Alexander P. Sukhorukov (Suchorukow) & Avinoam Danin

Taxonomic notes on *Atriplex* sect. *Teutliopsis* and sect. *Atriplex* in Israel and Syria

Abstract

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New data on representatives of the genus *Atriplex* sect. *Teutliopsis* and sect. *Atriplex* are given for Israel and Syria a. *A. laevis* (*A. littoralis* auct.) is new for the Eastern Mediterranean region. *A. patula* is represented in both Syria and Israel with the special variety *A. patula* var. *palaestina*. Its lectotype is chosen. *A. prostrata* is evidently very rare in Syria and not found yet in Israel. The specimens earlier defined as *A. prostrata* belong mostly to *A. davisii*. A*triplex micrantha*, new to Israel (and Jordan) is represented by two forms. A new key for the representatives of *Atriplex* sect. *Teutliopsis* in the study area is given. *Atriplex sagittata* (=*A. nitens* auct.) should be excluded from the floristic lists of both countries. The records earlier defined as *A. sagittata* belong to *A. hortensis*, a very rare alien.

Key word: *Atriplex*, Eastern Mediterranean, morphology.

Introduction

The genus *Atriplex* comprises about 260 representatives confined mostly to arid and semiarid regions of Eurasia, America, and Australia. There has been no monographic work concerning this genus for the E. Mediterranean area since Aellen (1939). Many groups of this genus require additional taxonomic research. Two recent articles examine several groups in the neighbouring territory: Saudi Arabia and Somalia (Al-Turki & al. 2000; Thulin 2007), respectively. This article contains new data on two groups of annual *Atriplex* species, with special emphasis being placed on the species of sect. *Teutliopsis* Dumort. emend. Sukhor.

The *Atriplex* section *Teutliopsis* comprises about 23 species and is characterised by comparatively mesomorphic green or greenish leaf blades that turn the margins toward the sunlight (‘compass plants’) and have isolateral non-Kranz anatomy. The herbaceous bracteoles are free or fused up to one half of their length and enclose the dimorphic (black to reddish and brownish) seeds (Suchorukow 2006). Most members of the section grow in the semi-deserts and dry steppes of northern C. Asia (Sukhorukov 2007a), preferably on saline soils. Only a few members occur in the semi-deserts of SW Asia, where they are more-or-less restricted to wet places. *A. littoralis* L., *A. patula* L., *A. prostrata* Boucher ex DC. (sub *A. hastata* L.), *A. micrantha* C.A. Meyer are indicated for the flora of Syria

(Mouterde 1966). Only *A. patula* and *A. prostrata* are reported for Israel (Zohary 1966; Danin 2004). *A. davisii* Aellen is recorded from Syria and Lebanon by Greuter & al. (1984) and recently from Israel (Suchorukow 2007b) as well.

Reliable determination of species in the group is based on bracteole structure and therefore requires fruiting material. In fact, many specimens kept in the herbaria are collected without mature fruits and lack fully developed bracteoles. Often they consist only of the upper parts of the plants with lanceolate leaves, and even the lower leaf blades, which in some species show important diagnostic features, are lacking. However, many specimens with well-developed bracteoles are found to be erroneously determined.

In contrast to the four species of sect. *Teutliopsis*, from *Atriplex* sect. *Atriplex* only one species, *A. sagittata* (sub *A. nitens*), has been reported from the area so far.

The aim of the present study is to solve some taxonomical problems in two groups of *Atriplex*, and to add new data to the distribution of its representatives in the Eastern Mediterranean.

Materials and Methods

Much of the field work for the present revision was carried out in Israel during 2007 and 2008. In addition, the following herbaria were visited (abbreviations according to Holmgren & Holmgren 1998-): B, G, W, LE, MW, HUJ, MHA. Only the new synonyms are given in the present article; for additional synonymy of the taxa see Suchorukow (2006). Specimens from Israel are listed according to the geographical districts of Israel as used by Danin (2004: p.13).

