

## Taxonomic monograph of the tribe *Nigelleae* (Ranunculaceae): a group including ancient medicinal plants

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**Abstract:** The tribe *Nigelleae* Schröd. (Ranunculaceae) worldwide distribution has been studied taxonomically, based on morphological, palynological and seed morphological characters, as well as chromosome counts. Extensive field works have been carried out in Turkey, Greece, Iran, Syria, Lebanon, Portugal and in Northern Cyprus. Moreover, the specimens of major herbaria in Turkey, Ukraine, Russia, Syria and Iran as well in Europe have been examined. This study represents the most comprehensive monograph of the tribe based on field work across its nearly entire distributional range, complemented by examination of over 980 specimens from 25 herbaria and our collections with nomenclatural contributions. Eighteen species are recognized under three genera, namely *Garidella* Tourn. ex L. (2 species), *Komaroffia* Kuntze (2), and *Nigella* L. (14). Four new combinations have been proposed here as *Komaroffia bucharica* (Schipcz.) Dönmez, *Nigella arvensis* L. var. *aristata* (Sibthorp & Smith) Dönmez & Uğurlu, *N. oxypetala* Boiss. var. *latisecta* (P.H.Davis) Dönmez & Uğurlu and *N. oxypetala* var. *lancifolia* (Hub.-Mor.) Dönmez & Uğurlu. Status of three names have been changed. Lectotypes of *Komaroffia integrifolia* and *K. bucharica* have been selected and incorrect lectotypification for *K. bucharica* is discussed. Twenty new synonyms have been proposed here, most of which belong to the *Nigella arvensis* complex. Although there are various generic and infrageneric treatments of *Komaroffia* and *Garidella*, both of them have been recognized here as separate genera in the tribe *Nigelleae* as they were accepted by some previous authors. Keys for identifying the genera, species and infraspecific taxa have been prepared. Chromosome numbers are given, based on our novel data and the pertinent literature. Additionally, descriptions, synonymies, water colour illustrations, distribution maps, taxonomic notes and lists of all specimens examined are provided for each taxon. Based on the literature, herbarium specimens and field observations, IUCN threat categories have been proposed for the taxa.

**Key words:** Chromosome, *Garidella*, *Komaroffia*, *Nigella*, pollen, taxonomy

### 1. Introduction

*Ranunculaceae* (buttercup family) includes 62 genera and 2500 species (Tamura, 1993), and it is divided into five subfamilies, based on molecular and morphological data (Wang et al., 2009). For a better understanding of its phylogeny, the family has been investigated by various molecular markers, such as restriction site mapping (Johansson and Jansen, 1991, 1993; Johansson, 1995, 1998), nuclear sequences (Jensen et al., 1995; Ro et al., 1997), and a combination of nuclear and chloroplast sequences (Hoot, 1995; Wang et al., 2009). Alongside these molecular studies, morphological characters have also been used in an attempt to improve resolution (Hoot, 1991; Loconte et al., 1995; Wang et al., 2009). Seed micromorphology is extensively used for resolving interspecific phylogeny and improving taxonomy of *Nigella* s.l. (Heiss et al., 2011).

For understanding phylogenetic relationships among the subfamilies of *Ranunculaceae* and among the tribes within subfamily *Ranunculoideae*, the family has been

studied with a combination of multiple markers (i.e. eight molecular markers from nuclear, chloroplast and mitochondrial genomes) providing better resolution and higher support values by Cossard et al. (2016). According to this research, the subfamily *Ranunculoideae* is divided into ten tribes including the tribe *Nigelleae* (Cossard et al., 2016). Both of the phylogenetic analyses, based on both chloroplast and nuclear markers, nested the genus *Nigella* in the tribe *Nigelleae*. However, the tribe *Nigelleae* has been represented by only two species according to given Bayesian inference tree obtained from the combination of eight markers *Nigella sativa* L. and *N. damascena* L. (Cossard et al., 2016), and representatives of the other genera/subgenera of the tribe, varying according to different authors, were not included in the phylogenetic analyses mentioned above. In spite of representation with few species in the phylogenetic analysis of *Ranunculaceae*, the tribe has been taxonomically well known since the Linnean time.

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The tribe *Nigelleae* is best known by the genus *Nigella*, whereas the other two genera, *Garidella* and *Komaroffia*, are less famous. All taxa of the tribe are characterised by annual life span, mostly sessile leaves, showy sepals, small petals and capsule fruit composed of 2 to several united follicles.

The tribe is distributed in the Mediterranean area, northeast Africa, Middle Europe and Irano-Turanian area as an outline. While the genus *Nigella* has largest distribution within the mentioned area, *Komaroffia* is confined to relatively narrow area in Middle Asia with two species. *Garidella* has main distribution in Turkey and the neighbouring countries comprising two species.

The last attempt to taxonomic revision of *Nigella* s.l. (including the taxa of *Komaroffia* and *Garidella*) in monographic fashion was made by Zohary (1983). Although his study provided some novelties and valuable contributions to taxonomy of the taxa, there have been significant changes in the taxonomy of *Nigella*, both at generic and specific levels, since his publication. Moreover, his nomenclatural applications for some taxa are also requiring amendments according to the International Code of Nomenclature for algae, fungi, and plants (Turland et al., 2018). Hence, a new critical monographic revision has been carried out based on new collections from the critical areas, by visiting a comprehensive amount of herbarium material physically and virtually, and by considering the recent molecular phylogenetic approaches.

The objectives of this study are (1) to investigate the taxonomic relationship among the species of three genera, *Garidella*, *Komaroffia*, and *Nigella*, (2) to examine the diagnostic characters of all species and to delimit those based on a large sample set and phylogenetic data, (3) to update the nomenclature based on the relevant type materials, and (4) to supply updated taxonomic and biological data, such as identification keys, illustrations, distribution maps, etc.

### 1.1. Morphological characters with ecological adaptations

**Habit and stem:** The members of the *Nigelleae* tribe are annual herbs. Mostly erect, rarely ascending plants, stem simple to few or much branched. Due to different ecological conditions, such as living in open steppe or more densely covered grassland areas, dry or humid climate, stem length, habit and branching patterns of the individuals are varying.

**Leaf:** The rosette leaves and stem leaves are similar to each other in dividing into segments and in outline. However, the basal leaves are larger than the stem leaves, and the upper stem leaves reach to flowers and enclose them in some taxa. The lacina are linear, lanceolate, triangular or rarely filiform in some species.

**Flower:** The flowers are hermaphrodite, hypogynous (superior ovary) and very diversified and specialised

among the *Ranunculoid* flowers (Figures 1–3). Sepals are usually petaloid and mainly divided into limb and claw (Figure 1b). The sepal colours are the main components to determine the flower colour, which are predominantly blue or yellow or grade between these colours. The petals (honey leaves) are usually much smaller and functionally highly specialised (Figure 1c). The petals are clearly divided into upper (inner) and lower (outer) lobes (lips). Lower (outer) lips are divided to nearly half of their length, and it has a pair of protuberances at the base bearing various colours. The protuberance is called pseudonectary (Liao et al., 2020) and is rewarding the pollinators (Figure 1c). The nectary is situated in the base of upper lobes as a pit and usually has liquid nectar. Lower lip has one to several transversal lines in various colours. As ornamental factors, the lines and pseudonectaries on the base of lower lips attract various insect species. Stamens are several; their numbers range from 15 to 45 in various taxa. They are grouped in some species of *Nigella* such as *N. orientalis* L., *N. oxypetala* Boiss. and *N. koyuncui* Dönmez & Uğurlu.

**Fruit:** Fruit of *Nigelleae* tribe are connate or semiconnate follicles. While the term capsule is used to mention fused carpels, the term follicles are used for separated carpels typically found in various *Ranunculaceae* genera. The capsule is differentiated clearly into ovary and beak, especially in the genera *Nigella* and *Komaroffia* (Figure 2b). Degree of connation of the follicles is an important character to distinguish the taxa, both at generic and species level. Connation of the follicles reaches the highest level with the smallest beaks in *Garidella*.

**Beak (Style):** The styles are elongate above the anthers (Figures 1d and 1e) and receive pollen grains from other flowers, and the anthers bent to base of ovary before maturation and release pollen grains. Beak length, number of veins, twisting and position are important characters; hence, follicle and beak lengths are given separately in the descriptions below. The upper positions of the immature anthers and styles is a mechanism for preventing self-pollination in *Nigella*. While the species of *Nigella* have long styles, the species of *Garidella* have relatively shorter styles.

**Seed:** The seeds are mostly triquetrous, discoid and oblong, and some of them have wings in various width. The wing of seeds is distinct in the sect. *Nigellastrum* Moench of *Nigella*. In respect of ornamentation and cell shapes, the seeds are very diverse (Dadandı et al., 2009; Heiss et al., 2011; Uğurlu Aydın and Dönmez, 2019) and seed morphology sometimes appears as a useful taxonomic character at specific level.

**Breeding biology:** In spite of this specialised flower structure, our field observations on the flowers of the tribe show that there is not a specialised single insect species pollinating, but the flowers are generalised. The flowers of *Nigella* are mostly pollinated by honeybees (*Apis* sp.),

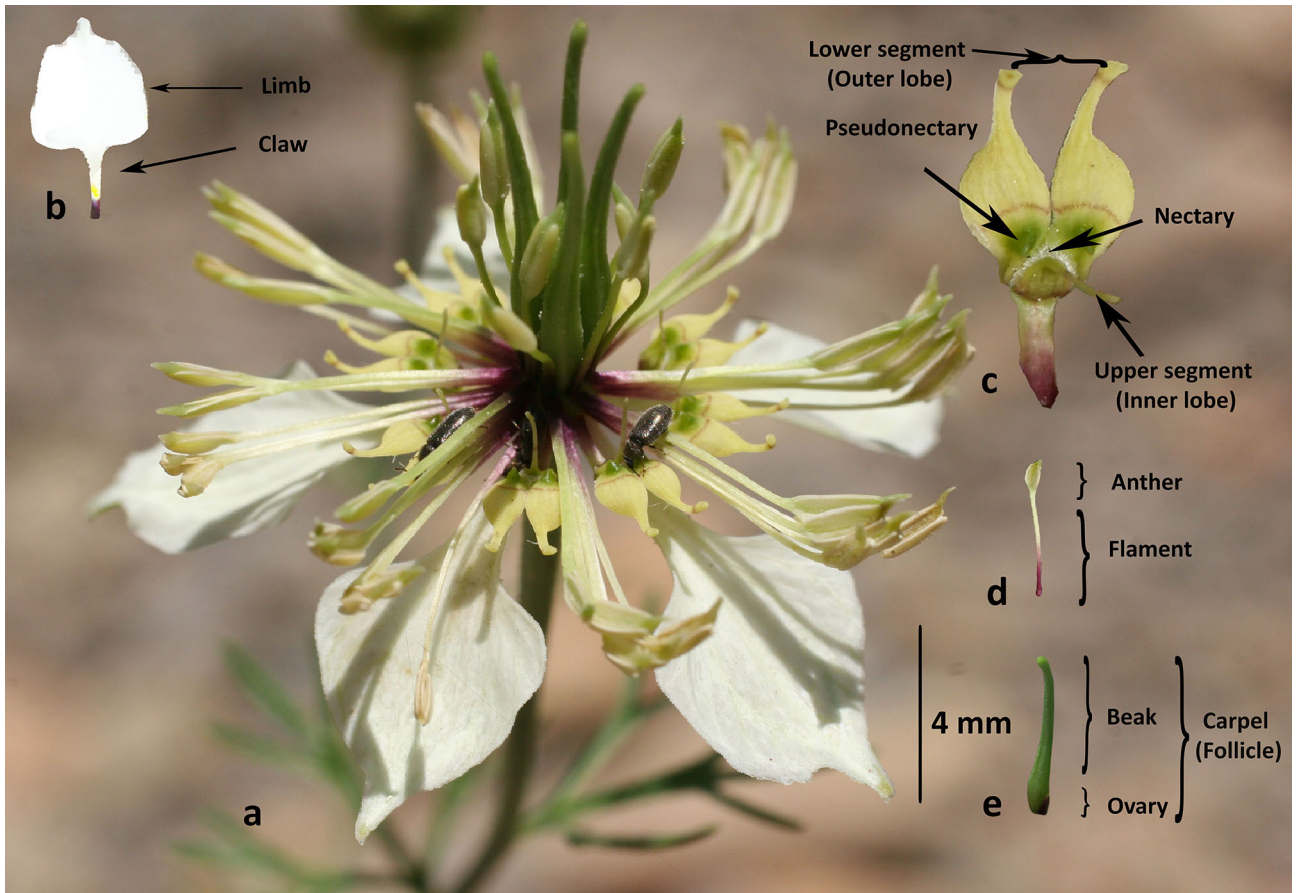


Figure 1. A general view of flower parts of *Nigella*. a. Flower. b. Sepal. c. Petal. d. Stamen. e. Carpel.

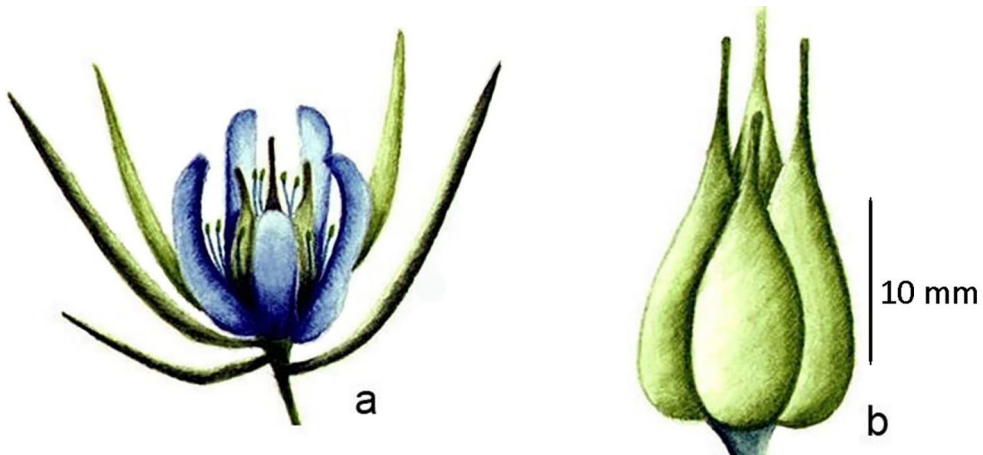
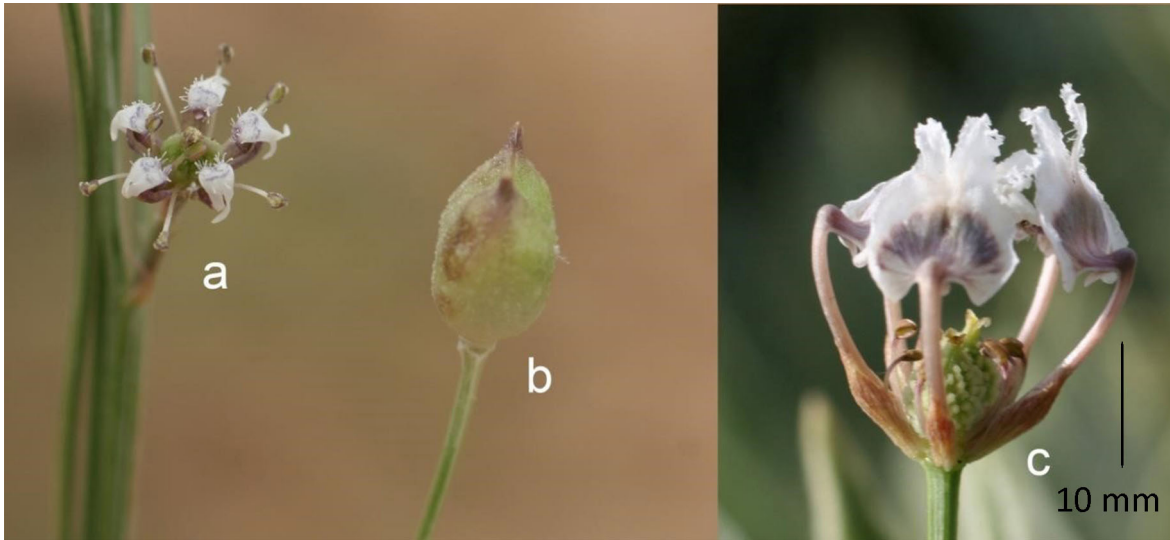


Figure 2. A general view of the flower and capsule of *Komaroffia*. a. Flower. b. Fruit (capsule).

bumble-bees (e.g., *Bombus lucorum*, *Bombus lapidarius*), wasps (e.g., *Polistes dominulus*, *Eumenes pedunculatus*, *Cerceris arenaria*, *Philanthus triangulum* and *Ammophila sabulosa*), *Halictus* sp., *Chrysis* sp. and *Lasioglossum* sp. (Weber, 1992). Additionally, the seeds collected from Syria, Lebanon and Greece during the field studies of the

present investigation have been germinated in Turkey that is far away from their natural distribution area, and the seedlings gave well-developed flowers and seeds without specialized pollinators, if they have. Hence, we concluded that these plants do not have any specialised pollinator in their own habitats.



**Figure 3.** Flower and fruit in the genus *Garidella*. a. Flower. b. Fruit. c. Flower of *G. unguicularis*.

### 1.2. Taxonomy

The tribe *Nigelleae* is composed of three genera, namely *Garidella*, *Komaroffia*, and *Nigella*. However, based on the previous authors' taxonomic approaches, these genera are evaluated as infrageneric taxa within the genus *Nigella* (see Table). The tribe is represented by the genera *Nigella* and *Garidella* in the Species Plantarum (Linnaeus, 1753).

The tribe is a small and taxonomically interested group that includes eighteen species (Boissier, 1867; Krasheninnikov, 1937; Tutin, 1964; Davis, 1965; Guest, 1980; Pignatti, 1982; Zohary, 1983; López González, 1985; Amich, 1986; Riedl, 1992; Strid, 2002; Dönmez et al., 2010; Dönmez and Uğurlu, 2015), distributed mostly in the Mediterranean Region, Middle and SW Asia (Supplement 2 Figure 1). One of the species, namely *Nigella sativa* (black cumin), has been extensively used in traditional medicine and as spice (Baytop, 1994). Moreover, black cumin has a long history of use, as it was also found in archaeological excavations (Salih et al., 2009). In addition, *Nigella damascena* is an important ornamental plant, historically and today.

### 2. Material and methods

Extensive field surveys and population investigations in Turkey were carried out during the years of 2008–2011. Additional field works were also conducted in Portugal, Greece, Northern Cyprus, Lebanon, Syria, and Iran for critical taxa by the first author. All collected specimens are deposited in HUB. Herbarium studies were done by the first author in ANK, AEF, ATH, BAK, BEOU, BM, COI, EGE, GAZI, HEID, HUB, ISTF, ISTE, K, KW, LE, NY, P, SP, TUH, TUR, UC, W, WU, and the images of the specimens from E and G herbaria were evaluated. Herbarium acronyms

follow Thiers (2017). Relevant literature and floras (Boissier, 1867; Krasheninnikov, 1937; Tutin, 1964; Davis, 1965; Guest, 1980; Pignatti, 1982; Zohary, 1983; Amich, 1986; Riedl, 1992; Strid, 2002) were used for taxonomic purposes. For nomenclature, Tropicos ([www.tropicos.org](http://www.tropicos.org)), The Plant List ([www.theplantlist.org](http://www.theplantlist.org)), Catalogue of Life ([www.catalogueoflife.org](http://www.catalogueoflife.org)), The International Plant Name Index ([www.ipni.org](http://www.ipni.org)), The Euro+Med PlantBase ([ww2.bgbm.org/EuroPlusMed/](http://ww2.bgbm.org/EuroPlusMed/)) and The Biodiversity Heritage Library ([www.biodiversitylibrary.org](http://www.biodiversitylibrary.org)) were considered. Zohary (1985) has been followed for application of the synonyms in order to keep nomenclature stability with some corrections and our novel contributions. Conservation status of locally endemic taxa was assessed based on field observations following IUCN (2016) criteria. The distribution maps were made using QGIS software (GNU General Public License).

The list of examined specimens and conservation status (Supplement 1), and the distribution maps of the taxa (Supplement 2) are given as supplementary materials.

### 3. Results

#### 3.1. Taxonomic treatment

Family: *Ranunculaceae* Jussieu

Subfamily: *Ranunculoideae* Arnott

Tribe: *Nigelleae* Schröder (*Nigellinae*). Validated by a diagnosis in German. Isonym: Langlet ex Tamura.

**Description:** Annual herbaceous plants. Leaves pinnate, pinnatisect, palmate or simple. Flowers on top of stem or branches, hermaphrodite. Sepals mostly petalous. Petals are divided into two halves, unguiculate. Ovary with biinteguments. Fruit semi or completely connate follicle or capsule.  $n = 6$  (rarely  $n = 7$ ).

**Table.** Comparison of different taxonomic treatments of *Nigelleae* taxa at generic and infrageneric levels.

Tribe	Genus	Subgenus	Section	Subsection	References
	<i>Garidella</i> <i>Nigella</i>	– –	– –	– –	Linnaeus (1753)
	<i>Nigella</i>	–	–	–	Sibthorp & Smith (1806)
	<i>Garidella</i> <i>Nigella</i>	– –	– –	– –	Bieberstein 1808
Helleboreae	<i>Garidella</i> <i>Nigella</i>	– –	– <i>Nigellastrum</i> <i>Nigellaria</i> <i>Erobathos</i>	– –	De Candolle (1824)
	<i>Nigella</i>	–	–	–	Spenner (1829)
Helleboreae	<i>Nigella</i>	–	–	–	Bentham-Hooker (1862)
	<i>Garidella</i> <i>Nigella</i>	– –	– <i>Nigellaria</i> <i>Erobathos</i> <i>Nigellastrum</i>	–	Boissier (1867)
Helleboreae	<i>Nigella</i>	–	<i>Garidella</i> <i>Eunigella</i> <i>Erobathos</i>	–	Willkomm & Lange (1880)
	<i>Nigella</i>	<i>Garidella</i> <i>Melanthium</i> <i>Nigellina</i>	<i>Eugaridella</i> <i>Komaroffia</i> <i>Nigellastrum</i> <i>Eunigella</i> <i>Erobathos</i>	–	Brand (1895)
Helleboreae	<i>Nigella</i>	–	<i>Garidella</i>	–	Prantl (in Engler-Prantl) (1891)
		–	<i>Nigellastrum</i> <i>Eunigella</i>	–	
	<i>Nigella</i>	–	<i>Komaroffia</i> <i>Garidella</i> <i>Nigellastrum</i> <i>Erobathos</i> <i>Eunigella</i>	– – – – <i>Nigellaria</i> <i>Stellaris</i>	Terracciano (1897-1898)
	<i>Nigella</i>	–	<i>Garidella</i> <i>Nigellastrum</i> <i>Nigella</i> <i>Komaroffia</i>	–	Krasheninnikov (1937)
	<i>Nigella</i>	–	–	–	Davis (1965)
	<i>Nigella</i>	–	<i>Komaroffia</i> <i>Garidella</i> <i>Nigella</i>	– – <i>Nigellaria</i> <i>Erobathos</i>	Zohary (1983)
	<i>Nigella</i> <i>Garidella</i> <i>Komaroffia</i>	–	–	–	Tamura (1993)
	<i>Nigella</i> <i>Garidella</i> <i>Komaroffia</i>	–	–	–	Strid (2002)
<i>Nigelleae</i>	<i>Komaroffia</i> <i>Garidella</i> <i>Nigella</i>	– – –	– – <i>Erobathos</i> <i>Nigellaria</i> <i>Nigellastrum</i>	–	In this paper

**Type genus:** *Nigella* L. (1753: 534).

**Key for the genera**

1. Leaves simple or palmately divided; petals simple ..... 1. *Komaroffia*  
 –. Leaves compound or pinnatifid; petals divided into upper and lower lips ..... 2  
 2. Sepals longer than petals, petaloid; carpels longer than 8 mm ..... 2. *Nigella*  
 –. Sepals shorter than petals, leafy; carpels 4–5 mm ..... 3. *Garidella*  
 1. **KOMAROFFIA** Kuntze, Trudy Imp. S.-Peterburgsk. Bot. Sada x. (1887: 144); Prantl, in Engl. & Prantl, Naturl. Pflanzenfam. iii. 2 (1891) 274. (Figures 4–6).

≡ *Nigella* sect. *Komaroffia* (Kuntze) Brand (1895).

**Type:** *Komaroffia integrifolia* (Regel) Lemos Pereira, Bol. Soc. Brot. sér. 2, 16: 37 (1942).

**Description:** Annual herb. Lower leaves nearly sessile, simple, lanceolate or oblong; lamina of upper leaves 3–5-palmately lobed into linear laciniae. Sepals 5. Petals (7) 8, stipitate, shorter than sepals, usually simple, rarely ±bilobed; outer lobe usually emarginated at apex, longer than inner lobe. Capsule composed of 2–5 follicles, sessile, connate more than half, dorsally and ventrally opened. Seeds oblong, verrucose.  $n = 7$ . The genus has two species occurring in Middle Asia and Iran.

**Key to the taxa of *Komaroffia***

1. Sepals 7–10 × 3–5 mm; petals c. 5 mm; capsules 6–8 × 8–10 mm; involucre bracts clearly longer (1.5×sepals) than sepals ..... 1. *K. integrifolia*  
 –. Sepals 12–14 × 5–8 mm; petals c. 9 mm; capsules 12–17 × 10–12 mm; involucre bracts as long as or slightly longer than sepals ..... 2. *K. bucharica*  
 1. ***Komaroffia integrifolia*** (Regel) Lemos Pereira, Bol. Soc. Brot. sér. 2, 16: 37 (1942) Figure 4.

Basionym: *Nigella integrifolia* Regel (1870: 246).

= *Nigella diversifolia* Franchet (1883: 220).

= *Komaroffia diversifolia* Kuntze (1887). Trudy Imp. S.-Peterburgsk. Bot. Sada x. (1887) 144; Prantl, in Engl. & Prantl, Naturl. Pflanzenfam. iii. 2 (1891) 274.

**Lectotype:** TAJIKISTAN. Kcharli-Tau hill, 7 May, *Sewerzow s.n.* (LE!, **selected here**), paralectotype: TAJIKISTAN. 28 April, slopes of Mogol-Tau Mt., *Sewerzow s.n.* (LE!, **selected here**) Figure 4.

**Description:** Annual herb; 5–25 cm, erect, simple to branched from base stems pubescent to pilose. Leaves distributed throughout stem; 10–40 × 1–5 mm, simple or palmately divided, sessile, linear lanceolate or oblong-lanceolate; stem leaves sessile, palmately lobed; upper leaves (involucrate leaves) 2–3 × flower length. Inflorescence (1) 2–7-flowered raceme. Flowers 10–18 mm diam. Sepals 5, oblong or ovate, obtuse at apex, greenish-blue, 5–9 × 3–4 mm, shortly pubescent at outside, veins distinct. Petals

5 (–6), shorter than sepals, blue, 4–6 × 1–2 mm; outer (lower) lip lanceolate, c. 5 mm, slightly hairy outside, upper (inner) lip very small, reduced, c. 0.5 mm. Stamens 15–20, filaments 4–5 mm, anthers 2.6–0.9 mm, obtuse, greenish, yellow in mature. Follicles 2 to 4 per flower, 5–6 × 2–3 mm, connate up to apex; beak very short, smooth, pilose. Seeds 2–2.1 × 1.4–1.6 mm, ovate mostly triquetrous.

**Chromosome number:** The chromosome number of the species is  $2n = 14$  as reported by Zakharyeva 1985 and Mitra & Bhowmilk 1996.

**Phenology:** Flowers from May to June and mature capsules from July to August.

**Distribution and habitat:** *Komaroffia integrifolia* is known from the herbarium specimens collected from Afghanistan, Kazakhstan Balkash, Amu Derya, Syri Derya, Karakale, Turkmenistan Mt. and Khorasan. The species grows in steppes and in fields as weed, from 200–2100 m.

**Etymology:** The epithet “*integrifolia*” denotes entire leaves of this species.

**Taxonomic and nomenclatural notes:** *Komaroffia* has two species, namely *K. integrifolia* and *K. bucharica* (Figures 4–6), and they are easily distinguished from each other by sepal, petal and capsule sizes as given in the key above. The larger characters of *K. bucharica* can be attributed to its higher ploidy level or other factors which may effect the sizes of the mentioned characters. During literature survey, we have not found any investigation into the poliploidy level of the species, and we have not got any opportunity for observing the individuals of the species in their natural living areas. Hence, further investigations can enlighten the nature of diagnostic characters of the species.

The species *K. integrifolia* is represented with many specimens at the LE herbarium and several of them are labelled as “specimen authenticum”. Based on the protolog, two of the collections “Blühende und fruchttragende Exemplare am 28 April am Mogol-Tau” und am 7 Mai auf dem Vorgebirge Kcharli-Tau, *Sewerzow s.n.* are representatives of the type material. Both specimens definitely belong to *K. integrifolia* and they were collected by *Sewerzow* without collection number. Among them, the fruiting material has more diagnostic characters and hence was selected as lectotype.

2. ***Komaroffia bucharica*** (Schipczinski) Dönmez **comb. nov.** Figures 5 and 6e–6g.

Basionym: *Nigella bucharica* Schipcz., Bot. Mater. Gerb. Glavn. Bot. Sada R.S.F.S.R. 5: 174 (1924).

= *Nigella media* Pachom., Opred. Rast. Sred. Azii 3: 237 (1972). **syn. nov.**

**Lectotype:** UZBEKISTAN. Buchara, Hissar, Sarydjuj, 730 m, 13 June 1897, *Lipsky 1873* (LE!, **selected here**, isolectotype LE!, **selected here**) Figure 5; paralectotypes,

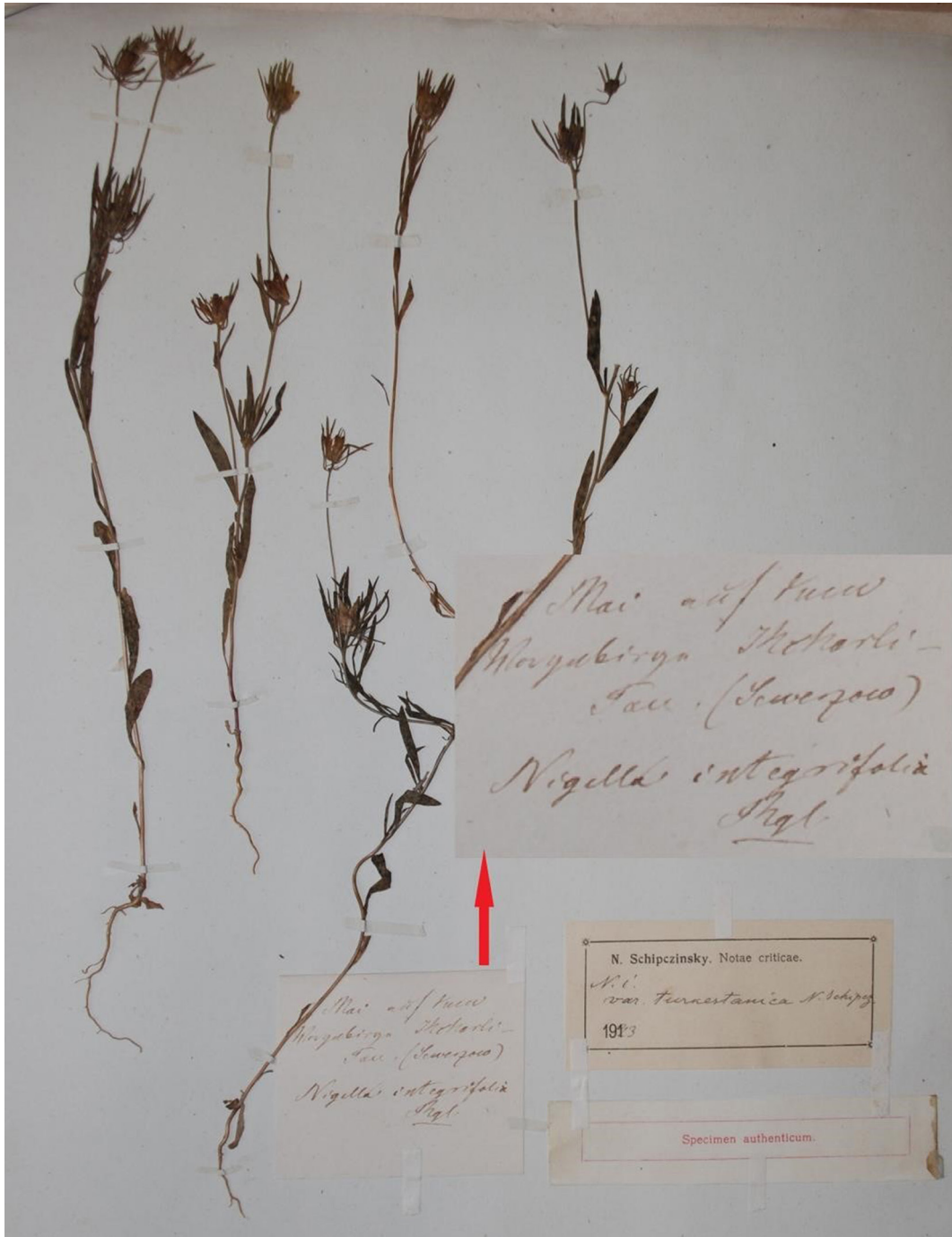


Figure 4. Lectotype of *Komaroffia integrifolia* (red arrow points to the label).

