add. Fl. Agri. Nyss.* 129 (1885). **Fig. 1.**

Annual; densely glandular-pubescent and setose with patent bristles inserted on a small tubercle. *Tap root* thin, scarcely woody. *Stems* branched from the base,



FIG. 1. *Nonea pallens*: habit, flower with bract, open corolla showing faucal scales, stamens and pistil, corolla, and mericarp in lateral view.

10–40cm, erect-ascending, foliaceous. Lower *cauline leaves* 6–7 × 1.5–2cm, shortly tapering at the base, delicate, narrowly ovate-lanceolate, acute, with margins entire and flat; upper *cauline leaves* similar but smaller, 3–4 × 1–1.5cm, sessile. Inflorescence

rich, lax, with cymes strongly elongating in fruit; bracts foliaceous, bristly, longer than flowers. *Pedicels* short, the lowermost c.3mm, the others c.1.5mm, declined in fruit. *Calyx* 5–6mm at anthesis, tubular, bristly, divided near to the base into five sublinear, acuminate teeth; fruiting calyx strongly accrescent, spherical-sacciform, c.9 × 9mm. *Corolla* 8–9mm long, white to pale yellow, tubular to narrowly campanulate, weakly curved, with tube slightly shorter than limb; limb shortly exceeding calyx, 3–4mm diam., with lobes erect, obovate, slightly erose-crispate, c.2mm long. Throat with five bilobed scales bearing sparse, slender trichomes. *Stamens* inserted in the upper half of the corolla tube below the scales, with anthers c.0.9mm, brown-yellow. Basal corolline annulus thickened, with short hairs. *Stigma* capitate, reaching the anthers. *Pollen grains* prolate, polar diam. c.20µm, equatorial diam. c.16µm, 4–5 zonocolporate, tectum psilate-punctate with an equatorial reticulum (*Pulmonaria obscura*-type). *Mericarps* obliquely ovoid, subhorizontal with a lateral beak, c.4 × 2.5mm, dark grey, with an obscure reticulation of blunt ridges, testa surface smooth; basal ring c.1.5mm high, scarcely thickened and minutely puberulent, with about 12 subvertical wrinkles terminating into short, acute teeth.

#### ICONOGRAPHY

Josifović (1974), Fig. VII; Demiri (1981), Fig. 1819.

*N. pallens* was included by Popov (1953) in the section *Cryptanthera* DC. along with *N. melanocarpa* Boiss., *N. caspica* (Willd.) G. Don, *N. pulla* (L.) DC., *N. armeniaca* (Kusn.) Grossh., *N. intermedia* Ledeb. and several others. The name of this section is, however, inappropriate from both a formal and a substantial viewpoint. As it contains *N. pulla*, the type species of the genus (Janichen, 1953), the correct name for this section is sect. *Nonea*; however, all genuine *Nonea* species have anthers included in the tube, while De Candolle's section of *Nonea* with exserted stamens (*Phaneranthera*) is today separated as the genus *Elizaldia* Willk. (Johnston, 1924). Even as defined by Popov (1953), sect. *Cryptanthera* has little biological meaning because it was based on vaguely defined morphological characters, such as the nutlets 'more or less curved but not reniform and without a ventral attachment': practically all *Nonea* species except *N. echioides* (L.) Roemer & Schultes (= *N. ventricosa* (Sm.) Griseb.) and the species of the small section *Orthocaryum* DC., such as *N. lutea* (Desr.) DC. and *N. obtusifolia* (Willd.) DC.

Because of its white, small corolla shortly exceeding the calyx, and mericarp features, *N. pallens* is a well-defined species, without obvious relationships with other members of the genus. In the habit, dense glandular pubescence, long bracts, deeply divided calyx and weakly curved corolla with erose-crispate lobes, the closest relative is probably *N. caspica* (Willd.) Don, a species which, however, has a distinct distribution and chromosome number (see below). Petrović himself noted 'proche de *N. picta*' (= *N. caspica*) on one of the specimens in G. On the type specimen Petrović also observed that *N. pallens* has been sometimes erroneously identified with *N.*

*echioides*, a Mediterranean species with small white flowers but very distinct in its reniform mericarps with a ventral attachment on the gynobase (sect. *Cyrtocaryum* DC.).

Judging from the examined specimens (FI, W, G), *N. pallens* also shows a low infraspecific variability. According to Popov (1953), the only taxon to be included in the variation of *N. pallens* is probably *N. pulchella* Pachoskii, which was seen as a xerophytic form from Southern Ukraine. Popov (1953) stated also that the specimens of *N. pallens* from the proximity of Filippopolis (Plovdiv) in Bulgaria 'are perennials and transitional to *N. pulla*', but examination of specimens in FI from the same region did not provide evidence supporting this observation. Whatever the case, the Turkish specimens are annual and correspond very well to the typical form of the species described from Serbia.

