A taxonomic revision of *Veronica* sect. *Beccabunga* in Egypt: confirmation with new additions

Monier Abd El-Ghani[1], Mohamed Karam[2], Faten Abd El-Baky[2] & Refaat Ali[2]

[1] The Herbarium, Faculty of Science, Cairo University, 12613 Giza, Egypt, e-mail: elghani@yahoo.com(corresponding author)

[2] Botany Department, Faculty of Science, Fayoum University, 63514 Fayoum, Egypt

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Abstract. This article presents a taxonomic revision of the genus *Veronica* (sect. *Beccabunga*) from Egypt. The morphological characters in about 800 herbarium specimens are examined, as well as in fresh material collected from natural habitats. Ten taxa are identified, including *V. anagalloides* subsp. *anagalloides* and *V. anagalloides* subsp. *heureka,* as two new additions to the flora of Egypt. A full taxonomic treatment with a key to the species is given. Some important characters are described used in this key. The results also confirm the occurrence of *V. anagallis-aquatica* var. *anagallis-aquatica* and *V. catenata* var. *catenata* in Egypt. A doubtful occurrence of *V. kaiseri* (endemic to Sinai) in the Fayoum region would need further verification.

Key words: Egypt, flora, key, *Plantaginaceae*, *Scrophulariaceae*, taxonomy, *Veronica*

Introduction

Veronica is the largest genus in the tribe *Veroniceae* (within the *Plantaginaceae* sensu APG (Angiosperm Phylogeny Group) 2003, formerly a part of *Scrophulariaceae*), with 450 species, which has recently been redefined to include the Australasian species of the *Hebe* complex (Albach & al. 2004a; Garnock-Jones & al. 2007). The species of *Veronica* is mainly distributed in temperate regions of the Northern Hemisphere (Hong 1984), in many parts of the Southern Hemisphere (Raven 1975) and in Australasia (Albach & al. 2004a). It is highly diverse ecologically, with species growing in aquatic to dry steppe habitats, from the sea level to the high alpine regions. This diversity and the fact that many species have beautiful blue flowers may explain the interest in *Veronica* for a long time (Albach & al. 2005a).

The genus *Veronica* has traditionally been considered a member of the *Scrophulariaceae*. However, recent extensive molecular investigations of this and related families have demonstrated that the traditional *Scrophulariaceae* are polyphyletic (Olmstead & Reeves 1995; Olmstead & al. 2001; APG 2003; Oxelman & al. 2005). Consequently, *Veronica* has been transferred to the *Plantaginaceae* (Albach & al. 2005b; Olmstead 2005). The taxonomic history of *Veronica* clearly illustrates the difficulties arising in recognition of natural (monophyletic) groups within the genus based only on morphological traits, due to the fact that many of the traditionally used taxonomic characters are evolutionary unstable and, therefore, unsuitable for taxonomy (Albach & al. 2004b). The taxonomic complexity of the genus is due to several polymorphic subgenera, sections and species groups consisting of closely related taxa, although the genus itself is rather well characterized and delimited, as is demonstrated by the fact that in the early 20th century the genus *Veronica* still included *Hebe* and allied genera. Among a number of approaches to the study of *Veronica*, the taxonomic

or cytotaxonomic investigations of Pennell (1921), Li (1952) and Fischer (1978, 1981) stand out. The most comprehensive taxonomic studies on the genus, including formal subgeneric classification, were made by Römpp (1928), Stroh (1942) and Borissova (1955).

Much of the diversity of plant life in the Mediterranean region is based on the processes coupled with the tectonic events since the Oligocene. Axelrod (1973) identified four major environmental factors influencing the evolution of the Mediterranean flora: topographic, edaphic, climatic, and biological, which help to understand the evolutionary patterns in *Veronica*. Parallel evolution is common in the genus, because these changes have influenced a group of related species that evolved phenotypic and genotypic correspondences, probably as a result of identical selection pressures (Albach & al. 2004c).

A new intrageneric classification of *Veronica* has been proposed by Albach & al. (2004a) based mainly on molecular data, although considering also a combination of morphological, ultrastructural, biogeographical, and phytochemical characters. In this classification, several genera segregated from *Veronica* in the last two centuries have been resubmerged (e.g., *Hebe, Pseudolysimachion*, and *Synthyris*). Therefore, this classification based also on the concept of monophyletic taxa needs either to lump up some well recognized genera into a large genus *Veronica* s.l., or to split *Veronica* into several small genera that partly seem impossible to separate by morphological or structural characters. Albach & al. (2004a) discussed the advantages and disadvantages and concluded that it is best to recognize a large genus *Veronica* (including *Hebe, Parahebe, Chionohebe, Heliohebe, Detzneria, Derwentia, Pseudolysimachion, Synthyris* and *Besseya*), with 13 subgenera viz. *Beccabunga, Chamaedrys, Cochlidiosperma, Derwentia, Hebe, Pellidosperma, Pentasepalae, Pocilla, Pseudolysimachium, Stenocarpon, Synthyris, Triangulicapsula,* and *Veronica.* Even on morphological grounds, one of the most recent splitters of *Veronica* maintained that it is "desirable to keep them (the remaining species of the genus) all in a single genus, *Veronica*" after the separation of two species as genus *Oligospermum* and of ten species as genus *Cochlidiosperma* (Hong 1984).

Following the old above mentioned authors like Römpp (1928), Fischer (1981) arranged genus *Veronica* into five sections: namely *Beccabunga, Paederotoides*, *Pocilla* (= *Alsinebe*), *Veronica,* and *Veronicastrum*. The section *Beccabunga* comprises two subsections *Beccabunga* (= *Eubeccabunga*), and *Anagallides* (= *V. anagallis-aquatica* aggr.). The former subsection does not possess any grave taxonomical problems; in remarkable contrast, the latter one, *V. anagallis-aquatica* aggr., is an extremely confusing complex of several closely interconnected species and subspecies (Chrtek & Osbornová-Kosinová 1981; Öztürk & Fischer 1982; Saeidi & Kharabian 2005). According to Albach & al. (2008), *Veronica* subg. *Beccabunga* consists of three sections: *Beccabunga* (Hill) Dumort., *Acinifolia* (Römpp) Albach and *Alsinebe* subsect. *Serphyllifolia* G. Don.

In Egypt, Chrtek & Osbornová-Kosinová (1981) recognized five taxa belonging to sect. *Beccabunga* (*V. anagallis-aquatica*, *V. catenata* subsp. *pseudocatenata*, *V. anagalloides* subsp. *taeckholmiorum*, *V. scardica* subsp. *africana* and *V. kaiseri*). Recently, Boulos (2002) identified in Egypt 11 taxa of *Veronica* belonging to subgenus *Beccabunga*. This subgenus is divided into two sections: *Beccabunga* and *Alsinebe* (= *Pocilla*). The latter includes *V. anagallis-aquatica*, *V. catenata* subsp. *pseudocatenata*, *V. anagalloides* subsp. *taeckholmiorum*, *V. scardica* subsp. *africana* and *V. kaiseri* (= *V. musa*), and the former includes *V. persica*, *V. polita*, *V. campylopoda, V. rubrifolia* subsp. *respectatissima*, *V. syriaca,* and *V. biloba*. Table 1 summarizes the available information about the Egyptian taxa of *Veronica*, section *Beccabunga,* as reported in the earlier works on the flora of Egypt.

Economically, in traditional medicine some *Veronica* species are used as diuretic, for wound healing and against rheumatic pains (Baytop 1984; Fujita & al. 1995). Furthermore, several other species are used in the treatment of cancer, influenza, hemoptysis, laryngopharyngitis, hernia, cough and respiratory diseases, as well as an expectorant and antiscorbutic agent (Tomassini & al. 1995; Su & al. 1999; Graham & al. 2000; Saracoglu & al. 2002, 2004; Harput & al. 2004).

The present study is a critical revision of *Veronica* sect. *Beccabunga* in Egypt in an attempt to unravel some perplexities in its taxonomic complexity.