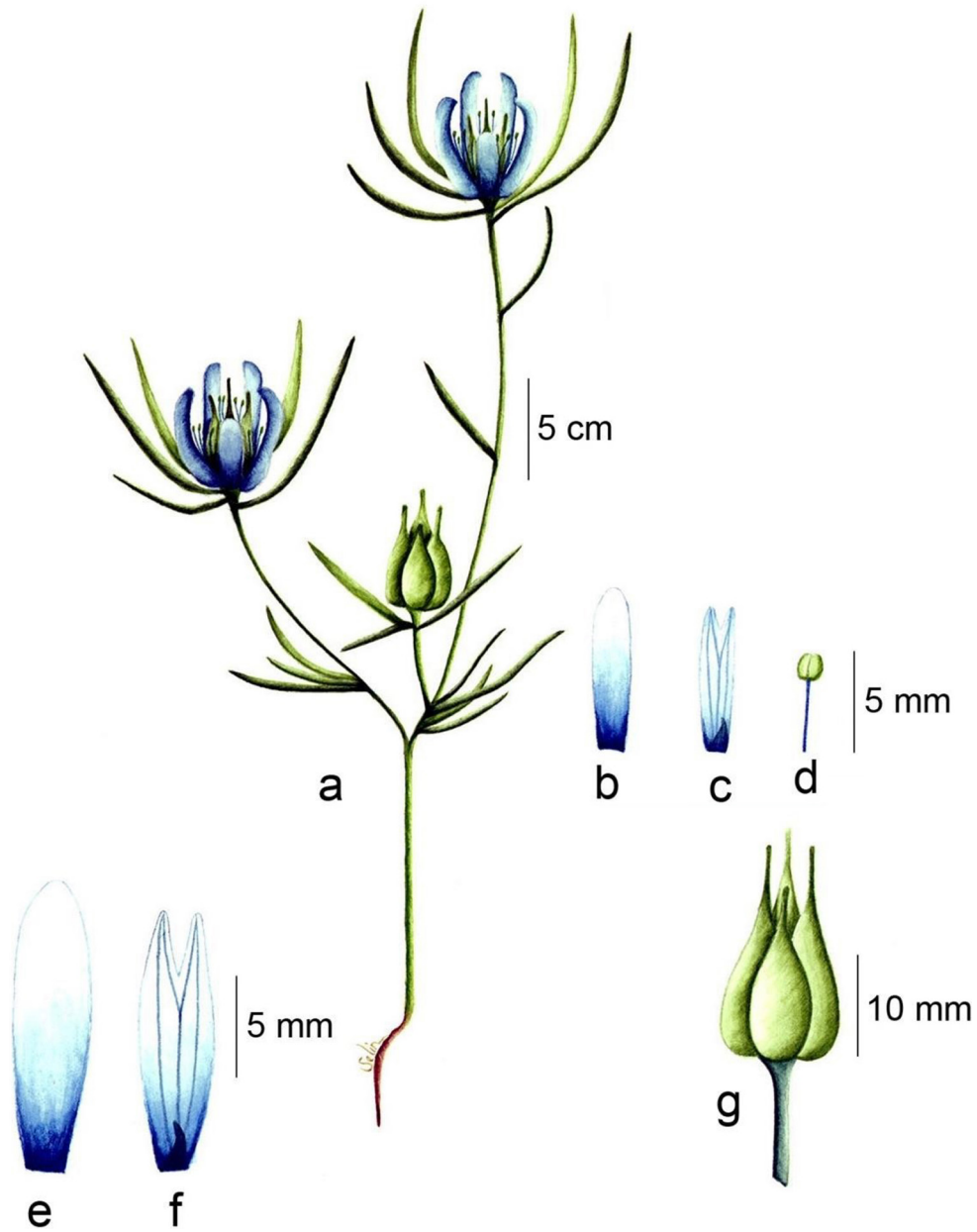
**selected here:** UZBEKISTAN. Inter Schirken et Akkurgan, *Roshevitz* 653 (LE!-two sheets). [= Bukhara, Hissar], Hills at the southern slope of Hissar Range, Kara-tag, 20 May 1913, *A.I. Michelson* 1725 (LE!). Hissar, *S. Korshinsky* 674 (LE!), Hissar, on slopes of hills, 17 May [18]97, *S. Korshinsky*, 676 (LE!), *S. Korshinsky* 677 (LE!), *S. Korshinsky* 685 (LE!), Buchara, Gizzar, in decl. callium,

17 May 1997, *S. Korshinsky* 733 (LE!). *S. Korshinsky* 734 (LE!). Negovat, 1750 m, *Lipsky* 1874 (LE!). Kabadian, Babatag, *S. Korshinsky s.n* (LE!). Gusar, *S. Korshinsky s.n* (LE!). Baldschuan, flumen Vanchsch, *Michelson* 3566 (LE!). Mont. Dschilany-tau, *Michelson* 1667 (*Regel* V. 1883) (LE!). TAJIKISTAN. Kuljab, *Diwnogorskaja* 578 (LE!). Pjandch (LE!), Taschbulak (LE!) (two sheets), Kurganbulak, *Regel*



Figure 5. Lectotype of *Komaroffia bucharica*.





**Figure 6.** *Komaroffia integrifolia* and *K. bucharica*. a–d. *K. integrifolia*. a. General view. b. Sepal. c. Petal. d. Stamen. e–g. *K. bucharica*. e. Sepal. f. Petal. g. Capsule.

*s.n.* (LE!), Aksu, *Regel s.n.* (LE!), Kurgantepe, *Regel s.n.* (LE!), Gasi-Mailik, *Regel s.n.* (LE!). Denau, Sangardak *Lipsky 1676* (LE!).

**Description:** Annual herb, erect, simple to much branched, 10–40 cm, sparsely pubescent. Leaves 20–40 × 1–3 mm, distributed throughout stem; lower leaves simple or divided, linear-lanceolate, attenuate at base; stem leaves sessile, palmately lobed, upper leaves involucrate, shorter or slightly longer than the flowers, simple or 1–2-palmate. Inflorescence rarely single flowered or densely racemose. Flowers 15–25 mm diam. Sepals 5, persistent, hairy dorsally,

oblong or ovate, obtuse or truncate at apex, violet-blue, 12–14 × 4–9 mm. Petals 5, smaller than sepals, blue, 5–10 × 2–3 mm; lower (outer) lip ligulate, flat, c. 9 mm in length, deeply (mostly 1/3) divided into halves, sparsely long hairy outside; upper (inner) lip reduced, ligulate, c. 0.7 mm. Stamens 15–20, filaments 8–10 mm, anthers 0.79–1 mm, apex obtuse. Follicles 3–5, inflated, connate up to apex, 12–17 × 2–3 mm (including beak); beaks very short. Seeds 2–2.1 × 1.4–1.6 mm, oblong, triquetrous, deeply reticulate ornamentation.

**Chromosome number:** The chromosome number of the species is given by Zakharyeva (1985) as  $2n = 14$ .

**Phenology:** Flowers from May to July and mature capsules from July to August.

**Distribution and habitat:** *Komaroffia bucharica* is known from Middle Asia; around the borders of Uzbekistan and Tajikistan. Narrowly distributed in East of Uzbekistan and West of Tajikistan. The species grows in steppe openings and in fields as weed, from 700–1500 m.

**Etymology:** The epithet “bucharica” denotes the collection site of the holotype from Buchara.

**Taxonomic and nomenclatural notes:** *Komaroffia bucharica* is easily distinguished by having larger flowers and capsules. Regarding the typification of the species, 14 specimens mentioned in the protolog under the title “*Specimina vidi*” without direct assignments of the specimens to the described species, *Nigella bucharica*. Consequently, all of the listed specimens in the protolog have been assumed to be representative samples of *N. bucharica* by the taxonomist studying the genus.

Among the original materials, the specimen collected by Lipsky (*Lipsky 1873*) is selected as lectotype for this species, because it sufficiently covers the given description. The rest of the original specimens accepted as paralectotypes are given under *Komaroffia bucharica*.

Diagnostic characters of *K. bucharica* are length of the sepal, petal and capsules from the other species as indicated in the key. Beside this, sepals are the most visible structure at first glance and length of them are changing over time. In regard to mature flowers, sepals are clearly longer than 10 mm in *K. bucharica* specimens. However, immature specimens of this species may lead to misidentification. One of the specimens collected by Korshinsky (*S. Korshinsky 675*) has several early developing stages of flowers, except the central one. For identification of *Komaroffia* specimens, therefore, development stage should be considered. Description of *N. bucharica* is revised according to the original material and further material collected after publication of the species.

Zohary accepts *Komaroffia bucharica* as synonym under *Nigella integrifolia* with the name of *Nigella integrifolia*, and he selected a specimen as lectotype (1983). Citation of the lectotype is as: [Buchara: Cholm, 1927, Korschinsky (LE!, type of *N. bucharica* Schipcz!); “Turkestan: Bakdschuam” (?), 3000 ft, 1883.]. Such kind of specimen is not given in the protolog and selection of lectotype from a specimen not representing the original specimens conflicts with the relevant article of the *Codes* and the current *Code* (Turland et al., 2018). Among all of the Korshinsky specimens studied at LE and the other herbaria, this specimen has not been found. Additionally, numeration of the sample given in this lectotype citation does not fit into the Korshinsky’s style.

2. **GARIDELLA** Tourn. ex L., Sp. Pl. 1: 425 (1753). Figure 7.

**Type:** *Garidella nigellastrum* L., Sp. Pl. 1: 425 (1753).

= *Nigella* subsect. *Nigellastrum* (Heist. ex Fabricius) Zohary, Pl. Syst. Evol. 142(1-2): 99, as ‘(DC.)’ (1983). **syn. nov.**

**Description:** Annual herb. Basal and lower leaves bipinnate, laciniae filiform. Inflorescence loosely racemose, flowers with long pedicels. Sepals 5. Petals 5, longer than sepals, with long claw, bilobed; outer lobe divided into two lobes, longer than inner lobe. Capsules with 2–3 follicles, connate throughout, dorsally and ventrally opened. Seeds oblong, reticulate or striate, unwinged.  $n = 6$ . S. Europe, SW and Middle Asia.

**Key to the taxa of *Garidella***

1. Petal claw as long as sepal; lower (outer) lip of petal oblong ..... 1. *G. nigellastrum*

–. Petal claw as  $2 \times$  sepal; lower (outer) lip of petal ovate to elliptic ..... 2. *G. unguicularis*

1. ***Garidella nigellastrum*** L., Sp. Pl. 1: 425 (1753).

Figure 7a–b.

≡ *Nigella nigellastrum* (L.) Willk., Prodr. Fl. Hispan. 3(4): 963 (1880).

= *Garidella anethifolia* Salisb., Prodr. Stirp. Chap. Allerton 374 (1796).

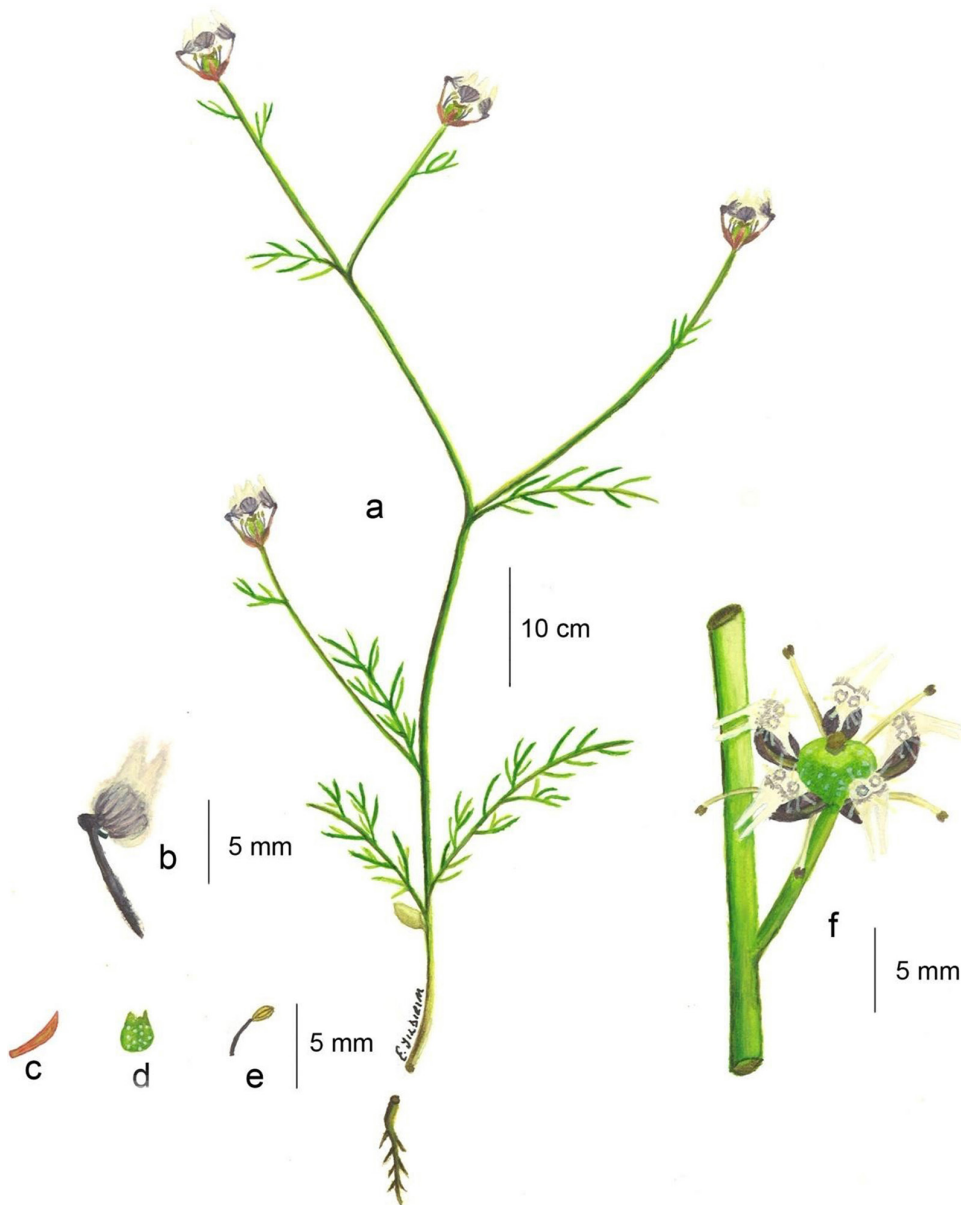
= *Garidella nigelliformis* St.-Lag., Ann. Soc. Bot. Lyon vii. (1880) 126. *nom. nud.*

= *Garidella nigelliformis* St.-Lag., Ann. Soc. Bot. Lyon viii. (1881) 203.

**Lectotype:** Herb. Linn. No. 587.1 (LINN Herb photo!, selected by Zohary 1983).

**Description:** Annual herb, erect, usually branched; stems glabrous, striate, (10–) 20–40 (–60) cm. Leaves distributed throughout stem; basal leaves petiolate up to 15 mm, oblong obovate in outline, lamina 15–35  $\times$  8–20 mm, 2–3-pinnatisect, ultimate segments linear, 3–6  $\times$  0.3–0.5 mm; stem leaves sessile or petiolate to 1–2 mm, 1 or 2 pinnatisect. Inflorescence composed of single to (2–) 4–6 (–8) flowered raceme. Flowers 6–8 mm diam. Sepals 5, glabrous, 3–5  $\times$  1–3 mm, oblong, elliptic, navicular, acute at apex, brown, greenish. Petals 5 (–6), white, yellowish, blue, violet, with transversely line or dotted ornamentation, 5–8  $\times$  2–3 mm, claw and limb distinctly geniculate, lower and upper limbs distinct; upper (inner) lip reduced, 0.5–1 mm; lower (outer) lip linear; deeply divided into linear halves at distal with long sparse hairs. Stamens (10–) 12–16, in 2 rows, filaments 2–4 mm, anthers 0.8–1.1 mm, apex truncate, greenish, yellow or violet at maturity. Follicles 2 (–3), connate nearly up to apex, 5–10  $\times$  2–3 mm (including very short beak), slightly tuberculate on ventral surface with finely anastomosing veins. Seeds 2–4  $\times$  2–3 mm, triquetrous with finely reticulate vein and small pit.

**Chromosome number:** The chromosome number of *G. nigellastrum* found here is  $2n = 12$  and it is reported for the first time.



**Figure 7.** *Garidella nigellastrum* and *G. unguicularis*. a. Habit of *G. nigellastrum* and *G. unguicularis*. b. Petal of *G. nigellastrum*. c-f. *G. unguicularis*. c. Sepal. d. Capsule. e. Stamen. f. Flower.

**Phenology:** Flowers from May to June and mature capsules from July to August.

**Distribution and habitat:** *Garidella nigellastrum* is widely distributed in the Mediterranean Region and SW Asia (Supplement 2 Figure 2). The species grows in steppe openings, slopes and deciduous scrub openings, from sea level to 1000 m.

**Etymology:** The epithet “nigellastrum” denotes that the plants are similar to *Nigella*.

**Taxonomic notes:** The species shows little intraspecific variation with respect to all characters, except flower colour. Petals have a very wide range of colours from

pale white, yellowish and blue to violet. Flowers of the plants have been examined during the field studies made throughout the distribution ranges of the species to observe relationships between pollinators and flowers. There is no insect species specifically pollinating this taxon.

2. *Garidella unguicularis* Poir., Lam., Tabl. Encycl. ii. 500. [t. 379]. (1812). Figures 7c–7f.

≡ *Nigella unguicularis* (Poir.) Spenn., Monog. Nigell. 12.

**Type:** “Dans l’Orient”, leg. A. Michaux (P).

**Description:** Annual herb, erect, usually branched; (10–) 20–45 (–70) cm, striate, usually glabrous. Leaves distributed throughout stem length; basal leaves petiolate

up to 15 mm; lamina 15–35 × 8–20 mm, oblong to obovate in outline, 2- to 3-pinnatisect, segments linear; stem leaves sessile or petiolate to 1–2 mm, 1-2 pinnatisect. Inflorescence composed of single flower or loosely branched raceme. Flowers 10–15 (–20) mm diam. Sepals 5, glabrous, brown, greenish, 5–5 × 2.5–4 mm, oblong, elliptic, obovate, acute at apex. Petals 5 (–6), distinctly geniculate, claw × 2-sepal or longer, 8–11 mm, limb orbicular, deeply emarginate at apex, maroon, brownish, blue, violet, spotted or lined ornamentation upper (inner) lip reduced, 1–1.5 × 1.5–2 mm; lower (outer) lip orbicular, ovate, 7–9 × 5–8 mm, sparsely long hairy, margin irregularly toothed, undulate. Stamens (12–)15–16, in 2 rows; filaments 3–5 mm, anthers 1–2 mm, truncate at apex, greenish, yellow or brown at maturity. Follicles 2 (–3) per flower, connate nearly up to apex, 5–10 × 2–3 mm (including beak), tuberculate on surface, finely veined. Seeds 2–4 × 2–3 mm, triquetrous, reticulately pitted on surface.

**Chromosome number:** The chromosome number for *G. unguicularis* counted here is  $2n = 12$  for the first time.

**Phenology:** Flowers from May to June and mature capsules June to July.

**Distribution and habitat:** *Garidella unguicularis* is a widespread species in the Mediterranean and SW Asian regions (Supplement 2 Figure 2). The species grows in steppe openings, stony slopes and deciduous scrub openings, from 250–1700 m.

**Etymology:** The epithet “*unguicularis*” denotes that it bears long claw of the petals.

**Taxonomic notes:** Intraspecific variation is rather low, except flower colour. This species is easily distinguished from *N. nigellastrum* by having relatively larger flowers, long petal claw and hooded lips at apex.

### 3. *Nigella* L.

*Nigella* L., Sp. Pl. 1: 534 (1753).

**Type:** *Nigella arvensis* L., Sp. Pl. 2: 584 (1753).

= *Erobathos* Spach, Hist. Nat. Vég. (Spach) 7: 301 (1838).

**Description:** Annual herbs. Basal and lower leaves 2- to 3-pinnatisect, segments filiform, linear, oblong or ovate. Inflorescence racemose or rarely single flowered. Sepals (4–) 5 (–8) with a claw and limb, petaloid, blue, whitish, yellow or greenish. Petals (honey leaves, nectary leaves) (5–) 8 (–10), smaller than sepals, distinctly geniculate, stalk and limb distinct; limb bilabiate; lower (outer) limb deeply divided into two lobes, brightly coloured with transverse lines and, each lobe attenuate with an appendage usually ending in a knob; the upper lip smaller than the inner, triangular to lanceolate. Stamens (20–) 40–50 (–60) in 8-groups or equally distributed with long filaments. Follicles (2–) 5–7 (–14), united to form a capsule, sometimes inflated, dehiscent on the adaxial suture; styles receptive along adaxial surface, persistent to form

a beak on the follicle. Seeds triquetrous or compressed, sometimes winged rugose or tuberculate, black or brown, shiny or dull.

The genus is distributed in South Europe, North Africa, Middle and South Asia.

### Key to the taxa of *Nigella*

1. Ultimate leaf segments usually flat, linear; flowers yellow; follicles flat; seeds discoid, winged as half of seed ... 2
    - . Leaf segments filiform, ovate or oblong; flowers various degrees of blue, rarely yellow; follicles inflated; seeds triquetrous or shortly oblong, unwinged ..... 4
  2. Leaf and fruit long ciliate ..... 14. *N. ciliaris*
    - . Leaf and fruit glabrous ..... 3
  3. Lower (outer) lip of petal simple or emarginate ..... 12. *N. orientalis*
    - . Lower (outer) lip of petal divided into two halves with long filiform protuberance ..... 13.
- Nigella oxypetala* (including *N. latisecta* and *N. lancifolia*)
4. Follicles connate up to apex, beak filiform ..... 5
    - . Follicles connate up to half or more connate, free at apex, beak lanceolate ..... 10
  5. Fruit stellate; plant prostrate ..... 6
    - . Fruit not stellate; plant usually erect ..... 7
  6. Ultimate leaf segments ovate; fruit beak 10–15 mm ..... 11. *N. fumariifolia*
    - . Ultimate leaf segments filiform or linear; fruit beak 15–30 mm ..... 10. *N. stellaris*
  7. Flowers enclosed by involucre bracts; capsule surface smooth ..... 8
    - . Involucrum bracts equal or shorter than flower; capsule verrucose ..... 9
  8. Capsule inflated; lower lips of petals wide, deltoid or D-shaped ..... 1. *N. damascena*
    - . Capsule hard, slightly inflated; lower lips of petals filiform ..... 2. *N. elata*
  9. Leaf segments linear; lower lip of petals filiform, glabrous ..... 9. *N. turcica*
    - . Ultimate leaf segments oblong or ovate; lower lips deltoid, hairy ..... 8. *N. sativa*
  10. Sepals yellow or pale yellow, petals orange or greenish yellow; lower lips of petal with green protuberance (pseudonectary), violet lined ..... 6. *N. koyuncui*
    - . Sepal blue, violet, petals blue, violet, dark red or brownish; lower lip of petal various ornamentation ..... 11
  11. Seed surface verrucose, wrinkled, pale coloured ..... 5. *N. arvensis*
    - . Seed surface shiny, smooth ..... 12
  12. Sepal lips lanceolate-ovate; beak erect, shorter than carpel ..... 7. *N. segetalis*
    - . Sepal lips deltoid-orbicular; beak patent or semierect, as long as carpel or longer ..... 13
  13. Carpel surface verrucose, connate up to apex; beak patent ..... 4. *N. papillosa*

–. Carpel surface smooth, connate more than; beak semi-erect ..... 3. *N. gallica*

The genus is traditionally composed of 14 species which are treated in three sections. This intrageneric classification of *Nigella* is following DeCandolle who has accepted three sections, namely *Erobathos* DC., *Nigellaria* DC. and *Nigellastrum* (Fabricius) DC. Among the 14 species, 10 naturally grow in Turkey.

*Nigella* Sect. *Erobathos* DC., Syst. Nat. [Candolle] 1: 49 (1824). Figure 8.

≡ *Nigella* subsect. *Erobathos* (DC.) Zohary, Pl. Syst. Evol. 142(1-2): 97 (1983). **syn. nov.**

1. *Nigella damascena* L., Sp. Pl. 2: 584 (1753). Figures 8a–8d.

**LECTOTYPE:** Herb. Linn. No. 700.1 (LINN photo!, selected by Zohary 1983).

≡ *Melanthium damascenum* Medik., Philos. Bot. (Medikus) 1: 96 (1789).

≡ *Erobathos damascenum* Spach, Hist. Nat. Vég. (Spach) 7: 302 (1838).

= *Erobathos coarctatum* Spach, Hist. Nat. Vég. (Spach) 7: 304 (1838).

= *Nigella bourgaei* Jord., Pugill. Pl. Nov. 2 (1852).

= *Nigella damascena* subsp. *minor* (Boiss.) Terracciano (1898: 151).

= *Nigella damascena* var. *africana* Brand in Abh. Vor. Ges. Nat. 37 (1895).

= *Nigella damascena* var. *minor* Boiss. (1839: 45).

= *Nigella elegans* Salisb., Prodr. Stirp. Chap. Allerton 374 (1796).

= *Nigella multifida* Gaterau, Descr. Pl. Montauban 100 (1789).

= *Nigella taurica* Steven, Bull. Soc. Imp. Naturalistes Moscou 29 (2): 283 (1856).

**Description:** Annual herb, erect, usually branched, (10–) 15–35 (–45) cm; glabrous rarely short setose hairy on leaves, striate. Leaves 2- to 3-pinnatisect, segments long filiform, lamina 15–35 (–60) × 10–20 (–30) mm. Inflorescence few branched raceme, flowers enclosed with 3–5 pinnatisect leaves. Flowers 20–45 (–60) mm diam., dark blue, sky blue, whitish with white and blue spot at centre. Sepals 5, glabrous, sky blue or other degrees of blue; claw very short, 2–5 mm in length; limb 15–20 (–25) × 8–15 mm, deltoid to orbicular, shortly attenuate to truncate at base, acute at apex, dorsally whitish. Petals (7–) 8, dark blue, 4–6 × 2–4 mm with sparsely long hairs, distinctly geniculate, upper (inner) lip shortly ligulate or triangular, 1.5–2 mm; lower (outer) lip deeply divided into triangular or ovate halves, each half 2 mm, abruptly constricted into filiform portion, apex slightly clavate with single purplish line; pseudonectaries green, as conic protuberance, with purplish single line, covering the petal base. Stamens 40–50 (–60), filaments 5–10 mm, anthers

1.9–2.2 mm in length, obtuse at apex, greenish, violet or yellow at maturity. Follicles connate and distinctly inflated, 10–20 (–30) × 6–10 (–15) mm, smooth; beaks filiform, 5–15 mm in length, twisted. Seeds 2.5–3.5 × 1.5–2.5 mm, ovate, black, striate laterally, unwinged.

**Chromosome number:** The chromosome number of the species is reported as  $2n = 12$  here, in accordance with most of the previous reports (Diosdado et al., 1994; Mitra and Bhowmilk, 1996).

**Phenology:** Flowers from May to July and mature capsules from July to August.

**Distribution and habitat:** *Nigella damascena* is distributed in the Mediterranean Region, Europe and SW Asia, and it is also cultivated for ornamentation. The species grows mostly in deciduous scrub steppe openings, from sea level to 1500 m.

**Etymology:** The epithet “damascena” denotes the city of Damascus in Syria.

**Taxonomic notes:** The species is closely allied with *Nigella elata* in terms of morphology and molecular phylogeny (Bittkau and Comes, 2009). However, it is distinguished from it by petal and fruit features. The lobes of the lower petal lips are widely triangular and bigger than those of *N. elata*. The capsule wall has a papery texture, and it is widely inflated. Although some authors have been using the plant height for distinguishing these two species, our extensive field observations showed that both species are similar in size.

2. *Nigella elata* Boiss., Diagn. Pl. Orient. ser. 1, 1: 66 (1843). Figures 8e and 8f.

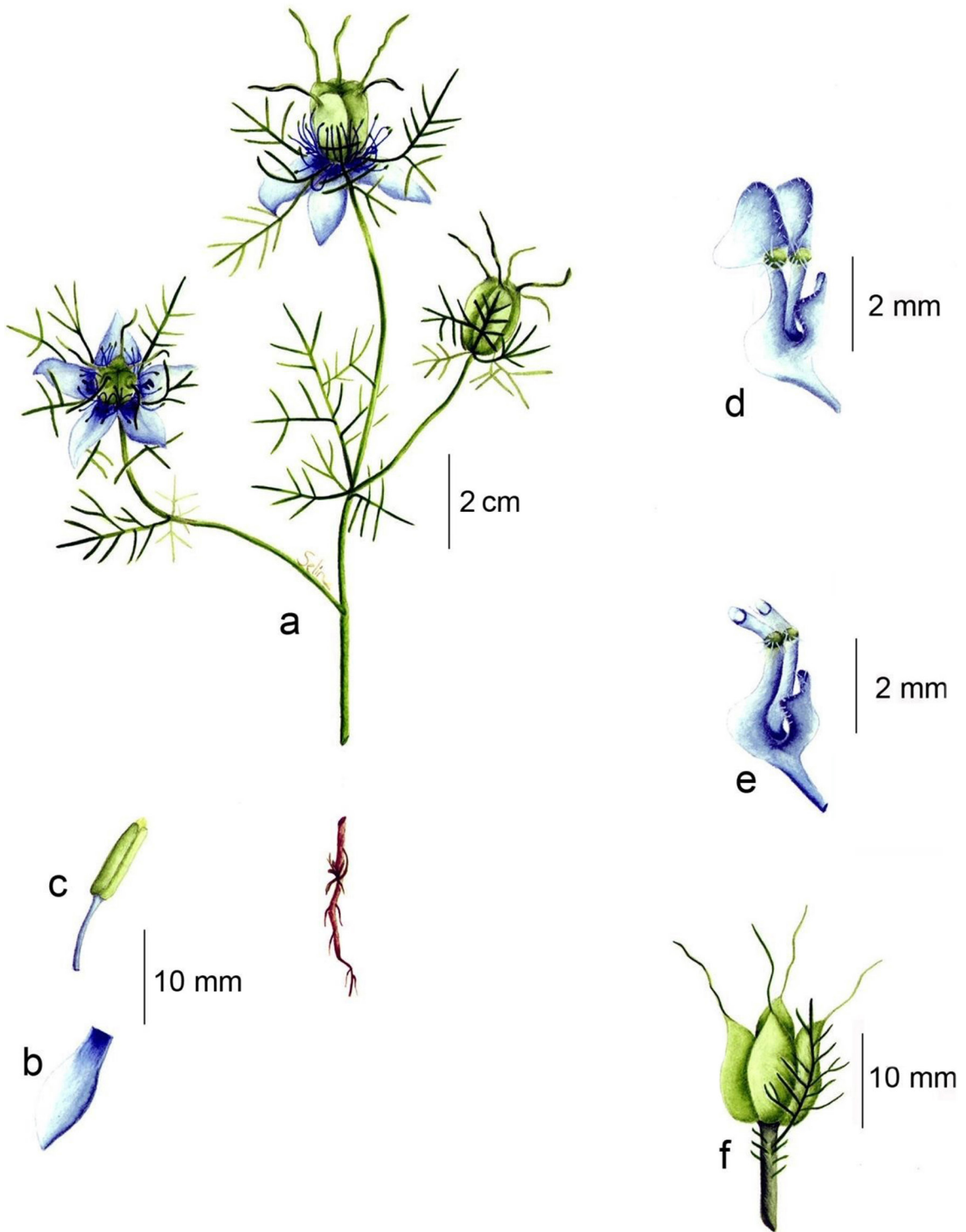
= *Nigella involuocrata* Moench, Methodus (Moench) 314 (1794).

