

Taxonomic and nomenclatural remarks on *Allium* L. subgen. *Melanocrommyum* (Webb & Berth.) Rouy sect. *Megaloprason* Wendelbo

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Taxonomic and nomenclatural remarks on *Allium* L. subgen. *Melanocrommyum* (Webb & Berth.) Rouy sect. *Megaloprason* Wendelbo

REINHARD FRITSCH

ABSTRACT

FRITSCH, R. (1993). Taxonomic and nomenclatural remarks on *Allium* L. subgen. *Melanocrommyum* (Webb & Berth.) Rouy sect. *Megaloprason* Wendelbo. *Candollea* 48: 417-430. In English, English and French abstracts.

The *Allium* species of sect. *Megaloprason* s.str. are in detail discussed, especially the critical species *A. rosenbachianum* and *A. stipitatum* and their near relatives. The section is divided into three newly described subsections subsect. *Megaloprason* (Typus: *A. rosenbachianum* Regel s.str.), subsect. *Elatae* (Typus: *A. stipitatum*), and subsect. *Costatae* (Typus: *A. jesdianum* Boiss. & Buhse). *Allium hollandicum* is newly described as valid name for *A. aflatunense* hort. non B. Fedtsch. as used for some horticultural cultivars. A new subspecies *Allium rosenbachianum* subsp. *kwakense* from Tadjikistan is also described. A key for determination using living plant in flowering stage is delivered.

RÉSUMÉ

FRITSCH, R. (1993). Remarques taxonomiques et nomenclaturales sur *Allium* L. subgen. *Melanocrommyum* (Webb & Berth.) Rouy sect. *Megaloprason* Wendelbo. *Candollea* 48: 417-430. En anglais, résumés français et anglais.

Des espèces d'*Allium* de la section *Megaloprason* sont discutées en détail, plus particulièrement les espèces *A. rosenbachianum*, *A. stipitatum* et ses proches. La section est divisée en trois subsections décrites récemment: subsect. *Megaloprason* (Typus: *A. rosenbachianum* Rgl. s.str.), subsect. *Elatae* (Typus: *A. stipitatum*), et subsect. *Costatae* (Typus: *A. jesdianum* Boiss. & Buhse). Quelques cultures de jardinage de l'espèce *Allium aflatunense* auct. non B. Fedt. sont décrites comme des formes de l'espèce nouvelle *A. hollandicum*. Une sous-espèce nouvelle d'*Allium rosenbachianum* subsp. *kwakense* de Tadjikistan est décrite aussi. Une clé de détermination utilisable sur des plantes vivantes en fleurs est proposée.

KEY-WORDS: *Allium* — Wild species — Central Asia — Southwest Asia — Taxonomy — Description — Nomenclature — Key for determination.

Introduction

Subgenus *Melanocrommyum* is one of the greater groups of the genus comprising now somewhat more than 120 species. Nearly all of them grow in the mountains of Southwest and Central Asia, but some of them are known as decorative plants in Europe, too. They are commonly regarded to be taxonomically and nomenclaturally difficult, although WENDELBO dealt with them in the 1950th and 1960th when he had revised the genus for the "Flora Iranica".

After having described sect. *Regeloprason* in 1966, he continued in 1969 to name and characterise additional groups as an attempt to subdivide the great diversity of species belonging to subg. *Melanocrommyum* known from Southwest Asia: sect. *Acanthoprason*, sect. *Thaumasoprason*, and sect. *Melanocrommyum*. EKBERG (1969) assisted him by describing sect. *Porphyroprason*.

Wendelbo united the remaining species under sect. *Megaloprason* which became an unclearly circumscribed group not only because very tall species as well as much shorter ones like *A. brachyscapum* and *A. scotostemon* were initially included. Several species reach Southwest Asia from the north; their main area of distribution is situated in the mountains of Central Asia. They, as well as many other species only known from Central Asia, must have been insufficiently known to him. All these species cannot be united under one section standing in one line with the other sections in Wendelbo's sense. Therefore, knowing the great diversity of Central Asian species, KAMELIN (1973) did not accept WENDELBO's concept of section *Megaloprason*.

Many species were newly described in the last two decades (GAFFAROV & TURAKULOV, 1991; KAMELIN, 1976a, 1976b, 1980; KHASSANOV & MALTZEV, 1988; KIT TAN & SORGER, 1986; KOYUNCU & KOLLMANN, 1978; KRASSOVSKAJA, 1982; KRASSOVSKAJA & LEVICHEV, 1986; TURAKULOV, 1986; VVEDENSKY, 1971; WENDELBO, 1973) which are to be recognized now. A further attempt to find a better and more natural classification in subg. *Melanocrommyum* (FRITSCH, 1992) showed, that all of the sections described by WENDELBO can well be accepted today. Several groups of related species were separated from sect. *Megaloprason* sensu Wendelbo forming own sections. In that way, sect. *Megaloprason* Wendelbo s.str. became a rather well circumscribed group restricted to those taxa which are closely related to *A. rosenbachianum* sensu Wendelbo. The species included are characterised by initially fasciculate, later broadly ovate inflorescences, somewhat incurved, lanceolate and spoonlike or long-lanceolate to long-triangular tepals which become strongly reflexed in the later phase of flowering, and long lanceolate, shallowly but broadly ribbed laminae. However, several taxonomical and nomenclatural problems connected with the species included remained, and shall be dealt with now.