Results

1. *Atriplex* sect. *Teutliopsis* in Israel and Syria

Key for identification of the species of sect. Teutliopsis growing in Israel and Syria

1. All leaves lanceolate, mostly serrate or dentate, rarely entire. Glomerules condensed, with 8-20 female flowers. Bracteoles semicircular mostly toothed, without appendages on their dorsal sides. Stem branched in upper part only.....***A. laevis* C.A. Meyer**
1. Lower leaves triangular, rhombic, rarely all leaves oblong or lanceolate (some forms of *A. patula*). Glomerules loosely arranged at least in the lower part of the inflorescence, with 2-8 female flowers, or inflorescence spike-like. Stem usually branched from the base or from middle part.....**2**
2. Bracteoles fused only basally, without appendages in their dorsal parts, circular or ovoid, its diameter or length (if ovoid) very variable: 2.0-5.5 (7.0-12.0) mm. Inflorescence always spike-like. Black seeds 1.0-1.8 mm, brownish seeds 2.0-3.0 mm in diameter. Lower leaves triangular or rhombic-triangular. .....***A. micrantha* C.A. Meyer**
2. Bracteoles fused for 1/8-1/2; shape variable, when rounded, then fused up to 1/2. Inflorescence not spike-like, with distinct glomerules. Leaves lanceolate, rhombic or triangular. **3**

3. Bracteoles rhombic, very variable in degree of fusion (1/8-1/2), in lateral parts with two angles, dorsally in lower or middle parts mostly with appendages. Lower leaves rhombic, oblong or lanceolate. Plants up to 100 cm high, with well-developed, horizontally spreading or ascending lower branches. .....***A. patula* L.**
3. Bracteoles circular, elliptical, ovoid or triangular. Lower leaves triangular or rhombic-triangular. **4**
4. Bracteoles triangular, fused up to 1/3, with appendages in lower part. Plants up to 0.6 (1) m high, lower branches horizontally spreading..... ***A. prostrata* Boucher ex DC.**
4. Bracteoles rhombic or circular, fused for ½, usually with appendages in middle or upper parts. Plants up to 2 m high, branches horizontally spreading or ascending..... ***A. davisii* Aellen**

Check-list of the representatives of Atriplex sect. Teutliopsis

1. *A. laevis* C.A. Meyer in Ledebour, Ic. Pl. Fl. Ross. 1: 10 (1829) – Fig. 1 a, b

A. littoralis auct. fl. syr., non L.

Typus: [Rossia], prope Swejow, leg. C.A. Meyer (LE), lecto – Suchorukow & Tschernewa in Suchorukow (2006)

Flowering time: IV-V; fruiting: V-VI. In contrast to the native Mediterranean species of *Atriplex*, this species germinates after the hot season in Israel and Syria.

Distribution in the area: **Syria**: **SW**: Aateibe, 30.05.1952, H. Pabot (G). This is the first record of the species in the Eastern Mediterranean region. It might have a wider distribution.

General distribution: Native to Central Asia and South Siberia, as a new alien (or an adventive) in the Far East (Russia, Japan), European Russia, Turkey, and recently Iran (Hedge 1997).

2. *A. patula* L., Sp. Pl.: 1053 (1753) – Fig. 1c, d

Typus: Europae cultis ruderatis, n 1221.19 (LINN, n.v.), lecto — Taschereau (1972)

Morphologically, *A. patula* is very variable. All specimens seen, collected at the fruiting stage, possess small lower bracteoles (up to 3 mm long) and by them they have to be included in the variety *A. patula* L. var. *palaestina* Eig. Of the four sheets cited in Eig's (1946) protologue we found only two. The specimens from Israel (Haifa, near marshes of Kishon, 9.1925, Eig & Faktorovsky 44996 (HUJ!), and "Sharon plain, Binyamina to Kabbara, 27.8.1926, Eig 44995 (HUJ!)) consist of lower plant parts or upper flowering branches. The specimen from [Israel], Sharon plain, Binyamina, ditch, 23.10.1925, Eig 44994 (HUJ!) is in fruiting stage and therefore choosen here as the lectotype for *A. patula* var. *palaestina* Eig.

A. patula var. *palaestina* was considered by Zohary (1966) erroneously as synonym of *A. hastata* var. *microtheca* Schum.

Eventually, *A. amana* Post, Fl. Syr. Palest. & Sinai: 681 (1896) also belongs here. However, only one uninformative specimen has been seen by the first author in G, though from the type locality: "Kespel Dagh [Amanus], 1887, G. Post 187, ex herb. P. Aellen".

Flowering time: VIII-IX; fruiting: XI-XII.