Material and methods

Field work was conducted for a two-year period (2007–2008) to collect fresh samples of the studied *Veronica* species in their natural habitats, and field ob-

Table 1. Summary of available information of the Egyptian taxa of *Veronica* (section *Beccabunga*) as recognized and reported in earlier workers of the Flora of Egypt: + = present; – = absent ;× = recorded as synonym.

Species	Taxa	Authors												
		1	2	3	4	5	6	7	8	9	10	11	12	13
1. *V. anagalloides*	Ang.	–	+	+	+	+	+	×	×	–	–	–	–	–
	H.	–	–	–	–	–	–	–	–	–	–	–	–	–
	T.	–	–	–	–	–	–	–	–	+	+	+	+	+
2. *V. anagallis-aquatica*	Q.	–	–	+	–	+	+	+	+	–	+	+	–	+
	N.	–	–	–	–	–	–	–	+	+	–	–	+	–
3. *V. catenata*	C	–	–	×	×	–	–	×	×	–	–	–	+	–
	Pc	–	–	–	–	–	–	–	–	+	–	+	×	+
4. *V. scardica*	S.	–	–	–	–	–	–	–	–	+	+	+	+	+
5. *V. beccabunga*	B.	–	–	–	–	+	–	+	+	–	–	–	–	–
6. *V. kaiseri*	K.	–	–	–	–	–	–	+	+	+	+	+	+	+
7. *V. musa*	M.	–	–	–	–	–	–	–	+	–	×	×	+	×
No. of taxa	**11**	**0**	**1**	**2**	**1**	**3**	**2**	**3**	**4**	**5**	**4**	**5**	**6**	**5**

Taxa abbreviations

Ang: *V. anagalloides* subsp. *anagalloides*
H: *V. anagalloides* subsp. *heureka*
T: *V. anagalloides* subsp. *taeckholmiorum*
Q: *V. anagallis-aquatica*
N: *V. anagallis-aquatica* var. *nilotica*
C: *V. catenata* var. *catenata*
Pc: *V. catenata* subsp. *pseudocatenata*
S: *V. scardica* subsp. *africana*
B: *V. beccabunga*
K: *V. kaiser*
M: *V. musa*

Authors

1. Forsskål (1775)
2. Boissier (1879)
3. Ascherson & Schweinfurth (1887, 1889)
4. Sickenberger (1901)
5. Muschler (1912)
6. Ramis (1929)
7. Täckholm (1956)
8. Täckholm (1974)
9. Chrtek & Osbornová-Kosinová (1981)
10. El Hadidi & Fayed (1995)
11. Boulos (1995)
12. El Hadidi & al. (1999)
13. Boulos (2002)

servations were carried out in several localities. Furthermore, morphological data of the Egyptian taxa of *Veronica* were also based on the herbarium collections kept in the major Egyptian herbaria: Cairo University (CAI), Agricultural Museum (CAIM), and National Research Centre (CAIRC). Specimens were also examined for variation in morphological characters. More than 800 specimens were collected and examined with a MS003A binocular head zoom stereo microscope. The investigated areas were in the western Mediterranean coastal strip and the Nile Valley. For each species, the specimens were grouped according to the phytogeographical regions of Egypt (Wickens 1977) and were given nomenclature, typification, representative specimens, local and general distribution. For nomenclature, literature was consulted, e.g., Täckholm (1974), Chrtek & Osbornová-Kosinová (1981), Fischer (1981), El Hadidi & Fayed (1995), Boulos (1995, 2002), El Hadidi & al. (1999). Abbreviations of the authors' names follow Brummitt & Powel (2001).

Key to the taxa of *Veronica* sect. *Beccabunga*

1. Stems procumbent or ascending; leaves mostly petiolate **2**

1*. Stems erect; lower leaves petiolate **3**

2. Lamina broadly oblong, ovate or subelliptic; inflorescences opposite; capsule 2.4–4(–5.5) mm, as long as the calyx . . . . . **5.1.** *V. beccabunga* subsp. *beccabunga*

2*. Lamina somewhat rhombic to suborbiculate; inflorescences often alternate; capsule (2–)2.5–3(–3.5) mm, slightly shorter than calyx . . . . . **4.1.** *V. scardica* subsp. *africana*

3. Capsule with acute apex, as long as the calyx or slightly longer **4**

3*. Capsule with rounded apex, as long as the calyx or shorter **5**

4. Lamina suborbicular to broadly elliptic; inflorescences alternate; capsule 2.5 × 2.2–2.5 mm, as long as the calyx lobes . . . . . **6.** *V. kaiseri*

4*. Lamina ovate-elliptical to lanceolate; inflorescences opposite; capsule 2.5–3 mm long and wide, slightly longer than the calyx ..... **2.2.** *V. anagallis-aquatica* var. *nilotica*

5. Upper leaves ovate-lanceolate to lanceolate; capsule orbicular **6**

5*. Upper leaves lanceolate to linear lanceolate; capsule elliptical **9**

6. Bracts shorter than flower and fruit pedicels, lanceolate **7**

6*. Bracts longer than flowers and fruit pedicels in the 1st and 2nd flower in inflorescence, upper bracts leafy lanceolate ..... **3.2.** *V. catenata* subsp. *pseudocatenata*

7. Lower leaves shortly petiolate, leaves 120 mm long, 40 mm wide; pedicel erect; capsule often shorter than calyx ..... **2.1.** *V. anagallis-aquatica* var. *anagallis-aquatica*

7*. Lower leaves sessile, leaves broader and shorter (90 × 25 mm); pedicel patent; capsule normally as long as the calyx or slightly longer **8**

8. Leaves oblong-ovate to oblong-lanceolate, leaf base amplexicaule-truncate, margin entire; raceme lax, with 15–25 flowers; style >2 mm lon ..... **3.1.** *V. catenata* var. *catenata*

8*. Leaves ovate to ovate-lanceolate, base attenuate, margin serrulate or denticulate; raceme dense, with 10–40 flowers; style < 2 mm long ..... **1.2.** *V. anagalloides* subsp. *heureka*

9. Leaves lanceolate to linear-lanceolate (20–25 × 3–12mm); bract longer than pedicel; style 1–1.3 mm long; capsule smaller, as long as calyx or slightly longer ..... **1.3.** *V. anagalloides* subsp. *taeckholmiorum*

9*. Leaves lanceolate, up to (15) mm wide, leaf base truncate; bract less than or as long as pedicel; style 0.6–1.5 mm long; capsule large, 1–2 times as long as calyx ..... **1.1.** *V. anagalloides* subsp. *anagalloides*

Taxonomic treatment

Veronica L.

Veronica sect. ***Beccabunga*** (Hill) Dumort., Fl. Belg.: 35 (1827); *Veronica* subg. *Beccabunga* (Hill) M.M. Mart. Ort., Albach & M.A. Fisch., Taxon 53(2): 438 (2004); ≡ *Beccabunga* Hill, Brit. Herb.: 94 (1756); ≡ *V.* subsect. *Beccabunga* (Hill) Elenevsky, Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 82(1): 153 (1977).

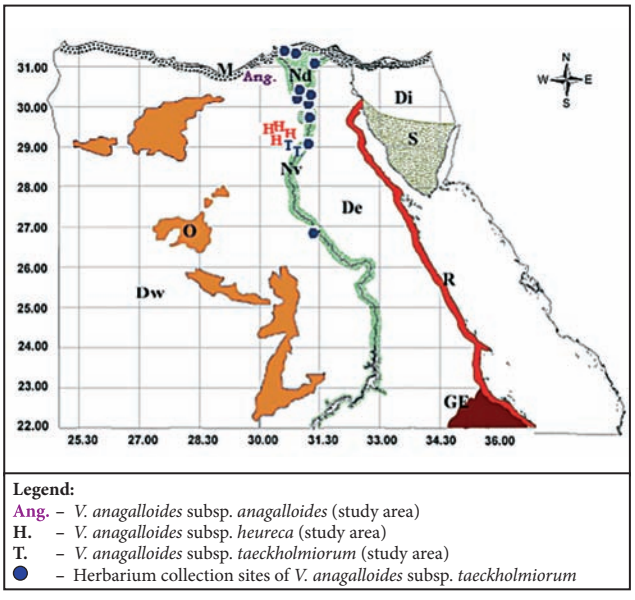
Type: *Veronica beccabunga* L.