The *A. rosenbachianum*-group

Section *Megaloprason* is typified by *A. rosenbachianum* Regel. WENDELBO understood this species in an other way than commonly accepted at that time (for details see FRITSCH, 1990a). In his treatment of genus *Allium* for "Flora Iranica" (1971), WENDELBO used this name for plants the leaves of which are up to 5 cm broad, semi-erect, glaucous, dull, and remarkably tapering toward the base. Their scape is rather stout bearing a few ribs most prominent in its basal part though nearly missing in its upper part. The inflorescence is initially fasciculate, becomes soonly semi-orbicular and later broad-suborbicular, is somewhat loose and composed of rather stout pedicells. We could analyse three living collections of this taxon from the Botanical Garden of Göteborg which were mentioned in "Flora Iranica" under *A. rosenbachianum* and fully correspond to Tab. 27 Figs. 1 & 2 therein. *Allium rosenbachianum* sensu Wendelbo agrees much better with the original description by Regel than the interpretation by Lipsky and Vvedensky. It could be regarded to represent the true species if those plants would grow in the locus classicus in the Wakhsh mountains near the river Kyzylsu above Baldzhuan. But they do not grow there! I visited this area in 1988 and 1991 and was not able to find plants as characterised by Wendelbo neither in the wild nor as corresponding dry specimen(s) in the herbaria of Tashkent and Dushanbe. Apparently *Allium rosenbachianum* sensu Wendelbo is an Afghan (Hindukush) taxon whose area of distribution reaches the Pamir, as one living collection demonstrates we received via the Main Botanical Garden of Moscow from an unspecified place of the Tadjik Pamir, as well as Pakistan. The name *A. angustitepalum* Wendelbo should be available for this taxon because it has been taken into synonymy, without any discussion, under his *A. rosenbachianum* by Wendelbo itself in "Flora Iranica".

Allium rosenbachianum in the strict sense of Regel's description still grows on the above mentioned locus classicus. I was able to collect several samples of them. The plants have also leaves 5 cm broad or somewhat broader remarkably tapering toward the base, though these are bright yellowishgreen, glossy, not glaucous, and initially nearly adpressed to the earth. Later they elongate basally and the upper end is already withering in flowering time. The scape is rather thin, rarely more than 60 cm high, cylindrical, absolutely smooth and glossy. The also rather loose inflorescence becomes somewhat more orbicular, though the pedicells are thin and wire-like. These plants from

the locus classicus are fully corresponding to the plants of the typus sheet as well as to the original description — they are *Allium rosenbachianum* Regel in the strict sense.

This true *A. rosenbachianum* is seldom to be found in herbaria. Its area of distribution is still insufficiently known due to undercollection in south-eastern Tadjikistan and neighbouring areas. We found this taxon in valleys of the rivers Kyzylsu and Jakhsu in the mountainous regions of Wakhsh and Khasratishokh, where it is scattered on small places, often on steep slopes, in the dense shadow under shrubby species of *Acer*, *Lonicera*, *Prunus*, and other broadleaved shrubs. The silvery-carmine flowers are not showy, so that the plants never have such a striking appearance like *A. stipitatum* or *A. giganteum*.

Such a colour of flowers is also found in other nearly related taxa. This is true for *A. sarawschanicum* Regel (incorrectly spelled “*seravschanicum*” or “*zeravschanicum*” by Vvedensky) which differs from *A. rosenbachianum* by six obliquely sideward directed, peculiar outgrowths on the top of the ovary as well as by slightly glaucous, erect, longitudinally folded, sometimes more than 8 cm broad leaf blades the margins of which overlap one another and which are in a collar-like manner outside bent in their basal part. This species prefers other ecological conditions (FRITSCH, 1990b). It is growing in the shadow under trees and on steep northern slopes under higher shrubs, as well as in cracks and on small terraces of north-facing, precipitous rocks. *Allium sarawschanicum* is known from a great area of distribution reaching from the southern slopes of Alai (vouchers in TAD) and Saravshan mountains in the north to the mountains of northwestern Afghanistan and the Kopetdag in the south. The isolated population of the Kopetdag does not show any clear difference against the plants of the Saravshan (Khassanov, pers. commun.). Therefore I treat *A. pseudozeravschanicum* Popov & Vved. as synonym in agreement with VVEDENSKY (1971) and WENDELBO (1971). A second and still undescribed taxon differs from *A. rosenbachianum* s.str. by several characters preferably of the leaves. Their laminae are broader, strictly erect, sometimes longitudinally twisted, especially in its median part canaliculate, basally only slightly tapering, slightly glaucous though yellowish-green and glossy, too. The scape reaches up to 80 cm, despite a slight glaucous covering it is glossy and in the fresh condition completely smooth. Inflorescence and flowers are nearly identical to those ones of *A. rosenbachianum* s.str. Several sheets of this taxon are present in the herbarium of Dushanbe originating from the Hissar mountains north of Dushanbe and from other parts. I collected it several times on shady places under *Acer turkestanica* Pax and other tall shrubs in elevations mostly above 1800 m s.m. as well as in the Kugitek (Wakhsh) and Khasratishokh mountains under *Juglans* and on similar, shady places (FRITSCH, 1990b, as *A. rosenbachianum*). Herbarium specimens verify its presence in the Karategin mountains (situated between Hissar and Wakhsh mountains) presenting a link between the above mentioned parts of the area of distribution. These morphological differences are constant also among cultivated plants in Dushanbe and Gatersleben. They characterise these plants, which are distributed much further to the north and prefer somewhat different ecological conditions, as a taxon of its own near to *A. rosenbachianum* s.str. I describe it herewith on the subspecific level.