Distribution in the area: **both states**. Selected specimens: **Syria**: Kespel Dagh, 1887, G. Post 187 sub *A. amana* (G); Lake of Antiochia, marshes dry in summer, 26.08.1931, A. Eig & M. Zohary (HUJ); **Israel**: Acco Plain: Ein Aphya, 25.09.1962, L. Prusbul & B.

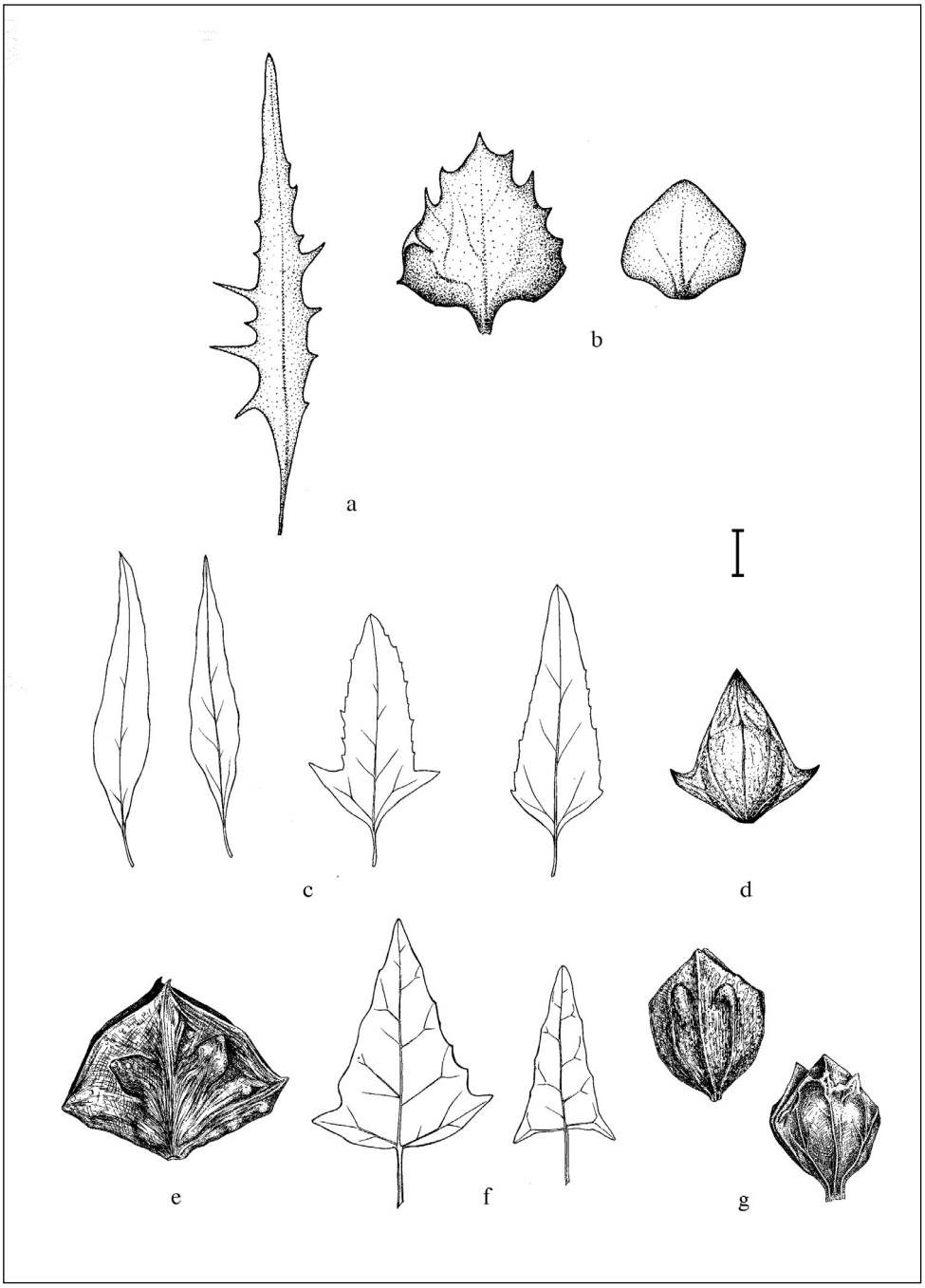

Fig. 1. a: *Atriplex laevis* – leaf, b: bracteoles; c: *A. patula* – leaves, d – bracteoles; e: *A. prostrata* - bracteoles; f: *A. davisii* – leaves (the right drawing also suitable for leaf shape of *A. prostrata*); g: *A. davisii* – bracteoles. Scale bar: 1 cm for leaves; 1 mm for bracteoles.