= *Nigella involuocrata* K.Koch, Linnaea 19(1): 48 (1846).

= *Nigella bithynica* Azn., Bull. Soc. Bot. France 44: 165 (1897). TURKEY. İstanbul described from Kartal.

**Type:** TURKEY. Manisa: “in dumasis montis Mesogis inter Derwend et Alaseher, ad basin Tmoli prope Sardes”, July 1842, *Boissier* (G-Boiss.!).

**Description:** Annual herb, erect, simple or branched, (15–) 20–40 (–80) cm; sparsely scabrid hairy, rarely glabrous, striate. Leaves (1–) 2–3-pinnatisect, segments long filiform, lamina 10–40 (–60) × 10–20 (–30) mm. Inflorescence few branched raceme, rarely single flowered; flowers enclosed with 3–5 pinnatisect leaves. Flowers 10–15 mm diam., pale to sky blue. Sepals 5, glabrous, without claw, sky blue or other ranges of blue, obovate or oblong, (4–) 8–16 × (2–) 4–10 mm, mucronate at apex. Petals (7–) 8, blue to dark blue, 3–4 × 2–3 mm with sparsely long hairs, distinctly geniculate, upper (inner) lip small, ligulate or widely triangular, 1.5–2 mm; lower (outer) lip deeply divided into filiform halves, each half geniculate, with green spot, apex slightly clavate with single purplish line. Stamens 40–45, filaments 6–10 mm, anthers 0.9–1.1



**Figure 8.** *Nigella damascena* and *N. elata*. a. General view of these species. b–d. *N. damascena*. b. Sepal. c. Stamen. d. Petal. e–f. *N. elata*. e. Petal. f. Capsule.

mm in length, obtuse at apex, green, bluish, yellow at maturity. Follicles connate forming a hard capsule, 6–12 (–16) × 4–10 (–15) mm, smooth; beaks filiform, 5–10 mm in length, twisted. Seeds 2.5–3 × 1.4–1.6 mm, black, striate

laterally, unwinged. Seeds 2.5–3 × 1.4–1.6 mm, black, striate laterally, unwinged.

**Chromosome number:** The chromosome number for *Nigella elata* is given here as  $2n = 12$  for the first time.

**Phenology:** Flowers from May to June and mature capsules June to July.

**Distribution and habitat:** *Nigella elata* naturally occurs in western Turkey, Greece, Bulgaria and Crimea. The species grows in deciduous shrub openings, steppes and fields, from sea level to 1750 m.

**Etymology:** The epithet “*elata*” is relative length to *N. damascena*.

**Taxonomic notes:** The plant height changes according to habitat; it is c. 15 cm in dry habitats. Stem length does not show any significant difference between *N. damascena* and *N. elata* according to our examinations on the specimens of these two species. Dry and sturdy texture of capsule is characteristic to the species.

*Nigella* Sect. *Nigellaria* DC. Syst. Nat. [Candolle] 1: 49 (1824). Figure 9.

3. *Nigella gallica* Jord., Pugill. Pl. Nov. 3 (1852). Figures 9a–9c.

= *Nigella hispanica* L., Sp. Pl. 2: 584 (1753).

= *Nigella hispanica* var. *parviflora* Coss.

= *Nigella arvensis* auct. non L.

= *Nigella divaricata* sensu Willk. in Willkomm & Lange (1880: 964).

= *Nigella amoena* Salisb., Prodr. Stirp. Chap. Allerton 374 (1796).

= *Nigella arvensis* subsp. *hispanica* (L.) Malag., Acta Phytotax. Barcinon. 18: 10 (1977).

= *Nigella gaditana* Soleirol ex Nyman, Consp. Fl. Eur. 1: 16 (1878).

= *Nigella intermedia* Rouy & Foucaud, Fl. France [Rouy & Foucaud] 1: 122, in obs. (1893).

= *Nigella intermedia* K.Koch, Linnaea 19(1): 48 (1846).

= *Nigella polygynia* Moench, Suppl. Meth. (Moench) 111 (1802).

**Type:** FRANCE. “Hab. In arvis Galliae austro-occidentalis, Toulouse (Timbal-Lagrave), etc.” (P; not seen, JSTOR-photo!).

**Description:** Annual herb, erect, simple, mostly branched; stems glabrous to finely scabrid on nerves and leaf margin, (15–) 25–40 (–60) cm, striate. Basal leaves petiolate, up to 15 mm; lamina (10–) 20–25 × 8–15 mm, oblong to ovate in outline, 2- to 3-pinnatisect, ultimate segments oblong, 3–6 (–15) × 0.3–0.4 (–2) mm; stem leaves sessile or petiolate to 1–2 mm, 1–2 pinnatisect. Flowers rarely solitary or widely branched raceme. Flowers 20–30 (–40) mm diam. Sepals 5, glabrous pale to sky blue, divided into claw and limb; claw 5–8 × 1–2 mm in length; limb (6–) 10–14 × 4–7 (–10) mm, deltoid to orbicular, shortly attenuate at base, acute at apex, veins distinct. Petals (7–) 8, blue, 4–5 × 2–3 mm with 6 to 10 long hairs, distinctly geniculate; upper (inner) lip linear to filiform, 1–3 × 0.5–0.7 mm, transversely violet lined at apex; lower (outer) lip widely ovate in outline; deeply divided into ovate

halves, each half 2–3 mm, apex clavate with 1–2 purplish lines; pseudonectaries green, as conic protuberance, with purplish single line, covering the petal base. Stamens 40–50 (–70), in 8 groups in some flowers, filaments 8–13 mm, anthers 1.9–2.1 mm, with apical appendage, greenish violet, yellow at maturity. Follicles (3–) 4–6 (–8) per flower, connate more than half the length, (10–) 15–20 × (0.7–) 2–3 mm (including beak), smooth, slightly tuberculate on ventral suture, transversally veined; beaks twisted, erect, equal or shorter than capsule, each follicle with 3 (–5) distinct veins at base of beak. Seeds 2–3 × 2–2.2 mm, triquetrous, shiny, brown, indistinctly winged on margin.

**Chromosome number:** Chromosome number of the species is given as 2n=12 by Queirós (1990) and Pacheco (2004).

**Phenology:** Flowers from May to June and mature capsules from June to July.

**Distribution and habitat:** *Nigella gallica* is known from Spain and Portugal (Supplement 2 Figure 3). The species grows on dry slopes and in abandoned fields, from sea level to 1100 m.

**Etymology:** The epithet “*gallica*” deals with French.

**Taxonomic notes:** The species is similar to *N. arvensis* at first glance. However, it is clearly distinct from it by longer and twisted beaks of carpels.

4. *Nigella papillosa* G.López, Anales Jard. Bot. Madrid 41 (2): 468 (1985). Figures 9a, 9d and 9g.

= *Nigella hispanica* auct. et L. pro parte (excl. lectotypus) G.López (1985: 468).

**Type:** SPAIN. Sevilla: Gines, la Vereda, sur sol margeux, 4 June 1978, S. Silvestre MA230899!-JSTOR-photo! (Société pour Pechange des plantes vasculaires de l’Europe occidentale et du bassin méditerranéen, fase. 18, núm. 9176, 1978–1979).

**Description:** Annual herb, erect, simple mostly branched, (15–) 25–50 (–70) cm, glabrous, glaucous, finely scabrid on leaf margin and nerves, striate. Basal leaves up to 20 mm, petiolate; lamina (10–) 20–30 × 10–15 mm, oblong to orbicular in outline, 2–3-pinnatisect, ultimate segments filiform, oblong or triangular, 3–6 × 0.3–0.4 mm; stem leaves sessile or petiolate to 1–2 mm, 1–2-pinnatisect. Inflorescence composed of single flowers or raceme; flowers enclosed by leafy bracts, (20–) 30–50 (–75) mm diam. Sepals 5, glabrous, pale to sky blue, violet; claw and limb ±distinct; claw (2–) 4–6 × 1–2 mm in length; limb 15–25 × 10–15 mm, deltoid to ovate-orbicular, shortly attenuate to truncate at base, obtuse or acute at apex, glabrous. Petals (7–) 8, blue, 6–10 × 6–9 mm with 8 to 12 long hairs, distinctly geniculate, upper (inner) lip ligulate, lanceolate or filiform, 4–6 × 1–2 mm, slightly clavate with purplish single transverse line at apex; lower (outer) lip widely ovate in outline; deeply divided into ovate halves, with a pair of filiform protuberance at base,

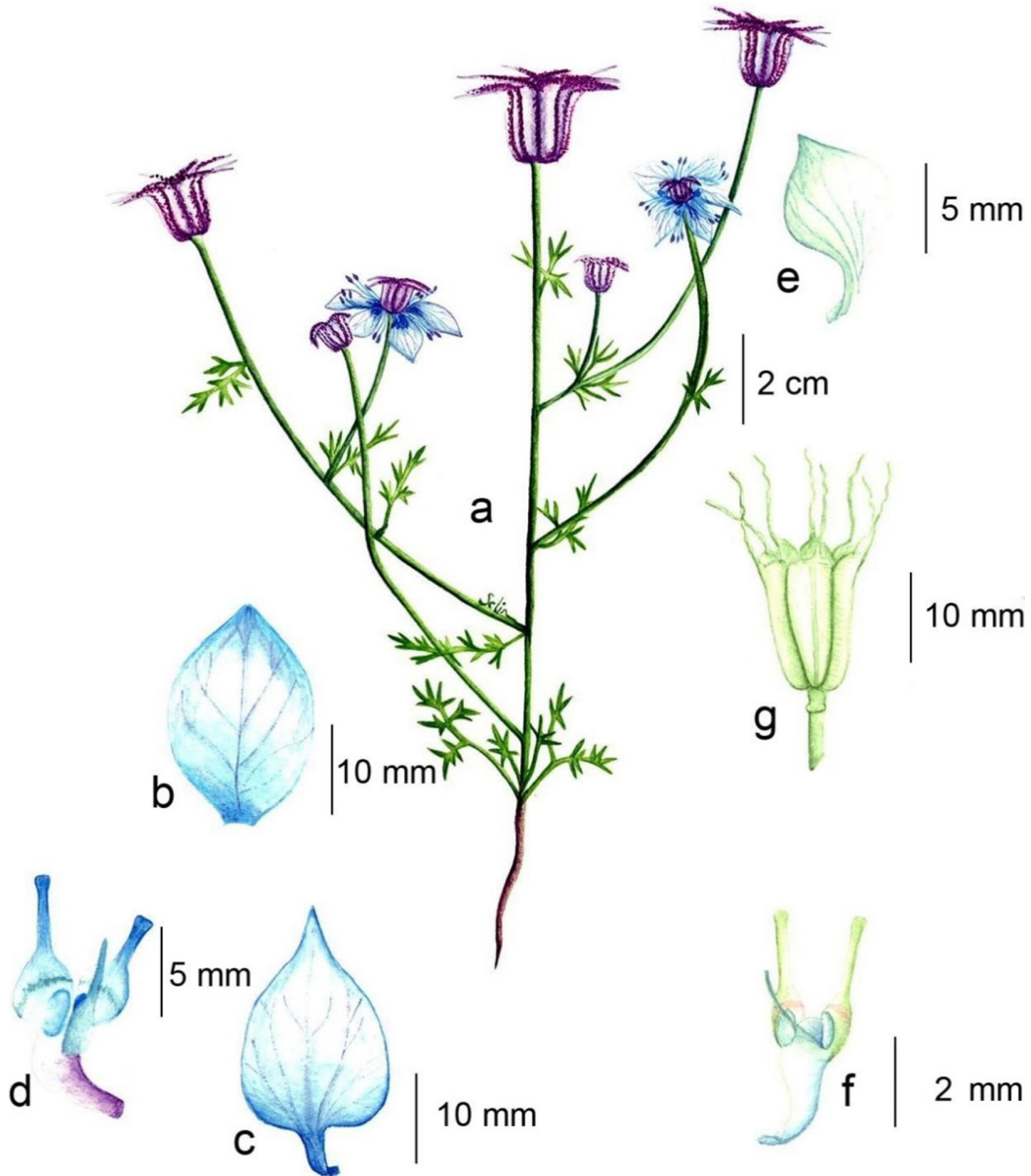


Figure 9. a. *N. gallica* and *N. papillosa*. b–c. *N. papillosa*. d–g. *N. gallica*. d. Petal. e. Sepal. f. Petal g. Capsule.

each half 2–3 mm, apex slightly clavate with 1–2 purplish lines; pseudonectaries green, as conic protuberance, with purplish single line, covering the petal base. Stamens 60–80 in 8 groups, filaments 10–16 mm, anthers 1.9– 2.1 mm, with apical appendage, greenish pale purplish, violet. Follicles (5–) 8–10 (–15) per flower, (10–) 15–30 × 2–4 mm (including beak), distinctly tuberculate, connate up to throughout carpel length; beaks equal or shorter than capsule, with 3–5 distinct veins at the base. Seeds 2–3 × 1–2 mm, triquetrous, shiny, indistinctly winged on margin.

**Chromosome number:** Chromosome number is given as  $2n = 12$  for *N. papillosa* by Silvestre (1986) and Pastor et al. (1990).

1. Flowers in 5–7 cm diam.; sepals without claw or claws 1–2 mm .... 1. subsp. .... *papillosa*  
 –. Flowers in (3–) 3.5–5 cm diam.; sepal claws 3–6 mm  
 ..... 2. subsp. *atlantica*

4a. *Nigella papillosa* G.López subsp. *papillosa*

**Phenology:** Flowers from March to July and mature capsules from April to August.

**Distribution and habitat:** *Nigella papillosa* subsp. *papillosa* is known from Spain and Portugal growing in cornfields (Supplement 2 Figure 3), c. 500–1000 m.

**Conservation status:** The species is known from two countries with limited specimens. Based on limited collections and narrowly distribution pattern, it is assigned



to the LC (Least Concern) status according to the IUCN Red List criteria (IUCN 2016).

**Etymology:** The epithet “papillosa” denotes the distinct verrucae on capsule surface.

**Taxonomic notes:** The species is distinct among all *Nigella* species by its biggest capsule and distinctly horizontal beaks. This subspecies is characterised by having larger flowers and short sepal claws, if present.

4b. *Nigella papillosa* G.López subsp. *atlantica* (Murb.) G.López, *Anales Jard. Bot. Madrid* 41(2): 468 (1985).

≡ *Nigella hispanica* subsp. *atlantica* Murbeck (1897: 3).

= *Nigella arvensis* subsp. *atlantica* (Murb.) Malag., *Acta Phytotax. Barcinon.* 18: 10 (1977).

= *Nigella hispanica* var. *intermedia* Coss., *Not. Pl. Crit.* 49 (1849).

**Type:** ALGERIA. “In Algeria [Tunisia: Tunetia centr: Maktar, in collibus calcareis, 2.6.1903, Sv. Murbeck sn-JSTOR-photo!]

**Phenology:** Flowers from May to June and mature capsules from June to July.

**Distribution and habitat:** *Nigella papillosa* subsp. *atlantica* occurs in the West Mediterranean area (Supplement 2 Figure 3). The species grows in abandoned fields and on dry slopes, 600–1100 m.

**Etymology:** The epithet “atlantica” denotes the Atlas Mountain.

5. *Nigella arvensis* L., *Sp. Pl.* 2: 584 (1753). Figure 10.

**Lectotype:** Herb. Burser VII (1): no. 123 (UPS-photo!, selected by Strid in Jarvis *et al.* (2005: 469).

**Description:** Annual herb, ascending to erect, simple to branched from base; stems glabrous, glaucous or from finely scabrid to puberulous, (4–) 10–25 (–60) cm, striate. Basal leaves petiolate, up to 25 mm; lamina (5–) 15–30 (–55) × (2–) 10–20 (–40) mm, orbicular to obovate in outline, rarely linear, (1–) 2–3-pinnatisect, rarely simple, ultimate segments filiform, oblong or ovate, (2–) 5–15 × 0.1–1 (–5) mm; stem leaves sessile or petiolate to 1–2 mm, 1–2 (–3) pinnatisect, rarely simple. Inflorescence composed of single flower or widely branched raceme, flowers (10–) 15–25 (–40) mm diam., in various degrees of blue, violet or pale green, with dark blood red to purplish central mark. Sepals 5, glabrous, blue to pale blue, divided into claw and limb; claw 3–7 mm in length; limb (4–) 6–10 (–13) × (3–) 5–9 (–12) mm, oblong, deltoid to ovate-orbicular, shortly attenuate, truncate or cordate at base, obtuse or acute at apex, veins dorsally distinct. Petals (7–) 8, blue, violet, maroon, greenish, 5–8 × 5–8 mm with sparsely long hairs, distinctly geniculate, upper (inner) lip lanceolate to filiform, 3–5 × 1–2 mm, transversely violet lined at apex; lower (outer) lip widely ovate in outline, deeply divided into ±equal halves with a pair of conic 2–3 mm protuberance at base, clavate at apex with 1–2 transversely lines. Stamens (20–) 40–50, rarely in 8 groups, filaments

4–10 mm, anthers 1.9–2.1 mm, acute, truncate or beaked at apex, greenish, violet or maroon, yellow at maturity. Capsules 2 to 4 (–8) per flower, (4–) 8–12 (–20) × 2–4 mm (including beak), smooth or slightly tuberculate on ventral suture or throughout, connate to half of capsule length; beaks usually equal or longer than capsule, straight, rarely twisted or hooked at apex, each capsule with 1–3 distinct veins at base of beak. Seeds 1.5–2.5 × 1.4–2 mm, mostly triquetrous, black and a few white tubercles, indistinctly winged on margin.

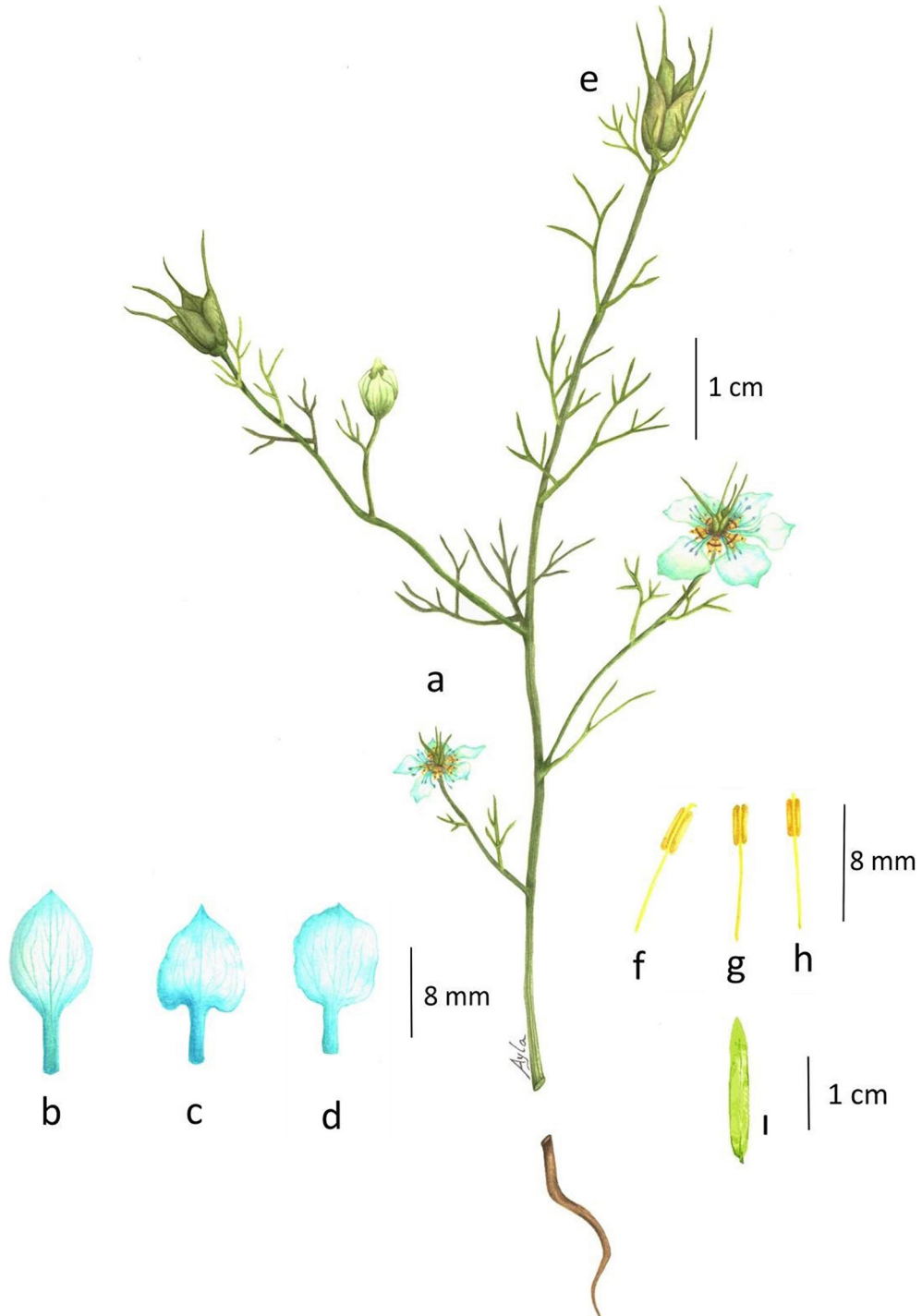
**Chromosome number:** It is reported here as  $2n = 12$ . The same chromosome number was also reported by Datta and Biswas (1983) and Magulaev (1984).

**Phenology:** Flowers from May to August and mature capsules from July to September.

**Distribution and habitat:** *Nigella arvensis* is the species of the *Nigelleae* tribe with the widest distribution, and it naturally occurs in North Africa, Southern Europe, the Middle East and SW Asia. It grows in fields, abandoned areas, near seashores, in steppes, roadsides and deciduous forest openings, from sea level to 1800 m.

**Etymology:** The epithet “arvensis” denotes that it grows in fields and ploughed areas.

**Taxonomic notes:** *N. arvensis* is a polymorphic species showing the highest diversity in Turkey and Greece. Due to high level of polymorphism, many new species and intraspecific taxa have been described in the last century, based on the polymorphic characters. The Aegean Islands are the most attractive area for describing new species and further research on cytotypes (Strid, 1969) and molecular phylogeography. Bittkau and Comes 2009; Jaros *et al.*, 2018). We can not insight acceptable supports for distinguishing several species within the *N. arvensis* complex from the recently published molecular studies given above. Two new species (*N. degenii* and *N. doerfleri*) were described by Vierhapper (1926) from the Aegean Islands, and later, three new species (*N. icarica*, *N. carpatha*, and *N. stricta*) were added by Strid (1970). Moreover, Strid (1970) described four new subspecies from different islands, namely, *Nigella degenii* Vierh. subsp. *barbro* Strid, *N. degenii* Vierh. subsp. *minor* Strid, *Nigella degenii* Vierh. subsp. *jenny* Strid, and *Nigella arvensis* subsp. *brevifolia* Strid. In this study, the type specimens and other collections were examined, and field observations were made on the Islands, namely Syros, Icaria, Karpathos, Piraeus, Paros, and Rhodopeus for a better understanding of the Islands’ endemic taxa. And, based on pollen morphology and seed surface ornamentation studies, we inferred that all these subspecies are representatives of the polymorphic *N. arvensis* complex. None of Strid’s infraspecific taxa is recognized here since all of his subspecies are based on what we have come to understand as taxonomically insignificant characters, often representing just extremes of a continuum.



**Figure 10.** *Nigella arvensis* var. *arvensis* and var. *aristata*. a–c. Sepal. e. Capsule. f–h. Stamen and apex of anthers. i. Leaf of *Nigella arvensis* var. *simplicifolia*.

Zohary (1983) first criticised (it is impossible escape from the so many sharp eyes) the description of so many (sub)species from the Balkans and the Aegean Islands and then he accepted all of the species (*N. degenii* Vierh., *N. doerfleri* Vierh., *N. degenii* subsp. *barbo* Strid, *N. degenii*

subsp. *jenny* Strid, *N. degenii* subsp. *minor* Strid, *N. stricta* Siren, *N. carpatha* Strid, and *N. icaria* Strid) as synonym of *N. arvensis*. When he accepted these taxa as synonyms, he neglected the rules for the synonym of the relevant Code. Although Zohary presented strict criticism on

describing so many taxa from the region, he nevertheless divided the *N. arvensis* complex into 15 varieties (i.e. 1- *N. arvensis* L. var. *arvensis*, 2- *N. arvensis* L. var. *glaucescens*, 3- *N. arvensis* L. var. *glauca*, 4- *N. arvensis* L. var. *mutica*, 5- *N. arvensis* L. var. *negevensis*, 6- *N. arvensis* L. var. *multicaulis*, 7- *N. arvensis* L. var. *involucrata*, 8- *N. arvensis* L. var. *beershevensis*, 9- *N. arvensis* L. var. *palaestina*, 10- *N. arvensis* L. var. *microcarpa*, 11- *N. arvensis* L. var. *assyriaca*, 12- *N. arvensis* L. var. *anatolica*, 13- *N. arvensis* L. var. *longicornis*, 14- *N. arvensis* L. var. *iranica*, and 15- *N. arvensis* L. var. *simplicifolia*).

The specimens of the varieties, which were accepted or described by Zohary have been recollected from the field or examined in the mentioned herbaria. Continuum of the morphological characters of the taxa involved in the *Nigella arvensis* complex is a well-known phenomenon, and the identification key for the varieties given by Zohary is not useful for distinguishing the taxa. Moreover, according to the Greek taxonomists (personal communication), it is hardly possible to identify any specimens of the *N. arvensis* complex in the absence of the location data from the islands where the specimens were collected. Flower colouration and the patterns on the sepals are too variable, and they cannot be used in the separation of the taxa as discriminating characters. Based on some distinct characters, which are relatively more robust (enclosed bracts, division, simple leaves), the *N. arvensis* complex is evaluated under three varieties (*N. arvensis* var. *arvensis*, *N. arvensis* var. *aristata* (Sibthorp & Smith) Dönmez & Uğurlu, and *N. arvensis* var. *simplicifolia* Zohary) for a better understanding of the species. This is just a simple and helpful way for botanists who intend to identify the specimens of *N. arvensis*. Pollen morphological characteristics (Işık et al., 2019) as well as seed morphological features (Dadandı et al., 2009; Heiss et al., 2011; Uğurlu-Aydın and Dönmez, 2019) of the taxa in the *Nigella arvensis* complex have been also taken into consideration in this study. It is concluded that they are all similar within the complex.

1. Flowers enclosed by simple or compound bracts ..... 5a. var. *arvensis*
    - Flowers not enclosed by bracts or bracts just beneath the flowers ..... 2
  2. Stem leaves usually compound, reduced or rarely simple; if so then small filiform ..... 5b. var. *aristata*
    - Stem leaves well-developed simple lanceolate ..... 5c. var. *simplicifolia*
- 5a. *Nigella arvensis* L. var. *arvensis* Figures 10a–10h.  
 = *Nigella doliata* Pall. ex M.Bieb., Fl. Taur.-Caucas. 2: 16 (1808).  
 = *Nigella divaricata* Beauvre ex DC., Syst. Nat. [Candolle] 1: 329 (1817).  
 = *Nigella foeniculacea* DC., Syst. Nat. [Candolle] 1: 328 (1817).

- = *Nigella foeniculacea* Hohen. ex Boiss., Fl. Orient. [Boissier] 1: 65 (1867).  
 = *Nigella tuberculata* Griseb., Spic. Fl. Rumel. 1(2/3): 310 (1843).  
 = *Nigella agrestis* J.Presl & C.Presl, Delic. Prag. 225 (1822).  
 = *Nigella arvensis* β [var.] *typica* Boissier (1867: 66).  
 = *Nigella arvensis* β [var.] *verruculosa* Beck (1890: 398).  
 = *Nigella arvensis* α [subsp.] *normalis* Terracciano (1898: 31).  
 = *Nigella arvensis* subsp. *arvensis* Tutin (1964: 209).  
 = *Nigella arvensis* L. var. *glaucescens* Gussone (1826: 216) et Fl. Sic. Prodr. 2, 34 (1828). Type: ITALY. Calabria: Gussone (FI, n.v.).  
 = *Nigella divaricata* Moris (1837: 54).  
*Nigella divaricata* Beauvre ex DC., Syst. Nat. [Candolle] 1: 329 (1817).  
 = *Nigella divaricata* Beauvre ex DC. (1817: 329) sensu Guss. (1845: 30). Ic: Deless., Icon. 1, t. 46 (1821); Guss. (1828: 260).  
 = *Nigella divaricata* var. *palaestina* Zohary, Palestine J. Bot., Jerusalem Ser. 2: 153 (1941).  
 = *Nigella catanae* Tenore (1842: 14).  
 = *Nigella arvensis* var. *glauca* (Schkuhr) Boiss. (1867: 66); Lectotype: TURKEY. Armenia, Calvert (selected by Davis 1965, K!).  
 = *Nigella glauca* Schkuhr ex Wender., Linnaea 14(6): 587 (1841). Homonym: *Nigella glauca* Wallroth, Linnaea 14(6): 587 (1841).  
 = *Nigella huthii* Brand, Helios xiii. (1895) 26 et 191.  
 = *Nigella degenii* Vierh., Magyar Bot. Lapok 1926, xxv. 148 (1927). Strid, Op. Bot. 28: 51 (1970).  
 = *Nigella doerfleri* Vierh., Magyar Bot. Lapok 1926, xxv. 147 (1927). Strid, Op. Bot. 28: 53 (1970).  
 = *Nigella arvensis* L. β [subsp.] *glauca* (Boiss.) Terracc.; op. cit. 36 (1898: 36), (excl. var. *glaucescens*).  
 = *Nigella arvensis* L. subsp. *glauca* (Boiss.) Terracc. in Strid, Op. Bot. 28: 38 (1970).  
 = *Nigella icarica* Strid, Op. Bot. 28: 48 (1970).  
 = *Nigella arvensis* L. var. *assyriaca* (Boiss.) C.C.Towns., Fl. Iraq 4(2): 682 (1980): (1980). ≡ *Nigella arvensis* var. *assyriaca* (Boiss.) Zohary, Pl. Syst. Evol. 142(1-2): 91 (1983).  
 = *Nigella degenii* Vierh. subsp. *barbro* Strid, Op. Bot. 28: 58 (1970).  
 = *Nigella degenii* Vierh. subsp. *minor* Strid, Op. Bot. 28: 61 (1970).  
 = *Nigella stricta* Strid, Op. Bot. 28: 63 (1970).  
 = *Nigella carpatha* Strid, Op. Bot. 28: 49 (1970). Icon.: in Strid, Op. Bot. 28: 52, f.10 (1970).  
 = *Nigella arvensis* L. var. *mutica* Bornm. (1898: 547). (subsp. *tuberculata*); Type: ISRAEL. Jaffa: 1925, Bornmüller (lectotype: B).