***Allium rosenbachianum* Regel subsp. *kwakense* R. M. Fritsch, subsp. nov.** (Fig. 1).

Typus: Tadzhikistan: Hissar-Gebirge nördl. Dushanbe, Kondara-Tal, lehmiger Hang nahe der Kwak-Hütte, ca. 1830 m ü. M., 16.V.1987 leg. R. Fritsch et A. Ivanov No. 131/86 (GAT, Isotypus: TAD).

Bulbus latiuscule ovoideus, usque 3 cm diametro, tunicis papyraceis griseo-brunnescentibus. Scapus strictus, cylindricus, laevis, 50-80 cm longus, 410 mm diametro. Folia 2-3(-5), lamiis scapo basiliter marginis superpositis amplectens, lamina oblongo-lanceolata, stricta, crassiuscula, apice in medio late canaliculata, margine subrecurvata, superne sublucentes laevis, inferne fere tenuiter costata, breviter et obtusus arcuatim apiculata, apice cucullata; margine basi tenuiter denticulato-ciliata, in apice versus glabrescentes usque laevis, 20-40 cm longa, (1.5-)3-6(-8) cm lata, luteo-virides usque virides, leviter glauca. Spatha in valvas duas vel trias ovatas vel triangulatas longe apiculatas divisa, membranacea, brunnescent, nervis aequicoloratis. Inflorescentia initio planiusculo-globosa, mox globosa, usque 12 cm diametro, multiflora, laxiuscula. Pedicelli crassiusculi stricti,

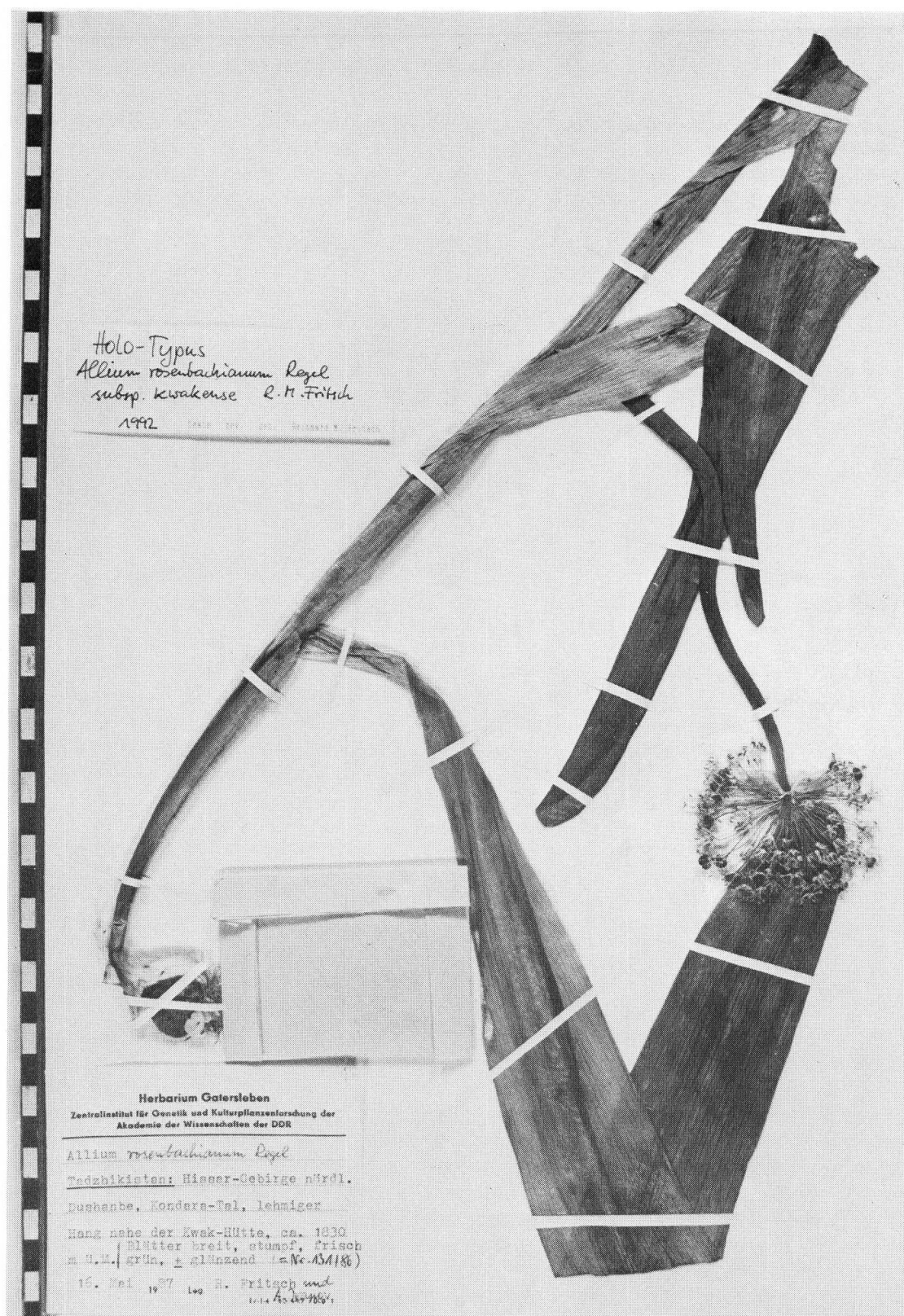


Fig. 1. — Typus of *Allium rosenbachianum* Regel subsp. *kwakense* R. M. Fritsch (graduation of scale in centimeters).