1. *Veronica anagalloides* Guss., Pl. Rar. 5: tab. 3 (1826) (Fig. 1).

Type: Italia, "In stagnis depressis Calabriae orientalis, prope Catanzaro al fiume Magliacane", *Gussone* (PAL).

1.1. *Veronica anagalloides* subsp. ***anagalloides***; *V. haussknechtii* Boiss., Fl. Or. 4: 438 (1879); *V. comosa* K. Richt., Denkschr. Akad. Wiss. Wien Math.-Naturwiss. Kl. 50(2): 24 (1885); *V. anagallis-aquatica* subsp. *anagalloides* (Guss.) Rouy, Fl. Fr. 11: 39 (1909); *V. villicaulis* Bornm., Dansk Bot. Ark. 15(4): 44 (1955).

Annual, seldom perennial herb, stem erect, unbranched or branched in the middle (seldom at base), blackened when dry, solid (10–)15–50(–80) cm, glabrous, seldom glandular-pubescent. Leaves opposite, sessile, linear-lanceolate, (15–)25–35(–80) mm long, (2–)3–10(–15) mm wide, semi-amplexicaule, with truncate bases and acute apices. Margin serrulate to subentire, glabrous or with very scattered glandular hairs (seldom upper glandular-pubescent). Inflorescences axillary racemes, arising in opposite pairs, up to 150 mm, peduncle 10–20(–30) mm long, 20–60-flowered, glandular hairs, seldom glabrous. Bracts (1–4) mm long, linear to subulate, with acute apices. Pedicels (3–)5–7(–8) mm long, (1–)1.5–2-



Legend:
Ang. – *V. anagalloides* subsp. *anagalloides* (study area)
H. – *V. anagalloides* subsp. *heureca* (study area)
T. – *V. anagalloides* subsp. *taeckholmiorum* (study area)
● – Herbarium collection sites of *V. anagalloides* subsp. *taeckholmiorum*

Fig. 1. Distribution of the studied specimens of the taxa of *V. anagalloides*.

(–2–5) times the length of the bracts, subpatent to erecto-patent or slightly arcuate, or hooked beneath the flower. Calyx (1–2) mm long, corolla rotate, pale-blue, pale-lilac, or white with purple veins, 5 mm in diameter. Style (0.6–14.5) mm. Capsule elliptic, turgid with cuneate base, apex slightly emarginate, 2–3(–4) mm long, 1.7–2.5 mm wide, longer than wide, 1–2 times the length of the calyx, with very scattered minute glandular hairs. Seed elliptic to suborbicular, plano-convex, 0.4–0.7 mm long. Flowering: April to October.

Specimens studied. M: Alexandria, Rashid, 01.06.2007, *Abd El-Ghani* & *al.* s.n. (CAI).

Habitat and distribution. Wet places: stream banks, lake shores, marshes, ditches, coastal dunes, saline soils, cultivated lands. Rarely in the Mediterranean Costal Region (Rashid).

General distribution. Northwestern Turkey, southwestern, southern, and central Anatolia, Central and South Europe, North Africa, Caucasia, Iran, Afghanistan, Central Asia, Mongolia, West and North China, Korea, Japan.

1.2. *V. anagalloides* subsp. ***heureka*** M.A. Fisch., Fl. Iranica 147: 158 (1981).

Type: Iraq: Kurd., Sul.: M. Avroman prope Tawilla, 1400 m, 15–18.06.1957, *Rechinger* f. 10290 (**holotype**, W).

Annual herb, stem erect, often branched, 5–20 (–60) cm tall, completely glabrous. Leaves opposite, sessile, ovate to ovate-lanceolate, 6–(8–)15–35-(–60) mm long, (4–)8–20(–30) mm wide. Base wide, occasionally subtriangular, apices acute to obtuse, with margin smoothly serrulate, or denticulate to subentire and glabrous. Inflorescences axillary, racemes, arising in opposite pairs up to 100 mm. Peduncle (5–)10–20 mm (10–)15–30(–40)-flowered, 3–7 pedicels per cm, sparsely glandular–pubescent. Bracts elliptic, with acute apices 2–6 mm long. Pedicel (4–)5–8(–10) mm, (1–)1.5–2(–3) times the length of the bract, patent, often curved beneath the flower. Calyx 1–3 mm long. Corolla pale-blue, pale-lilac, pink or white, 3–6 mm in diameter. Style 0.9–1.8 mm long. Capsule suborbicular, or broadly ovate, ± turgid, rounded or truncate at base. Apex rounded-obtuse or slightly attenuate, entire or slightly emarginate, (2.5–)3.5(–4) mm long, 2–3.5(–4) mm wide. Seed widely elliptic, plano-convex, smooth, 0.4–0.8 mm long. Flowering: March to September.

Specimens studied. Nv: Fayoum, Azbet Safer, 05.05.2007, *Yousef* (FAY); El-Zawaia, 14.04.2008, *Yousef* (FAY); El–Edwa, 1.6.2008, *Yousef* (FAY); Etsa, El-Gharaq, 03.04.2007 & 29.02.2008, *Yousef* (FAY); Tamiya, El Maasara, 01.06.2008, *Yousef* (FAY).

Habitat and distribution. In diverse humid habitats, in and along rivers, around wells and springs, in swamps, on lake shores, on granite and limestone, in sulphurous springs; (25–)500–1500(–3100) m. Fayoum Governorate.

General distribution. Sinai, Turkey (scattered), Southwest Asia to Pakistan, perhaps also in Central Asia and western Himalaya.

1.3. *V. anagalloides* subsp. ***taeckholmiorum*** Chrtek & Osb.-Kos., Folia Geobot. Phytotax. 16: 426 (1981); *V. anagallis-aquatica* L. var. *anagalloides* sensu Täckh., Stud. Fl. Egypt, ed. 2: 498 (1974).

Type: Bechtim situ septentr. ab opp. Kahira, prope rivum inter agros, 04.04.1977, *Chrtek*, *Kosinová*, *Slavíková* (**holotype**, PRC).

Annual, occasionally biennial herb. Stem erect, laterally and occasionally basely branched or unbranched, black when dry, (10–)15–40(–60) cm tall, glabrous or seldom with single glandular hairs. Leaves opposite, sessile, lanceolate to linear-lanceolate, 20–55 mm long, 3–12 mm wide. Amplexicaule-truncate or amplexicaule-subcordate at base, with acute or subacute apices with serrate to subentire margin, glabrous. Inflorescence of axillary racemes, arising in opposite pairs. Racemes 30–70(–150) mm long, straight to arcuate. Peduncle (5–)10–20 mm, densely flowered, (3–)4–7(–9) flowers per cm. Bract elliptic, with subobtuse apices, 2–4(12) mm, pedicel (1.5–)2–3(–5) mm long, shorter than the bract, straight or slightly curved upward in fruit. Calyx 1.5–2(–3) mm long and 0.6 mm wide, oblong to linear sepals, with green margin and obtuse apices. Collora pale-blue to pale-violet, seldom white with violet veins, 2–3.5 mm in diameter. Style 1–1.3 mm long. Capsule elliptic, (1.7–)2–2.5(–3) mm long, 1.3–2(–2.2) mm, as long as calyx or slightly longer, glabrous or sparsely glandular hairy. Seed elliptic to suborbicular, plano-convex, smooth, 0.5–0.6 mm long. Flowering: March to May.