- = *Nigella arvensis* L. var. *negevensis* Zohary (in Zohary & Feinbr. 1966: 194) sub subsp. *tuberculata*. **syn. nov.** Type: ISRAEL. Negev: Mishor Yemin (Tureiba), sands of Neogene sandstone, 1957, *M. Zohary* & *Y. Waisel* 842 (holotype HUJ).
- = *Nigella arvensis* L. var. *multicaulis* Zohary in Zohary & Feinbr. (1966: 194) sub subsp. *tuberculata*. **syn. nov.** Type: ISRAEL. W. Negev: env. of Wadi Sheneq (Nahal Habsor), sandy loess soil, 1949, *M. Zohary* & *G. Orshan* 837 (holotype HUJ).
- = *Nigella arvensis* var. *cossoniana* Ball (1877).
- = *Nigella deserti* Boiss., Ann. Sci. Nat., Bot. sér. 2, 16: 359 (1841).
- = *Nigella deserti* var. *arabica* Boiss., Ann. Sci. Nat., Bot. ser. 2, 16: 359 (1841).
- = *Nigella deserti* var. *assyriaca* Boiss., Ann. Sci. Nat., Bot. ser. 2, 16: 359 (1841).
- = *Nigella deserti* Boiss. var. *latilabris* Zohary (1941: 154). **syn. nov.**
- = *Nigella arvensis* L. var. *involutrata* Boiss. (1867: 66); Type: GREECE. Attica, Heldreich 1673 (Lectotype K!).
- = *Nigella arvensis* L.  $\gamma$  [subsp.] *involutrata* Terracciano (1898: 38).
- = *Nigella arvensis* L. var. *beershevensis* Zohary in Zohary & Feinbr. (1966: 193) subsp. *arvensis*. **syn. nov.** Type: ISRAEL. N. Negev, 20 km N. W. of Beersheva, *Zohary* & *Waisel* 875 (holotype HUJ).
- = *Nigella arvensis* L. var. *palaestina* (Zohary) Zohary & Feinbr. (1966: 194). **syn. nov.** sub subsp. *divaricata*. Holotype: Sharon Plain, sandy coast, 1956, Zohary & Waisel (HUJ).
- = *Nigella arvensis* L. var. *divaricata* (Beaupre) Boiss. (1967: 66).
- = *Nigella divaricata* Beaupre ex DC. var. *palaestina* Zohary f. 2 (1941: 153).
- = *Nigella arvensis* L. var. *microcarpa* Boiss. (1867: 66). (err. *macrocarpa*). **syn. nov.** Lectotype: In Creta prope Cydoniam, Heldreich (K!).
- = *Nigella arvensis* L. subsp. *divaricata* var. *daucifolia* Zohary (1966: 194).
- = *Nigella cretensis* Steven, Bull. Soc. Imp. Naturalistes Moscou 29(1): 282, in textu (1856).
- = *Nigella taubertii* Brand, Helios xiii. (1895) 27 et 192.
- = *Nigella arvensis* L. subsp. *taubertii* (Brand) Maire (1964: 40).
- = *Nigella arvensis* subsp. *brevifolia* Strid, Op. Bot. 28: 44 (1970).
- = *Nigella arvensis* L. var. *tauricola* P.H.Davis (1965: 102). **syn. nov.**
- = *Nigella arvensis* L. var. *assyriaca* (Boiss.) Zohary, Pl. Syst. Evol. 142(1-2): 91 (1983), **syn. nov.** Lectotype: (Iraq) In deserto Assyriae, Aucher-Eloy 48 (G!, K!, BM).
- = *Nigella deserti* var. *assyriaca* Boiss., Ann. Sci. Nat., Bot. ser. 2, 16: 359 (1841).  $\equiv$  *Nigella arvensis* var. *assyriaca* (Boiss.) Zohary, Pl. Syst. Evol. 142(1-2): 91 (1983).  $\equiv$  *Nigella assyriaca* (Boiss.) Boiss., Fl. Orient. [Boissier] 1: 67 (1867). Brand (1895: 27).
- = *Nigella assyriaca* var. *longicornis* Zohary, Palestine J. Bot., Jerusalem Ser. 2: 154 (1941).
- = *Nigella deserti* Boiss., Ann. Sci. Nat., Bot. sér. 2, 16: 359 (1841).; (1867: 67).
- = *Nigella deserti* Boiss. var. *arabica* Boiss., Ann. Sci. Nat., Bot. ser. 2, 16: 359 (1841).
- = *Nigella arvensis* L. var. *caudata* Boissier (1867: 66).
- = *Nigella deserti* Boissier A [subsp.] *normalis* Terracc. et  $\beta$  [subsp.] *assyriaca* Terracc. (1898: 42).
- = *Nigella arvensis* L. subsp. *arvensis* var. *arabica* (Boiss.) Zohary in Zohary & Feinbr. (1966: 193).
- = *Nigella arvensis* L. var. *anatolica* Zohary, Pl. Syst. Evol. 142(1-2): 92 (1983). **syn. nov.** Type: TURKEY. vilayet Sivas, environs of Suşehri, *Artemisia* steppe, 860 m, 1963, *Zohary* 67950 (holotype HUJ).
- = *Nigella arvensis* L. var. *longicornis* (Zohary) C.C.Towns., Taxon 16(5): 467 (1967). Type: SYRIA. Hauran, Tel Chihane (near Chaboo), *Eig* & *Zohary* (holotype HUJ).
- = *Nigella assyriaca* Boiss. var. *longicornis* Zohary (1941: 154).
- = *Nigella arvensis* L. var. *iranica*, Pl. Syst. Evol. 142(1-2): 93 (1983). **syn. nov.** Type: W. IRAN. Zahub to Karand, 1240 m, 1965, *Damn, Baum* & *Plitmann* 65-152 (HUJ).
- Phenology:** Flowers from May to July (October) and mature capsules from July to October.
- Distribution and habitat:** *Nigella arvensis* var. *arvensis* is widely distributed in North Africa, Europe, SW Asia and the Middle East. The species grows in steppes, fields, and deciduous scrub openings, from sea level to 1900 m.
- Taxonomic notes:** The floral leaves or bracts enclosing the flowers also show variations in segments width. While the floral leaves of some specimens have very fine segments and strictly enclose the flowers, in some others the floral leaf segments are few and just far beyond the flowers.
- 5b. *Nigella arvensis* L. var. *aristata* (Sibthorp & Smith) Dönmez & Uğurlu **comb. et stat. nov.** Figures 10a–10h.
- $\equiv$  *Nigella aristata* Sm., Fl. Graec. Prodr. 1(2): 373 (1809).
- $\equiv$  *Nigella huthii* Brand, Helios xiii. (1895) 26 et 191. var. *aristata* (Sm.) Brand (1895: 192).
- $\equiv$  *Nigella arvensis* L. subsp. *aristata* (Sm.) Nyman (1878: 17), **syn. nov.**
- = *Nigella arvensis* L. var. *involutrata* (Boiss.) Terracc. (1898: 37). Lectotype: GREECE. Sterea Ellas: “prope Athenas versus Phalerum”, *Heldrich* 1673 (K!, selected by P.H.Davis 1965, C, G-Boiss!, LD, S, UPS, W!).
- = *Nigella aristata* Sm. subsp. *rechingeri* Tutin (1961: 322).
- = *Nigella arvensis* L. subsp. *rechingeri* (Tutin) Tutin (1964: 5). Type: GREECE. W. Aegean “Euboea [Evvia],

in ditone pagi Palaeochora, in olivetis". 29 Jun. 1958. *Rechinger 19400* (W!; isotype; G!, M).

= *Nigella degenii* Vierh. subsp. *jenny* Strid, Op. Bot. 28: 60 (1970), **syn. nov.** Type: GREECE. Kikladhes, Siros, near the village of Finimas, c. 80 m, 25 June 1967, (holotype LY, isotypes E, FI, G, LD, M, W).

**Phenology:** Flowers from May to July (October) and mature capsules from June to October.

**Distribution and habitat:** *Nigella arvensis* var. *aristata* is known from the Balkans and Turkey. The species grows in steppes, fields, and deciduous scrub openings, from sea level to 1900 m.

**Etymology:** The epithet "aristata" denotes long beak of carpels.

**Taxonomic notes:** Morphological characters (such as habit, height, indumentum and length of ultimate leaf segments) of the taxa accepted as synonym under *Nigella arvensis* var. *aristata* are mostly polymorphic and not useful for distinguishing any of them. In addition, it appears that they are generally effected by the environmental conditions. Therefore, several of the taxa belonging to the *N. arvensis* complex, which were published from the Balkan Peninsula and various Aegean Islands, have been reduced to synonyms under this taxon.

5c. *Nigella arvensis* L. var. *simplicifolia* Zohary, Pl. Syst. Evol. 142(1-2): 93 (1983). Figure 10i.

= *Nigella arvensis* L. var. *oblanceolata* P.H.Davis, Fl. Turkey 10: 231, 14 (1988). Type: TURKEY. Antalya: Yarış hamlet, in hedgerows, 140 m, fls. pale blue, *Ayaşlıgil 1675* (holotype Hb. Ayaşlıgil).

**Type:** IRAQ. Diyala: 25 km S.E. of Mandali, 1957, *Ali El Ravi 20709* (holotype K!, isotype W!).

**Phenology:** Flowers from April to June and mature capsules from June to August.

**Distribution and habitat:** *Nigella arvensis* var. *simplicifolia* is currently known only from Turkey and Iraq. The species grows near hedges and in steppes, 100–1300 m.

**Etymology:** The epithet "simplicifolia" denotes that the leaves of this taxon are simple, and this character is very unusual within the genus *Nigella*.

**Taxonomic notes:** The leaves are simple or rarely lobed. In respect of this leaf character, *Nigella arvensis* var. *simplicifolia* is an outstanding taxon. However, a specimen collected from Turkey with slightly lobed leaves, has been also placed under this name.

6. *Nigella koyuncui* Dönmez & Uğurlu, Novon 23(4): 411 (2015). Figure 11.

**Type:** TURKEY. Sinop: Boyabat, Uzunçay village, 41°38'N 034°36'E, 442 m, 7 July 2009, A.A.Dönmez 15801-Z.Uğurlu (holotype HUB!, isotypes AEF!, HUB!, EGE!, MO!). Paratype: Boyabat, Uzunçay village, 41°38'N 034°36'E, 442 m, 7 July 2009, A.A.Dönmez 16019-Z.

Uğurlu; Boyabat, Çayköy village, 550 m, 21 July 1993, A.A.Dönmez 3664-H.Şağban et. al. (HUB!).

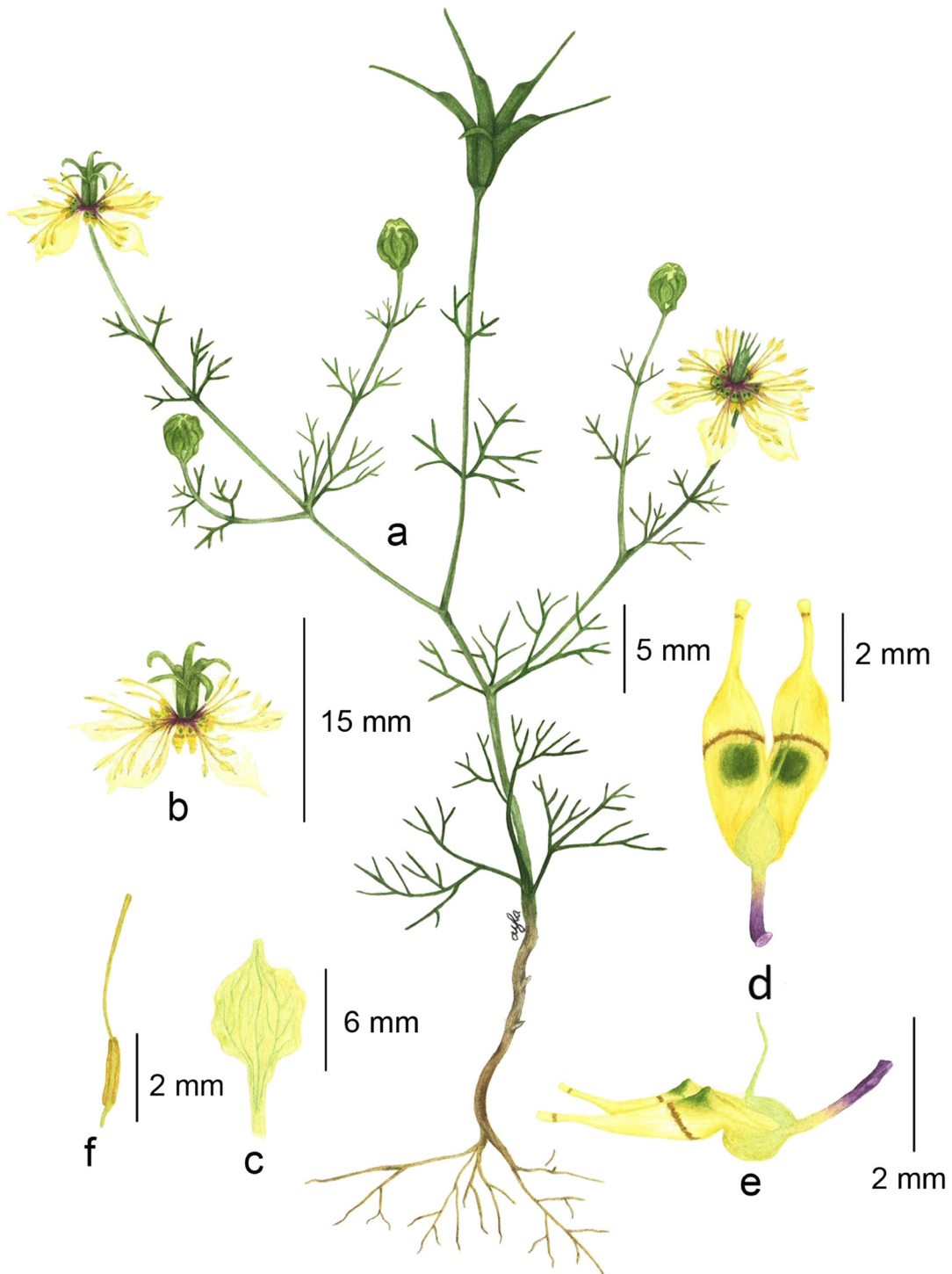
**Description:** Annual herb, erect, simple to branched from base; stems glabrous to finely scabrid, 5–25 cm, striate. Leaves glabrous to scabrid, distributed throughout stem length; basal leaves petiolate, to 15 mm; lamina 5–25 × 8–20 mm, orbicular to obovate in outline, 2- to 3-pinnatisect, ultimate segments linear, 3–6 × 0.3–0.4 mm; stem leaves sessile or petiolate to 1–2 mm, 1- or 2 (–3) pinnatisect. Flowers solitary or 2–7-flowered raceme. Flowers 10–22 mm diam., with dark blood red to purplish red central mark; sepals 5, whitish to pale yellow with green midrib evident dorsally, divided into claw and limb; claw 3–5 mm in length; limb 4–8 × 4–7 mm, deltoid to orbicular, shortly attenuate to truncate at base, briefly cuspidate at apex, veins distinct, glabrous; petals (7–) 8, yellow, 4–5 × 2–3 mm with 4 to 10 long hairs, distinctly geniculate, upper (inner) lip widely triangular at lower half, 1 × 0.5 mm, upper half filiform, 1.8–2 mm, slightly clavate with purplish single transverse line at apex; lower (outer) lip widely ovate in outline; deeply divided into ovate halves, each half 2 mm, abruptly constricted into filiform portion, apex slightly clavate with single purplish line; pseudonectaries green, as conic protuberance, with purplish single line, covering the petal base; stamens 40, in 8 groups, filaments 3–5 mm, anthers 1.9–2.1 mm, with apical appendage, greenish yellow, yellow at maturity. Carpels 2 to 4 per flower, 20–24 × 2–3 mm (including beak), smooth, slightly tuberculate on ventral suture, connate to half capsule length; beaks ca. equal to capsule, each capsule with 3 (–5) distinct veins; seeds 2–2.1 × 1.4–1.6 mm, mostly triquetrous, with black and a few white tubercles, indistinctly winged on margin.

**Chromosome number:** The chromosome number of the species is reported by Dönmez et al. (2015) as 2n=12.

**Phenology:** Flowers from May to June and mature capsules from July to August.

**Distribution and habitat:** *Nigella koyuncui* is known only from two localities in Sinop in the south of the Middle Black Sea Mountain range in Turkey (Supplement 2 Figure 4). The species grows in openings of the *Juniperus excelsa*-*Berberis vulgaris*-*Quercus pubescens*-*Pistacia terebinthus* mixed scrubs and on stony slopes, 400–450 m. Beside this, another specimen collected from Gilan (Iran) is clearly identical to *Nigella koyuncui*, in respect of its morphological characters, which was examined at W herbarium. The region of Gilan located around the Caspian Sea is similar to the type locality of the species in Turkey with respect to climatic conditions. Yellow flower colour in the Gilan specimen is a distinct feature for identification of the species as *Nigella koyuncui*.

**Etymology:** The epithet "koyuncui" denotes the Turkish plant taxonomist, Prof. Dr. Mehmet Koyuncu who was born in the city of the type locality.



**Figure 11.** *Nigella koyuncui*. a. General view. b. Flower (sepal and petals removed). c. Sepal. d. Petal (view from anterior). e. Petal (lateral view). f. Stamen.

**Taxonomic notes:** The species is clearly distinct from *N. arvensis* by having yellow flower colour. Based on this flower colour, the species might be considered as member of the *Nigellastrum* section. However, leaf, fruit and the other characters are more close to *N. arvensis*. The studied

specimen collected from Iran (*Tesone s.n*) is a typical material of this species. The most prominent diagnostic characters of the species are the yellow flowers with green pseudonectary, which are easily recognizable even from the specimens collected in Iran nearly 50 years ago. In

respect of distribution ranges Turkish localities and the locality of Iranian specimen are very far away from each other. Although their morphological similarities, their disjunct distribution requires further phylogeographic investigations.

7. *Nigella segetalis* M.Bieb., Fl. Taur.-Caucas. 2: 16 (1808). Figure 12.

= *Nigella sativa* L., Sp. Pl. 2: 584 (1753).

= *Nigella cretica* Mill., Gard. Dict., ed. 8. n. 4 (1768). ≡ *Nigella sativa* var. *cretica* De Candolle. (1818: 331).

= *Nigella foeniculacea* DC., Syst. Nat. [Candolle] 1: 328 (1817).

= *Nigella foeniculacea* Spenner, non DC. (1829: 9).

= *Nigella foeniculacea* Ledebour (1842: 736), non DC. (1829:9).

= *Nigella foeniculacea* Hohen. ex Boiss., Fl. Orient. [Boissier] 1: 65 (1867).

= *Nigella bicolor* Boiss. et Heldr., Diagn. Pl. Orient. ser. 1, 8: 7 (1849).

= *Nigella segetalis* M.Bieb., Fl. Taur.-Caucas. 2: 16 (1808). α [subsp.] *normalis* Terracciano (1898: 26).

= *Nigella segetalis* M.Bieb., Fl. Taur.-Caucas. 2: 16 (1808).

= *Nigella segetalis* var. *armena* (Stev.) Boissier (1867: 65).

= *Nigella verrucosa* K.Koch, Linnaea 15(3): 246 (1841).

= *Nigella armena* Steven, Bull. Soc. Imp. Naturalistes Moscou 21(2): 274 (1848).

= *Nigella segetalis* M.Bieb., Fl. Taur.-Caucas. 2: 16 (1808).

= *Nigella segetalis* β [subsp.] *armena* (Stev.) Terracciano (t. 898, 1898: 26).

**Type:** RUSSIA: CRIMEA. "In Tauriae agris, M. Von Bieberstein (LE photo!).

**Description:** Annual herb, ascending to erect, simple mostly branched; stems glabrous, rarely pilose, 10–25 (–50) cm, striate. Basal leaves 10–15 mm petiolate; lamina 15–50 × 10–30 (–45) mm, oblong-obovate to orbicular in outline; 2–3-pinnatisect, ultimate segments oblong or lanceolate, 5–15 × (0.5–) 1–2 mm; stem leaves sessile or petiolate to 1–2 mm, 2–3 pinnatifid, smaller than basal leaves. Inflorescence loosely branched raceme; flowers 10–30 mm diam., blue, with dark blood red to purplish central mark. Sepals 5, patent or reflexed, oblanceolate-ovate, shortly attenuate at base, obtuse or orbicular at apex, veins distinct, glabrous, blue to pale blue, divided into claw and limb; claw 2–5 (–8) mm in length; limb (3–) 5–9 (–13) × (3–) 5–8 (–12) mm, oblong, deltoid to ovate-orbicular. Petals (7–) 8, blue, violet, 4–5 × 2–3.5 mm distinctly geniculate, upper (inner) lip long triangular, lanceolate 1.3–1.7 × 0.7–1.1 mm, with transversely violet lines at apex; lower (outer) lip ovate in outline; deeply divided into 2–4 mm equal halves, sparsely long hairy, with a pair of

conic 2–3 mm protuberances at base, clavate at apex with 1–2 transversely lines; pseudonectaries green, as conic protuberances, with purplish single line, covering the petal base. Stamens 30–40, rarely in 8 groups, filaments 5–9 mm, anthers 1–1.2 mm, obtuse or acute at apex, greenish blue to dark red, yellow at maturity. Follicles (3–) 5–6 per flower, 10–15 (–17) × 2–3 mm, slightly tuberculate on ventral suture, connate more than half of capsule length; beak 4–7 mm, usually recurved, with 4–5 distinct veins at the base. Seeds 1.8–2.1 × 1.1–1.3 mm, triquetrous, shiny, unwinged, black and white coloured.

**Chromosome number:** The chromosome number of the species is unknown.

**Phenology:** Flowers from May to June and mature capsules from July to August.

**Distribution and habitat:** *Nigella segetalis* is currently known from Turkey, Crimea and Armenia. The species grows in fields, gardens, steppe openings and abandoned agriculture areas, 700–1750 m.

**Etymology:** The epithet "segetalis" denotes the habitat which is related to cornfields.

**Taxonomic notes:** This species is taxonomically isolated and easy to distinguish from the other species by connated follicles and reflexed sepals.

8. *Nigella sativa* L., Sp. Pl. 2: 584 (1753). Figure 13.

= *Nigella cretica* Mill., Gard. Dict., ed. 8. n. 4 (1768).

*Nigella cretica* Garsault, Figure Pl. Med. 3: t. 412. 1764, nom. inval., opus utique oppressum; Descr. Pl. Anim. 246. 1767; Thell. in Bull. Herb. Boiss. Ser. II. viii. 902.

= *Nigella glandulifera* Freyn & Sint ex Freyn, Bull. Herb. Boissier Ser. II. iii. 559. (1903).

= *Nigella indica* Roxb. ex Flem., Asiat. Res. 11: 173 (1810).

= *Nigella sativa* L. var. *indica* (Roxb.) De Candolle (1818: 328).

= *Nigella sativa* L. α [subsp.] *normalis* Terracciano (1898: 27).

= *Nigella sativa* L. var. *hispidula* Boiss. (1841: 360).

**Type:** TURKEY. Mersin "in Cilicia, ca. Mersina" 1855, *Balansa* 627 (G!).

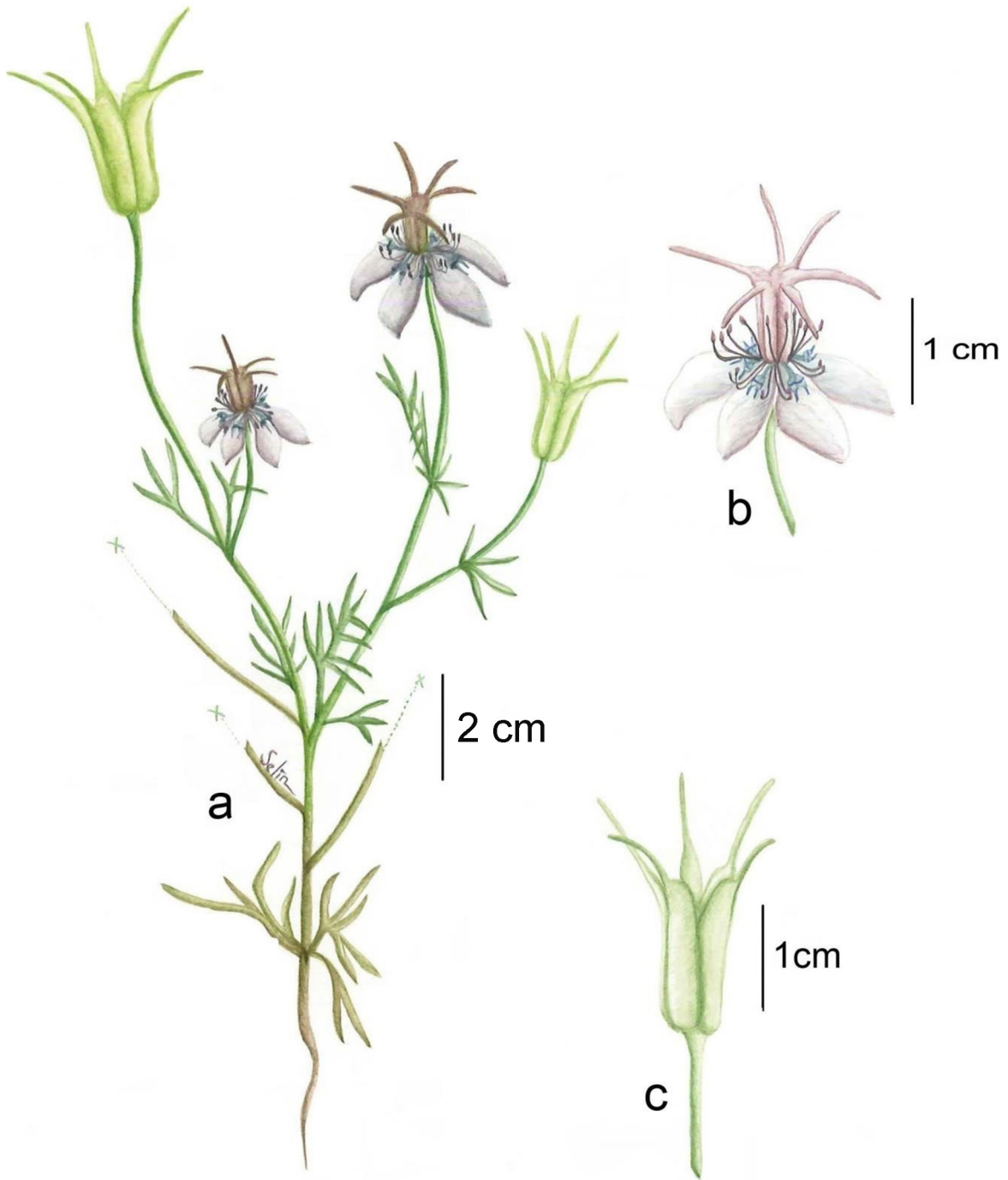
= *Nigella sativa* L. β [subsp.] *hispidula* (Boiss.) Terracciano (1898: 30).

= *Nigella truncata* Viv., Pl. Aegypt. Dec. 6. (1831).

= *Nigella sativa* L. var. *brachyloba* Boiss. (1867: 68).

**Type:** probably EGYPT and CRETE. (LINN Herb. 700/2-4 photo!).

**Description:** Annual herb, usually branched; stem pubescent or glandular hairy, (3–) 20–40 (–80) cm, distinctly striate. Basal leaves petiolate, up to 40 mm; lamina 15–60 × 20–45 mm, orbicular to ovate in outline, 2–4-pinnatisect, ultimate segments oblong-lanceolate, 3–5 × 0.5–1 mm; stem leaves sessile or rarely 1–2 mm, 2–3-pinnatifid; smaller than basal leaves. Inflorescence



**Figure 12.** a. General view of *Nigella segetalis*. b. Flower. c. Capsule.

racemose, flowers (10–) 20–30 (–45) mm diam., blue, with white-blue central mark. Sepals 5, sparsely hairy dorsally, blue to pale blue, divided into claw and limb; claw 3–5 (–7) mm in length; limb (4–) 6–8 (–12) × (4–) 7–10 (–12) mm, oblong, deltoid to ovateorbicular, shortly attenuate, truncate or cordate at base, obtuse or acute at apex, veins dorsally distinct. Petals 8 (–9), dark blue, 3–7 × 1.5–2.5 mm with sparsely long hairs, distinctly geniculate, claw

and lip distinctly separated; claw 1–2 mm; lip divided into upper and lower lips; upper (inner) lip long triangular, lanceolate, 2–3 × 0.7–1.8 mm, transversely violet lined at apex; lower (outer) lip ovate; deeply divided into 2–5 mm equal spatulate halves with sparsely long hairs, with disk shaped protuberance; Stamens (25–) 30–40 (–50), rarely in 8 groups, filaments 5–9 mm, anthers 1–2.2 mm, acute or truncate at apex, greenish blue, yellow at maturity. Follicles



(3-) 5-7 per flower, 7-12 (-15) × 6-10 (-13) mm; beak 6-12 mm, twisted, tuberculate throughout, connate to half capsule length, beaks usually equal or longer than capsule, carpel veins indistinct. Seeds 1.8-2.2 × 1.7-2.1 mm, triquetrous, black, indistinctly winged on margin.

**Chromosome number:** The chromosome number of the species is given here as  $2n = 12$ , and this is consistent with the previous reports (Datta and Biswas, 1983, 1985).

**Phenology:** Flowers from May to June and mature capsules from July to August.

**Distribution and habitat:** *Nigella sativa* is widely cultivated in Europe and various Asian countries (Supplement 2 Figure 5). It grows from sea level up to 1200 m.

**Etymology:** The epithet "sativa" denotes edible seeds of the plant.

**Taxonomic notes:** The species has glandular hairs, and a specimen collected from Turkey (*Balansa* 627) is described as a new variety of the species by P.E. Boissier as *N. sativa* var. *hispidula*. During our field works in Turkey, we collected some specimens from Arslanköy (Mersin), the type locality of this variety. Another species, namely *N. glandulifera* Freyn & Sint ex Freyn, is also distinguished by glandular hairs. Both of the taxa were distinguished from *N. sativa* in respect of their glandular hairs. *N. sativa* var. *hispidula* and *N. glandulifera* are accepted as the synonyms of *N. sativa*, with glandular hairs. It is a shared character, instead of being a diagnostic one. Escaping from cultivation is rare for *N. sativa*, but it is a possible phenomenon and some authors treated them as new taxa.

9. *Nigella turcica* Dönmez & Mutlu, Bot. J. Linn. Soc. 146(2): 251-255 (Figure 2). (2004). Figures 13b-13g.

**Type:** TURKEY. Iğdır: Tuzluca, around Turabi village, steppe, 40°03'N, 043°44'E, 1010 m, 31 May 2002, A.A.Dönmez 10833-B.Mutlu, (holotype HUB!, isotypes BM!, E!).

**Description:** Annual herb, usually branched; stem glabrous, 10-30 cm, distinctly striate or slightly winged. Basal leaves petiolate, up to 20 mm; lamina 15-30 × 20-40 mm, orbicular to obovate in outline, 2-3-pinnatisect, ultimate segments linear-lanceolate, 10-15 × 2-3 mm; stem leaves sessile or rarely 2-4 mm petiolate, 2-3-pinnatifid; (10-) 40-60 × (10-) 40-50 mm, leaf segments (10-) 20-30 × 2-5 mm. Inflorescence composed of single flower or widely branched raceme; flowers 20-30 mm diam., blue, with white-blue central mark. Sepals 5, sparsely hairy dorsally, blue to pale blue, divided into claw and lip; claw 3-4 × 0.1-1 mm; lip 6-8 × 6-8 mm, deltoid-orbicular, cordate at base, acute at apex, veins distinct. Petals (7-) 8, dark blue, 3-4 × 1-1.5 mm, distinctly geniculate, claw and lip distinct; claw 1-2 mm; lip divided into upper and lower lobes; upper (inner) lip long triangular, lanceolate, 1-1.3 × 0.5-0.8 mm, with transversely violet lines at apex; lower

(outer) lip ovate; deeply divided into 1.3-2 mm equal filiform halves, glabrous, without disc. Stamens 15-22, rarely in 8 groups, filaments 4-7 mm, anthers 1.9-2.1 mm, obtuse at apex, greenish blue, yellow at maturity. Follicles 5-6 per flower, 9-12 × 3-4 mm (excl. beak), ± opens dorsally; beak 10-15 mm, twisted, tuberculate throughout, connate more than half of the capsule length, beaks longer than carpel, carpel veins indistinct. Seeds 2.5-3.5 × 1.1-1.5 mm, triquetrous, black, indistinctly winged on margin.