splendidi, initio viridentes, demum viridibrunnescentii usque badii. Flores stellato-cyathiformes. Tepala longe linearitriangulari, obtusiuscula, apice inflexa, concava, canaliculata, initio curvatopatentia, mox reflexa et convolventia, 7-10(-12) mm longa, circiter 2 mm lata, subargentato roseo-purpurea, nervis viride-badiis. Filamenta tepaloris subaequilonga, in basi dilatata et per 1 mm connata, roseo-purpurea, superne subulata, albescentia vel rosea. Antherae roseo-violaceae. Ovarium breve stipitatum, late pyriforme, sexangulare, supra leviter radiato-insculptum, 2-3 mm longum, 3-4 mm diametro, cellulae epidermi longitudine elongatae, longe-gibberosae. Stylus conico-filiformis, deinde filamentis aequilongus, initio albus et violaceus. Stigma integrum, albescens. Capsula triangulata, duplo-pyramidalis, apice tuberculata, 7-8 mm diametro, 6-7 mm longa. Semina 3-4 per loculis, circiter 3 mm longa, 2.5 mm lata, 2 mm crassa, opaco-nigra, verruculosa.

Differt ab subspeciei typica lamina latiora, stricta, in basi minus attenuata, scapo longiore. Bulbos vivos traditi in hortum Gaterslebense No. TAX 1899.

Plants offered in the Dutch bulb trade under the name *A. spec.* 'Nivea' could also belong to subsp. *kwakense*. We received bulbs from Holland which showed as the only difference a slightly ribbed basal part of the scape. It is believed that this strain originated in Afghanistan. Another population from Afghanistan sent to us from Holland (collected by W. Kooiman, NA 355) has a fully smooth scape, but differs by a very dense inflorescence and much broader tepals. It may well be that a still insufficiently known and undescribed taxon exists in Afghanistan. It seems to be identical to a gathering of Rechinger (No. 3752) from Kerman as discussed by Wendelbo under *A. jesdianum*.

Another similar but more tender species is the recently described *Allium ecornutum* F. O. Khasanov & I. I. Maltzev currently only known from the Kugitang mountains in the extreme south of Uzbekistan. It differs from *A. sarawschanicum* by the rounded ovary without outgrowths, by narrower leaves, and by a much greater spathe. This species is still insufficiently known and deserves further research, especially the comparison of living plants with the other taxa of the section. Bulbs kindly sent to us from the Pamir Botanical garden Khorog without clearly indicating their place of collection but very probably originating from the Pamir mountains nearby, were first determined by us as *A. schugnanicum* Vved. which was described from an area not far from Khorog. Later the plants proved to be identical to *A. rosenbachianum* s.str. Judging from the words of its description, *A. schugnanicum* could well be a synonym of *A. rosenbachianum* Regel s.str. Though without having compared living plants from the loci classici of both species, it is too early to make a well based decision whether they are conspecific. Obviously the species dealt with above are nearly related and form a remarkable group characterised by mostly glossy, yellowish-green laminae, smooth and glossy scapes, rather lax inflorescences with silvery-carmine flowers the tepals of which are narrow lanceolate to long triangular. I propose to describe this group, which includes the nomenclatural type of sect. *Megaloprason* Wendelbo, on subsectional level.

Subsect. **Megaloprason** R. M. Fritsch, **subsect. nov.**

Typus subsectionis: *Allium rosenbachianum* Regel.

Scapus plerumque (30-)50-100 cm longus, in vivo glaberrimus, lucens, in sicco tenuiter costatus. Folia obovato-lanceolata, basi prope valde tenuiter, lucens, luteo-viride. Inflorescentia aliquantum laxa, multiflora. Pedicelli stricti, aliquantum tenui. Tepala tenuiter lanceolata usque longe triangulari, subargentato-rosea usque pallide purpureo-violacea.

The *A. jesdianum*-group

A second subsection comprises those species formerly erroneously named *A. rosenbachianum* and characterised by a ribbed scape, dull green to glaucous green, relatively longer, and only slightly tapering laminae, more compressed inflorescences consisting of more stout pedicells, and brightly pink to carmine-violet tepals of a striking colour.