Specimens studied. Nv: El Mahmudia, Minyet El Said, 14.08.1970, *Ibrahim* & *al.* s.n. (CAI); El Beheira Governorate, El Mahmudia, 25.04.1987, *Amer* 10205 (CAI); El Beheira Governorate, Damanhur, 18.03.1988, *Amer* 16173 (CAI); Mansoura, near the

town, 9.07.1971, *Imam* s n. (CAI); Ismailia, El Bassayla (Arab-Tufeila), 20.03.1982, Amer 1711 (CAI); Miniet El Qamh, 31.03.1958, *Boulos* s.n. (CAI); Cairo–Bilbeis road, 01.04.1949, *Täckholm* s.n. (CAI); Ashoum, 01.03.1942, *Shabetai* z6194 (CAIM); Abu Zaabal, 11.04.1946, *Shabetai* z.5936 (CAIM); Barrage, spring 1955, El Hadidi s.n. (CAI); Barrage, 30.03.1956, *Täckholm* s.n. (CAI); Qalyub, El Shobak, 22.04.1927, *Sabet* s.n. (CAI); Cairo, El Marg, 14.03.1880, *Schweinfurth* 195 (K) & (CAI); De Marg, north of Cairo, 14.01 & 08.11.1908, *Hartmann* s.n. (CAI); El Marg, 15–17.03.1948, *Khattab* 1230 & 1228 (CAIM); El Marg, 27.04.1948, *Shabetai* 1353 (CAIM); Giza, Kom El Ahmer, 22.03.1931, Drar z2143 (CAIM); Shubra, 18.12.1947 *Shabetai* z6938 (CAIM); Turah, south of Cairo, 10.04.1967, *El Hadidi* s.n. (CAI); Abu El Numros, 14.04.1922, *Simpson* 1029 (K), Saqqara, 15.03.1927, *G. Täckholm* s.n. (CAI); Giza, Dahshur, 8.04.1974, *Helmy* s.n (CAIM); N of Medinet El Fayoum, El Alam, 26.03.1923, *Simpson* 2128 (CAIM), El-Zawia, 14.04.2008, *Yousef* (FAY); Etsa, Fayoum, 15.03.1909, *Maire* s.n. (CAI); Faiyum, Itsa, 02.06.1983, *Abd El-Ghani* 6352 (K); Faiyum, Tamiya, 17.04.1984, *Abd El-Ghani* 7225 (K); Sohag-Khazindaria, 20.01.1986, *El Hadidi* s.n. (CAI).

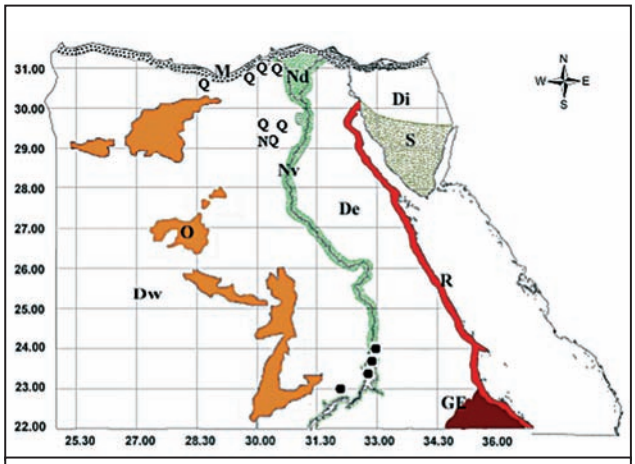
Habitat and distribution. In diverse humid habitats, in and along rivers, around wells and springs, in swamps, on lake shores, along irrigated fields. In the Nile Delta and northern part of the Nile Valley, south of El Minya.

Notes. *Veronica anagalloides* is represented by three subspecies, viz., *V. anagalloides* subsp. *anagalloides*, *V. anagalloides* subsp. *heureka* and *V. anagalloides* subsp. *taeckholmiorum*. The examined material of subspecies *heureka* differed from that of subsp. *anagalloides* and subsp. *taeckholmiorum* mainly by (a) wider and shorter leaves, and (b) suborbicular (not elliptical) and larger capsule. Whereas the differences between the subsp. *anagalloides* and subsp. *taeckholmiorum* were mainly in: (1) the relation of pedicel and bract – subsp. *taeckholmiorum* have a longer bract than pedicel (up to 1 cm), very dense inflorescence (up to 9 flowers per cm) and a small-size capsule, while subsp. *anagalloides* has a bract equal or shorter than pedicel, and (2) the density of flowers in inflorescence is lower than in other subspecies (up to 7 flowers per cm) and the capsule is relatively large. In a long debate on the occurrence of *V. anagalloides* in Egypt, Chrtek & Osbornová-Kosinová (1981), El Hadidi & Fayed (1995), El Hadidi & al. (1999), and Boulos (1995, 2002) referred to the occurrence of *V. anagalloides* subsp. *taeckholmiorum* and did not refer to subsp. *anagalloides* and subsp. *heureka*. The present results correspond to the findings of all earlier mentioned authors referring to the occurrence of *V. anagalloides* subsp. *taeckholmiorum*. Some of the collected specimens were identified as *V. anagalloides* subsp. *anagalloides* and *V. anagalloides* subsp. *heureka,* which are considered new records for the flora of Egypt.

2. *Veronica anagallis-aquatica* L., Sp. Pl. ed. 1: 12 (1753) (Fig. 2).

2.1. *V. anagallis-aquatica* var. ***anagallis-aquatica***

Perennial or annual herb, rhizomatous. Stem erect or procumbent, usually branched up to the middle, often with repent vegetative branches at base. Usually thick-succulent, (20–)30–100(–120) cm tall, glabrous. Leaves opposite, lower leaves shortly petiolate (but those of basal lateral branches usually distinctly petiolate), upper sessile. Lamina of lower leaves ovate, elliptic or oblong, obtuse, narrowing towards the top, acute. The middle and upper ones broadly lanceolate, (15–)30–80(–120) mm long, (7–)10–30(–40) mm wide, cordate-amplexicaule, often subauriculate and enlarged, with uppermost occasionally slightly cuneate-and acute apices, margin serrulate, denticulate to subentire, glabrous, seldom uppermost glandular-pubescent. Inflorescence of axillary racemes, arising in opposite pairs (50–120 mm long),



Legend:
● – Herbarium collection sites of *V. anagallis-aquatica* var. *nilotica*
N. – *V. anagallis-aquatica* var. *nilotica* (study area)
Q. – *V. anagallis-aquatica* var. *anagallis-aquatica* (study area)

Fig. 2. Distribution of the studied specimens of the taxa of *V. anagallis–aquatica*.

peduncle mostly 20–40 mm long, (20–) 30–40 (–60)-flowered, with 3–7 pedicels per cm in fruit, glabrous or glandular-pubescent. Bracts linear to lanceolate, with acute apices and 2–4 mm long. Pedicel 4–7(–10) mm in fruit, 1–2(–3) times the length of the bract, suberect, arcuate-erect, subpatent, curved upwards in fruit. Calyx 2–3 mm long in flower, lobes ovate-lanceolate, with apices acute. Corolla rotate, lavender to pale-blue or pale-lilac, 4–8 mm in diameter. Style 1.5–2.5 mm. Capsule subglobose, slightly compressed, orbicular, apex rounded or only very slightly emarginate, (2.5–)3–3.5 (–4) mm long, 2.5–3.2(–4) mm wide, equals calyx or slightly shorter, glabrous or sparsely shortly glandular-pubescent. Seed elliptic to suborbicular, plano-convex, smooth, (0.3–)0.5–0.7 mm long. Flowering: March to November.

Specimens studied. M: Borg El-Arab, New Borg El-Arab, 01.06.2007, *Abd El-Ghani* & *al.* (FAY); Abo-Qier; El Siouf, Ele'waayd, 01.06.2007, *Abd El-Ghani* & *al.* (FAY); Rashid, domain of El Salts, 01.06.2007, *Abd El-Ghani* & *al.* (FAY); **NV:** El Beheira Governorate**,** Mahmudiya, 01.06.2007, *Abd El-Ghani* & *al.*; Fayoum, Menshat Abd-Allah; 21.03.2007, *Yousef* (FAY); Fayoum, Azbet Safer, 05.05.2007, *Yousef* (FAY); Fayoum, El Moror, 02.04.2008, *Yousef* (FAY); Fayoum, Howara Adlan, 23.02.2008, *Yousef* (FAY), Fayoum, Sinnures, Azbet Abd-El Azem, Menshat Beni Othman and Menshat Tantway, 10.03.2007, *Yousef* (FAY); Fayoum, Sinnures, domain El Sheikh Ebeid, 05.02.2007, *Yousef* (FAY); Fayoum, Sinnures, Mtrtaars, 07.02.2007, *Yousef* (FAY); Fayoum, Etsa, El-Gharq, 23.02.2007, 13.04.2007 & 29.02.2008, *Yousef* (FAY).