**Chromosome number:** The chromosome number of the species is unknown.

**Phenology:** Flowers from April to May and fruits from May to July.

**Distribution and habitat:** *Nigella turcica* is currently known only from a single location, i.e. the type locality, and it is a narrow endemic to Turkey, Iğdır, Tuzluca (Supplement 2 Figure 5). Similar habitats in the area of Iğdır and the neighbouring provinces have been visited extensively to find another location of the species, but without success, to date. The species grows in dry steppe, on dry red-coloured salty soil in the valley of Aras. Vegetation of the area is dominated mostly by salt adapted annual or perennial herbs of various families, but mostly *Chenopodiaceae*. The area is under strong drought stress due to low annual mean precipitation, 257.6 mm. It grows at altitudes between 1000 and 1200 m.

**Etymology:** The epithet "turcica" denotes the country where the plant was collected.

**Taxonomic notes:** The species is closely related to *Nigella sativa* L., black cumin. However, in consideration of the diagnostic characters, *N. turcica* can easily be distinguished by having very long and twisted beaks of carpels and wider leaf segments. The carpels open ventrally, and beaks split dorsally (Figure 12g); independently, from the ventral opening. This is a unique character within the genus *Nigella*.

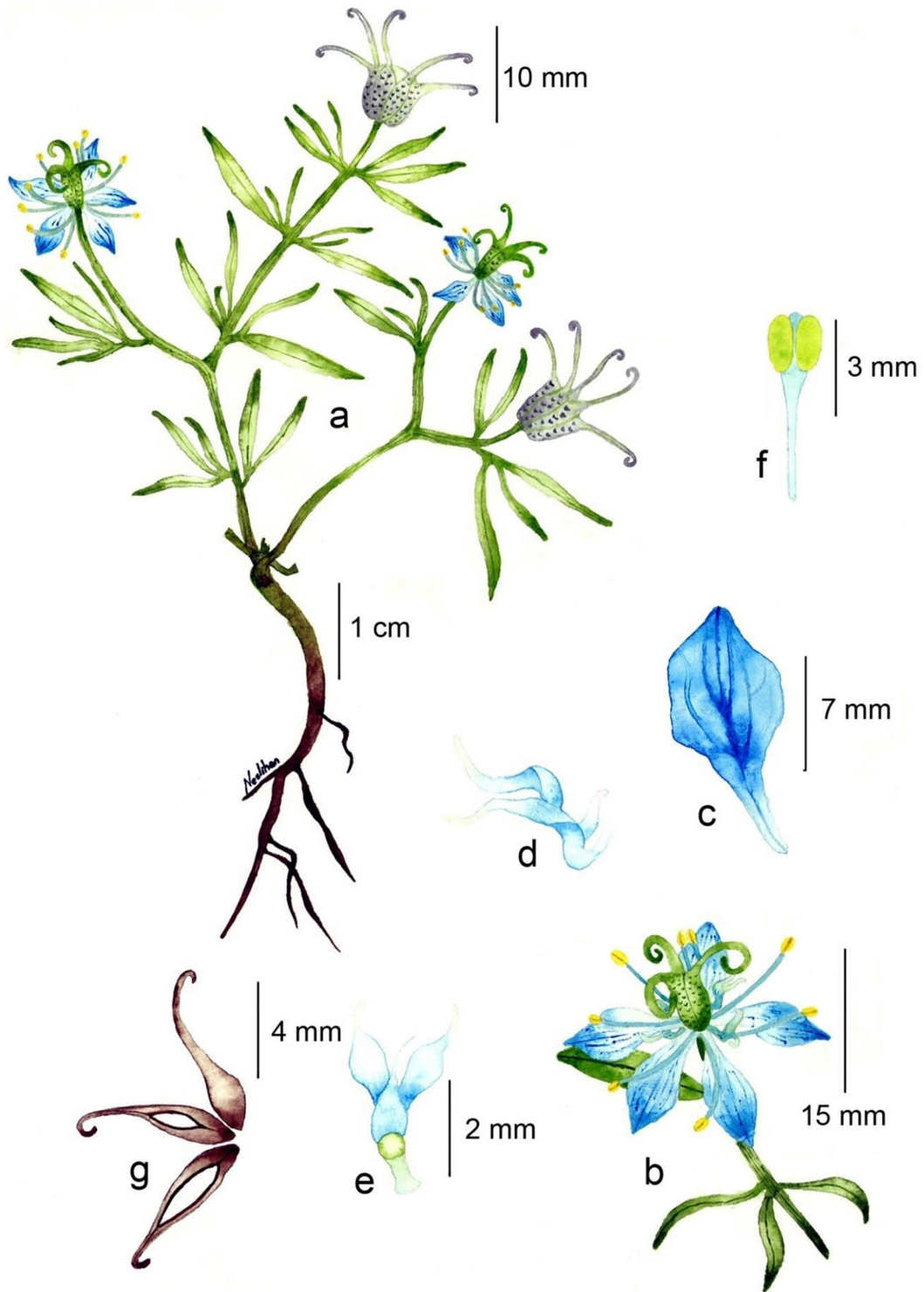
10. *Nigella stellaris* Boiss., Diagn. Pl. Orient. ser. 1, 8: 8 (1849). Figure 14.

≡ *Nigella fumariifolia* α [subsp.] *stellaris* (Boiss.) Terracciano (1898: 41).

= *Nigella cilicica* Boiss. et Bal. in (Boissier 1856: 11).

**Type:** TURKEY. Antakya: In cultis montis Cassii [J. Akra] in regione inferiore inter Cassab [Yayladağ] et Suadiyeh, June 1846, Boissier (K!).

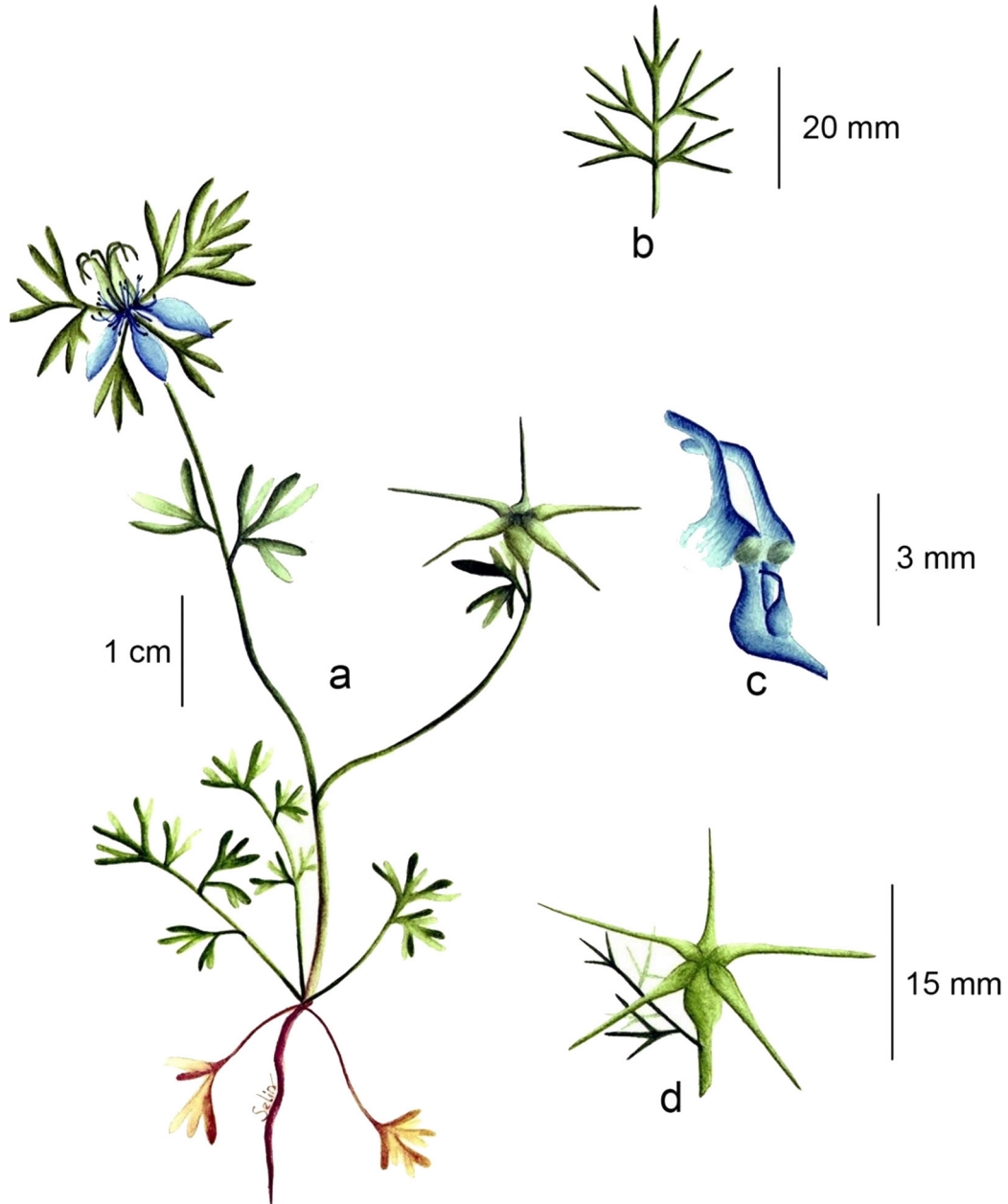
**Description:** Annual prostrate herb, usually branched from base, (4-) 10-30 (-40) cm; glaucous, rarely minutely setose hairy, striate. Basal leaves petiolate, up to 10 mm; lamina 5-25 × 8-25 mm, orbicular to obovate in outline, 2-3-pinnatisect, ultimate segments oblong, 3-6 × 1-2 mm; stem leaves sessile, 2-3-pinnatifid; (10-) 25-45 (-70) × (10-) 20-35 (-60) mm, ultimate leaf segments (10-) 20-30 × 2-5 mm. Inflorescence widely branched raceme, enclosed leafy bracts; flowers 15-20 (-30) mm diam.,



**Figure 13.** *Nigella sativa* and *N. turcica*. a. General view of *Nigella sativa*. b–g. *N. turcica*. b. Flower. c. Sepal. d–e. Petal. f. Stamen. g. Dorsally opened follicles.

blue, with white-blue central mark. Sepals 5, glabrous, blue, sometimes greenish blue, dorsally whitish blue, veins distinct, divided into claw and lip; claw 2–3 × 0.5–1 mm;

lip 7–10 × 6–9 mm, deltoid-orbicular, truncate or shortly cuneate at base, obtuse or emarginate at apex. Petals (–7) 8, dark blue, 5–7 × 2–3 mm with 4–10 long hairs distinctly



**Figure 14.** *Nigella stellaris* and *N. fumariifolia* a. General view of these species. b–d. *N. stellaris*. b. Leaf. c. Petal. d. Capsule.

geniculate, claw and lip distinctly separated; claw 1–2 mm; lip divided into upper and lower; upper (inner) lip widely triangular, 1–1.3 × 0.5–0.8 mm, with transversely violet lines at apex; lower (outer) lip ovate; deeply divided into 1.3–2 mm equal filiform halves, glabrous, without disc. Stamens 40–50, rarely in 8 groups, filaments 5–8 mm, anthers 1.9–2.1 mm, obtuse or emarginate at apex, bluish, yellow at maturity. Follicles 3–5 per flower, connate throughout length, stellate, 4–6 × 2–3 mm; beaks 3–6 × longer than carpel, 15–30 mm, tuberculate on base, beaks

with 3–5 distinct veins. Seeds 1.8–2 × 0.8–1.2 mm, mostly triquetrous, black, verrucose unwinged.

**Chromosome number:** The chromosome number of the species is unknown.

**Phenology:** Flowers from May to July and mature capsules from June to August.

**Distribution and habitat:** *Nigella stellaris* is known only from Turkey and Syria (Supplement 2 Figure 5). The species grows in *Pinus brutia* openings, abandoned fields, near hedges and mainly on limestone, from sea level to 800 m.

**Etymology:** The epithet “stellaris” denotes star-shaped appearance of the mature capsule.

**Taxonomic notes:** It is very similar to *N. fumarifolia*, but it differs from it by larger flower and fruits, as well as by narrow and long leaf segments.

11. *Nigella fumariifolia* Unger, Ins. Cyp. 319 (1865). Figure 14a. as *Nigella fumariaefolia* Kotschy, in Unger, Ins. Cyp. 319.

= *Nigella fumariifolia* Kotschy  $\alpha$  [subsp.] *normalis* Terracciano (1898: 40).

**Type:** CYPRUS. “in valle prope Carium ad Episcopi ac ad pagum Fini infra monasterium Troodissa”, 17 May 1862, *Kotschy 665.741* (BEOU! K! W!).

**Description:** Annual prostrate herb, usually branched from base, 2–10 (–25) cm; glaucous, rarely minutely setose hairy, striate. Basal leaves petiolate, up to 10 mm; lamina 5–20  $\times$  8–15 mm, orbicular to obovate in outline, 2–3-pinnatisect, ultimate segments ovate, 3–6  $\times$  2–3 mm; stem leaves sessile, 1–2 (–3)- pinnatifid; (10–) 20–40 (–60)  $\times$  (10–) 15–25 (–40) mm, leaf segments (10–) 20–30  $\times$  2–5 mm. Inflorescence composed of single flower or a few flowered racemes, enclosed by leafy bracts; flowers 15–25 (–30) mm diam., blue, with white-blue central mark. Sepals 5, glabrous, blue, sometimes greenish blue, dorsally whitish blue, veins distinct, divided into claw and lip; claw 2–3  $\times$  0.5–1 mm; lip 6–10  $\times$  6–9 mm, deltoid-triangular, truncate or shortly auriculate at base, obtuse at apex, veins dorsally distinct. Petals (–7) 8, blue, 4–6  $\times$  2–3 mm, with 4–10 long hairs, distinctly geniculate, claw and lip distinctly separated; claw 1–2 mm; lip divided into upper and lower; upper (inner) lip widely triangular at lower half, 1–1.1  $\times$  0.6–0.9 mm; lower (outer) lip widely ovate, transversely violet lined at apex and base; deeply divided into 1.3–2 mm equal filiform halves, glabrous, without disc. Stamens (20–) 30–40, rarely in 8 groups, filaments 5–8 mm, anthers 1.9–2.1 mm, obtuse or emarginate at apex, bluish, yellow at maturity. Follicles 3–5 per flower, connate throughout length, 3–5  $\times$  2–2.5 mm; beaks 3–5  $\times$  longer than carpel, 9–12 mm, stellate, tuberculate, with 3–5 distinct veins. Seeds 1.6–1.9  $\times$  0.8–1.1 mm, mostly triquetrous, black with white verrucose, unwinged.

**Chromosome number:** The chromosome number of the species is unknown.

**Phenology:** Flowers from May to June and mature capsules from June to July.

**Distribution and habitat:** *Nigella fumariifolia* have been investigated in Cyprus and on various Greek Islands. A few individuals were observed in the Turkish Republic of Northern Cyprus in sandy and limestone areas.

**Etymology:** The epithet “fumariifolia” denotes that the leaves of the species remind leaves of *Fumaria*.

**Taxonomic notes:** The species is similar to *N. stellaris*, but it is distinguished by small sizes of leaves, flowers

and fruits. Hence, these morphological differences in the sizes of the leaf, flower and fruit should be investigated in respect of polyploidy.

*Nigella* L. sect. *Nigellastrum* (Fabricius) DC. Reg. Veg. Syst. 1, 326 (1817). Figures 15 and 16.

$\equiv$  *Nigella* subsect. *Nigellastrum* (DC.) Zohary (1983: 94) **syn. nov.**

= *Nigella* subsect. *Nigellastrum* (Heist. ex Fabricius) Zohary, Pl. Syst. Evol. 142(1-2): 99, as ‘(DC.)’ (1983).

12. *Nigella orientalis* L., Sp. Pl. 2: 584 (1753). Figure 15a.

= *Nigellastrum flavum* Moench, Methodus (Moench) 312 (1794).

= *Nigellastrum orientale* Bercht. & J.Presl, Prir. Rostlin Aneb. Rostl. 1: Ranuncul. 102. (1823).

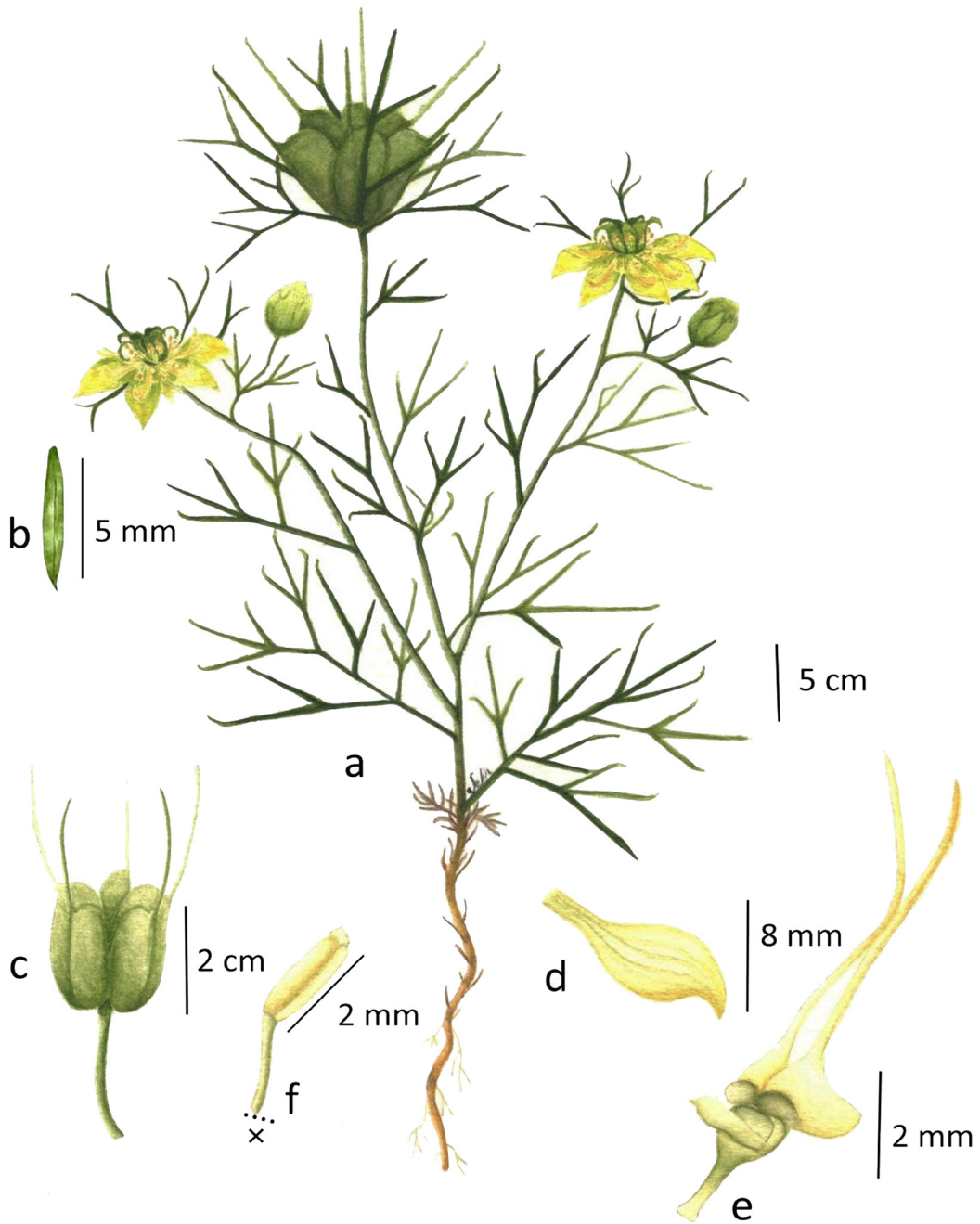
**Type:** SYRIA. Aleppo: from Aleppo (Herb. Linn. 700/8 photo!).

**Description:** Annual erect herbs, stem simple or branched, (5–) 15–30 (–75) cm; glabrous or minutely setose hairy, striate. Basal leaves petiolate, up to 20 mm; lamina 15–35 (–75)  $\times$  10–20 (–35) mm, orbicular to obovate in outline, 2–3 pinnatisect, ultimate segments linear to filiform, 3–8  $\times$  0.5–1.2 mm; stem leaves sessile, 1–2 (–3) pinnatifid; (10–) 20–30 (–50)  $\times$  (20) 30–50 (–60) mm, leaf segments (6–) 10–20 (–30)  $\times$  2–5 mm. Inflorescence composed of single flower or few-flowered racemes,  $\pm$  enclosed leafy bracts; flowers 15–25 mm diam., yellow, with red or dark red central mark. Sepals 5, glabrous, pale yellow, sometimes greenish, dorsally reddish, ciliate on margin or dorsally, divided into claw and lip; claw 3–5  $\times$  1–1.5 mm; lip 6–9  $\times$  4–6 mm, deltoid, shortly attenuate at base, acute at apex, veins dorsally distinct. Petals (–7) 8, yellow, 5–7  $\times$  3–4 mm, with (4–) 8–12 long hairs, distinctly geniculate, claw and lip distinctly separated; claw 1–2 mm; lip divided into upper and lower; upper (inner) lip widely triangular, 1–1.2  $\times$  0.8–1.1 mm; lower (outer) lip deltoid, 6–7  $\times$  4–6 mm, entire or emarginate at apex, transversely violet striated; deeply divided into 1.3–2 mm equal filiform halves, glabrous, without disc. Stamens 30–35, rarely in 8 groups, filaments 4–7 mm, anthers 1.9–2.1 mm, beaked at apex, dark red, yellow at maturity. Follicles (2–) 4–7 (–10) per flower, connate more than half, 10–30  $\times$  4–6 mm (excl. beak); beaks equal or shorter than carpel, 8–13 mm, recurved, smooth, with 3–5-distinct veins. Seeds 4–6  $\times$  4–5 mm, discoid, flat, black, shiny smooth, width of wing equal to seed.

**Chromosome number:** The chromosome number of the species is unknown.

**Phenology:** Flowers from June to July and mature capsules from July to August.

**Distribution and habitat:** *Nigella orientalis* is known only from Greece, Turkey, Syria, Iraq Iran, and the Caucasus (Supplement 2 Figure 6). The species grows



**Figure 15.** *Nigella orientalis* and *N. oxypetala*. a. General view. b. Leaf of *N. oxypetala* var. *lancifolia*. c. Capsule. d. Sepal e. Petal f. Stamen of *N. oxypetala* var. *oxypetala*, *N. oxypetala* var. *lancifolia*, and *N. oxypetala* var. *latisecta*.

in steppes, fields and abandoned agriculture areas, rarely among *Quercus* scrub, 700–1900 m.

**Etymology:** The epithet “orientalis” denotes the Orient area.

**Taxonomic notes:** The species is easily distinguished from *N. oxypetala* by shorter extension of the lower petal lips.

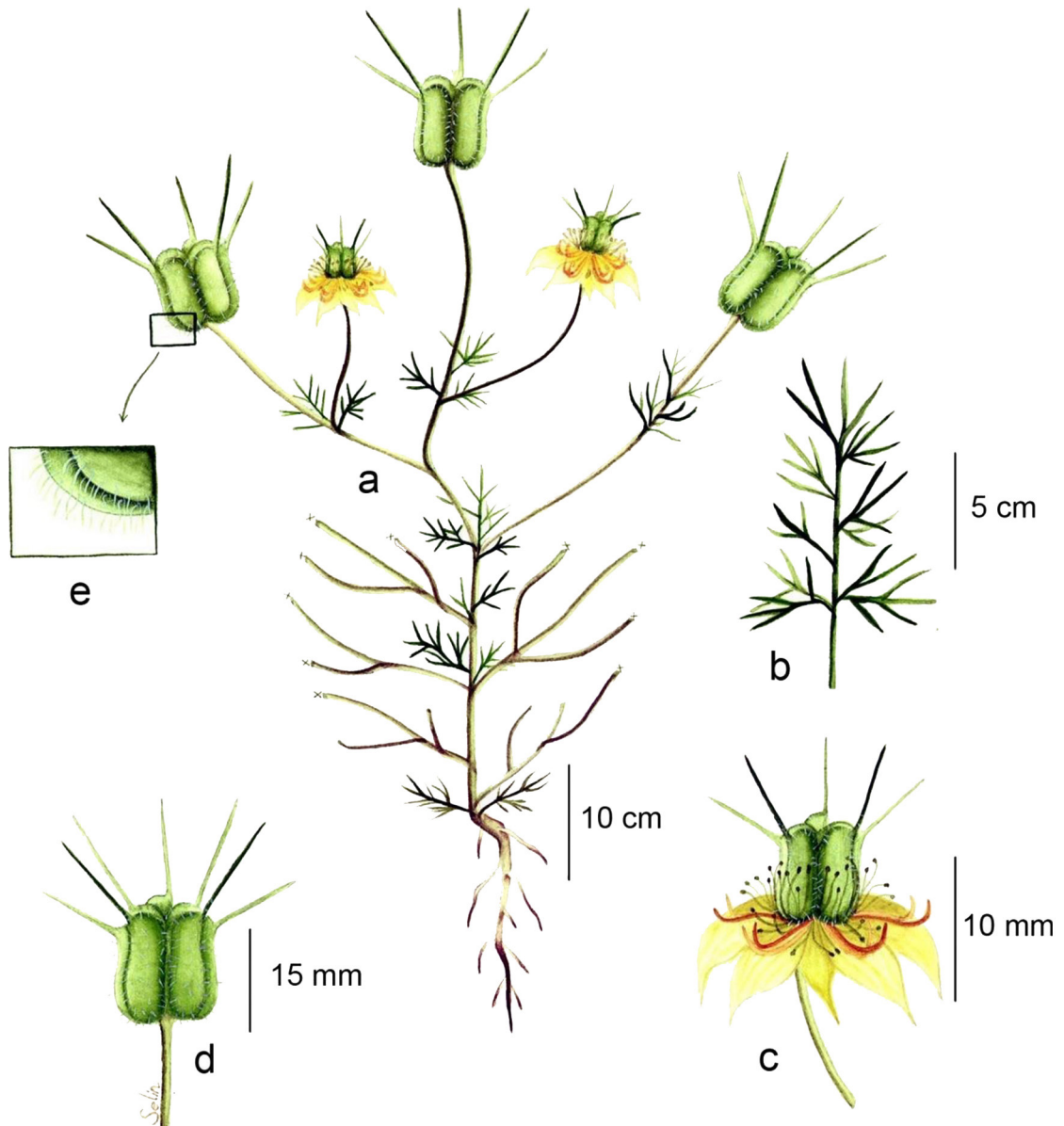
13. *Nigella oxypetala* Boiss., Ann. Sci. Nat., Bot. sér. 2, 16: 357 (1841). Figures 15b–15f.

= *Nigella noeana* Boiss., Diagn. Pl. Orient. ser. 2, 1: 19 (1854).

= *Nigella oxypetala* Boiss. var. *noeana* (Boiss.) Boiss. 1: 70 (1867).

= *Nigella oxypetala* Boiss. var. *tenuifolia* Boiss. 1: 70 (1867).

= *Nigella oxypetala* Boiss. var. *persica* (Boiss.) Brand (1895: 185).



**Figure 16.** *Nigella ciliaris*. a. Habitus (branches removed). b. Leaf. c. Flower. d. Capsule. e. Hairs ( $\times 5$ ).

= *Nigella oxypetala* Boiss. var. *typica* Brand (1895: 185).

= *Nigella oxypetala* Boiss. [subsp.] *normalis* Terracciano (1897: 145).

= *Nigella persica* Boiss., Ann. Sci. Nat., Bot. sér. 2, 16: 358 (1841).

**Type:** TURKEY. "Cappadocia orientalis, *Aucher 51* (G!, K!).

**Description:** Annual erect herbs, stem simple or branched, (10–) 20–30 (–60) cm; glabrous or minutely setose hairy on leaf margin, striate. Basal leaves petiolate, up to 30 mm; lamina 20–40 (–90)  $\times$  10–25 (–40) mm, oblong to obovate in outline, 2–3 pinnatisect, ultimate

segments linear, 5–30  $\times$  0.5–2 (–5) mm; stem leaves sessile, (1–) 2–3 pinnatifid; (15–) 25–40 (–60)  $\times$  (15–) 25–40 (–60) mm, leaf segments (7–) 10–20 (–30)  $\times$  2–5 mm. Inflorescence composed of single flower or few-flowered racemes,  $\pm$ enclosed leafy bracts; flowers 15–25 (–35) mm diam., yellow, with red or dark red central mark. Sepals 5, glabrous, yellow or pale yellow, sometimes dorsally reddish, ciliate on margin or dorsally, divided into claw and lip; claw 2–4  $\times$  0.5–1.5 mm; lip 6–12  $\times$  4–8 mm, deltoid or oblong, shortly attenuate at base, acute at apex, veins dorsally distinct. Petals (7–) 8, yellow, 5–7  $\times$  3–4 mm, with 8–10 long hairs, distinctly geniculate, claw and lip

distinctly separated; claw 2–3 mm; lip divided into upper and lower; upper (inner) lip triangular, 1–1.4 × 1–2 mm; lower (outer) lip deltoid, 3–5 × 3–4 mm, protuberance 8–12 mm with sparsely long hairs, entire or emarginate at apex, transversely violet striated; deeply divided into 1.3–2 mm equal filiform halves, glabrous, without disc. Stamens (30–) 40–50 (–70), rarely in 8 groups, filaments 5–7 mm, anthers 1.9–2.1 mm, beaked at apex, yellow, rarely red. Follicles (2–) 4–7 (–10) per flower, connate more than half, 10–30 × 5–7 mm (excl. beak); beaks shorter than carpels, 6–10 (–15) mm, recurved, smooth, 3–5-distinct veins. Seeds 4–6 × 4–5 mm, discoid, flat, black, shiny smooth, width of wing equal to seed.

**Chromosome number:** The chromosome number of the species is reported here as  $2n = 12$  for first time.

1. Flowers and fruit enclosed by involucre leaves .....  
 ..... 1. var. *oxypetalata*  
 –. Involucre leaves absent ..... 2  
 2. Leaf segments narrow, filiform; 1–2 (–4) mm wide ..  
 ..... 2. var. *latisecta*  
 –. Leaf segments lanceolate; (1–) 4–6 mm wide .....  
 ..... 3. var. *lancifolia*  
 13a. *Nigella oxypetalata* Boiss. var. *oxypetalata* (Figure 15).

**Phenology:** Flowers from June to July and mature capsules from July to August.

**Distribution and habitat:** *Nigella oxypetalata* is known from Eastern Turkey, Lebanon, Syria, Iran, Azerbaijan and Armenia (Supplement 2 Figure 6). The species grows in steppes, fields, gardens, abandoned areas and *Quercus* openings, 300–2000 m.

**Etymology:** The epithet “oxypetalata” denotes narrow and acute petals of the species.

13b. *Nigella oxypetalata* Boiss. var. *latisecta* (P.H.Davis) Dönmez & Uğurlu **comb. et stat. nov.** (Figure 15).

≡ *Nigella latisecta* P.H.Davis, Notes Roy. Bot. Gard. Edinburgh 26: 168 (1965).

≡ *Nigella oxypetalata* Boiss. subsp. *latisecta* (P.H.Davis) Takhtadzhyan & Fedorov (1972: 54). **syn. nov.** Type: TURKEY. Kayseri: 1250 m, *Balls 1127a* (E!).

≡ *Nigella oxypetalata* Boiss. subsp. *latisecta* (P.H.Davis) Takht., Fl. Erevana ed. 2, 54 (1972).

**Phenology:** Flowers from June to July and mature capsules from July to August.

**Distribution and habitat:** *Nigella oxypetalata* var. *latisecta* is known from Central and Eastern Turkey and Armenia (Supplement 2 Figure 6). The species grows in fields, gardens, abandoned areas, steppes and *Quercus* openings, 400–1900 m.