Baum 302711 (HUJ); Sharon Plain, between Benei-Beraq and Petah-Tiqva, dry marsh, 19.09.1924, A. Eig sub *A. hastata* var. *microtheca* (HUJ); Kinrot Valley, Deganiya, on the coast of eastern Jordan, near drainage ditches, 8.11.1939, Beit Gordon 03519 (HUJ); Northern Negev: Nahal Grar, near Tel Shari'a, 3 km NW of Mishmar HaNegev, 25.09.1996, A. Danin 44410 (HUJ); 2 km W from Bet Shean, valley of the Harod river, XII.2008, A. Danin & A. Sukhorukov (MW, HUJ).

General distribution: temperate Eurasia, America (as alien), N Africa (native?).

3. *A. prostrata* Boucher ex DC. in Lam. & DC., Fl. Franc., ed. 3, 3: 387 (1805) – Fig. 1 e, f (right-hand drawing)

Typus: [Gallia], Env. du Havre, Herb. DC 386 (G-DC; n.v.), lecto — Gustafsson (1976)

Flowering time: VIII-IX; fruiting: XI-XII.

Distribution in the area: **Syria:** a few specimens with spreading lower branches collected mostly in vegetative stage: 1) Ghruta, 11.05.1952, H. Pabot (G); 2) Rabrui, 11.10.1953 (G). The records for Israel given in Greuter & al. (1984: 293) and Danin (2004: p. 59) are not confirmed because no real *A. prostrata* was found in the herbaria visited or in nature. Zohary (1966: 149) named the specimens *A. hastata* but they belong to other species instead.

General distribution: temperate Eurasia; N Africa; E Australia (as alien); N America; ? S America.

4. *A. davisii* Aellen, Not. Royal Bot. Gard. Edinb. 28(1): 30 (1967) – Fig. 1 f, g

Typus: [Turkey], prov. Niðde: Aksaray, [H=] 950 m, edge of ditch, procumbent, Davis & Hedge D-32846 (holo — E, photo!, iso — G!)

=*A. micrantha* C.A. Meyer var. *congesta* Aellen, nom. nudum, Aellen's authentic specimens in herb. G (!), W (!);

=*A. gillii* Aellen, nom. nudum, Aellen's authentic specimens in herb. G (!), W (!).

Flowering time: VIII-IX; fruiting: XI-XII.

Taxonomic notes: This species has extremely variable morphology. Aellen (1967) described *A. davisii* as a plant with procumbent lower branches and leaf petioles up to 5 mm long. The plants growing in Israel often show a main stem up to 2 m high, with horizontally spreading lower branches, and petioles 5-25 mm long. Morphologically, *A. davisii* is close to *A. chenopodioides* Batt. from the Western Mediterranean region. That species has fetid leaf blades (Romo 2002), aphyllous inflorescences and always circular bracteoles.

Distribution in the area: Apart from earlier specimens recorded in Israel from Jerusalem area (Suchorukow 2007 b), there are many additional specimens from Israel earlier identified as *A. patula*, *A. prostrata* (*'A. hastata'*) or other *Atriplex* species:

Syria: Near water, south east of Damascus, alt. 700 m, 1937, J.E. Dinsmore 20301 (G); 20 km E de Damas, 24.X.1952, H. Pabot (G), mounted together with *Atriplex belangeri*.

Israel: Carmel Coast: Tantura, marshes, 19.10.1949, D. Zohary 03537 (HUJ), Nahal HaTaninim, nature reserve, riverside and marshes, 4.11.1976, J. Mattatia (HUJ); Sharon Plain: Hadera, 9.IX.1906, A. Aaronsohn 1719a (G); Philistean plain, Yarkon river, Tel-Aviv, 17.10.1966, L. Prusbul 308461 (HUJ); Shefela: Ramla toward Bet-Shemesh, 31.10.1998, O. Fragman 44503 (HUJ); Judean Mts.: Emeq Refaim, 15.12.1984, A.