Habitat and distribution. Streams, ditches, banks, springs, swamps, wet meadows, a.s.l. 4000 m. Distribution: almost cosmopolitan, in Asia at higher altitudes. It has been reported from the Nile Delta and Nile Valley by Muschler (1912: 877), as well as by Täckholm (1956: 131, 1974: 498).

General distribution. Widespread in temperate regions of the world including also various tropical African montane areas.

2.2. *V. anagallis-aquatica* var. ***nilotica*** R. Uechtr., in Asch. & Schweinf., III. Fl. Égypte 2: 117 (1889); Muschl., Man. Fl. Egypt 2: 877 (1912); Ramis, Best.–Tabell., Fl. Aegypt. 168 (1929); Täckh., Stud. Fl. Egypt ed. 1: 131 (1956); Täckh., Stud. Fl. Egypt ed. 2: 498 (1974).

Annual herb, stem erect, ascending unbranched or occasionally branched, 20–30 cm tall. Glabrous to glandular pubescent throughout inflorescence. Leaves opposite, few, basal leaves attenuated to short petiole, ovate-elliptical to lanceolate, 6–20–40 × 11–8 mm, subcordate or cuneate at base,± acute apices with entire to serrate margin, glabrous or sparsely glandular hairy. Inflorescence of axillary racemes, arising in pairs, but the first one arises single. Racemes 60–100 mm long, peduncle (5–)15–20 mm, ± lax flowers, (each 1 cm with 3–4 flowers). Bracts narrow rhombic or elliptical and with acute apices, 2–6 mm long. Pedicel 2–, 3–4 mm long, ascending. Calyx, 1.8–2.5 × 0.8–1 mm, ovate-oblong or elliptical, with minutely papillose-erosulate margin and acute apex. Corolla pink, 2-3 mm in diameter. Style 0.8–1.5 mm long. Capsule orbicular or broadly elliptical, with acute apex, 2.5–3.3 × 2.3–3 mm, slightly longer than the calyx; sparsely glandular hairy. Seed elliptic to suborbicular, plano-convex, smooth, 0.6–0.7 mm long. Flowering: March to August.

Specimens studied. NV: Nile shore at mountains Silsila, Kom Ombo, 11.02.1964, *Täckholm* (CAI); Aswan, Dance Island, 19.01.1978, El Hadidi (CAI); Aswan, Nile bank at the Cataract Hotel, 02.07.1967, *El Hadidi* & *Ghabbour* (CAI); Ballana 23.04.1964, *Boulos* (CAI); Aswan, Abu Simbel, 14.03.1963, *Aallah* 1597(CAIM); Fayoum, Etsa, cultivated land of El-Gharq, 03.02.2007 & 13.04.2007, *Yousef* (FAY).

Habitat and distribution. The Nile Delta and Nile Valley (Aswan) by Muschler (1912: 877), Täckholm (1956: 131, 1974: 498).

Notes. *Veronica anagallis-aquatica* is a polymorphic species. It has been discussed differently by several authors (Täckholm 1956, 1974; Boulos 1995, 2002; El Hadidi & Fayed 1995), who confirmed the occurrence of *V. anagallis-aquatica* in Egypt. The finds run against the opinion of Chrtek & Osbornová-Kosinová (1981) and El Hadidi & al. (1999), who reported an absence of *V. anagallis-aquatica* in Egypt and mentioned the presence of *V. anagallis-aquatica* var. *nilotica* in the country, particularly in Aswan. Meanwhile, the present study partially agrees with all previously mentioned authors, confirming the occurrence of both taxa *V. anagallis-aquatica* var. *anagallis-aquatica* and *V. anagallis-aquatica* var. *nilotica*. In the present study, some specimens of *V. anagallis-aquatica* var. *nilotica* were collected from cultivated lands of the Fayoum Governorate, in accordance with Täckholm (1956, 1974) who mentioned occurrence of this variety in the Nile Delta and Nile Valley as a rare taxon.

3. *Veronica catenata* Pennell, Rhodora 23: 37 (1921) (Fig. 3).

Type: Hot Springs, South Dakota, collected in flower and fruit June 16, 1892, *P.A. Rydberg* 926 (**holotype**, NY).

3.1. *V. catenata* var. ***catenata***

Perennial or annual herb. Stem erect or ascending, branched, 15–60(–80) cm long, glabrous. Leaves opposite sessile, oblong-ovate to oblong-lanceolate, (5–)25–50(–90) mm long, 5–15(–25) mm wide. Leaf base amplexicaule-truncate or amplexicaule-subcordate and with acute apices, margin entire or subentire. Inflorescence of axillary racemes, arising in opposite pairs, 100–160 mm long, peduncle mostly 10–30 mm long, lax, 15–25-flowered, bow-like, with less than 3 pedicels per cm, glabrous or sparsely to densely short-glandular hairy. Bracts oblong, with obtuse apices, 1–4 mm long. Pedicel 1.8–4 mm long, much shorter than the bract, patent. Calyx 5–3 mm long, narrow ovate, with obtuse sepals. Corolla white to pale-pinkish with darker veins, short of the margin, (4.6–)4.8–5.1(–5.3) mm in diameter. Style 1.3–2.5 mm long. Capsule obcordate to orbicular, emarginate to notched for 0.1–0.3 mm at apex, 2.5–3(–3.5) mm long, 3–4 mm wide, occasionally wider than long to equally wide as long; indumentum like inflorescence. Seed elliptic to suborbicular, plano-convex, smooth, 0.4–0.7 mm long. Flowering: June to October.

Specimens studied. Nv: Fayoum, Menshat Abd-Allah, 21.03.2007, *Yousef* (FAY); Fayoum, Azbet Safer, 05.05.2007, *Yousef* (FAY); Fayoum, Howara Adlan, 23.02.2008, *Yousef* (FAY); Fayoum, Sinnures, Azbet Abd El-Azem; Menshat Beni Othman and Menshat Tantway, 10.03.2007, *Yousef* (FAY); Fayoum, Sinnures, domain El Sheikh Ebeid, 05.02.2007, *Yousef* (FAY); Fayoum, Sinnures, Matrtaars, 07.02.2007, *Yousef* (FAY); Fayoum, Etsa, El-Gharq, 23.02.2007, 13.04.2007 & 29.02.2008, *Yousef* (FAY).

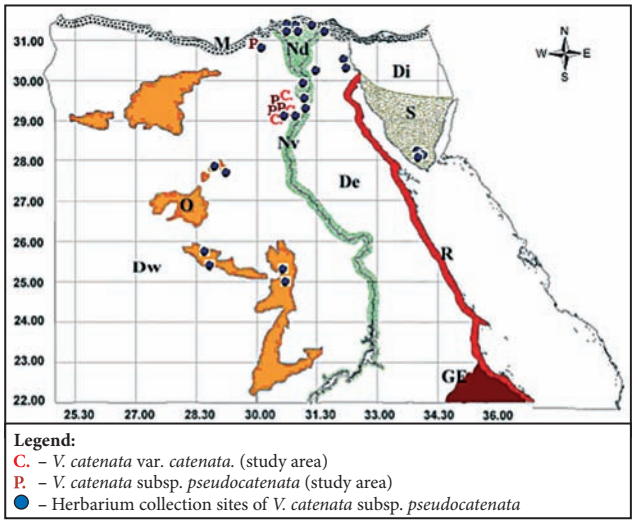


Fig. 3. Distribution of the studied specimens of the taxa of *V. catenata*.

Habitat and distribution. Calcareous springs, rills, sloughs, ditches and shores. The Nile Valley, Fayoum.

General distribution. North America, Europe, North Africa and Asia (Fischer 1981).

3.2. *V. catenata* subsp. ***pseudocatenata*** Chrtek & Osb.-Kos., Folia Geobot. Phytotax., 16: 430 (1981); *V. aquatica* Bernh., Begriff Pfl.-Art: 66 (1834), non S.F. Gray; Asch. & Schweinf., III. Fl. Égypte 2: 117 (1887); Sickenb., Mèm. Inst. Égypt. 4, 2: 265 (1901); *V. anagallis-aquatica* var. *aquatica* sensu Täckh., Stud. Fl. Egypt ed. 1: 131 (1956); Täckh., Stud. Fl. Egypt ed. 2: 498 (1974).