**Etymology:** The epithet “latisecta” denotes that the leaves of the species are divided into widely leaf segments.

**Taxonomic notes:** Instead of accepting diagnostic characters for describing this taxon on species level, the characters of the width of leaf segments and the presence

of involucre leaves are continuous to typical *N. oxypetalata*. Hence, this species is assigned to *N. oxypetalata* as a variety.

13c. *Nigella oxypetalata* Boiss. var. *lancifolia* (Hub.-Mor.) Dönmez & Uğurlu **comb. et stat. nov.** Figure 15.

≡ *Nigella lancifolia* Hub.-Mor., Bauhinia iii. 311 (1967). **syn. nov.**

**Type:** TURKEY. Karaman: Karaman-Çumra, 21 km N. of Karaman, Feldrand, ca. 1000 m, 9 June 1966, Sorger (Herb. Sorger; type of *N. lancifolia* Hub.-Mor!).

**Phenology:** Flowers from June to July and mature capsules from July to August.

**Distribution and habitat:** *N. oxypetalata* var. *lancifolia* (Hub.-Mor.) Dönmez & Uğurlu is restricted to central part of Turkey (Niğde and Konya provinces), and it is a narrow endemic (Supplement 2 Figure 6). The species grows in fields as weed, abandoned fields and steppes. However, it does not form large populations.

**Etymology:** The epithet “lancifolia” denotes the widely lanceolate leaves of the taxon.

**Taxonomic notes:** The taxon was described at specific level from central Turkey. In consideration of the closely related taxa, we observed that the widely lanceolate leaf segments are the only character for distinguishing it from typical *N. oxypetalata*. Beside this, some of the leaf segments of some individuals growing on fertile soils are also as wide as those of *N. oxypetalata*. Moreover, the pollen and seed characters are not distinctive between these taxa. Due to the presence of morphological variations in the leaf segments (which are wider than those of *N. oxypetalata* var. *oxypetalata*) *N. lancifolia* Hub.-Mor. has been reduced to a variety of *N. oxypetalata*.

14. *Nigella ciliaris* DC., Syst. Nat. [Candolle] 1: 327 (1817). Figure 16.

≡ *Nigella oxypetalata* DC. [subsp.] *ciliaris* Terracciano (1897: 146).

**Type:** [Lebanon] “in oriente prope Barut” [Beirut], Labillardiere (FI-WEBB: holotype K photo!). Icon.: Deless., Icon, t. 45 (1821); Zohary, Fl. Palaest. I, t. 281 (1966).

**Description:** Annual erect herbs, stem simple or branched, (10–) 20–30 (–80) cm; sparsely long villose, striate. Basal leaves petiolate, up to 25 mm; lamina 15–40 (–110) × 10–30 (–50) mm, oblong to ovate in outline, 2–3-pinnatisect, ultimate segments linear, 5–30 × 0.5–2 mm; stem leaves sessile, 2–3-pinnatifid; (10–) 40–60 × (10–) 40–50 mm, leaf segments (10–) 20–30 × 2–5 mm. Inflorescence composed of single flower or a widely branched raceme, ± enclosed by leafy bracts; flowers 15–25 (–35) mm diam., yellow, with red or dark red central mark. Sepals 5, long villose hairy, yellow or pale yellow, sometimes dorsally reddish, ciliate on margin or dorsally, divided into claw and lip; claw 3–6 × 1–2 mm; lip 6–12 × 4–8 mm, deltoid, shortly attenuate at base, acute at apex, veins dorsally distinct. Petals (7–) 8, yellow, 5–8 × 3–5 mm,

with 10–20 long hairs, distinctly geniculate, claw and lip distinctly separated; claw 1–3 mm; lip divided into upper and lower; upper (inner) lip triangular, 1–1.4 × 1–2 mm; lower (outer) lip deltoid, 6–8 × 5–7 mm, protuberance 10–15 mm with sparsely long hairs, entire or emarginate at apex, transversely violet striated; deeply divided into 1.3–2 mm equal filiform halves, glabrous, without disc. Stamens 40–50, rarely in 8 groups, filaments 8–10 mm, anthers 1.9–2.1 mm, beaked at apex, yellow. Follicles (2–) 4–7 (–10) per flower, connate more than half, long villose hairy, (10–) 15–30 × (4–) 5–7 (–10) mm (excl. beak); beaks shorter than carpels, 10–15 (–20) mm, recurved, smooth, 3–5 distinct veins. Seeds 4–7 × 4–6 mm, discoid, flat, black, shiny smooth, width of wing equal to seed.

**Chromosome number:** The chromosome number of the species is determined here and given by Datta and Biswas (1983) as  $2n = 12$ .

**Phenology:** Flowers from May to June and mature capsules from June to July.

**Distribution and habitat:** *Nigella ciliaris* is currently known only from seven localities in the Middle East countries; Cyprus, Syria, Lebanon, Israel, and Jordan. The species grows in agricultural areas and steppes, on limestone. (Supplement 2 Figure 6). It grows from sea level to 800 m.

**Etymology:** The epithet “ciliata” denotes long hairs on fruits.

**Taxonomic notes:** The species is characteristic by long ciliate hairs on its capsules and it is easily recognizable by this characters.

#### 4. Discussion

While the genera *Garidella* and *Komaroffia* have been treated without intrageneric classification, *Nigella* is accepted as covering three sections, following the traditional infrageneric taxonomy of the genus (De Candolle, 1824; Willkomm and Lange 1880). One of the previous authors (Brand 1895) accepted these sections at subgeneric level (Table). Further division of the sections into subsections, subsect. *Erobathos* (DC.) Zohary, subsect. *Nigellaria* (DC.) Terracc. and subsect. *Nigellastrum* (DC.) Zohary by Zohary (1983) have been reduced to synonymy. These subsections do not provide any contribution to the taxonomy within the genus.

The *N. arvensis* complex has been long under discussion, and the taxa of the complex have been treated variously by several authors (e.g., Boissier, 1867; Terracciano, 1897; 1898; Vierhapper, 1926; Strid, 1970; Zohary, 1983). The main reason for the drastic taxonomic and nomenclatural changes for *N. arvensis* is as mentioned as a plasticity due to various environmental conditions by Strid (1970). Although Zohary expressed that he was suspicious about the descriptions of several taxa (three

species and 4 subspecies) from the Aegean Islands, which have been densely botanized by sharp eyed taxonomists for a long time, he accepted 17 varieties of the species, and seven of them have been published by himself. Based on morphological features and all available data, three varieties are accepted under *N. arvensis* and 14 infraspecific taxa are now treated as synonyms, which are given here: *N. arvensis* L. var. *negevensis* Zohary; *N. arvensis* L. var. *multicaulis* Zohary; *N. deserti* Boiss. var. *latilabris* Zohary; *N. arvensis* L. var. *beershevensis* Zohary; *N. arvensis* L. var. *palaestina* (Zohary) Zohary & Feinbrn.; *N. arvensis* L. var. *microcarpa* Boiss.; *N. arvensis* L. var. *tauricola* P.H.Davis; *N. arvensis* L. var. *assyriaca* (Boiss.) Zohary; *N. arvensis* L. var. *anatolica* Zohary; *N. arvensis* L. var. *iranica* Zohary; *Nigella arvensis* L. subsp. *aristata* (Sm.) Nyman.

The genera *Komaroffia*, *Garidella* and *Nigella* are similar in most respects of pollen morphology. Pollen grains are frequently trizonocolpate, but in some species of the genera both trizonocolpate and nontrizonocolpate pollen grains (with a ring-like aperture or with two colpi or with colpi distributed over the whole surface) are present. Trizonocolpate pollen grains are radially symmetrical, isopolar, and small to medium in size. The pollen grains of *Komaroffia* (P: 25–48 µm, E: 23–49 µm) and *Garidella* (P: 25–36.25 µm, E: 20–32.5 µm) are in general smaller than those of *Nigella* (P: 25–53.75 µm, E: 25–55 µm). Hence, the smallest dimensions are recorded in *Garidella*, while the largest dimensions are recorded in *Nigella*. There are no species-specific differences within the latest genus.

Basic chromosome number of the taxa of *Nigelleae* is (n) 6, and all of the taxa have 12 diploid chromosomes according to the relevant literature (Strid 1970, Marks 1977, Subramanian 1985, Mitra and Bhowmik, 1996, Ghosh and Datta, 2006). In addition, karyological analyses have been carried out for almost all the taxa within the scope of this project, with the exception of *Komaroffia bucharica*. According to the Zakharyeva (1985), *K. bucharica* has 14 diploid chromosomes, but the previous studies report 12 chromosomes for the species.

Nomenclatural rules required new combinations for some taxa and therefore, *Nigella bucharica* Schipcz. is accepted as *Komaroffia bucharica* (Schipcz.) Dönmez, *Nigella arvensis* L. subsp. *aristata* Nyman is accepted as *Nigella arvensis* L. var. *aristata* (Nyman) Dönmez & Uğurlu, *Nigella latisecta* P.H.Davis is accepted as *Nigella oxypetala* var. *latisecta* (P.H.Davis) Dönmez & Uğurlu, *Nigella lancifolia* Hub.-Mor. is accepted as *Nigella oxypetala* var. *lancifolia* (Hub.-Mor.) Dönmez & Uğurlu.

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## Supplementary Material\_Supplement 1

### 1. *Komaroffia integrifolia* (Regel) Lemos Pereira

**Specimens examined:** TURKMENISTAN. Ashkhabad: Gaudan, 1500 m, *Meshtscherjakov s.n.* (LE!). AFGHANISTAN. Hai Rud-Valley, *Aitchison* (FI); Prov. Maimana 500 m, 1962, *Hedge & Wendelbo* (E photo!, W!). Kabul, 2100 m, 1962, nos. 3111, 3594 (E photo!). Nordost Afghanistan, Gipfelregion eines Kalk-Limonit-Berges bei Dschebel-Seradsch, 1730 m, 13 May 1951, *A.Gilli 827*. KAZAKHASTAN. Hungersteppe, am linken Syr-Daria-Ufer, 1883, *Musa* (FI). TAJIKISTAN. env. of the town Dushand Shin 1960 (E photo!). IRAN. Gorgan: Golidagh, coll. ign. (E!). Golestan: Dasht-e Chalpush, 920–1000 m, *Terme & Matin 34593* (E!). Horasan: Djeneran et Kujan, *Rechinger 4704* (HUB!). 150 km N.W. of Mashad, abandoned fields, 1962, *Zohary & Orshan 9978* (HUI). Horasan: between Chamanbid and Bojnurd, *Ghahreman-Agustin* (TUH!); *FUMH 28909!*. Sarakhs, 220 m, 23 May 1972, *H. Faroughi 4762* (TUH!). Shahrud-Bustam (Turan protected area): Kuh-e peygamber, 35°43'N, 56°45'E, S Zamanabad, in saxosis calc, 1300–1500 m, 1 May 1975, *Rechinger 50888* (TUH!). Khorasan: 15 km on the Gifan road from Bojnoord near the village Soorek *s.n.* (TUH!).

**Conservation status:** The species is known from few collections. However, the collection sites are very far away from each other. Thus, the species could be considered as LC (Least Concern) status according to the IUCN Red List criteria (IUCN, 2016).

### 2. *Komaroffia bucharica* (Schipczinski) Dönmez

**Specimens examined:** UZBEKISTAN. Terrace of the river Khodzha-Inak, gravelly soil, 7 May 1941, *L.Popova, 410* (LE!). Bukhara, Denau, Sangardak, 114 m, 20 June 1896, *V.I.Lipsky, 1878* (LE!). Iter Samarcandense Buharicum, 16 May 1913, *B.A.Fedtshenko 1667*, (LE!). Planta Bucharica 1906, *Rosthewitz 635* (LE!); Iter Samarcandense, Buharicum 1913, *B.A.Fedtschenko 1725* (LE!); Iter Turkistanicum, *S.Korshinskyi s.n.*, (LE!). TAJIKISTAN. 526 (E photo). W herbarium, *14384!* Vicinities of Stalinabad [Dushanbe], roadside, Grasses herbaceous ephemeric vegetation with perennials, [without a date], *Gontcharov & Zapryagayeva s.n.* (LE!); Southern Tajikistan, flood plain at the left bank of Kafirnigan to the south of Isanbai, 7 May 1947, *E.A.Varivtseva & G.N.Nepli 1710* (LE!); ridge of Gardaniyshti Range, Tepak, slope of deep gorge, 2100 m, 2 June 1948, *E.A.Varivtseva & G.N.Nepli 774* (LE!); SE slopes of Babatag Range on the opposite of Kyzyl spring not far from Hissar, Premontane plain, gravel, 800 m, 14 May 1938, *I.A.Linczevski 166* (LE!). Western slope of Babatag [Range], middle part, Dzhidabulak, 29 April 1986, *R.V.Kamelin 309* (LE!).

**Conservation status:** The species is known from few collections from the mentioned herbaria. However, the collection sites are very far away from each other. Therefore, the species could be considered as the LC (Least Concern) status according to the IUCN Red List criteria (IUCN 2016).

## 2. *GARIDELLA*

### 1. *Garidella nigellastrum* L.

**Specimens examined:** SPAIN. Dilar, ad Granada, 300–400 m, 1895, *Porta & Ricca* (O. 12 K!). FRANCE. Aix, 1876, *Carlier 1077* (FI). SWITZERLAND. Vaud, 1876, *coll. ign.* (FI). GREECE. near Phanar 1931, *s.n.* (K!). CRIMEA. Sevastopolsky region, Oboronne, 2 June 1964, *I. Kuznetzove s.n.* (KW!). TURKEY. Bilecik: Bilecik-Söğüt, 16 km. ca. 410 m, 12 June 1954, *H.Demiriz s.n.* (ISTF!). Amasya: 1889, *Bornmüller* (E photo!). Çankırı: Çakmaklıdere, 800 m, *Bornmüller 1929* (E photo!). Eskişehir: 18 mil from Polatlı to Sivrihisar, ca. 800 m, 18 June 1965, *M.J.E. Coode & B.M.G.Jones* (E photo!, ISTF!). Uşak: Uşak, 910 m, *Bal. s.n.* (IBI). Kırşehir: Ömerhacı village, 990 m, gypsum, *B.Mutlu 5061* (HUB!). Amanus Mts., ascent to Karaksu, 1932, *Eig & Zohary s.n.* (HUB!). Maraş: *Balls 1142* (E photo!); Süleymanlı, Avcılar village, *Quercus-Pinus brutia* opening, 905 m, 37°49'63.9"N, 036°47'39.5"E, 22 July 2008, *A.A.Dönmez 14982* (HUB!). Mersin: Mut, Çamlıca village, 307 m, 36°37'35.1"N, 038°16'16"E, 24 July 2009, *A.A.Dönmez 15965* (HUB!); Arslanköy road, 293 m, 36°52'54.4"N, 034°34'32.8"E, 5 July 2011, *A.A.Dönmez 17832-Z.Uğurlu* (HUB!). Antakya: Arsuz, 10 m, 36°22'22"N, 035°51'54.4"E, 26 July 2009, *A.A.Dönmez 15976* (HUB!); Osmaniye, Toprakkale, rocky slopes, 58 m, 37°02'21"N, 036°08'26.6"E, 26 July 2009, *A.A.Dönmez 15977* (HUB!). Kilis: Süngütepe village, Deliçay slopes, 425 m, 36°48'38.8"N, 036°58'02"E, 9 May 2008, *A.A.Dönmez 14370* (HUB!). Kahramanmaraş: Süleymanlı, 8 September 1981, *B. Yıldız 3260* (HUB!). Urfa: 15 km from Hilvan to Urfa, 1 June 2010, *A.A.Dönmez 16951-G.Zare* (HUB!). Diyarbakır: Çınar, 710 m, 37°40'04.7"N, 040°28'02.9"E, 8 May 2008, *A.A.Dönmez 14358* (HUB!). Siirt: 5 km from Siirt to Eruh, 18 June 2003, *A.A.Dönmez 11174-B.Mutlu* (HUB!). CYPRUS. Girne: Esentepe, 14 m, 35°21'38.5"N, 038°35'13.8"E, 14 July 2009, *A.A.Dönmez 15940* (HUB!). Gazimağusa: 3 km from Turnalar village to Kantar, 165 m, 35°22'09.9"N, 038°60'26"E, 13 July 2009, *A.A.Dönmez 15928* (HUB!); 5 km from Büyükkonuk village to Kalıca, 137 m, 35°25'17.1"N, 038°59'12.6"E, 13 July 2009, *A.A.Dönmez 15934* (HUB!). İskele: between Aygün-Sımrüstü village, 50 m, 35°16'24.9"N, 038°51'36.9"E, 14 July 2009, *A.A.Dönmez 15938* (HUB!); Serdarlı village 87 m, 35°14'51.1"N, 038°35'49.3"E, 14 July 2009, *A.A.Dönmez 15944* (HUB!); Sımrüstü village, 18 m, 35°16'09.1"N, 038°51'56.1"E, 14 July

2009, *A.A.Dönmez 15946* (HUB!). Güzelyurt: Lefke, Cengizköy, 62 m, 35°07'60.2"N, 032°52'20.6"E, 14 July 2009, *A.A.Dönmez 15948*; St. Chrysostomo, 1889, *Pichler* (FI); İskele road, Sınırüstü village, 49 m, 35°17'16.4"N, 033°31'31.5"E, 21 June 2011, *A.A.Dönmez 17765-D.Genç* (HUB!). TURKMENISTAN. Karakala: *fide* URSS (LE). IRAQ. Jebel Sinjar, 750 m, 1948, *Gillet 11002* (K!). Swara-Tuka, open oak scrub, 1955, *Robertson 219* (K!). CAUCASUS. 1831, *Hohenacker* (FI). AZERBAIJAN. Karabagh: *Szovits 536* (K!). ARMENIA. Aragatsotn province, 13 June 2010, *G.Fayvus et al. 10-0946* (W!). IRAN. Urmia: *Knapp, s.n.* (TARI) Lorestan: Khorramabad, Cham-Divan, 1100 m, 23.5.1999, *Veiskarami* (TUH!). Gilan: Kaluraz, *Lipsky, s.n.*, (TARI) Quazvin; Bibersin, *Bushe s.n.*, (TARI). SYRIA. Aleppo: Afrin, Questal Jindu Barsa mountain, 623 m, 36°37'34.1"N, 037°01'48.2"E, 3 June 2009, *A.A.Dönmez 15453* (HUB!). ISRAEL. N. Negev, 5 km W. of Beth-Kama, stony soil, 1981, *Danin 1816* (HUI).

**Conservation status:** The species exhibits a wide distribution range with typically small populations. Hence, it is assigned to the LC (Least Concern) status according to the IUCN Red List criteria (IUCN, 2016).

## 2. *Garidella unguicularis* Poir.

**Specimens examined:** TURKEY. Elazığ: env. of Elazığ, 1160 m, 1963, *Zohary 37622* (HUI). Siirt: Sassun (Sason), *fide Hand.-Mazz* (G photo!). Kahramanmaraş: Ahır Dağı, Küçükgöl, 1400-1700 m, 26 June 1992, *Z.Aytaç 4867-H. Duman* (HUB!). Antakya: Aktepe, 278 m, 36°42'44.5"N, 036°30'35.3"E, 9 May 2008, *A.A.Dönmez 14373* (HUB!). Hatay: between Kerhan [Kirikhan] and Alexandretta [İskenderun], 1931, *Zohary* (HUI). Gaziantep: Gaziantep, *Haradj. 1343* (E!). Adıyaman: Kahta, *fide Hand.-Mazz.* (E!). Diyarbakır: Çermik, 18 June 1985, *A.Güner 6488* (HUB!). Mardin: Kızıltepe, Kılıçlı village, steppe, 389 m, 36°59'30.7"N, 040°13'59.3"E, 8 May 2008, *A.A.Dönmez 14365* (HUB!); Mardin at Senar, *Sint.* 1888 (E!). SYRIA. Damascus: Bloudan, Slopes of Yunnan mountain, 1740 m, 38°44'58.8"N, 036°08'13.4"E, 30 May 2009, *A.A.Dönmez 15440* (HUB!); Das, Das from Surgaya to Bloudan around of the city, 30 May 2009, *A.A.Dönmez 15437-B.A. Sawman* (HUB!); Aleppo: Afrin, Questal Jindu, Barsa mountain, 623 m, 36°37'34.1"N, 037°01'48.2"E, 3 June 2009, *A.A.Dönmez 15454* (HUB!); Selemie, 1933, *Eig & Zohary* (HUI). Harmal, 1934, *Stud. Rer. Nat.* (HUI). Jebel Druze, E1 Kefr, 1932, *Eig & Zohary* (HUI). Mt. Hermon, Shibba to Ein Jinna, 1924, *Em* (HUI). PALAESTINE. Judean Mts., env. of Jerusalem, 1934, *Eig & Feinbrun 107* (HUI). CYPRUS. Kykko, 3300 4300 ft., 1913, *Haradjian 949* (K!). IRAQ. Jebel Sinjar, 750 m, 1948, *Gillet 11001* (K!).

**Conservation status:** The species has relatively a wide distribution. With the exception of the general threats to the nature in the distribution area of the species, we have not determined any specific threat to *Garidella unguicularis*. Hence, no threat category (IUCN 2016) is proposed for this species.

### 3. *NIGELLA* L.

#### 1. *Nigella damascena* L.

**Specimens examined:** MOROCCO. Berkane, 1929, *Faure* (HUI). PORTUGAL. Algarve: 1959, *stud. biol.* 273 (HUI). SPAIN. Catalonia occ.: Les Borges Blanques, 1933, *Font Quer* (HUI). FRANCE. Montpellier: 1931, *Eig* (HUI). ITALY. Liguria, Val Polcevara, 1907, *Canneva* (HUI). Sardinia: Platamona Sorso, 1959, *Chipappini* (FI). Sicily: Palermo in campus, 1903, *Ross* 403 (FI). Agrigento Sicily, *Polunin* 8062 (E photo!). SWITZERLAND. In ruderalis (data illegible) (K!). CROATIA. Rovigno: [Croatia: Istra, Rovinj], 1928, *Bojko* (HUI). SERBIA. Belgrade: *Bornmüller* 1888, (BEOU!). BULGARIA. Pcelina: 1958, *Radenkova* 541 (COI!, HUI). GREECE. Macedonia: *D. Siucovic*, 7 June 1922, (BEOU!). Ukraine: Crimea, South beach, Karasan, 3 September 1925. *P.Oksijuk s.n.* (KW!). South beach, Sırtek, 22 August 1925, *P.Oksijuk s.n.* (KW!). TURKEY. Edirne: Enez, 44 m, 40°34'42"N, 026°18'35"E, 5 August 2008, *A.A.Dönmez* 15000-*B.Mutlu* (HUB!); Enez, 150 m, 40°41'24.8"N, 026°23'06.4"E, 7 May 2001, *A.A.Dönmez* 8718 (HUB!); Keşan, 300 m, 20 June 1999, *A.A.Dönmez* 7066 (HUB!); between Keşan İpsala, 25 May 1973, *G.Artem* (GAZI!). Kırklareli: Pınarhisar, 259 m, 41°38'10.8"N, 027°33'34.4"E, 5 August 2008, *A.A.Dönmez* 15002 (HUB!); Çanakale: Dardanelles, m. Saradschik, 1883, *Sint.* 882 (E photo!). Istanbul: Kilyos, 3 March 1889, *Azn.* (E photo!); Beylerbey, *P.H.Davis* 1860l (E photo!). Düzce: Akçakoca, 23 July 2002, *A.Doğru Koca* 1918 (HUB!). Zonguldak: Kacaköy to Zonguldak, *Kasapligil* 108 (E photo!). Kars: Ardahan, Cincirop, 18 July 1947, *A.Heil. et M.Baş.* (ISTF!). Balıkesir: Marmara adası, 16 July 1968, *A. Baytop* (ISTE!). CRETE. S. E. foothills of Levka Ori, *Orshan* 10505-3 (HUI). Nomos Kikladon: 50-70 m, 20 April 2002, *A.Tsopra* (HUB!). Khios: *Orphanides* (E photo!). Thraki: prov. Evros, distr. Dhidhimotiho, 2070 m, *E.Stamatiadou* 25 May 1972 (ATH!). Sterea Ellas: prov Etolis-Akarnania, distr. Nafpaktos, *E.Stamatiadou* 12 May 1974 (ATH!). Peloponnisos: prov Ilias, distr. Olymbia, 20-25 m, *E.Stamatiadou* 29 April 1971 (ATH!). Pyreus: 157 m, 028°01'04.6"N, 020°38'02.7"E, 19 June 2009, *A.A.Dönmez* 15475 (HUB!). Paros: Island, near beach of Vukakos, field margin, 12 m, 37°01'07.8"N, 025°07'07"E, 14 June 2009, *A.A.Dönmez* 15461 (HUB!). IRAN. Tabriz: *Gill-Sm*, 1660 m (TUH!); Luristan Bisheh, 1200 m, *Koeie* 1454 (TUH!). CYPRUS. Kyrenia range, 1948, *Kennedy* 1649 (K!). LEBANON.

Beyrut: Yammounek, 1486 m, 34°07'09.4"N, 36°01'24.6"E, 10 June 2010, *A.A.Dönmez 17023* (HUB!).

**Conservation status:** The species has a relatively wide distribution, composed of populations with few individuals. With the exception of the common threats to nature throughout the distribution area of the species, there are no specific threats to *Nigella damascena*. Hence, no threat category (IUCN 2016) is proposed for this species.

## 2. *Nigella elata* Boiss.

**Specimens examined:** GREECE. Macedonia: Krusa Balkan, Paprat distr. 1918, *Russel 64* (K!). BULGARIA. S. of Ivajlovgrad: 1959, *Kojochanov* (K!). UKRAINE. Crimea, Feodosia district, Mt. Karagach, 21 April 1964. *Dubavyk O. s.n.* (KW 000045038!). Crimea, near Gurzuf stone his, 24 June 2010, *Pytof. Z. s.n.* (KW 000093106!). TURKEY. Ephesus: stony ground, 1962, *Zohary 2179* (HUIJ). Phrygia, Sultan Dağları, 1899, *Bornmüller 4028* (MPU). İstanbul, *Aznavour 4452* (type specimen of *N. bithynica*, E photo!). Kırklareli: Dereköy-Demirköy road, 9 September 1976, *N. & E. Özhatay* (ISTE!). Çanakkale: Erenköy, *Kirk!* (W photo!); Kartal, July 1893 & 1896, *Azn.!* (E photo!); Haramidere, 1967, *A.Baytop & G.Atilla No: 11.549* (ISTE!, E photo!). Bursa: Çınarcık-Armutlu road, 20 June 1975, *N. & E. Özhatay 32062* (ISTE!); Bursa, July 1874, *Pichler* (E photo!). Balıkesir: Assos in Troad, *Sint. 1883: 1049* (E photo!). Bolu: 14. km from Kıbrısçık to Bolu, 40°26'53.6"N, 031°46'12.6"E, 1110 m, 7 November 2009, *A.A.Dönmez 16555-Z.Uğurlu*; 5. km from Kıbrısçık to Beypazarı, 40°25'15.8"N, 031°54'04.6"E, 1110 m, 8 August 2010, *A.A.Dönmez 17617-Z.Uğurlu* (HUB!); Gölcük, around Sünnet Lake, 12 July 2009, *A.A.Dönmez 15832* (HUB!). Ankara: Kızılcahamam-Kargasekmez, ca. 1000 m, 12 July 1974, *O.Ketenoğlu 10* (ANK!). Çankırı: Atkaracalar, Dumanlı Mt., Karaküllü valley, 1250-1350 m, 31 July 1991, *A.Duran 1992* (GAZI!). İzmir: Güme Da., above Tire, 100 m, 1906, *Bornmüller 9002* (E photo!). Balıkesir: Yeşilhisar village, Savaştepe, 5 June 1980, *G. & H.Çakırcı* (ISTE!); 15 km from Konakpınar road junction to Saruhan, 399 m, 39°22'09"N, 027°57'51.8"E, 25 July 2008, *A.A.Dönmez 14994* (HUB!); Eskişehir: Türkmen Mt., Kaplan valley, *T.Ekim 2573* (ANK!). Konya: Sultan Mt., Akşehir, 1100 m, *Bornmüller 4025* (E photo!). Denizli: from Serinhisar to Denizli, 969 m, 37°36'57.2"N, 029°16'41.7"E, 2 July 2011, *A.A.Dönmez 17815-Z.Uğurlu* (HUB!). Isparta: Eğirdir, Yukarıgökdere, 1700 m, 11 July 1974, *H.Peşmen 1805-A.Güner* (HUB!); 2–3 km SW of Gönen, 22 June 1978, *H.Peşmen 3959-B.Yıldız* (HUB!).



**Conservation status:** The species is known from different countries with limited number of specimens. Based on limited collections and narrowly distribution pattern, it is assigned to the LC (Least Concern) status according to the IUCN Red List criteria (IUCN 2016).

### 3. *Nigella gallica* Jord.

**Specimens examined:** PORTUGAL. Alto Doura, 1955, *Fernandez 5659* (HUI). Estrada 19 July 1974, *s.n.* (COI!). Lisboa 5 July 1988, *M. Queiros* (COI!). Pocinha, 2 February 1987 (COI!). Porto Hamso, 28 July 1961 (COI!). Vale de rio (COI!). Coimbra, *J. Paiva, Herb No 8231* (COI!); Coimbra, June 1959. Pyreneia (COI!). P. Montserrat 16 September 1969 (COI!). SPAIN. Castelnaudary, Urgel (FI). Figueras, champs Font del Sock, 1912, *Bilot 706* (FI). Östpyranen, Lerida, Segre-Tal östl. Seo de Urgel, 6 km O Martinet, ca. 1050 m, silikat, 27 July 1968 *F. Krendl 766* (W!).

**Conservation status:** The species is known from different countries with limited specimens available. Based on limited collections and narrowly distribution pattern, it is assigned to the LC (Least Concern) status according to the IUCN Red List criteria (IUCN 2016).

### 4. *Nigella papillosa* G.López

#### 4a. *Nigella papillosa* G.López subsp. *papillosa*

**Specimens examined:** PORTUGAL. Prov. Algarve (FI). SPAIN. Sierra de Sacana, 1889, *Reverchon 710* (E photo!). Granate Puebla de Don Federieo 1890, *Porta & Rigo 257* (K!). distr. Burgos 1960, *Dresser 503* (E photo!).

#### 4b. *Nigella papillosa* G.López subsp. *atlantica* (Murb.) G.López

**Specimens examined:** PORTUGAL. Coimbra Maior (COI!). Mt. Sleica (COI!). Alentino (COI!). Campo Maior, *Daniel F. dos Santos 1886* (COI!). ITALY. Sicily: Girgenti [Agrigento] ai Macalabi (s. col.), 1897, *coll. unknown 858* (K!). MOROCCO. Sisi Abdalla, 1928, *Jahandiez 405* (E photo!). ALGERIA. Oran, 1906, *Faure* (E photo!). Kabylieh, Kerrata, 1898, *Boce 241* (E photo!). Sable de la Calle, 1841, *Durieu 6* (P). TUNISIA. Maklar, 1897, *Mubreck 1* (K!, isotype of subsp. *atlantica* Murb.); Le Kef, 1937, *Espina 3126* (HUI).

**Conservation status:** The species is known from various countries, but with limited specimens. Based on limited collections and narrowly distribution pattern, it is assigned to the LC (Least Concern) status according to the IUCN Red List criteria (IUCN 2016).

### 5. *Nigella arvensis* L.

**Conservation status:** The species is divided into several intraspecific taxa. Conservation status of the accepted varieties is given under them (see below).