The best known taxon of this subsection is *A. jesdianum* Boiss. & Buhse, the "*A. rosenbachianum*" in the sense of Lipsky, Vvedensky and many other authors. It is surprising, that apparently only one morphological type was distributed by commercial growers and among most botanical gardens: it is characterised by a rather great number (up to 10 in strong plants) of narrow, broadly ribbed leaves, a tall, densely and sharply ribbed scape also in the living state, and by thin and elastic, papery, strongly parallel nerved bulb tunics. Such plants agree very well with the type specimen except that bulb tunics are missing in the type. Plants from the Hissar mountains I collected (and also present in the Gazimajlik and Kugitang mountains) do not much differ. Their morphological variability and ecological adaptation were described in detail in a previous paper (FRITSCH, 1990b). Wendelbo interpreted this species in another way by mentioning only 2-3 leaves and accepting finely reticulate-fibrous outer bulb tunics as the most typical character of *A. jesdianum*. According to the specimens cited in "Flora Iranica" (76: 84), he saw no other vouchers from the Yasd mountains than the type specimens which do not possess tunics. However, material collected on the locus classicus by Faroughi and Assadi was distributed in the series "Flora of Iran" under No. 17947. The sheet present at Geneva presents only one bulb the tunics of which are very fine and smooth without any trace of reticulations. Additionally, these plants show very fine and dense verruculose ovaries, whereas Figure 12d in WENDELBO (1959) indicates coarse and more prominent epidermal cells of the ovaries intermixed with much more nonprominent ones for the plants in Wendelbo's sense which very probably belong to another taxon which has botanically still to be recognized.

Another taxon with a ribbed scape is found in catalogues and horticultural books under the name *A. aflatunense*. These plants are similar to *A. jesdianum*, however in all parts stouter and shorter and they reach the flowering stage 2-3 weeks earlier. Their scapes show sharp ribs in a greater distance one from another, the leaves are somewhat broader, more sideward reflexed, and remarkably thicker. The inflorescence is dense and remains over rather a long time on a half-orbicular stage reaching a nearly orbicular shape only when the last flowers open. The tepals are only 7-9 mm long, though broader than in *A. jesdianum* and only slightly lengthwise incurved. Several horticultural cultivars exist differing by the colouration of the flowers. Very probably this taxon is of horticultural origin and was for first time offered by the Dutch breeder of decorative bulbous plants, Van Tubergen, in the first decades of our century. The plants share with the true *A. aflatunense* B. Fedtsch. (which will be discussed below) only one character: the somewhat broader (2-2.5 mm) tepals — they were obviously misnamed. Because a valid botanical name is not available, I describe this taxon herewith.

***Allium hollandicum* R. M. Fritsch, spec. nov. (Fig. 2).**

Typus: Ex culturae in horto Gaterslebenensis, No. TAX 1631, leg. 27.V.1986 (GAT).

Bulbus latiuscule ovoideus, usque 5 cm diametro, tunicis tenerissimis membranaceis. Scapus strictus cylindricus, basi distincte costatus, 40-60 cm (in fructibus usque 80 cm) longus, 5-10 mm diametro, viridis, glaucus. Folia 4-6(-8), lamina late lanceolata, recurvata, basi crassiuscula, apice tenuiter saepe dependens, superne laevis vel fere sulcata, subtus latior mucronato-costata, breviter et obtusa arcuatim apiculata, apice cucullata, margine laevis, (25-)30-45 cm longa, 1.5-5(.7) cm lata, viridis, plus minus glauca. Spatha membranacea, fragilis, in valvas duas late ovatas divisa, lutescens. Inflorescentia initio hemisphaerica, deinde globosa, densa, multiflora, diametro 4-12 cm. Pedicelli tenues, stricti, solidi, lucentes, brunnei saepe viridescentes. Flores stellato-cyathiformes. Tepala late lanceolata, acuta margine inflexa, curvato-potentia, mox reflexa et tortuosa, 7-9(-10) mm longa, 2-2.5 mm lata, pallide lilacina vel rosea usque purpurea, nervus paullo viride-badius. Filamenta basi dilatata breve connata, supra subulata, tepalis 2/3-3/4 longitudinis, lilacina usque purpurea. Antherae 2-2.5 mm longae, circiter 1 mm latae, violaceae. Ovarium stipitatum, planiusculo-globosa, sexangulare, cellulae epidermi longitudine subelongatae, acutiusculo gibberosae. Stylus conico-filiformis, 3-6 mm longus, albidus. Stigma integrum, albidum. Capsula triangulata, obtuso-conica, breve stipitata, usque 8 mm longa et diametro, rugosa. Semina 1-2(-3) per loculo, 3.5-4 mm longa, 3-3.5 mm lata, 2.5-3 mm crassa, opaco-nigra, verruculosa.