Type: Káhira, 27.03.1974, *Zouhar* (**holotype**, PRC).

Perennial herb, stem ± erect, unbranched or densely branched, 30–70 cm tall, occasionally tinged purple, robust, fistulous, glabrous. Leaves opposite, first pair petiolate from base, lamina of lower leaves oblong, 35 mm long and 10 mm wide, with entire margin and subacute apices. The middle and upper ones oblong-ovate to oblong-lanceolate or lanceolate, 40–60 mm long, 15–25 mm wide. Leaf margin serrate and acute to obtuse apex, leaf base amplexicaule-subcordate, glabrous. Inflorescence of axillary racemes, arising in opposite pairs, occasionally arising single at lower part, 100–160 mm, peduncle mostly 10–30 mm long, lax, 15–45 flowered, bow-like, with less than or equal to 3 pedicels per cm, glabrous or sparsely to densely short-glandular hairy. Bract leafy in primary flowers and decreasing in size when ascending up to 12 mm. Pedicels 5–7 mm long, not longer than decreasing in size bract when ascending, patent. Calyx 3–3.5 mm long, 1–1.5 mm wide ovate-oblong, with entire margin, occasionally with appendages and acute apex. Corolla pale-bluish lilac or bright sky-blue, 2.8–3 mm long. Style 1.5–2 mm long. Capsule obcordate to orbicular, 2.8–3.2 mm, with rounded apex, occasionally wider than long to equally wide as long, slightly shorter than the divergent calyx, glabrous. Seed elliptic to suborbicular, plano-convex, smooth, 0.5–0.6 mm long. Flowering: January to June.

Specimens studied. M: Geneina El Sobbari Haitin near lake Mariut, 18.11.1926, *Drar* 4184 (CAIM); Alexandria, Miska at Victoria, 09.10.1923, *Simpson* 2194 (K); Abo-Qier, El Siouf-Ele'waayd, 01.06.2007, *Abd El-Ghani* & *al.* (FAY); El Boseili near Rosetta, 06.05.1976, *Khanagry* & *Mokhtar* 246 (CAIM); El Hammad, Masraf El Gadia, Markaz Rashid, 23.09.1971, *Boulos* & *al.* (CAI); Rashid, domain of El Salt, 01.06.2007, *Abd El-Ghani* & *al.* (FAY); **Di:** Ezbet El Madrasa, 25.04.1980, *El Bakry* 7 (K); Ismailia, at Timsah Lake, south of the town, 18.3.1927, *G. Täckholm* s.n. (CAI); **Nv:** El Mattaria, Dakahila, 21.05.1967, *Täckholm* s.n. (CAI); El Gedia, Kafr El Sheikh, 03.04.1993, *Shamso* s.n. (CAI); Mansoura, near the town, 09.04.1971, *Imam* s.n. (CAI); El Beheira Governorate, Ityai El Barud, 18.11.1987, *Amer* 14881 (CAI); El Beheira Governorate, Kom Hamada, 15.04.1988, *Amer* 16755 (CAI); Tanta, 05.04.1975, *Gazzar* s.n. (CAI); Masraf Bilbeis, 04.01.1926, *Simpson* 3545 (CAIM); Barrag, 06.03.1952, *El-Hadidi* s.n. (CAI); Barrag, El Qanitir El Khairia, 30.03.1956 & 14.04.1961, *Täckholm* s.n. (CAI); Nouzha, 19.04.1913, *Bolland* B739 (CAIM); Cairo, Guezireh, 22.02.1911, *Täckholm* s.n. (CAI); Giza, 10.3.1917, *Drar* s.n. (CAIM); Giza farm, 27.02.1922, *Simpson* 650 (K); El Saff, 02.04.1967, *El-Hadidi* & *al.* s.n. (CAI); Faiyum, El Alam, 26.03.1923, *Simpson* 2121(K) & (CAIM); El Fayoum, El Alam, 04.01.1939, *Shabetai* 7007 (CAIM); Fayoum, Kom Aushim, 18.03.1977, *Täckholm* s.n. (CAI); Fayoum, Kafr Mahfous, Beni Osman, 20.11.1972, *El-Hadidi* s.n. (CAI); Fayoum, Menshat Abd-Allah, 21.03.2007, *Yousef* (FAY); Fayoum, Ezbet Safer, 05.05.2007, *Yousef* (FAY); Fayoum, El Moror, 02.04.2008, *Yousef* (FAY); Fayoum, Howara Adlan, 23.02.2008, *Yousef* (FAY); Fayoum, Menshat Senures, 17.05.1972, *Abbas* & *al.* 3109 (CAIM); Fayoum, Sanhur El Bahariya, 15.05.1972, *Abbas* & *al.* 3081(CAIM); Sinnures, Ezbet Abd El-Azem, Menshat Beni Othman and Menshat Tantway, 10.03.2007, *Yousef* (FAY); Sinnures, domain El Sheikh Ebeid, 05.02.2007, *Yousef* (FAY); Sinnures, Matrtaars, 07.02.2007, *Yousef* (FAY); Ibshawai district, Shakshouk, 10.04.1982, *Abd El-Ghani* 3601 (CAI); Ezbet Anabe, El Shawashna, 14.05.1972, *Abbas* & *al.* 3049 (CAIM); Gebel Saad, El Shawashna, 15.08.1972, *Abbas* & *al.* 3182 (CAIM); Fayoum, ditch near Shakshuk, 26.05.1922, *Simpson* 1304 (CAIM); Fayoum, Feb 1932, *Oliver* s.n. (CAI); Fayoum, Ezbet El Newish, 22.06.1980, *Abbas* & *El Hediny* 8 (CAIM); Etsa, 15.03.1909, *Maire* s.n. (CAI); Faiyum, Itsa district, 02.01.1983, *Abd El-Ghani* 4853 (CAI); Etsa, El-Gharq, 23.02.2007, 13.04.2007 & 29.02.2008, *Yousef* (FAY); **O:** Bahariya Oasis, Bawiti, Ain Bishmu, along irrigation canal, 18.02.1980, *Abd El-Ghani* 2413 (CAI); Bahariya Oasis, El Heiz, 20.03.1940, *Drar* 52 (CAIM); Dakhla Oasis, 13.03.1913, *Bolland* s.n. (CAIM); Dakhla Oasis, Rashda, 11.03.1929, *Shabetai* z552 (CAIM); Dakhla Oasis, Hindaw, 11.03.1931, *Hassib* s.n. (CAI); Dakhla Oasis, Bir El Sheikh Badran, Hindaw, 06.03.1934, *Shabetai* z4388 (CAIM); Dakhla Oasis, Bir El Kodia, 17.03.1967, *El Hadidi* & *al.* s.n. (CAI); North of Kharga Oasis, 23.01.1924, *Simpson* 2147 (K); Kharga Oasis, 15.01.1928, *G. Täckholm* s.n. (CAI); Kharga Oasis 16.10.1928 & 12.03.1929, *Drar* s.n. (CAIM); Kharga Oasis, 09.02.1931, *Sabet* s.n. (CAI); Kharga Oasis, 28.02.1935, *Drar* 20.09.1935 (CAIM); El Kharga, 20.03.1962, *Sharobim* & *Shalaby* 1683 (CAIM); **S:** Feiran Oasis, 05.05.1939, *Drar* 269 (CAIM); S Sinai, G. Musa, 20.04.1962, *Shalaby* & *El-Hedini* 1005 (CAIM); S Sinai, Wadi Catherine, 20.04.1962, *Khattab* & *al.* 1039(CAIM); Convent El Arabain, at the foot of St Catherine, 16.04.1937, *Shabetai* z4193(CAIM); **R:** Hurgada, 04.03.1936, *Nasr* s.n. (CAI).

Habitat and distribution. Wet places, seldom in running water, lake shores, reeds, ditches, muddy places, old riverside arms; below 2500 m. Occurs in the Nile Delta, Nile Valley, Fayoum and the Western Desert Oases. Once collected along the Red Sea coast in Hurghada.