5a. *Nigella arvensis* L. var. *arvensis*

**Specimens examined:** GERMANY. Hessen, *Hohenacker* (E photo!). AUSTRIA. bei Döbling (Vienna), 1897, *Krebs* (E photo!). CZECH REPUBLIC. Weisskirchen, 1909, *Maloch 451* (E photo!). POLAND. Raclavice, 1954, *Jaszewicz* (BM photo!). RUSSIA. Odessa 1893, *Kulikovsky 114* (E photo!). CRIMEA. 12 km N. of Simpheropol, 1898, *Desouchet* (MPU). HUNGARY: Erisi et Iris, Csepel, 1871, *Sonklar* (E photo!). BULGARIA. Ad Sados: 1899, *Stribrny* (E photo!). FRANCE. pros Lyon, *Guinand 1869* (P). Paris 1958, *Roux* (P). MONTENEGRO. Vranj ano, 1895, *Adamovic s.n.* (E photo!). GREECE. Epirus, 1889, *Baldacci s.n.* (E photo!); 1917, *Kolley & Kench s.n.* (BM!). Macedonia: Great Carabarum about 4 miles S. of Salonika, (BM!); W. Macedonia: prov. and distr. Florina, *E. Stamatiadou 15843* (ATH!); Dodekanisos, insula Liadi, *Rechinger 7785* (W!). Anidhros, *Rechinger 5246* (W!, as *N. doerfleri* Vierh.); insula Naxos ad pagum Apiranthos 1932, *Rechinger 2246* (W!). ins. Tino, Tuntas, *Rechinger* (as *N. aegaea* Vierh., *N. degenii* Vierh. subsp. *barbro* Strid). Samos, W. of Tigani 1964, *Gathorne-Hardy 812* (E photo!). Chios: Pelmaion, 1939, *Platt 364* (K!). Cyelados: Suphrania, 1935, *Rechinger 7620* (W!, G photo!). Rodhos: Bord de champs 1870, *Bourgeau* (G photo!, as var. *glaucum*); 2.5 km NE Afantou, 20 June 1967, *A.Strid 31052* (WU!); around Kalithera mare Resort Faliraki road, *Pistacia*, scrub, 18 June 2009, *A.A.Dönmez 15469-T. Karamplians* (HUB!). Paros: Island, Nausa town, 15 m, 37°07'27.4"N, 025°14'14"E, 14 June 2009, *A.A.Dönmez 15460-T.Karamplians* (HUB!). Paros: Island, Near beach of Vukakos, 12 m, 37°01'07.8"N, 025°07'07.4"E, 14 June 2009, *A.A.Dönmez 15462* (HUB!); Near beach of Vukakos, field margin, 12 m, 37°01'17.8"N, 025°07'07.4"E, 14 June 2009, *A.A.Dönmez 15462* (HUB!); Pyreaus: 157 m, 028°01'04.6"N, 020°38'02.7"E, 19 June 2009, *A.A.Dönmez 15474* (HUB!); Siros: Island, Kini village, 176 m, 37°26'52.9"N, 024°55'35.4"E, 13 June 2009, *A.A.Dönmez 15459* (HUB!). Crete: Kissamos, 1884, *Reverchon 216* (K!, E! G photo!, type of *N. arvensis* subsp. *brevifolia* Strid). TURKEY. Çanakkale: Erenköy, *Kirk!* (E photo!); 36.6 km from Gelibolu to Keşan, 24 m, 40°40'26.8"N, 026°48'11.6"E, 15 July 2012, *A.A.Dönmez 18115-Z.Uğurlu* (HUB!); Edirne: Enez, 20 m, 26 June 1999, *A.A.Dönmez 7167* (HUB!); Gülçavuş village, 25 m, 40°37'26.6"N, 026°05'33.5"E, 4 August 2008, *A.A.Dönmez 14996-B.Mutlu* (HUB!); Enez, from Edirne to Havsa, 96 m, 41°35'08.8"N, 026°44'11.6"E, 5 August 2008, *A.A.Dönmez 15001-B.Mutlu* (HUB!). İstanbul: Halkalı to Safraköy, 19 July 1896, *Azn.* (E photo!). Kırklareli: Pınarhisar, Poyralı village, 5 August 2008, *A.A.Dönmez 15004* (HUB!);

Pınarhisar, Sergen, 362 m, 41°38'32.6"N, 027°42'04.5"E, 5 May 2008, *A.A.Dönmez 15005-B.Mutlu* (HUB!); around Kofçaz, 290 m, 41°48'55.1"N, 027°11'70.3"E, 15 July 2012, *A.A.Dönmez 18120-Z.Uğurlu* (HUB!). Bursa: Bursa, *Salahittin* (E photo!). Kastamonu: Tosya, *Sint. 1892: 4382* (E photo!). Kırıkkale: between Samsun road asphalt-Şarklı village, 1000 m, 23 June 1990, *A.A.Dönmez 2537* (HUB!); Delice, 2 km from Çoğul-Ortakışla road junction to Ortakışla, gypsum slopes, 633 m, 40°01'19.4"N, 034°07'10.8"E, 30 June 2008, *A.A.Dönmez 14847* (HUB!). Manisa: Sipil Dağı from Atalanı to Manisa 5.5. km, limestone, 1210 m, 38°39'41.8"N, 027°23'24.2"E, 15 July 2012, *A.A.Dönmez 18114-Z.Uğurlu* (HUB!). İzmir: Çeşme, Çiftlik, 8 m, 38°14'04.3"N, 26°13'58.2"E, 24 August 2012, *A.A.Dönmez 18186* (HUB!). Isparta: Ş. Karaağaç, 1150-1250 m, 24 June 1994, *B.Mutlu 776* (HUB!). Afyon: Çay, Karamuk Lake, 1050 m, 8 August 1992, *A.A.Dönmez 2920* (HUB!). Konya: Sultan Da. m. Akşehir, 1000 m, *Bornmüller 1899: 4026* (E photo!). Ankara: 10 km N of Ankara, 1962, *M. & D.Zohary 85* (HUB!); Kalecik, 1929, *Bornmüller 13686* (G photo!); Beynam, 1100 m, *P.H.Davis 13009* (E photo!). Niğde: Ulukışla, 5 km from Ulukışla to Ereğli, 1480 m, 37°33'37.3"N, 034°26'15.6"E, 23 July 2009, *A.A.Dönmez 15961-Z.Uğurlu* (HUB!); Aksaray: env. of Aksaray, 1953, *H.Birand & Zohary 2793* (HUB!). Kayseri: 1200 m, *Bal. 861* (E photo!); Sarız, 1600–1700 m, 5 August 1991, *H.Duman 4370* (GAZI!, HUB!). Maraş: Çardak, in valley above Erecek, *P.H.Davis 20393* (E-photo!). Tunceli; above Pertek, 1500 m, *P.H.Davis 31506* (E photo!; ANK!). Elazığ: district Elazığ, 14 km N of village Pertek, 1963, *Orshan & Plitmann 472-232* (HUB!). Muğla: W. of Muğla, *Dudley & Davis 35441* (K!); Datça, Marmaris, 1962, *Dudley 35441* (K!). Antalya: Avlan G. to Elmalı, *Hub.-Mor. 9174* (G photo!); Pamphylia: between Alanya and Gazipaşa, 4 June 1950, *A. Hub.-Mor. 10398* (HUB!); Alanya, 1947, *P.H.Davis 14486* (K!); between Elmalı to Antalya, 1200 m, 1971, *Shmida et Lev-ari*. (E photo!); Elmalı: Çam kuyuları, Sarnıç alanı district, ca. 1400 m, *R. Çetlik 1662* (ANK!); Çalbalı Da., 1700 m, *P.H.Davis 15327* (E photo!). Isparta: Gönen, Subaşı, 1227 m, 37°59'22.7"N, 030°31'03.1"E, 22 July 2008, *A.A.Dönmez 14990* (HUB!); Konya: Konya to Çumra, Küçükköy, 980 m, *Helbaek 980* (E photo!); Tuzla, 6 July 1945, *Kasapligil* (ANK!); Seydişehir-Mortaş road, İçerikışla, ca. 1150 m, 21 July 1980, *H.Ocakverdi 897* (ANK!). Adana: Pozantı, *Gleisberg 275* (E photo!). Maraş: Göksu to Kapalak, 2 July 1906, *Post* (E photo!). Gaziantep: in agris circa Aintab [Gaziantep], *Hauskn.* (G photo!); Şanlıurfa: Ceylanpınar, 500 m, 10 June 1996, *N.Adiguzel 2581* (GAZI!); inter Orfa [Urfa] et Suerek [Siverek], *Kotschy 344* (G photo!, lectotype of var. *caudata* Boiss.); Mesopotamia inter Orfa et Suerek (Siverek), *Aucher 57* (lectotype of var. *minuta*, K!); Gaziantep: Aintab (Gaziantep), *Hauskn.* (syntype of var. *minuta*, K!); Diyarbakır: Diyarbakır, 1857, *Holmes* (E photo!). CAUCASUS. Castalinia Gori, 1881, *Brothers* (BM!). ARMENIA. pr. pag. Buhagiar,

1929, *Schelkovnikov et Kara-Muzza s.n.* (Hort. Bot. Arm.). IRAN. about 80 km E of Kermensah on the road to Hamadan, 1965, *Daxin & Plitmann 26387* (HUI). Ghilan, *Aucher-Eloy 4022* (P, BM!); Khuzestan, S. of Haft Tape, *Wright 428-106* (K!); Bakhtaran: 60 km to Bakhtaran, 1530 m, 13 April 1992, Aftar, Dadjou, *Mehdi-Moja, 14209* (TUH!); Mazenderan: Kelordasht, *Ghahreman-Agustin s.n.* (TUH!); Mazenderan: 10 km from Marzanabad to Kelardasht, 1200 m, 21 June 1989, *A.Ghah, V.Mozaff.* (TUH!); Dizful, 1851, *Loftus s.n.* (BM!). IRAQ. 6 km W of Tel Afar, 1948, *Gillett 11168* (K!); 36 km E of Samarra, 1957, *Ravi 20377* (K!); Erbil, 1893, *Bornmüller 830* (K!); Khanaqin, 26 May 1932, *B.P.Uvarov 14* (HUI); inter Mosul et Zako, 1957, *Rechinger 10637* (W); Kirkuk 1957, *Rechinger 9280* (W!). SYRIA. Swedaa: Syrian Desert, Bezarih near Palmyra, 1900, *Post* (BM!, Post Herbarium Lebanon!); Mayodina, 1946, *Brown s.n.* Antilebanon, env. of the village Jerejir, 1932, *Eig, Feinbrun & Zohary* (HUI). Antilebanon, Wadi el Hazir, *Gombault 2121* (P). LEBANON. Beirut, 1881, *Peyrox 939* (G photo!). Beirut 1876, *Post 95* (BM! Post Herbarium Lebanon!); Lattakia 1846, *Reuter* (G photo!). Saida, 1854, *Gaillardot 546* (K!). PALESTINE. Galilee Coast, Rosh-Haniqra, 1956, *Zohary & Waisel 917* (HUI); Ashkelon, 1956, *Zohary & Waisel 914* (HUI). Sharon Plain, Natanya, elevated sea shore 1938, *Eig, Zohary & Grizi* (HUI); Dunes along Mediterranean Nahariya, *L.Muselman 10485* (E photo!). ISRAEL. Sharon Plain, Even Jehuda, 1951, *Zohary & Amdursky s.n.* (K!); W. Negev, env. of Wadi Sheneq (Nahal Habsor), sandy loess soil, 1949, *Zohary & Orshan 837* (HUI: holotype of *N. arvensis* var. *multicaulis* Zohary subsp. *tuberculata*); 4 km south of Beersheva, 1928, *A. Eig, Zohary & Feinbrun 879* (HUI; type of *N. arvensis* var. *beershevensis* Zohary); Negev, 34 km S. of Beersheba. on the way to Asluj, 320 m, 23 May 1935, *Zohary & Feinbrun 87* (HUI); Judean Desert, Wadi Farah, 1934, *Eig, Zohary & Feinbrun 980* (HUI). EGYPT. Herb. *Oliver*, 1882, (G-DC G photo!, G-Boiss photo!); San Stephabia bei Alexandria, *O.Kaiser 1912* (G photo!); Arish, 1925, *Zohary* (HUI); Mandara, 1877, *Letourneux* (MPU). Desert de l'Isthm Aegypt, Wadi Maghara, 1920, *Tontan* (MPU). ALGERIA. Hautes Plateaux Oranais, env. de Bedeau, 1100m, 1934, *Faure* (HUI); Autours de Dyelfa: 1854, *Reboud* (G photo!). MOROCCO. Bir Rashid in segetibus, 1913, *Pitard 2921* (K!). LIBYA. Plain of AI Marj, 1922, *Hortert* (BM!); Valee de Zordes, 1875, *Daveau* (P, type of *N. taubertii* Brand); Tripoli, 1913, *Vaccari 102* (FI). TUNISIA. Huet de Pavillion (K!). in collibus Zayhonan, 1852, *Kralik, s.n.* (K!); ITALY: in agro Ticinense, *Graves* (K!).

**Conservation status:** Due to its extensive distribution, there is no threat for this taxon.

5b. *Nigella arvensis* L. var. *aristata* (Sibthorp & Smith) Dönmez & Uğurlu

**Specimens examined:** GREECE. Attica, 1673, *Heldreich* (BEOU!, K!), Larissa, 1885, *Hauskn.* (JE); insula Euboea, Hagios Dimitrios, 1958, *Rechinger 19017* (G photo!). Siros: Island, Kini village, 176 m, 37°26'52.9"N, 024°55'35.4"E, 13 June 2009, *A.A.Dönmez 15459* (HUB!); *Phaleros*, (BEOU!). Rodhos, Archangelos, *Rechinger 8408* (W!); 2 km S of Faliraki village, 5 m, 36°20'12.2"N, 028°13'04.9"E, 18 June 2009, *A.A.Dönmez 15468-T.Karamplians* (HUB!). W. Aegean region: prov. Evvia, distr Karista, 250–350 m, 11 June 1975, *E.Stamatisdou* (ATH!). Peloponnisos: prov and distr. Korintha, 650 m, 8 August 1974, *E.Stamatisdou* (ATH!). Thessalia: prov. Larisa distr. *Elassona*, 340–350 m, 25 June 1971, *E. Stamatisdou* (ATH!). Sterea Ellas: prov and distr. Attiki, 11 km from Kalavrita along road to Flamboura, 700 m, *Strid & al. 30359* (ATH!); 4 km from village of Souli along road to Stimfalia, 800 m, *Strid 30668* (ATH!); Grevenon, just N of the village of Kipourto, 700 m, *Strid & K.Tan 47333* (ATH!). Thessalia: prov. Magnisia, distr. Volos, 600 m, 8 August 1972, *Thomas Raus* (ATH!). Khios, *Platt 356* (E photo!). Samos, *Fors.-Maj. 619* (type of *N. huthii* W!). Kalimnos, *Rechinger 7872* (W!). Kos, *Rechinger 8033* (W!). Macedonia: (BEOU!). CROATIA. Dalmatia, 1868, *Pichler 23* (BM!, BEOU!). SYRIA. Swedaa: TelHadid, Thali village, 871 m, 32°43'14"N, 036°30'60"E, 1 June 2009, *A.A.Dönmez 15445* (HUB!); The road Silamiya to Rsafa, 120. km, near Iteryia village, 35°14'55.7"N, 037°31'55.1"E, 1 June 2009, *A.A.Dönmez 15449*; Teltemur: Desert, 40 km from Rakkat, 1 June 2009, *A.A.Dönmez 15451*; *ibid. A.A.Dönmez 15452*. TURKEY. Muğla, *Davis 13580* (E photo!); Keşan, Mecidiye, around Army base, sand, 1 m, 13 July 1999, *A.A.Dönmez 7203*; Pınarhisar, Erenler village, 259 m, 41°38'10.8"N, 027°33'34.4"E, 5 August 2008, *A.A.Dönmez 15003* (HUB!); Çanakkale: Dardanelles, *Sint. 1883: 622* (E photo!); Kocaeli: Adapazarı-Akmeşe road junction, around Çınarcık, 36 m, 41°03'16.7"N, 030°11'23.1"E, 9 August 2010, *A.A.Dönmez 17626-Z.Uğurlu* (HUB!); Ankara: between Irmak–Kalecik, steppe, 700 m, 17 July 1993, *A.A.Dönmez 3536-H.Şağban et. al.* (HUB!); Hasanoğlan, above Taşocağı, limestone, 6 July 2008, *A.A.Dönmez 14969* (HUB!); Delice, Delice-Çoğul village road junction, 627 m, 40°00'24.1"N, 034°06'36.2"E, 30 June 2008, *A.A.Dönmez 14850* (HUB!). Yozgat: Yerköy, İhsangazili village, 702 m, 39°53'13.8"N, 034°05'11.6"E, 30 June 2008, *A.A.Dönmez 14852* (HUB!). Ankara: Yaşamkent, steppe, 20 July 2009, *A.A.Dönmez 15954* (HUB!); İzmir: Lydia, *Bornmüller 323* (E photo!); Ödemiş, Bozdağ, 1200 m, *P.H.Davis 18168* (E photo!). Kütahya/Eskişehir: Kütahya to Eskişehir, 900 m, *P.H.Davis 37005* (E photo!); Eskigediz-Hisarçık road, Akkaya village, 875 m, 39°04'39.7"N, 029°24'46.6"E, 21 September 2011, *A.A.Dönmez 17854* (HUB!); *ibid. A.A.Dönmez 17855-Z.Uğurlu* (HUB!). Uşak: Gönendi bridge, 1027 m, 38°50'29.8"N, 029°53'19.7"E, 21 September 2011, *A.A.Dönmez 17856-Z.Uğurlu* (HUB!). Niğde: Ulukışla,

1478 m, 37°32'10.2"N, 034°29'09.8"E, 23 July 2009, *A.A.Dönmez 15955-Z.Uğurlu* (HUB!); Ulukışla, Yeni Yıldız village, 1470 m, 37°33'30.7"N, 034°26'55.1"E, 13 July 2012, *A.A.Dönmez 18103-Z.Uğurlu* (HUB!); Ulukışla, 5 km from Ulukışla to Ereğli, 1480 m, 37°33'37.3"N, 034°26'15.6"E, 23 July 2009, *A.A.Dönmez 15962-Z.Uğurlu* (HUB!). Kayseri: Pınarbaşı, Sağamır village, 1438 m, 38°39'39.2"N, 035°59'06.7"E, 1 August 2009, *A.A.Dönmez 15983-Z.Uğurlu* (HUB!). Sivas: Malatya road, Altınyayla road junction, 1432 m, 39°24'18.6"N, 037°05'38.7"E, 22 July 2008, *A.A.Dönmez 14977* (HUB!). Malatya: from Gürpınar to Elbistan, 1498 m, 38°31'31.5"N, 037°21'10.5"E, 22 July 2008, *A.A.Dönmez 14981* (HUB!); Darende, 4 km from Yazıköy to Darende, 1349 m, 38°38'06.4"N, 037°27'047"E, 1 August 2009, *A.A.Dönmez 15984-Z.Uğurlu* (HUB!). Sivas: Divriği, above Akmeşe village, 1290 m, 39°28'15.7"N, 038°00'47.7"E, 10 July 2001, *A.A.Dönmez 9610-H.Dönmez* (HUB!); Divriği, Karasar Pass, 1750 m, 39°16'05.2"N, 038°00'00.3"E, 25 June 2005, *A.A.Dönmez 12398-A.I.Al-Shehbaz et al.* (HUB!). Bingöl: Yolçatı, 2 km from Yolçatı to Solhan, 1170 m, 38°56'35.0"N, 040°05'40.4"E, 6 July 2008, *A.A.Dönmez 14957* (HUB!). Aydın: Aydın to Muğla, 11 miles from Aydın, 50 m, *P.H.Davis 35370* (E photo!); Bozcaada, *Urv. s.n.* (E photo!). Isparta: Şarkikaraağaç, Beyşehir Lake, 1112 m, 37°57'46.8"N, 031°26'49.6"E, 23 July 2008, *A.A.Dönmez 14987* (HUB!); Gelendost, Bağlıllı village, 996 m, 38°09'07"N, 031°03'22.2"E, 23 July 2008, *A.A.Dönmez 14989* (HUB!); Bozkır, Üçpınar village, 1260 m, 37°06'18.0"N, 032°18'26.9"E, 3 July 2011, *A.A.Dönmez 17822-Z.Uğurlu* (HUB!). Antalya: Alanya, 23 August 1947, *Davis 14485* (holotype of *N. arvensis* subsp. *taurica* (E photo!)). Mersin: [İçel] Ferhenkür. Anamur, *P.H.Davis 16328* (E photo!); 1 km from Bozyazı to Silifke, Tosaklar village, 1 m, 36°06'05"N, 038°01'48"E, 24 July 2009, *A.A.Dönmez 15966* (HUB!); Bozyazı, Tosaklar village, 1 m, 36°06'05"N, 038°01'48"E, 2 September 2009, *A.A.Dönmez 16164-Z.Uğurlu* (HUB!). Hatay: Samandağ beach, 0 m, 36°03'41.2"N, 35°57'51.1"E, 30 May 2010, *A.A.Dönmez 16975-G.Zare* (HUB!). LEBANON. Bir Hassan, 1929, *Gombault 617* (P); Bekaa Valley: Hermal, 698 m, 34°23'38.4"N, 36°25'35.1"E, 10 June 2010, *A.A.Dönmez 17014* (HUB!).

**Conservation status:** Due to its extensive distribution, there is no threat for this taxon.

5c. *Nigella arvensis* L. var. *simplicifolia* Zohary

**Specimens examined:** TURKEY. Antalya: Yarış hamlet, in hedges, 140 m, fls. pale blue, *Ayaşlıgil 1675* (E). (holotype of *N. arvensis* var. *oblanceolata* P.H.Davis). IRAQ. Baghdad, Inter Tigris flumen et montes Jabal Hamrin, 40-50 km Samara, 4 May 1967, *Rechinger 9594* (W!); Diyala, 5 June 1957, *Rechinger 4666* (W!).

**Conservation status:** The taxon is known only from three populations, and there is no further information about number of the individuals in these populations. However, based on abundancy of herbarium material and our field experience in the area, it is assumed that the taxon is not common. Hence, this taxon could be considered as the Endangered: EN B1ab(iii,v)+2ab(iii,v) status according to the IUCN Red List criteria (IUCN 2016).

#### 6. *Nigella koyuncui* Dönmez & Uğurlu

**Specimens examined:** TURKEY. Sinop: Boyabat, Koçak village, 400 m, 20 July 1993, *A.A.Dönmez 3664-H. Şağban & A. Kahraman* (HUB!); Boyabat, 1.4 km from Uzunçay to Gökçeagaçsakızı, 442 m, 41°39'38.2"N, 034°36'56.4"E, 6 July 2009, *A.A.Dönmez 15801. Z.Uğurlu* (HUB!); ibid. 6 August 2009, *A.A.Dönmez 16019* (HUB!); ibid. 2 July 2010, *A.A.Dönmez 17223-Z.Uğurlu* (HUB!); ibid. 25 October 2010, *A.A.Dönmez 17475* (HUB!). IRAN. Gilan: Lahijan. from Assiahar to Daglaman, 1500–1600 m, 8 July 1972, *Tesone s.n.* (W!, EVIN!).

**Conservation status:** Only two populations were found with no more than 1000 mature individuals in a total area of about 1 km<sup>2</sup> in Turkey. The geographical distance between the two populations is about 10 km. Thus the species could be considered as the Critically Endangered: CR B1ab (iii,v)+2ab (iii,v) status according to the IUCN Red List criteria (IUCN 2016). The Gilan (Iran) specimen has not been considered for the IUCN threat category evaluation due to the limited available data about the population in Iran.

#### 7. *Nigella segetalis* M.Bieb.

**Specimens examined:** UKRAINE. Burundul, 1896, *Calliger 282* (E photo!). *Iter Tauricum*, In regione deserta et inculta prope pagum Karabai, *A.Calliger 889* (KW!). Tauria, *Herbarium D.Obniski s.n.* (KW!). Tauria, In segetalis pr. P. Koktebel, 19 September 1909, *A.Junge s.n.* (KW!). Crimea, Sudak, on vineyard, 2 July 1908, *M.Savenpovi s.n.* (KW!). Crimea, Feodosiysky district to the north-east from Kortebel, on the road to Barakol, Lare plain, 1 June 1948, *M.Kotov & E.Karnauck s.n.* (KW!). Crimea, Leninsky region, 23 June 1964, *I.Kuznetzove & S.Morosjuk s.n.* (KW!). Kiev, Kiev-Petrivka, 25 May 1989, *S.L.Mosjakin s.n.* (KW!). TURKEY. Kastamonu: Paphlagonia, Tossia [Tosya], 1892, *Sintenisi 4159* (W!, E photo!). Konya, in eampis, 1845, *Heldreich G photo!* (type of *N. bicolor* Boiss. et Heldr.). Erzurum: between Horasan and Pasinler, 1700 m, 1957, *P.H.Davis 29422* (E photo!). Van: Salt Lake, 1953, *Birand & Zohary 3533* (HUIJ). Ankara: Çubuk valley, 26 May 1939, *Bağda* (ANK!); Beytepe, 800 m, 9 June 1975, *S.Erik 1278* (ANK!, HUB!). Kırıkkale: Delice, 650 m, 8 May 1990, *A.A.Dönmez*

1852 (HUB!). Çankırı: Korgun, Aktaş village, 1282 m, 40°50'36.5"N, 038°34'52.7"E, 15 June 2008, *A.A.Dönmez 14403* (HUB!). Çorum: Bayat, between Bayat and Yukarı Lapa, ca. 750 m. 16 June 1977, *M. Kılınç 7077* (ANK!). Tokat: 15 km from Tokat, on Artova to Sivas road, 14 June 1939, *Reese* (E photo!). Yozgat: Akdağmadeni, Köklü district, 1500 m, 7 July 1980, *T.Ekim-A.Düzenli 4555* (ANK!). Sivas: Suşehri, from Suşehri to Gölova, Karayakup village, 1375 m, 40°12'03.1"N, 038°42'35.0"E, 1 July 2008, *A.A.Dönmez 14860* (HUB!). Malatya: around Altınyayla road junction, 1432 m, 39°24'18.6"N, 037°05'38.7"E, 22 July 2008, *A.A.Dönmez 14986* (HUB!). Gümüşane: Mt, *Sint.* 1889: *1305* (E photo!). Erzurum: Gümüşhane road, Pırnakapan village, 1680 m, 39°57'02.6"N, 040°34'04.2"E, 23 June 2005, *A.A.Dönmez 12342-I.A.Shehbaz et al.* (HUB!); Çoruh valley, N of Bayburt, 1500 m, *P.H.Davis 31993* (E photo!). Iğdır: Tuzluca, Turabi village Aras valley, 1006 m, 40°03'14.3"N, 038°45'15.4"E, 20 June 2003, *A.A.Dönmez 11411-B.Mutlu* (HUB!); Ardahan, Akarsu village, 1220 m, 41°06'46.9"N, 042°07'19.1"E, 4 July 2008, *A.A.Dönmez 14926* (HUB!). Ankara: Yaşamkent, 5 June 2010, *A.A.Dönmez 17719* (HUB!); Şereflikoçhisar to Aksaray, 930 m, *Hub.-Mor. 16209* (G photo!). Kars: Posof, 5 August 1982, *N.Demirkuş 1817* (HUB!). Kayseri: Karahisar, plain at foot of Erciyes Mt, 1200 m, *Bal. 59* (E photo!). Sivas: Gürün to Sivas, 1400 m, *Stn. & Hend. 5730* (E!). Erzincan: Erzincan to Refahiye, 1550 m, *Hub.-Mor. 14297* (G photo!). Erzurum: from Karakurt to Kağızman, 1256 m, 40°05'43.7"N, 042°47'01.2"E, 1 August 2009, *A.A.Dönmez 15985-Z.Uğurlu* (HUB!); Horasan to Pasinler, 1650 m, *P.H.Davis 30791* (E photo!). Muş: Yaygın, Nadaslı village, 1275 m, 38°53'28.9"N, 041°26'12.8"E, 6 July 2008, *A.A.Dönmez 14952* (HUB!). Muş: Malazgirt, 1500 m, 9 July 1916, *Schischkin.* (LE photo!). Ağrı: Doğubeyazıt, 29 June 2009, *A.A.Dönmez 15502* (HUB!); Konya: Küçük Köy nr. Çumra, *Helbaek 2475* (E photo!). IRAN: Env. of Urmia, 1916, *Schelkovnikov 100-16* (W!); Lurestan, Khorramabad, 10 May 1999, 1200 m, *Veissian* (TUH!). GEORGIA. Tibilisi, collector unknown (KW!). ARMENIA. Erivan, 1956, *Taer* (K photo!; type specimen of *Nigella segetalis* M.Bieb. var. *armena* (Stev.) Boiss.).

**Conservation status:** The species is known from several countries with several populations. There is not a distinct threat to this species, except common ecological problems. Hence, this species is not assigned to any threat category of the IUCN.

## 8. *Nigella sativa* L.



**Specimens examined:** GREECE. Khios, *Pauli* (W!). UKRAINE. Prov. Kiev, pr. oppid. Uman, cult. 2991 (K!). UZBEKISTAN. July 1933, *E.P.Silantyeva et al.* (E photo!). TURKEY. İstanbul: Rumelikavagi to Rumelifeneri, *Azn.* (E photo!). Kocaeli: Tuzla, 24 August 1898, *Azn.* (E photo!). Kastamonu: Kerenli village, 19 September 1985, *M. Gürbüş* (ISTE!). Balıkesir: around Atköy, 13 June 1970, *M.Okur 18* (ISTE!). Afyon: Reşadiye village, ca. 1680 m, 23 July 1983, *Y.Gemici 2499* (EGE!). Isparta: Şarkikaraağaç, 1150 m, 8 September 1996, *B.Mutlu 1779* (HUB!). Denizli: Altınyayla, 19 July 2002, *A.A.Dönmez 10915-E. Dönmez* (HUB!); Acıpayam, Gölcük village, Girengiz stream, 749 m, 37°11'14.3"N, 029°14'00.1"E, 2 July 2011, *A.A.Dönmez 17816-Z.Uğurlu* (HUB!); Altınyayla, 19 June 2002, *A.A.Dönmez 10915* (HUB!). Muğla: Köyceğiz, Sultaniye, 15–30 m, 21 May 1991, *A.Güner 9189-M.Vural et al.* (HUB!). Burdur: Çavdır, Söğüt village, 24 August 2009, 650 m, *A.A.Dönmez 16160-E.Dönmez* (HUB!). Konya: Ermenek, 21 June 1984, *H.Sümbül 2953* (HUB!). İçel: Mersin plain, *Bal. 727* (E photo!); Arslanköy road, 1 km, 293 m, 36°52'54.4"N, 034°34'32.8"E, 5 July 2011, *A.A.Dönmez 17842-Z.Uğurlu* (HUB!); 10. km on Arslanköy road, 293 m, 36°52'54.4"N, 034°34'32.8"E, 5 July 2011, *A.A.Dönmez 17831-Z.Uğurlu* (HUB!). Gaziantep: Gaziantep, *Aucher 93* (E photo!). Maraş: Maraş, 580 m, *Balls 1139* (E photo!); Maraş ca. 580 m, 24 May 1934, *Balls & Gourlay 1139* (ANK!). Siirt: Mar Jakub m. Siirt, 900 m, *Nabelek 2161* (E photo!). IRAN. Prov. Khorassan in valle fluvii Atrek in agris incultis, 1937, *Rechinger 801* (K!); Mashad, Ardahal, 2 July 1965, *A. Parsa 9263* (TUH!). IRAQ. NW of Kulba 1957, *Ravi 21123* (K!); Lorestan: Khorramabad, Veissian, 1200 m, *Neiskami 23810* (TUH!); Mazandaran: Toneckabon, 1967, *Ghahreman 9264* (TUH!). CYPRUS. Supra Lapithos, 1880, *Sintenis & Rigo 619* (K!). EGYPT. Spontaneo nci contorni di Alexandria (FI). AFGHANISTAN. *Griffith 38a* (K!).

**Conservation status:** The species is known from cultivated material in Turkey. *N. sativa* var. *hispidula* Boiss. is described from Turkey. Type location of this variety was visited and the population was found. Based on our observations of this population, these plants are likely escaped from cultivation and probably naturalized. Therefore, the species is accepted only as cultivated taxon in Turkey, and it is not assigned to any of the IUCN threat categories.