Shmida (HUJ), near Zur Hadassa, edges of drainage pool, 15.10.1987, O. Cohen (HUJ), Jerusalem, Givat Ram, Botanical Garden nursery, 23.11.1987, A. Liston & H. Monias (HUJ); Motza, near a stream of sewage water, 4.12.2007, A. Danin & A. Sukhorukov (HUJ, LE, MW, H); Hula Plain: Hulata, near the lake, 16.09.1951, D. Zohary 63508 (HUJ); Kinrot Valley: Maagan, 26.10.1963, J. Weisel (HUJ), Buteiha, Mahjar, entrance the river Jordan to the Kinneret, 29.10.1970, A. Rabinovitz (HUJ).

General distribution needs further investigation. Until now the species is confirmed for C. and SW. Turkey, Greece, Iran and Afghanistan (Suchorukow 2008).

5. *A. micrantha* C.A. Meyer in Ledebour, Ic. Pl. Fl. Ross. 1: 11 (1829) – Fig. 2

Typus: [Rossia], Altai, Loktewsk, (anno) 1835, C.A. Meyer (holo–LE!)

Flowering time: VIII-IX; fruiting: XI-XII.

Taxonomic notes: Two subspecies of A. *micrantha* are known from Asia: subsp. *micrantha* with spike-like inflorescences, and *A. micrantha* subsp. *conglomerata* O. Schwarz reported from Caucasus with the flowers associated in glomerules (Schwarz 2003). In the Eastern Mediterranean region, there are two forms of *A. micrantha*: one with circular bracteoles and black seeds of 1.5-1.8 mm in width, and another with mostly ovoid bracteoles and smaller black seeds of 1.0-1.2 [1.5] mm in width. In the new form, the differences in shape (circular versus ovoid) between the bracteoles covering the female terminal flowers, and those at the lateral flowers are more evident than in *A. micrantha* subsp. *micrantha* (fig. 2 b, c). In both forms, however, the leaf shape can be variable in a population (Fig. 1f left-hand, 2a; cf. also Suchorukow 2006: Fig. 35).

In Syria and Israel, the first form morphologically corresponds to typical subspecies *micrantha* in other areas. The second form has not been described yet and deserves further studies. From Syria, both forms are represented in the herbaria. From Israel, all specimens collected in autumn and found in disturbed places belong to the latter form.

Distribution in the area: **Syria**, all parts (G, B, HUJ); but the form with ovoid bracteoles was seen on one sheet only: Calesyria, Chtora, 9.12.1894, E. Peyron (G) sub *A. nitens*. *A. micrantha* is new for **Israel**: Lower Galilee: Yifat, sewage, 2.11.1989, Danin (HUJ), Yifat, ditch of waste water, 13.08.1990, Danin 71064-71066 (HUJ), Yifat, 03.05.2008, Danin (MW, HUJ); Esdraelon plain: Kefar Barukh, garbage heap; plants up to 1.8 m high, 15.10.1989, Danin (HUJ); Mt. Hermon: Qalaat Namrud, near a spring, 02.06.2008, Danin (HUJ).

A. micrantha is also new for Jordan: Edom, Wadi Mousa, disturbed ground near Petra Inn Hotel, 27.10.1997, A. Danin (HUJ). This specimen belongs to the subspecies *micrantha*.

2. *Atriplex* sect. *Atriplex*

Only *A. sagittata* Borkh. (=*A. nitens* Schkuhr) was recorded for Israel (Danin 2000). However, closer inspection has shown that the corresponding specimens belong to *Atriplex hortensis* L. instead. That species is new for the area, very rare and not indigenous.

Israel: Samaria: Plantae palaestinae borealis, waste places, very rare, Nablus, alt. 600 m, 11.08.1912, Meyers & J.E. Dinsmore 2181 (G), Nablus, 11.08.1913, J.E. Dinsmore (HUJ); Judean Mts.: Jerusalem, alt. 700 m, 21.07.1952, id. 181 (HUJ). Its records can be connected with cultivated land.