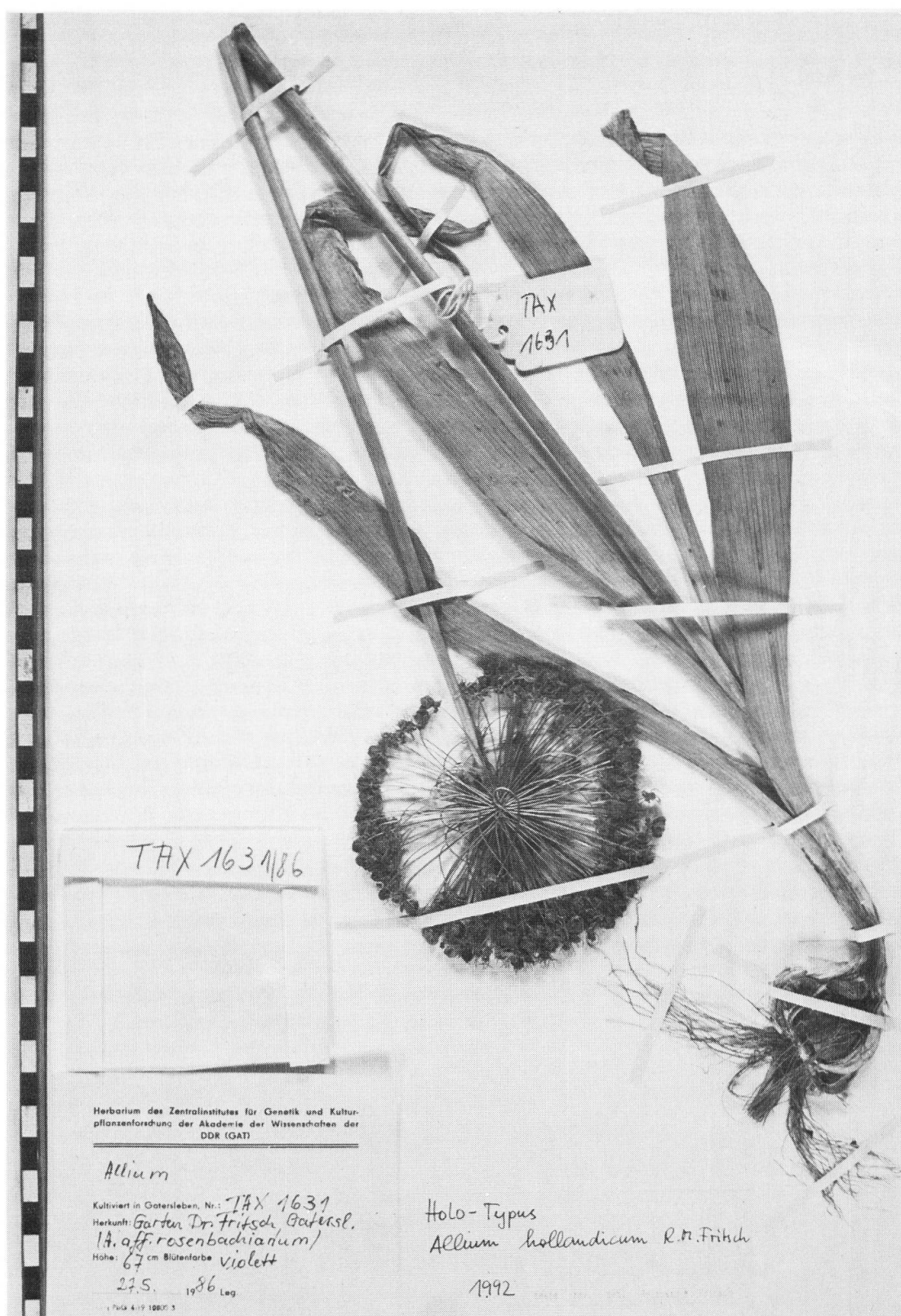


Fig. 2. — Typus of *Allium hollandicum* R. M. Fritsch (graduation of scale in centimeters).

Patria ignota probaliter forma hybrida hortorum. Differt ab *Allium aflatunense* B. Fedtsch. scapo in vivo costato et ad summum 1 m longo, folia angustioria, inflorescentia initio hemisphaerica, floret circiter tres hebdomas anterior. Proxima *A. jesdiano* sed statura compacta, tepalis brevioribus et latioribus, inflorescentiis densioribus, scapi paucicostatibus.

Allium angustitepalum Wendelbo as characterised above (*A. rosenbachianum* sensu Wendelbo) is also nearly related to *A. jesdianum*. Its flowers impress by the striking contrast between the bright pink tepals and more or less pure white subulate upper parts of the stamina which seems to be an useful character to single this species out of similar taxa on first glance. *Allium jesdianum*, *A. hollandicum*, and *A. angustitepalum* form a peculiar group which I describe as:

Subsect. **Costatae** R. M. Fritsch, **subsect. nov.**

Typus subsectionis: *Allium jesdianum* Boiss. & Buhse.

Scapus 50-120 cm longus, in vivo manifeste costatus, minimum in parte basali. Folia virides usque glauca, tenue lineari-lanceolata, basi prope paullo tenuiter, subtus lato-costata. Inflorescentia multiflora, aliquantum densa. Pedicelli stricti, aliquantum tenui. Tepala lineari-lanceolata, fulgente rosea usque pallide purpureo-violacea.

Difficulties in naming plants belonging to the above discussed species can be due to unusual great differences between young or tender specimens and fully mature ones. We were highly surprised to see that fully developed specimens of *A. rosenbachianum* s.str. and *A. angustitepalum* show twice the lengths and diameter of the scape, twice to three times the lengths and widths of laminae, three to four times more flowers per inflorescence, but only somewhat longer pedicells, tepals, and filaments. Young or tender plants belonging to other sections are also smaller in all parts, however they do not show such a striking difference in their overall impression. This may be the reason that a few species described long ago were extremely rarely collected and are now regarded to be doubtful taxa. For instance, *A. bakhtiaricum* Regel, and *A. kazerouni* Parsa from southern Iran, could be conspecific with species as discussed above or could at least belong to the described subsections. A clear decision needs to be based on the investigation of well developed, living material, however.