#### 9. *Nigella turcica* Dönmez & Mutlu

**Specimens examined:** TURKEY. Iğdır: Tuzluca, Turabi village, 1006 m, 40°03'14.3"N, 038°45'15.4"E, 30 May 2002, *A.A.Dönmez 10833-B.Mutlu* (HUB!); ibid. *A.A.Dönmez 10835-B.Mutlu* (HUB!); ibid., 20 June 2003, *A.A.Dönmez 11447-B.Mutlu* (HUB!); ibid., 13 May 2009, *A.A.Dönmez 15243* (HUB!); Ağrı: Doğubeyazıt, 29 June 2009, *A.A.Dönmez 15499* (HUB!).

**Conservation status:** Only one population was found with no more than 100 individuals in an total area of about 1 km<sup>2</sup>. The area were visited during three consecutive study years, and yearly fluctuations in number of fruiting individuals were recorded. The number of the individuals changes from 30 to 50 per year Furthermore, the area is under the threat of overgrazing pressure. Therefore, the species could be considered as the Critically Endangered: CR B1ab(iii,v)+2ab(iii,v) status according to the IUCN Red List criteria (IUCN 2016).

#### 10. *Nigella stellaris* Boiss.

**Specimens examined:** TURKEY. Adana: Osmaniye ca. 350 m, *Balls & Gourlay* (ANK!); Misis Mt., 20 May 1969, *A.Baytop, B.Çubukçu* (ISTE!). Mersin: Cilicia, plain of Tarsus, 1896, *Siehe 135* (G photo!); Mersin-Aslanköy road, 120 m, 27 May 1978, *A.Baytop, E.Tuzlacı* (ISTE!); Taurus, Bolkar dağları, 1859, *Kotschy 259* (G photo!); Amanus, Route de Beylan [Belen], 1932, *Delbes* (HUB!); Ermenek-Mut road, 200 m, 29 May 1981, *M. Koyuncu 4191-G.Sezik et al.* (HUB!); Silifke road, ca. 300 m, 15 May 1965, *Coode & Jones* (ISTF!). Kahramanmaraş: Süleymanlı, 800 m, 14 June 1981, *B. Yıldız 2652* (HUB!); plain of Tarsus, *Bal. Seyhan*: Feke, 600 m, *P.H.Davis 19648* (E photo!). Hatay: in cultis montis Cassii in regione inferiore inter Cassab (Yayladağı) et Suadiyeh, July 1846, *Boissier* (K!); Samandağ, Çevlik, around Titus tunnel, 28 March 2015, *A.A.Dönmez 19497-S.Kayıkcı*; Kasab, 40 m, 10 May 1945, *Norris* (E photo!); Seyhan: Osmaniye, 110 m, *Balls 1192* (E photo!). SYRIA. Mr. Nussairy [Jabal el Ansariye], Bahamra, 1909, *Haradjian 2683* (G photo!, E photo!).

**Conservation status:** The species is primarily known from the herbarium collections, with the most recent one being collected more than 30 years ago, to the exception of a single recent Turkish collection from Hatay by the present authors. All of the below given known collection sites and other possible locations in Turkey have been carefully investigated for the living individuals. However, without success, to this day. Nevertheless, it is too early for proposing the extinction of this species from all these areas. Therefore, due to existing collections from several different locations, we assume that the species lives still in nature with several locations, and we propose the Endangered: EN B1ab (iii,v)+2ab (iii,v) status according to the IUCN Red List criteria (IUCN 2016).

#### 11. *Nigella fumariifolia* Unger

**Specimens examined:** CYPRUS. Girne: Esentepe, 14 m, 35°21'38.5"N, 038°35'13.8"E, 14 July 2009, *A.A.Dönmez 15939* (HUB!); Lapta, Kayalar village, 5 m, 35°23'51.2"N, 032°57'05.6"E, 22 June 2011, *A.A.Dönmez 17786-H.Genç* (HUB!); Bei St. Chrysostome, 1889,

*Richter s.n.* (G photo!). Kyrenne, carob land, 1949, *Lasey 744* (K!); St. Hilarion 1941, *P.H.Davis 3618* (BM!). Drousa (Akamos), *P.H.Davis 23229* (E photo!); *Sintenis s.n.* Iter. Cyprus (COI!); in der Thalen bei Episcopi, *Kotschy 655* (syntype; K!); am Dorfe Finiaber Omodos, *Kotschy 741* (K!); In valle pr. Curium, ad Epistropi ai ad pagum Fini infra nuraterium Troodissa, *Kotschy 1862*, Herbarium Ernesti Huth (W!). CRETE. Distr. Sitia, 1942, *Rechinger 12674* (G photo!); Kasos, 1886, *Forsyth 884* (G photo!). Rodos: near Castelloso, 1948, *Goulyny* (K!). Paros: S. of Ventia, *Runemark et al. 41441* (E photo!).

**Conservation status:** The species is currently known from a few localities with not more than 50 individuals. The areas are under threat of tourism and settlements pressure. Therefore, conservation measurements are strongly needed. Actual threat status of the species is the Critically Endangered: CR B1ab (iii,v)+2ab (iii,v) according to IUCN Red List criteria (IUCN 2016).

## 12. *Nigella orientalis* L.

**Specimens examined:** GREECE. Lesvos, *Cand.* (E photo!). CAUCASUS. *Hohenacker*, ex. herb. Petropolit. (FI). Karabag, 1829, *Szovits 215* (K!); Iberia, *Wilhelm 55* (K!). TURKEY. Edirne: Edirne, İsmailce village, 6 July 1989, *G.Dalgıç 60335* (ISTE!). Kırklareli: Lüleburgaz, June 1954, *H.Peşmen s.n.* (ISTE!). Tekirdağ: Muratlı, 8 May 1989, *G. Dalgıç 60570* (ISTE!). Amasya: 1963, *Plitmann 97014* (HUIJ). Ağrı: Doğubeyazıt, Gürbudak road, Telçeken village, ca.1600 m, 24 June 1972, *T. Gözler, T.Kesercioğlu* (EGE!). Bitlis: west of the Ski lodge, 1700 m, 17 June 2004, *A.A.Dönmez 11945* (HUB!); Hizan, Tatik, 1850 m, 16 June 2000, *A.A.Dönmez 8047* (HUB!). Kars: Tuzluca (Grossheim 4: map 12). Konya: Bozkır, Harmanpınar village, 1208 m, 37°14'57.3"N, 032°10'17.7"E, 03 July 2011, *A.A.Dönmez 17819-Z.Uğurlu* (HUB!). İçel: 5 km of Mersin, s.l., *It. Leyd.* 1959: *1070* (E photo!). Adana: Pozantı-Gülek District, under *Juniperus excelsa* c. 1000–1300 m. 14 June 1991, *Y.Gemici 6264* (EGE!); Seyhan: Osmaniye, 110 m, *Balls 1192* (E photo!). Maraş: Ahir Mt, 900 m, *Balls 1127* (E photo!). Gaziantep, Sakçagözü Pass, Arapdede cemetery, 9 June 2001, *E.Akalın, U.Uruşak 80313* (ISTE!). Urfa: Urfa to Siverek, *Kotschy 59* (E photo!). Diyarbakır: Silvan, steppe, 16 June 1962, *C.Regel* (EGE!). Siirt, 1966, *P.H.Davis 4312* (K!). Mardin, Cizre to Hesana, *P.H.Davis 42723* (E photo!). SYRIA. Muslemie, 1931, *Zohary 200* (HUIJ); Jebel Druz, 1931, *Zohary* (HUIJ). Swedaa: from Azraa to Swedaa 20. km, 776 m, 32°48'24.1"N, 036°26'21.2"E, 1 June 2009, *A.A.Dönmez 15444* (HUB!); Swedaa: Tel Hadid, Thali village, 871 m, 32°43'14.0"N, 036°31'0.3"E, 1 June 2009, *A.A.Dönmez 15446* (HUB!); Sihan: Shahban, on the road of Shahbanad Murdk, 1043 m, 32°50'43.0"N, 036°37'18.4"E, 1 June 2009, *A.A.Dönmez 15442*

(HUB!). IRAN. inter Teheran et Tabriz, 1859, *Herb. Bungeanum* (K!). IRAQ. Mosul, 1841, *Kotschy 59* (K!).

**Conservation status:** The species has a wide distribution range according to the available collection data. However, almost everywhere habitats of the species are under threats, such as overgrazing, farming, etc. Despite the absence of a current extinction threat, the species should be monitored due to decreasing habitat sizes.

### 13. *Nigella oxypetala* Boiss.

#### 13a. *Nigella oxypetala* Boiss. var. *oxypetala*

**Specimens examined:** TURKEY. Izmir: (Lydia) Güme Dağ, *Bornmüller 1902* (K!). Konya: Beyşehir, 1937, *Reese s.n.* (HUI); Meram 7 June 1962, *Regel* (EGE!). Van: distr. Van, between Ahlat and Adilcevaz, 1964, *Zohary & Plitman 2163 20* (HUI). Erzurum: Gümüşhane road, Pırnakapan village, 1680 m, 39°57'02.6"N, 040°34'04.2"E, 23 June 2005, *A.A.Dönmez 12341-I. A.Shehbaz et al.* (HUB!). Kırıkkale: Delice, Çoğul village, 21 July 2008, *A.A.Dönmez 14975* (HUB!). Erzincan: Egin, Kemergoep, *Sint.* 1890: 2416 (E photo!). Malatya: Sürgü: Reşadiye Pass, limestone, 1500 m, 20 May 1989, *B.Yıldız 8597-E.Aktoklu* (EGE!). Tunceli: Pertek to Tunceli, 26 miles from Elaziğ, 1400 m, *P.H.Davis 29113* (E photo!). Elaziğ: Kovancılar, between Yarımca-Tepeköy, 992 m, 38°41'00.5"N, 039°47'58.1"E, 6 July 2008, *A.A.Dönmez 14962* (HUB!); N side of Hazar G., 1200 m, *P.H.Davis 29087* (E photo!). Bingöl: Yolçatı, 2 km from Yolçatı to Solhan, 1170 m, 38°56'35.0"N, 040°05'40.4"E, 6 July 2008, *A.A.Dönmez 14961* (HUB!). Erzurum: 24 km from Karakurt to Kağızman, 1256 m, 40°05'43.7"N, 042°47'01.2"E, 2 August 2009, *A.A.Dönmez 15986* (HUB!). Mersin: Mut, Çamlıca village, Akseki district, 307 m, 36°37'35.1"N, 038°16'16.0"E, 24 July 2009, *A.A.Dönmez 15964* (HUB!). Maraş: Süleymanlı, Avcılar village, 905 m, 37°50'03.9"N, 036°47'39.5"E, 22 July 2008, *A.A.Dönmez 14983* (HUB!). Gaziantep: Gaziantep, 900 m, *Balls 1156* (E photo!). Şırnak: Uludere, Taşdelen village, 28 June 2009, *A.A.Dönmez 15486* (HUB!); 26 km from Uludere road junction to Beytüşşebab, 1520 m, 37°22'23.6"N, 038°01'24.9"E, 17 June 2003, *A.A.Dönmez 11242* (HUB!). Hakkari: Canimaran, between Yüksekova and Şemdinli, c. 1900 m, 23 July 1981, *A. ve T.Baytop, A.Atilla 46772* (ISTE!). IRAN. *Aucher-Eloy 4021* (G photo!, type of *N. persica* Boiss.); Orumiyeh: Sangare Berzokhan, *Agustin 4726* (TUH!). Lorestan: Khorramabad, Neissian, 1100 m, 26 June 1999, *Veiskarami 2389* (TUH!). Fars: between Servestan & Fassa, 20 km to Fassa Mian-Jangal research station, 1700 m, 29 May 1991, *Jamzad & Taheri & Javidfask 69324* (TUH!); Shoulabad (50 km SW of Aligodarz), 1700 m, *Runemark & Lazari 26280* (TUH!); Isfahan: Semirom, Padena, between Tang-e Rigan and Deh-Bid, 1950

m, 11 June 1983, *Nawrooz* 2927 (TUH!); Chaharmahal-e Baktitvari: ca. 5 km from Lordegan to Banduman Park-e Jangali-e Doushalvary, 1640 m, 29 May 1986 *V. Mozaffarian* 54653 (TUH!). IRAQ. Arbil: Rawandiz, 1200-1800 m, *Thesiger* 1076; Wt. Qandil, between Shahidan et Pustashan, *Rechinger* 11731 (W!); Sulaymaniyah, 990 m, *Stutz* 1391 (W!). AZERBAIJAN. N. W. of Mahabad, 1962, *Furse* 3311 (K!). ARMENIA. 21 km N. of Erivan, 1919, *Grossheim* (BM!). SYRIA. Damascus: Das, Das from Surgaya to Bloudan around of the city, 30 May 2009, *A.A.Dönmez* 15439 (HUB!); in agris collinis pr. Aleppum [Haleb], 1841, *Kotschy* 216 (BM!); Swedaa: Shaf village, field margin, 1524 m, 32°38'10.8"N, 036°49'11.5"E, *A.A.Dönmez* 15447. LEBANON. pr. Bludan, 1855, *Kotschy* 77 (BM!). Bekaa: Yammounek, field margin, 1393 m, 34°08'38.4"N, 36°03'09"E, 10 June 2010, *A.A.Dönmez* 17026 (HUB!).

**Conservation status:** This variety grows in large areas, but it is not composed of individual-rich populations. However, due to extensive distribution range and absence of specific threats on this variety, it is not assigned to any IUCN threat category.

13b. *Nigella oxypetala* Boiss. var. *latisecta* (P.H.Davis) Dönmez & Uğurlu

**Specimens examined:** TURKEY. Kayseri, 1250 m, Balls 1127a (E photo!, type of *N. latisecta*). Kastamonu: Tosya, at Kavak Çeşme, *Sint.* 1892: 4138 (E photo!). Sivas: Suşehri, from Suşehri to Gölova, 1375 m, 40°12'03.1"N, 038°42'35"E, 1 July 2008, *A.A.Dönmez* 14857 (HUB!). Gümüşhane: N of Bayburt, 1500 m, *P.H.Davis* 31982 (E photo!, ANK!). Erzurum: Aşkale-Bayburt, 15 km, 5 July 1956, *N.Zeybek* (ISTF!). Kars: Kağızman, Tuzla, Gümüşlük, c. 1320 m, 20 June 1967, *G.Oğuz* (EGE!). Ankara: Ankara, 20 July 1909, *Freres de* (E photo!). Elazığ: Cip village, 6 June 1972, *Ş.Cirik* 22628 (ISTE!). Malatya: Arga to Malatya, *Post* 1906: 71 (E photo!). Tunceli: Hozat 1700 m, *P.H.Davis* 31125 (E photo!). Elazığ: Kharput, nr. Erzuruk, *Sint.* 1889: 808 (E photo!). Erzincan: Pigana, between Paschtasch (Bağıtaş) & Chostu on Euphrates, *Sint.* 1889: 995 (E photo!). Erzurum: W of Ilıca, 20 km from Erzurum, 1850 m, *P.H.Davis* 30856 (E photo!). Adana: Adana Zirai Mücadele Enstitüsü, 1969, *s.n.*, (ISTF!).

**Conservation status:** The species is widely distributed in Turkey, and it extends to SE Caucasus. As it has a large distribution range, there is not a specific threat for this variety; hence, it is not assigned to any IUCN threat category.

13c. *Nigella oxypetala* Boiss. var. *lancifolia* (Hub.-Mor.) Dönmez & Uğurlu

**Specimens examined:** TURKEY. Konya: Beyşehir to Konya, E. of Çandar, 6 July 1937, *Reese*; *ibid.*, *A. & T. Baytop s.n.* (GAZI!, ISTE 4348!). Isparta: Şarkikaraağaç, 16 July 1995, *B.Mutlu* 1524 (HUB!). Niğde: 5 km W of Ulukışla, *Sorger* 62-65-2 (E photo!); Ulukışla, 5 km from

Ulukışla to Ereğli, 1480 m, 37°33'37.3"N, 034°26'15.6"E, 23 July 2009, *A.A.Dönmez 15960* (HUB!).

**Conservation status:** The taxon is known only from four collections from central part of Turkey with less than 50 plant individuals in a total area of about 0.5 km<sup>2</sup>. These four populations are far away from each other (i.e. ca. 70 km). All known habitats are under agricultural and overgrazing threats. When plants are present as weeds in agricultural areas, herbicides usage is an additional threat for the populations of the taxon. Thus the variety could be considered as Critically Endangered: CR B1ab (iii,v)+2ab (iii,v), according to the IUCN Red List criteria (IUCN 2016).

#### 14. *Nigella ciliaris* DC.

**Specimens examined:** SYRIA. Jebel Druz, Sueda [Es Suweidiya], 1931, *Zohary 101* (HUI!); Homs, 1931, *Zohary 152* (HUI); Mrs. Nussairy [Jebel el Ansariye], Bahamra, 1901, *Haradjian 2682* (K!). Swedaa: From Azraa to Swedaa 20. km, 776 m, 32°48'24.1"N, 036°26'21.2"E, 31 May 2009, *A.A.Dönmez 15443* (HUB!). Calesyria: Chlora, 29 May 1893, *E.Peyron* (P photo!). Alep, Louis, 17 May 1931, *Frère* (P photo!). Djillîn (Syrie du sud), 2 May 1934, *R. Gombault* (P photo!). près du Nahr Abzach, 24 June 1934, *R.Gombault* (P photo!). au Jebel Barouk, 28 May 1933, *R. Gombault* (photo P!). Fick (Syrie du Sud), 13 April 1932, *R.Gombault* (P photo!). Tartous, 4 May 1931, *R.Gombault* (P photo!). Mogharat el Soukh, nécropole tyrienne à l'est de Tour, 7 April 1858, *C.Gaillardot* (P photo!). Megharat-el-Soukh, nécropole tyrienne et bords de l'aqueduc phénicien, à l'est de Sour, 7 April 1858, *C.Gaillardot* (P photo!). Damascus: 1830, *Aucher-Eloy, 56* (P photo!). PALESTINE. cultivé dans le jardin de M.Boissier, 1848, *G. F. Reuter* (P photo!). 1846, *C.Pinard* (P photo!). Inter Caïpham et Nazareth, 1 April 1887, *N. Jullien* (P photo!). Carmel, etc., 1846-4, *E. Boissier* (P photo!). Haifa, in monte Carmel, c. 100 m, 6 May 1897, *Bornmüller* (P photo!, WU!). LEBANON. pr. Tyrmn, *Gaillardot* (E photo!). Beirut: *Post 18* (FI, Post Herbarium!); Beirut: Hasmié, 26 April 1891, *E. Peyron* (P photo!). Beirut: 25 April 1866, *A.Lagrange* (P photo!). Ash Shamal Akkar Baynu N of Baynu, 13 June 1943, *P.H.Davis 6418* (K!). Chema (Liban sud), 12 April 1933, *R.Gombault* (P photo!). Ain Jedidi, 17 May 1931, *R. Gombault* (P photo!). Beirut: *E.G.Camus* (P photo!). environs de Saida, 20 March 1853, *C.I. Blanche* (P photo!). Beyrouth, 15 March 1831, *C.I.Blanche* (P! photo). Jabal Lubnan Aley Shimlan, 715 m, May 1959, *Maitland 495* (K!). ISRAEL. Upper Galilee, 1954, *Zohary 820* (HUI). Judean Mts., Tel Gath, *Ginzburg 66* (HUI). CYPRUS. Inter Rhizo Carpasso et Galinoperni, 1880-4-28, *P.E.E.Sintenis, & Rigo* (P! photo).

**Conservation status:** The species is known from several collections from Syria and the neighbouring countries in the Middle East. Collection sites of the species are far from each other and the total distribution area is more than 20.000 km<sup>2</sup>. In spite of its extensive distribution area, the species does not have any dense populations, and there are no recent collections in all these areas. Thus, the species could be considered as the LC status according to the IUCN Red List criteria (IUCN 2016).

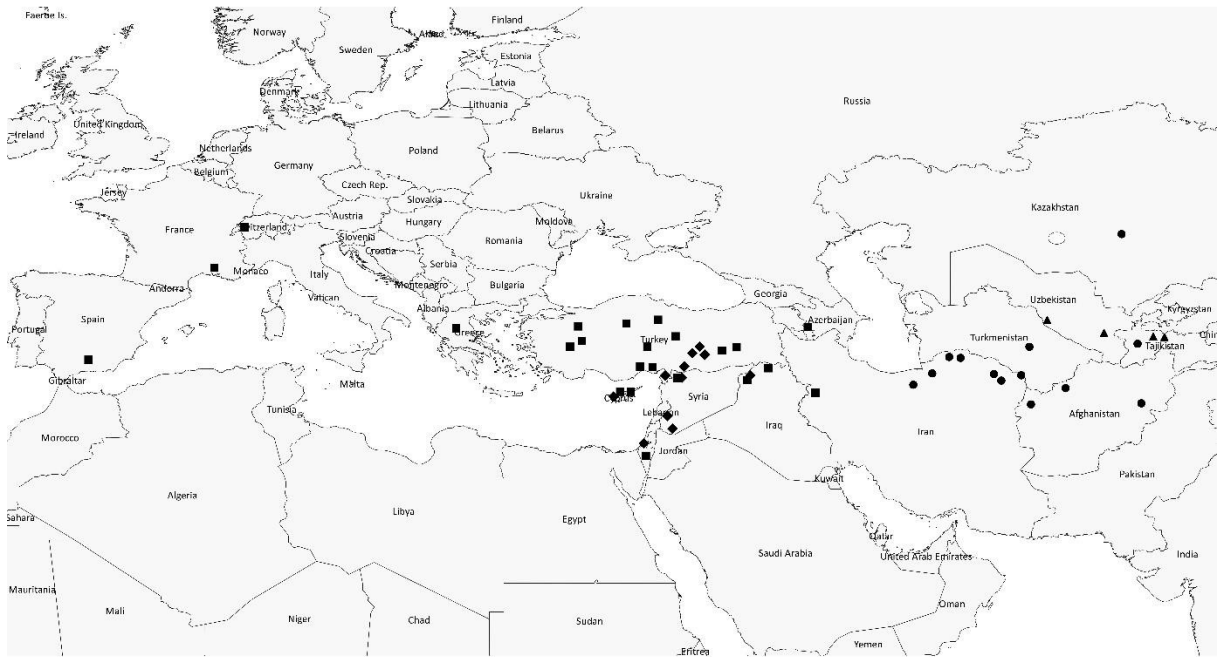
## Supplementary Material\_Supplement 2

### Distribution Maps

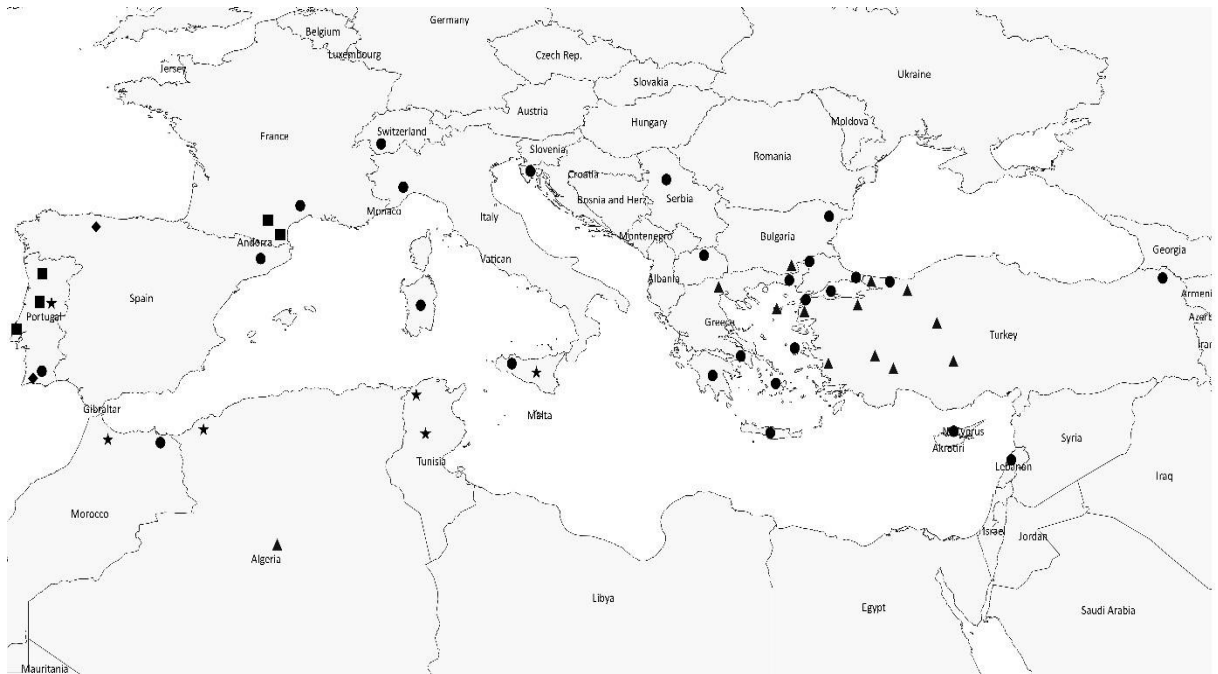


Supplement 2 Figure 1. Distribution ranges of the three genera of *Nigelleae*.

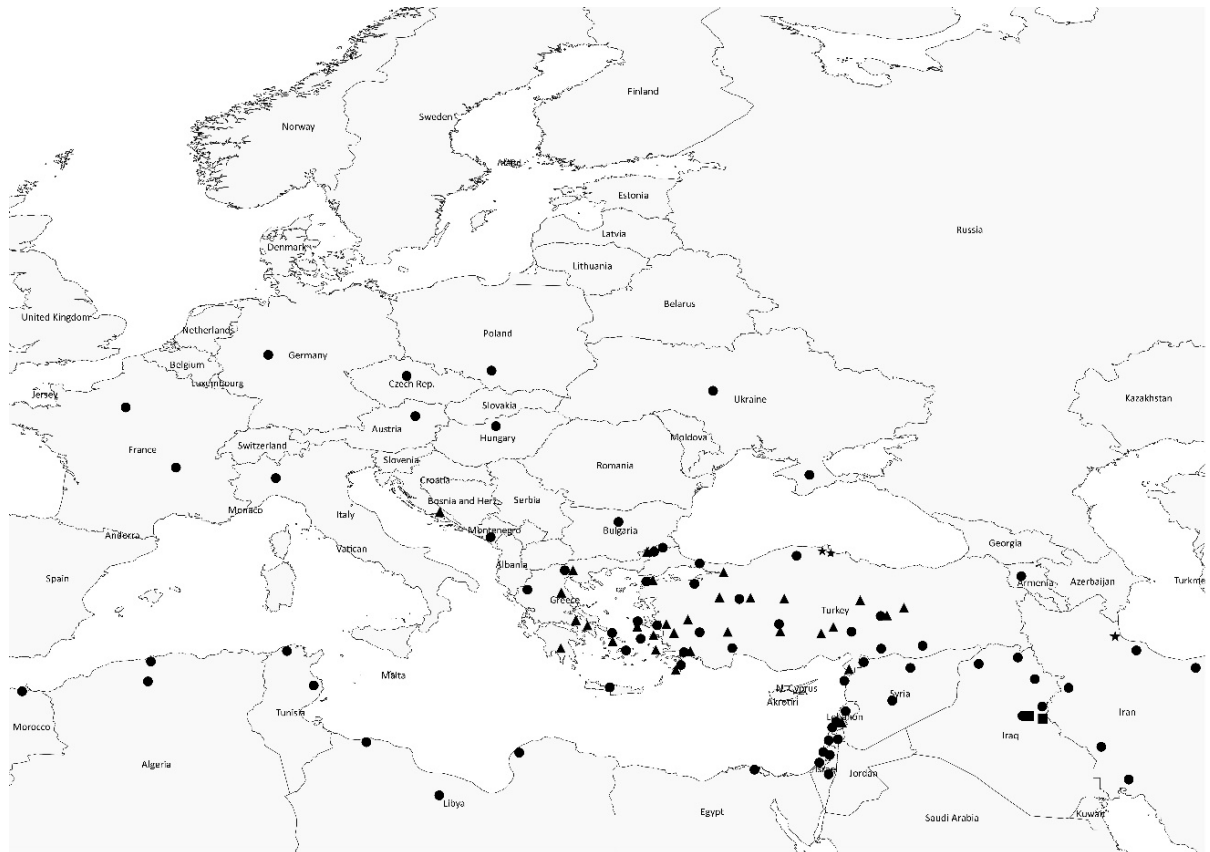




**Supplement 2 Figure 2.** Occurrences of *Komaroffia* and *Garidella*, based on the investigated herbarium specimens and collected materials. *Komaroffia integrifolia* (●). *K. bucharica* (▲). *Garidella unguicularis* (■). *G. nigellastrum* (◆).



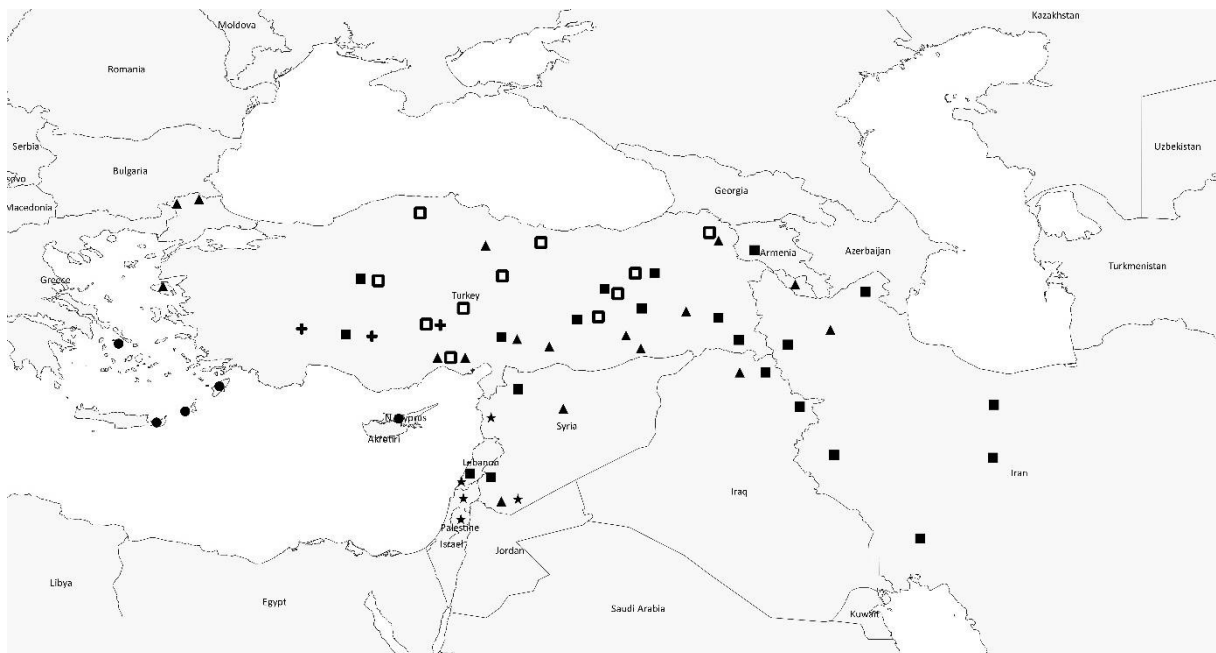
**Supplement 2 Figure 3.** Mediterranean occurrences of *Nigella damascena* (●). *N. elata* (▲). *N. gallica* (■). *N. papillosa* subsp. *papillosa* (◆). *N. papillosa* subsp. *atlantica* (★).



**Supplement 2 Figure 4.** Distribution ranges of *N. arvensis* var. *arvensis* (●). *N. arvensis* var. *aristata* (▲). *N. arvensis* var. *simplicifolia* (■). *N. koyuncui* (★) based on the studied herbarium material.



**Supplement 2 Figure 5.** Occurrences of *Nigella segetalis* (●), *N. sativa* (▲), *N. turcica* (■), *N. stellaris* (★), depicted based on the herbarium specimens studied.



**Supplement 2 Figure 6.** Occurrences of *Nigella fumariifolia* (●), *N. orientalis* (▲), *N. oxypetala* var. *oxypetala* (■); *N. oxypetala* var. *latisecta* (□); *N. oxypetala* var. *lancifolia*, based on the studied herbarium specimens.