General distribution. Egypt and Libya.

Note. The results of the present work agree with Chrtek & Osbornová-Kosinová (1981) about the occurrence of *V. catenata* subsp. *pseudocatenata* in Egypt. They also suggest the occurrence of *V. catenata* var. *catenata* in Egypt, as some of the collected specimens showed its diagnostic characters.

4. *Veronica scardica* Griseb., Spicil. Fl. Rumel. 2: 31 (1844); *V. gracilis* Uechtr. ex Velen., Abh. Böhm. Ges. 7(1): 35 (1886), non R. Br., Prodr. Fl. Novae Hollandiae (1810); *V. velenovskyi* Uechtr., Bot. Jahrb. 8. Literaturber.: 46 (1887); *V. bascensis* Simonk., Oesterr. Bot. Z. 38: 107 (1888) (Fig. 4)

Type: In Albania boreali: gregarie in sylvis umbrosis pr. Confluentiam utrusque Drinii [Kukës] locis udis, c. 200 m, substr. Diorite. [1839] *Grisebach* (GOET, G).

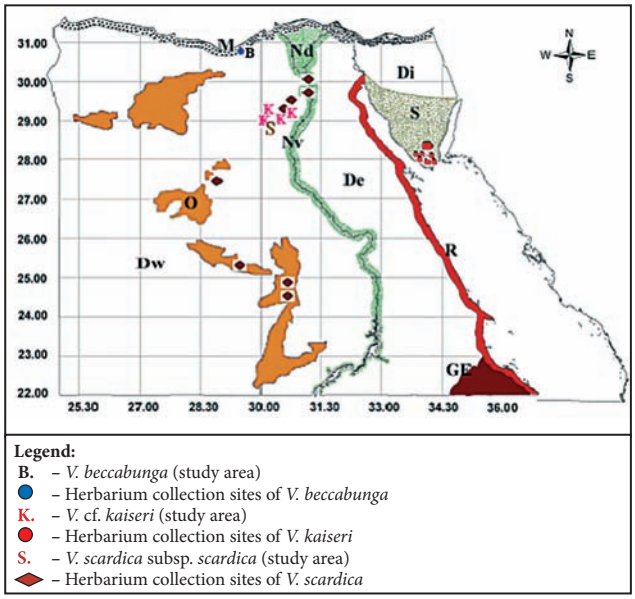


Fig. 4. Distribution of studied specimens of *V. beccabunga, V. scardica* and *V. kaiseri*.

4.1. *V. scardica* subsp. ***africana*** Chrtek & Osb.-Kos., Folia Geobot. Phytotax., 16: 433 (1981; *V. beccabunga* var *aegyptica* Täckh., Stud. Fl. Egypt ed. 1: 131 (1956); Täckh., Stud. Fl. Egypt ed. 2: 498 (1974).

Type: Kharga, 11.02.1931, *Sabet* (**holotype**, PRC).

Perennial (or annual) herb, stem erect or procumbent, strongly branched, rooting at the lower nodes, blackening when dry, often strongly tinged purple, 20(–40) cm tall, always completely glabrous. Leaves opposite 2-always petiolate (1–)2–3(–5) mm long, lower leaves petiolate, the upper sessile or subsessile, lamina somewhat rhombic to suborbiculate, with cuneate base and acute apices, 7–15(–30) mm long, (4–)6–12(–18) mm wide. Margin serrulate to dentate, often purple underneath, 8-glabrous. Inflorescence axillary, often alternate, up to 20 cm long, 3–6 times the length of the leaves. Peduncle 10(–20) mm long, 20(–45)-flowered, lax, (1–)2–4(–5) pedicels per cm, 5–20 mm long, glabrous or very sparsely glandular pubescent. Bract narrow-lanceolate, 1.5–4(–6) mm long. Pedicel 4–8(–12) mm long in fruit, 3–2.5–4(–5) times the length of the bracts, 2–3 times the length of the calyx, more or less 4-patent, uncurved upwards below fruit. Calyx 3–4.5 mm, 1.2–2 mm wide, lobes oblanceolate to obovate to subspathulate, with acute apices, occasionally 1 tooth, seldom 1–2 teeth per side. Collora pale-pinkish to white with darker veins, 4–5(–6) mm in diameter. Style (1.0–1.8) mm long. Capsule orbicular, somewhat inflated, base and apex rounded-truncate, apex slightly emarginate, (2–)2.5–3(–3.5) mm long, 2–3 mm wide, slightly wider than long, slightly shorter than calyx, glabrous. Seed elliptic, plano-convex, smooth, 0.4–0.6 mm long. Flowering: May to June.

Specimens studied. M: Borg El-Arab, New Borg El-Arab, 01.06.2007, *Abd El-Ghani & al.* (FAY); Abo-Qier, El Siouf, Ele'waayd, 01.06.2007, *Abd El-Ghani & al.* (FAY); Rashid, domain of El salts, 01.06.2007, *Abd El-Ghani & al.* (FAY); **Nv:** Geziret El Zamalek, 06.06.1930, *Shabetai* z4882 (CAIM); Giza, at the Nile, 06.03.1927, *G. Täckholm* s.n. (CAI); Fayoum, Kom Aushim, 21.08.1970, *Imam & al.* s.n. (CAI); Fayoum, Kafr Mahfus & Beni Othman, 20.11.1968, *El Hadidi* s.n. (CAI); Fayoum, Botany Dept. Excursion s.n. (CAI); Fayoum, Ebshawai, Zmam El Khold, 05.02.2007, *Yousef* (FAY); **O:** Bahariya Oasis, Al Harra, Ain Glit, 13.04.1980, *Abd El-Ghani* (K) & (CAI); Dakhla Oasis, 12.04.1928, *Simpson* 6004 (CAIM); Dakhla Oasis, El Qasr, 18.01.1929, *Shabetai* z373 (CAIM); Dakhla Oasis, 11.03.1931, *Hassib* s.n. (CAI); Dakhla Oasis, El Qasr, 12.02.1937, *Hassib* s.n. (CAI); Dakhla Oasis, El Qasr, Bir Gebel, 13.02.1968, *G. Romee* s.n. (CAI); Kharaga Oasis, S of the town, 15.01.1928, *G. Täckholm* s.n. (CAI); Kharaga Oasis, 16.10.1928 & 12.03.1929, *Drar* s.n. (CAIM); Kharga Oasis, Ain Karm Ashur, 20.01.1929, *Shabetai* z382 & z385 (CAIM); Kharga Oasis, 09.02.1931 & 11.02.1931, *Sabet* s.n. (CAI); Kharga Oasis, Ain Karm, 01.03.1934, *Shabetai* z4634 (CAIM); Kharga Oasis, 01.03.1934, *Shabetai* z4389 (CAIM); Kharga town, 09.02.1952, *Täckholm & Kassas* s.n. (CAI); El Kharga Oasis, 09.02.1959, *Imam* s.n. (CAI).

Habitat and distribution. Moist places on serpentine soil. Grows in the Kharga and Dakhla Oases in Faiyum, in the northern part of the Nile Valley, and in the Nile Delta.

General distribution. Southeast Europe, north to southern Moravia (Mohelno), Anatolia, Syria, South Iran and Egypt.

Note. The occurrence of *V. scardica* in Egypt was reported by many authors as subspecies *africana* (Chrtek & Osbornová-Kosinová 1981; Boulos 1995, 2002; El Hadidi & Fayed 1995; El Hadidi & al. 1999). The present study confirms the occurrence of *V. scardica* subsp. *africana*.

5. *Veronica beccabunga* L., Sp. Pl. ed. 1: 12 (1753); Hegi, I11. Fl. Mittel-Eur., ed. 2, 6(1): 234 f. 119 (1968) (Fig. 4).

Lectotype: Herb. Clifford 8, *Veronica* 5 (BM) (designated by E. Fischer 1997: 116).