The *A. stipitatum*-group

Also plants of *A. stipitatum* are occasionally misnamed as *A. rosenbachianum*, as some catalogues of bulb growers show. This is not surprising because of the many characters all of the above cited species have in common. In this case two main errors seem to be involved: firstly, the leaf margins of *A. rosenbachianum* in any sense are glabrous or somewhat scabrid. According to all available floras, the leaves of *A. stipitatum* have to be hairy, or at least scabrid on the lower side. In the populations of Hissar mountains (in the vicinity of the locus classicus), I found nearly glabrous plants as well as all kinds of more or less pubescent ones, sometimes only along the margins. Plants of Tian Shan and Alai mountains, as well as of European gardens, often possess fully glabrous laminae, so that they cannot be correctly determined as *A. stipitatum* using anyone of the available keys. The second problem arises in connection with the surface of the scape. I was not able to find any notice about it neither in the original description nor in a later paper of REGEL (including his final publication of 1887), nor in the important paper of LIPSKY (1900). Also descriptions of *A. stipitatum* in horticultural books did not mention this character, the "Hortus Third" (ANONYMUS, 1976) included. In several floras, Vvedensky described the scapes to be smooth or nearly so, and this is true. All plants of *A. stipitatum* I gathered in Tadjikistan (FRITSCH, 1990b), as well as in the Tian Shan and Alai mountains had smooth scapes in the living state. However, in the dry condition they are ribbed, as dry scapes of all species of subgen. *Melanocrommyum* are commonly more or less prominently ribbed. This fact is commonly known to botanists who collected *Allium* species in the wild. Apparently Wendelbo did not know it and

wrote in the description of *A. stipitatum* “scapus manifeste costatus” (1971, p. 85). Now the same wrong statement can be found in the “European Garden Flora” (STEARN, 1985), and in the “Dictionary of Gardening” (HUXLEY & al., 1992). These ribs of the dry scapes have their anatomical basis in rib-like structures on the outer side of the sclerenchymatous tissue of the scape (FRITSCH, 1993).

I also suggest that *A. hirtifolium* Boiss. has a smooth scape in the living state, and not a ribbed one (WENDELBO, 1971, p. 85: “scapus leviter costatus”). The other differences to *A. stipitatum* as given by WENDELBO (loc. cit.) are rather insignificant, the more as the outer bulb tunics of *A. stipitatum* disintegrate in fibre-like parts, too. It seems to me that LIPSKY (1900) could have been right to unite both species. However, I did not see living plants of *A. hirtifolium* from Iran, and it is too early to decide about this question now. On this occasion it should be referred to the correct citation of the typus of *A. hirtifolium*. In the original description by BOISSIER (1882) *Allium atropurpureum* Waldst. & Kit. var. *hirtulum* Regel is cited as the only synonym. According to the rules, *A. hirtifolium* is nomenclaturally based on this elder name and is typified on a specimen collected by Bode in “Persia australis in montibus bakhtiaricis”, and not by Aucher No. 5389 as cited by WENDELBO (1971) and by KOLLMANN (1984). The holo-type should be present at LE, but I was not able to find it during my stays at St. Petersburg in 1988 and 1989.

Allium stipitatum is known mostly from elevations below ca. 3000 m s.m. over a great area of distribution comprising the western Tian Shan, and the whole Pamir-Alaj mountainous systems till to the Hindukush in the south. Therefore it should not be surprising to find many variable characters. REGEL (1887) itself described variations of length and basal form of the filaments. However, many characters vary remarkably already within populations, as mentioned above for the leaves. This is especially true for the colour of the tepals which can vary from a bright pink to a faint purplish-carmine; also plants having greenish-white flowers are not rare in the wild and are known among the cultivars of commerce. Also the colour of the sheath leaves may be reddish-brown, then the scapes become also reddish-brown in their lower parts, or may be green, then such a colour is missing. Commonly beige as well as yellowish-orange bulbs are present within one population. The ovary is normally covered by finely pyramidal-tuberculate epidermal cells, but in one population from the Tian Shan mountains we found rather coarse and longitudinally prolonged cells. Other characters are widely influenced by the growing conditions, because *A. stipitatum* prefers places rich in nutriment also in the wild (FRITSCH, 1990b). Well manured plants develop scapes reaching 1.80 m height in the fruiting stage, up to 10 leaves per plant, the outermost ones of which can reach a length of 70 cm and a width of 12 cm. Then the bulb becomes rather flat because the height remains at approximately 6 cm whereas the diameter can reach up to 12 cm. Also the tepals become greater. Such plants are real “giants” so that it is not surprising that *A. stipitatum* can sometimes be found in gardens wrongly labelled as “Giant leek *Allium giganteum*”.

On poor sites, plants of *A. stipitatum* often do not reach a height of 1 m, are smaller in all parts, and develop sometimes only 3-4 leaves and a much smaller number of flowers. Such small plants of *A. stipitatum* correspond somewhat to the description of *A. altissimum*, if their leaves bear no hairs. However, *A. altissimum* has purplish tepals 2-2.5 mm broad, and such dark and broad tepals are not present in small plants of *A. stipitatum*. Nevertheless, a few populations we received from European botanical gardens under the name *A. altissimum* proved to be hairless forms of *A. stipitatum*.