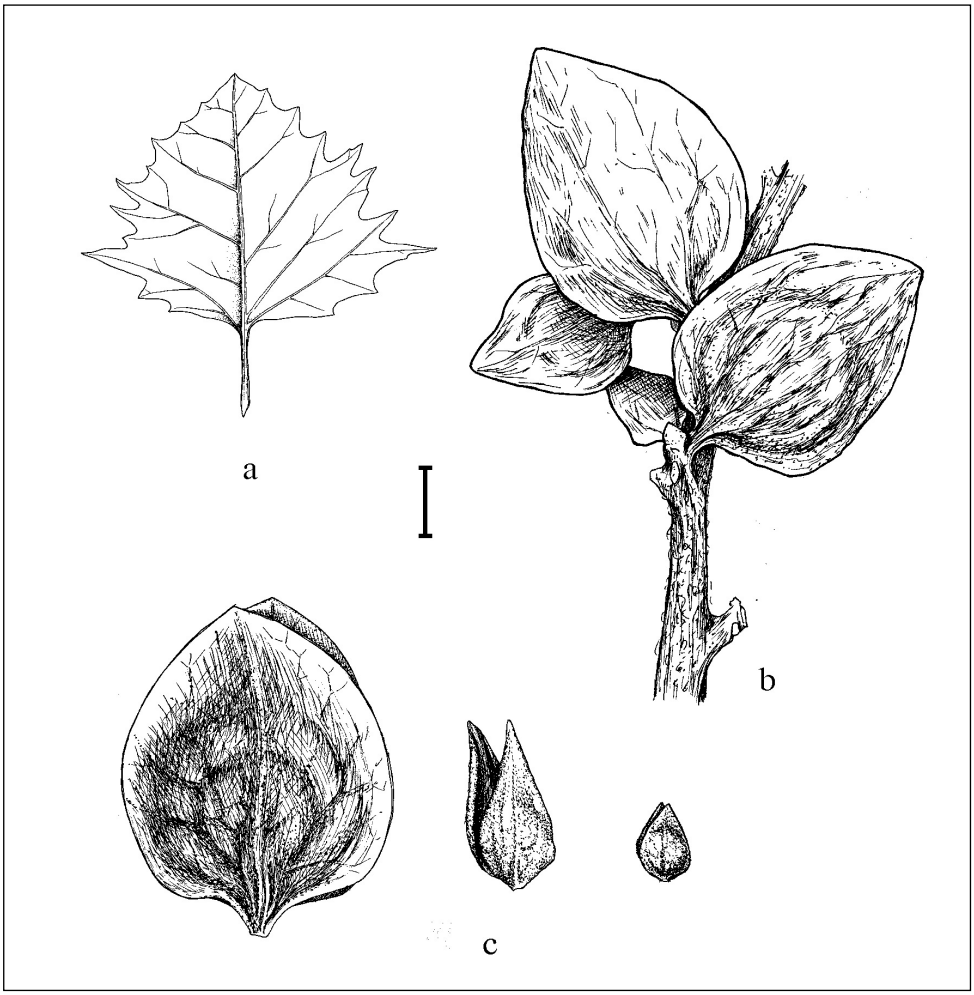

Fig. 2. *Atriplex micrantha*: a: leaf (drawing from the sheet collected in Israel (Yifat, 03.05.2008, Danin), the other shape see also Fig. 1f (left drawing of leaves of *A. davisii* suitable also for *A. micrantha* subsp. *micrantha*); b: bracteoles of *A. micrantha* subsp. *micrantha*; c: bracteoles of *A. micrantha* (the form with ovoid bracteoles). Scale bar: 1 cm for leaf; 1 mm for bracteoles.

The records of the Eurasian *A. sagittata* for Syria (Post 1896; Thiebaut 1953) are likewise erroneous, e.g., the specimen from "Chtora, 9.12.1894, E. Peyron" (G), sub *A. nitens* in fact belongs to *A. micrantha.* The southern range border of *A. sagittata* crosses Bulgaria (Jordanov & Kuzmanov 1966; vidi in MW!, LE!), Greece (Tan 1997; specimen n.v.), and Turkey (Davis 1966: specimen n.v.).

The Turanian *A. aucheri* Moq. might occur in Syria. Visually, it differs from *A. hortensis* by whitish (not green or reddish) leaf blades and diffuse or globular shape of plant body.

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References

Aellen, P. 1939: Die *Atriplex*-Arten des Orients. – Bot. Jahrb. Syst. **70(1):** 1-65.

— 1967: New *Chenopodiaceae* from Turkey. – Not. Roy. Bot. Gard. Edinburgh **28(1):** 29-34.

Al-Turki, T. A., Omer, S. & Ghafoor, A. 2000: A synopsis of the genus *Atriplex* L. (*Chenopodiaceae*) in Saudi Arabia. – Fedd. Repert. **111(5-6):** 261-293.