#### TYPIFICATION

Original material of *N. pallens* was traced in FI, W and G. Of the two G specimens, one bears an undated label in Petrović's handwriting ('*Nonnea pallens* Petr. in litt. Bord de moissons à Malošiste près de Nisch. Proche de *N. picta* et *N. pulla*. S. Petrović'), while the other a printed label dated 'March-May 1885' (no. 2238 '*Intersegetes ad Malošiste*'). The W specimen (accession no. 1761) is practically identical to the latter G specimen, but is dated April 1886. The FI specimen, formerly part of the Herbarium Levier, is very well preserved (Fig. 2) and bears a label in Petrović's handwriting dated April 1884: '*Nonnea (sic!) pallens* Petr. Avril 1884. Moissons de Malošiste près de Nisch. *N. appartient à la section des Cryptantherae. Confondu dans quelques herbier de l'Europe avec N. ventricosa. Dr. S. Petrović*' (FI). The indication of both the date and the 'locus classicus' cited in the protologue (moissons de Malošiste) proves that the specimen now in FI is one of those on which the author based his original description published one year later in the *Additamenta ad Floram Agri Nyssani* (in Serbian 'Dodatak flori okoline Niša'). Accordingly, the specimen is here selected as lectotype.

#### KARYOLOGY

Karyological analyses were carried out on mitotic metaphase plates of meristematic cells taken from roots of young seedlings. Seeds germinated only after a chilling treatment of one month at 3–4°C, directly on a natural, sandy substrate. After a pretreatment of about 2h in a 8-hydroxyquinoline solution, the material was fixed in Carnoy, hydrolysed in HCl 1N at 60°C for 6min and stained with lactopropionic orcein (18h). Idiograms were prepared on enlarged prints of the original micrographs. Measurements and values were computer-processed in order to obtain chromosome ordering and homologue recognition, the karyotype formula (Levan *et al.*, 1964) and the intra- ( $A_1$ ) and interchromosomic ( $A_2$ ) asymmetry indices proposed by Romero Zarco (1986).

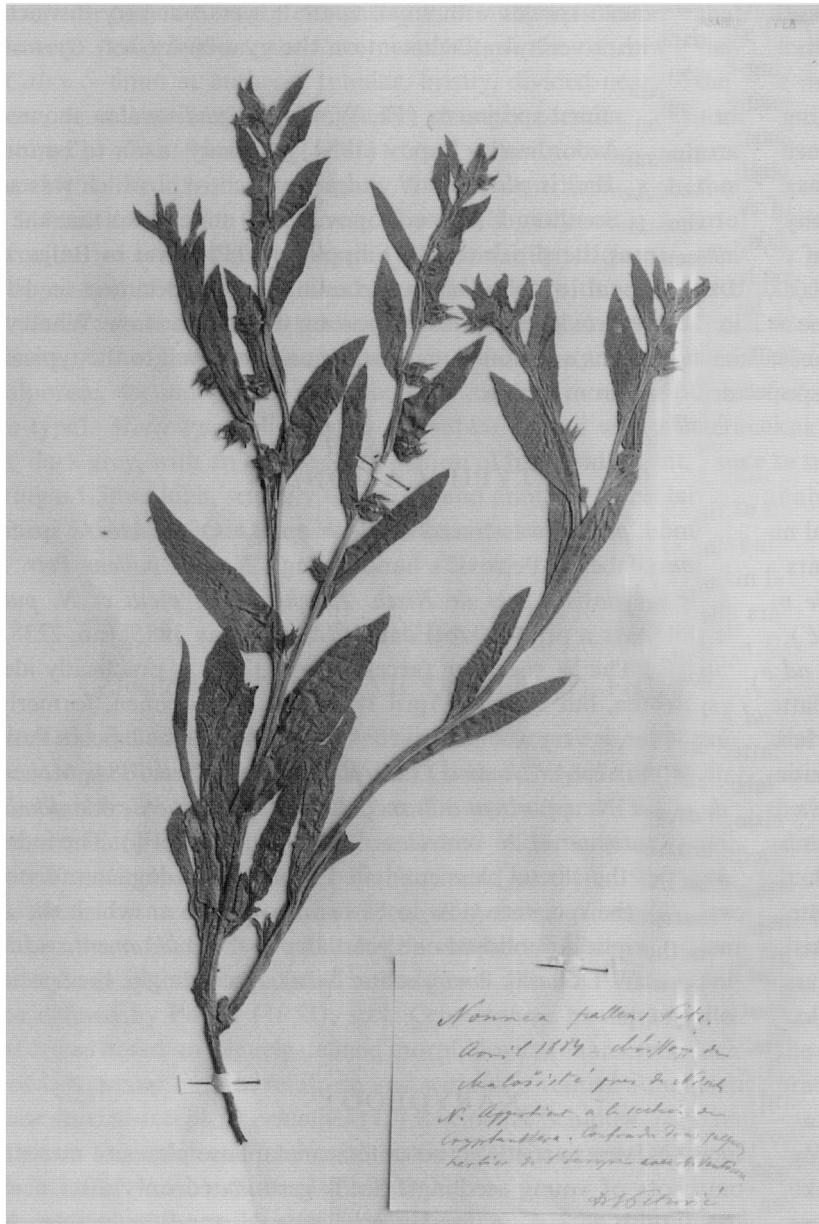


FIG. 2. Lectotype specimen ( $\times 0.45$ ) of *Nonea pallens* Petrović (FI).