5.1. *V. beccabunga* subsp. ***beccabunga*;** *V. fontinalis* Salisb., Prodr. Stirp. Chap. Allerton: 91 (1796), nom. illeg.; *V. beccabunga* var. *minorifolia* Sennen & Elías, Sched., nom. nud.; *V. tenerrima* F.W. Schmidt, Samml. Phys. Aufsätze Böhm Naturgesch. 1: 198 (1791); *V. beccabunga* var. *tenerrima* (F.W. Schmidt) Beck, Fl. Nieder-Österr.: 1050 (1893); *V. limosa* Lej., Rev. Fl. Spa: 2 (1825); *V. beccabunga* var. *limosa* (Lej.) Mathieu, Fl. Gén. Bélgique 1: 397 (1854); *V. beccabunga* var. *umbrosa* Tinant ex Mathieu, l.c.; *V. beccabunga* var. *bracteata* Bréb., Fl. Normandie ed. 3: 215 (1859); *V. beccabunga* var. *longibracteata* Schur, Enum. Pl. Transsilv.: 492 (1866); *V. beccabunga* var. *nivea* Schur, l.c.; *V. bacsensis* Simonk., Oesterr. Bot. Z. 38: 107 (1888); *V. baxteri* House, Bull. New York State Mus. Nat. Hist. 11: 233-34 (1921); *V. maresii* Sennen, Bol. Soc. Ibér. Ci. Nat. 29: 86 (1930); *V. beccabunga* var. *maresii* (Sennen) O. Bolòs & Vigo, Collect. Bot. (Barcelona) 14: 98 (1983); *Beccabunga vulgaris* Fourr., Ann. Soc. Linn. Lyon ser. 2, 17: 128 (1869).

Perennial herbs, creeping rhizomes, stem decumbent to ascending, usually slightly branched, often red, thick (3–6 mm in diameter), solid, (5–)10–20(–30) cm tall, 10–60 cm long, glabrous. Leaves opposite, clearly petiolate, petiole 2–4(–8) mm, fleshy, dark-green. Lamina broadly oblong, ovate or subelliptic, (10–)15–35(–65) mm long, (6–) 8–20(–33) mm wide, base rounded-truncate to cuneate. Apex obtuse-rounded. Margin denticulate, subserrulate or subentire, shining, completely glabrous. Inflorescence axillary, opposite, peduncle 20(–30) mm long, (5–)10–15(–22-)-flowered, always completely glabrous. Bracts small narrow-lanceolate, 2–3 mm long. Pedicel 2–10 mm, 0.8–2 times the length of the bracts, subpatent, arcuate-erect or suberect. Calyx 2–2.5 mm, ovate-lanceolate. Corolla deep or bright-blue (seldom pale-blue) with white centre, 5–6 mm in diameter. Style (1.3–3.5) mm. Capsule broadly elliptic or orbicular, seldom broadly elliptic, inflated, apex not or slightly emarginated, 2.5–4(–5.5) mm long, 3–4(–4.5) mm wide, slightly wider than long, equalling calyx. Seed broadly-elliptic, plano-convex, smooth, 0.4–0.6 mm long (Fig. 10). Flowering: May to October.

Specimens studied. **M:** Alexandria, Rashid, 01.06.2007, *Abd El-Ghani* & *Yousef* (FAY); Abo-Qier; 01.06.2007, *M. Abd El-Ghani* & *Yousef* (FAY).

Habitat and distribution. Streams, marshes, ditches, wet meadows, preferably in running water. Rarely in Oases, the Mediterranean and Sinai.

General distribution. Europe, Northwest Africa, Caucasia, Iran, western Siberia, Central and East Asia, introduced in North America (Fischer 1978).

Note. *Veronica beccabunga* in Egypt was reported by Täckholm (1974) occurring as a typical species, rarely in the Oases, Mediterranean region and Sinai. On the other hand, Chrtek & Osbornová-Kosinová (1981), Boulos (1995, 2002), and El Hadidi & Fayed (1995), El-Hadidi & al. (1999) did not confirm the occurrence of this species in Egypt. In the present study, however, specimens of *V. beccabunga* were collected from the Mediterranean region (Rashid), supporting the idea of Täckholm (1974) about the occurrence of *V. beccabunga* as a distinct species in Egypt.

6. *Veronica kaiseri* Täckh., Svensk Bot. Tidskr. 36: 250 (1942); Täckh., Stud. Fl. Egypt, ed. 1: 131 (1956); Täckh., Stud. Fl. Egypt, ed. 2: 498 (1974); Täckh. & Boulos, Publ. Cario Univ. Herb. 5: 99 (1974); Abdallah & al., Notes A.R.C. Herb. Egypt, 6: 190 (1984); El Husseini & Zareh, Taeckholmia 12: 66 (1989); *V. musa* Täckh. & El Hadidi, Bull. Soc. Geogr. Egypt 40: 151 (1969) (Fig. 4).

Type: Egypt, Sinai, Sheikh Umm Hussan Shiddeq, 09.09.1926, *Kaiser* 538 (CAI, **holotype**).

Syntype: Sinai, Wadi Bedr, 19 April 1891, *A. Kaiser* s.n, (G); Siq (Sheikh) Umm Hussan Shiddeq, 9.9.1926, *Kaiser* 538 (G, S); Wadi Feiran, *Boissier* s.n. (G); Wadi El Lega, May 1939, *Drar* 453(CAIM).

Perennial herb, stem erect or ascending, rooting at lower nodes. Terminally branched, slender, fistulose, (5–)10–30 cm tall, glabrous. Leaves opposite, short-petiolate (1–2 mm) in lower leaves, sessile in upper leaves. Lamina suborbicular to broadly elliptic (23–25 mm long × 20–23 mm wide), obtuse or rounded at base, with mucronate apices along entire margin, glabrous. Inflorescence axillary, alternate, 35–40 mm long, horizontal, peduncle 10(–20) mm long, few-flowered. Bracts linear-lanceolate, 3–4 mm long, with entire margin and acute apices. Pedicel 2–8 mm long, horizontal. Calyx 2.5–3.5 mm long, elliptical, with entire margin and acute apex. Corolla bright-blue, 3–4 mm diameter. Style1.5 mm long. Capsule ellipsoid, with acute apex, 2.5 mm long and 2.2–2.5 mm wide, equalling or slightly shorter than the calyx, glabrous. Seed ovoid, smooth, 0.8 mm. (Fig. 12) Flowering: April to August.

Specimens studied. S: Sinai, Sheikh Umm Hussan Shiddeq, 09.09.1926, *Kaiser* 538 (CAI, CAIM);

Mountain Musa, 07.05.1969, *Shalaby* & *El Hedini* s.n. (CAIM); Wadi Catherine, 20.04.1962, *Abdallah* & *Khattab* 1039 (CAIM); South Sinai, Wadi Isla, 17.04.1962, *Abdallah* 821 (CAIM).

Habitat and distribution. Moist shady places, in wadi beds and in the vicinity of wells. In the Sinai Peninsula.

General distribution. Endemic to Egypt.

Notes. Regarding the distribution and occurrence of *V. kaiseri*, Täckholm (1956, 1974) had made more detailed comparisons of the Sinai plants with both *V. beccabunga* and *V. scardica*, and had described them under the new specific name *V. kaiseri*. Chrtek & Osbornová-Kosinová (1981) confirmed the occurrence of *V. kaiseri* only from the Sinai Peninsula, in its southern granite mountain region. Several studies by Boulos (1995, 2002), El Hadidi & Fayed (1995), and El-Hadidi & al. (1999) agree with Chrtek & Osbornová-Kosinová (1981) and Täckholm (1974) about the occurrence of *V. kaiseri* only in Sinai. However, in the present study some specimens were collected from the Nile Delta (Fayoum area), which means that this taxon was present outside its type locality. However, we have collected specimens from the Nile Delta (Fayoum region) resembling *V. kaiseri* in the alternate and lax inflorescence, with few flowers and capsules with acute apex. These specimens differed from the holotype kept in the CAIM herbarium in their leaf morphology (elliptic-ovate *vs*. ovate) and petiole length of the lower leaves (1mm long *vs.* 2–3 mm). Prof. Dirk C. Albach and Prof. Boulos (personal communication) confirmed the identification of the specimens from the Nile Delta as *V. kaiseri*. Further investigations would demand more collected samples of this taxon to elucidate its situation.

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