Danin, A. 2000: The nomenclature news of Flora Palaestina. – Fl. Medit. **10**: 109-172.

— 2004: Distribution Atlas of Plants in the Flora Palaestina Area. – Jerusalem.

Davis, P. H. 1966: Flora of Turkey and the East Aegean Islands, **2.** – Edinburgh.

Eig, A. 1946: A revision of the *Chenopodiaceae* of Palestine and neighboring countries. – Palestine J. Bot. (Jerusalem Ser.) **3:** 119-137.

Greuter, W., Burdet, H. M. & Long, G. 1984: Med-Checklist, **1.** – Geneve.

Gustafsson M., 1976: Evolutionary trends in the *Atriplex prostrata* group of Scandinavia. Taxonomy and morphological variation. – Opera Bot. **39:** 1-63.

Hedge, I. 1997: *Atriplex*. – Pp. 63-87 in: Rechinger, K.H. (ed.), Flora des Iranischen Hochlandes und der umrahmenden Gebirge (Flora Iranica), **172.** – Graz.

Holmgren, P. K. & Holmgren, N. H. 1998- (continuously updated): Index Herbariorum. –Published on the internet http://sciweb.nybg.org/science2/IndexHerbariorum.asp.

Jordanov, D. & Kuzmanov, B. 1966: *Atriplex*. – Pp. 541-548 in: Jordanov, D. (ed), Flora Reipublicae Popularis Bulgaricae, **3.** – Sofia.

Mouterde, P. 1966: Nouvelle flore du Liban et de la Syrie, **1.** – Beirut.

Post, G. 1896: Flora of Syria, Palestine and Sinai. – Beirut.

— 1933: Flora of Syria, Palestine and Sinai **2.** – Beirut.

Romo, A. M. 2002: *Atriplex*. – Pp. 115-116 in: Valdés, B., Rejdall, M., Achnal el Kadmiri, A., Jury, J. L. & Montserrat J. M. (eds.), Checklist of vascular plants of N Morocco with identification keys, **1**. – Madrid.

Schwarz, O. 2003: *Atriplex micrantha* C.A. Mey. in Ledeb. und andere Meldearten. – Jahresh. Ges. Naturk. Württemberg **159:** 113-195.

Suchorukow (Sukhorukov), A. P. 2006: Zur Systematik und Chorologie der in Russland und benachbarten Staaten (in den Grenzen der ehemaligen UdSSR) vorkommenden *Atriplex*-Arten (*Chenopodiaceae*) . – Ann. Naturhist. Mus. Wien **108B:** 307-420.

— 2007a: Application of chorological method for solving the problems of phylogenesis and systematics (a case study of arid Eurasian *Chenopodiaceae*). – Arid Ecosystems **13(32):** 19-33.

— 2007b: Einige neue und wenig bekannte Sippen aus der Familie *Chenopodiaceae* in Europa und im östlichen Mittelmeergebiet. – Fedd. Repert. **118(3-4):** 73-83.

— 2009: Ergänzungen zur Flora Iranica – Familie *Chenopodiaceae*. – Ann. Naturhist. Mus. Wien **110B:** 153-158.

Tan, K. 1990: *Atriplex*. Pp. 121-126. – In: Strid, A. & Tan, K. (eds.), Flora Hellenica, **1**. – Koenigstein.

Taschereau, P. M. 1972: Taxonomy and distribution of *Atriplex* species in Nova Scottia. – Can. J. Bot. **50(7):** 1571-1594.

Thiebaut, J. 1953: Flore Libano-Syrienne, **3.** – Paris.

Thulin, M. 2007: A new species of *Atriplex* (*Chenopodiaceae*) from Somalia. – Nordic J. Bot. **24(5):** 507-508.
Zohary, M. 1966: Flora of Palaestina, **1**. – Jerusalem.

Addresses of the authors:
Alexander P. Sukhorukov (Suchorukow)[1] & Avinoam Danin[2]
[1]Dept. of Higher Plants, Biological Faculty, Moscow Lomonosov State University, Vorobyovy Gory, Russia 119991. E-mail: ryba4@yandex.ru
[2]Dept. of Evolution, Systematics, and Ecology, The Hebrew University of Jerusalem, Israel 91904. E-mail:danin@vms.huji.ac.il