*N. pallens* showed the following karyotype formula:  $2n=2x=14$ :  $2M+8m+2m^{sat}+2st$ , with mean chromosome size of  $2.7 \times 1.3 \mu\text{m}$  (Fig. 3). The  $A_2$  asymmetry, measured as the ratio standard deviation of chromosome lengths/mean chromosome length, was relatively low, 0.18, as a consequence of the small difference

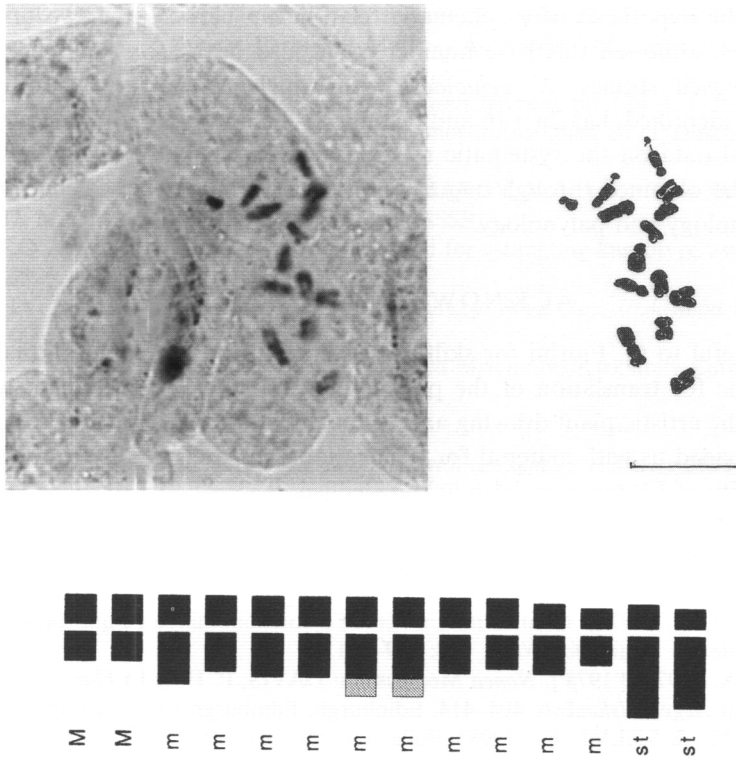


FIG. 3. Metaphasic chromosome plate and idiogram of *Nonea pallens* ( $2n=14$ ). Scale bar =  $10\mu\text{m}$ .

between the longer (c.  $4\mu\text{m}$ ) and the shorter (c.  $2\mu\text{m}$ ) chromosomes. The  $A_1$  asymmetry was also low, 0.3, because of the presence of only two subtelocentric chromosomes.

No published data about the karyology of this species were traced in the literature. In terms of size and morphology, the chromosomes of *N. pallens* are very similar to those observed in the other investigated species of the genus, such as *Nonea micrantha* Boiss. & Reut., *N. vesicaria* (L.) Rchb., *N. echioides* (Luque, 1995) and *N. obtusifolia* (Willd.) DC. (Constantinidis, 1996). The chromosomes of these plants are usually smaller and more symmetrical in respect of those found in the other genera of *Boraginaceae*. Even in terms of simple number, the data available on the genus are fragmentary, allowing only a few considerations to be made. The diploid number  $2n=14$  shows that *N. pallens* belongs to the line with the lowest basic number in the genus,  $x=7$ , which includes *N. lutea* (Desr.) DC., an annual species of the section *Orthocaryum* (Britton, 1951), and possibly, some eastern-European provenances of *N. pulla* (Bolkhovskikh *et al.*, 1969). The basic number  $x=7$  was found also in *Nonea caspica* from Bamian province, Afghanistan, which showed the tetraploid number  $2n=28$  (Podlech & Bader, 1974), though Aryavand (1975) found  $n=22$  on Iranian material of the same species. If  $x=7$  will be found in other provenances of

*N. caspica* the hypothesis of a systematic relationship between the two taxa could be supported, although this base number could also have arisen independently in unrelated *Nonea* species. *N. echioides*, with which *N. pallens* has often been erroneously identified, has  $2n = 16$  and belongs to the line with  $n = 8$  (Luque, 1995).

Additional data on the systematic relationships among these and other taxa of *Nonea* will be obtained through ongoing comparative studies based on karyology, micromorphology and palynology.

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