The above mentioned *A. altissimum* Regel is indeed a taxon closely related to *A. stipitatum*. As originally described, it is 1 m or somewhat more high, has up to 5 cm broad and rather long leaves, a smooth scape, and a similar inflorescence. The leaves are not hairy nor scabrid, green (not glaucous), the tepals not longer than 1 cm and as broad as mentioned above. Plants fully fitting these characters do really exist. We received a gathering from Alma-Ata originally collected near the pass of Kurday in the Transili (Zaili) Alatau mountains. The living plants delivered as additional characters separating them from *A. stipitatum*: strictly erect leaves, much more broadened bases of the inner filaments than the outer ones, and a flowering period beginning 3-4 weeks later. In 1991, our plants fit well the most questionable character given in the original description as “scapo apice anguino picto”: the upper parts of the scapes were covered by whitish spots. However, such spots were present in many species, including *A. stipitatum*, the young scapes of which survived

severe frosts without protection in some nights during April. I guess that, accidentally, such a late frost damaged the plants described by E. Regel als *A. altissimum*, too, whereas plants of *A. stipitatum* and *A. giganteum* remained undamaged in that year.

Plants as discussed above should represent the true *A. altissimum* Regel s.str. Unfortunately, a definite locus classicus is not known (FRITSCH, 1990a), and I was not able to find such plants neither in the Wakhsh and Khasratishokh mountains, nor in the vicinity of Baldzhuan. Also the herbarium of Dushanbe (TAD) did not contain a single voucher specimen for *A. altissimum*: all sheets maintained under that name were wrongly determined. A few are *A. stipitatum* and *A. sarawschanicum*, and the other ones (from the Hissar mountains) belong clearly to *A. rosenbachianum* subsp. *kwakense*.

However, this does not show that REGEL erred in describing *A. altissimum* to have come from the former province Baldzhuan. There are still hundreds of square kilometres, where these plants could grow, and which botanists still not visited in order to collect tall growing Alliums ...

Because of the many misdeterminations, the area of natural distribution of *A. altissimum* cannot be reconstructed basing on the points of occurrence given in the literature. Currently the assumption seems to me to be most probable, that it is found in several places along the outer lines of the distribution of *A. stipitatum*.

Several of the characters separating *A. altissimum* from *A. stipitatum* are shared by another nearly related taxon, *A. aflatunense* B. Fedtsch. non auct.: stiff and erect leaves without hairs, broadened bases of the inner filaments, shorter and broader tepals, and a later beginning of flowering period. However, plants of *A. aflatunense* s.str. have glaucous and much broader leaves and grow still taller than *A. stipitatum*. Some of these characters can well be seen on the photograph accompanying the original description (FEDTSCHENKO, 1904, tab. VII). In the wild, the scapes can reach more than 2 m height in the fruiting stage (Levichev, pers. commun.). Shortly, *A. aflatunense* looks like a still taller sister form of *A. altissimum*.

Allium aflatunense seems to be a rare species. It is only known from a few places of the western part of the Talassian Alatau and of the Fergana Mountains. Unfortunately, plants from the wild are missing in our collection at Gatersleben. Several strains provisionally determined as *A. aflatunense* Fedtsch. s.str. were grown from seed sent by botanical gardens. These strains contain plants with glaucous leaves and somewhat scabrid margins, as well as those ones with green leaves and smooth margins, and transitional forms of all kind. They all flower later than *A. stipitatum* and show more and somewhat higher broadened bases of the inner filaments. Therefore I strongly suppose they could be hybrids from a cross *A. stipitatum* × *A. altissimum* ... I could well imagine that such nearly related taxa like *A. stipitatum*, *A. altissimum*, and *A. aflatunense* can easily cross and give fertile offspring. Unfortunately, we do not investigate at Gatersleben what species can be crossed, and so I can give no evidence to this idea. May be, that further research will enable us to decide whether these three species should not better be regarded only as variants of a single variable species.

Nevertheless, *A. stipitatum* and those taxa discussed above on the species level as *A. hirtifolium* Boiss., *A. aflatunense* B. Fedtsch. non auct., and *A. altissimum* Regel form a group of its own, which can be distinguished from both the above described subsections by a special combination of characters: scapes and leaves are much taller, the scapes are stout and completely smooth, the laminae are very broad, ribbed like the much narrower ones of sect. *Costatae*, and can be pilose or at least hirsute along the margins, the inflorescences contain more flowers and are more compact, the pedicels are somewhat stout, and relatively shorter. The tepals can be broader or longer and show a striking pink to carmine-violet colour. I describe them as:

Subsect. **Elatae** R. M. Fritsch, **subsect. nov.**

Typus subsectionis: *Allium stipitatum* Regel.

Scapus plerumque ultra 1 m longus, in vivo glaberrimus, lucens, in sicco tenuiter costatus. Folia late lineari-lanceolata, basi prope paullo tenuiter, subtus non profunde lato-costata.

Inflorescentia pluriflora, densa. Pedicelli stricti, crassiusculi. Tepala lanceolata vel lineari-lanceolata, fulgente rosea usque purpureo-violacea.

On the taxonomic level of series, the valid name ser. *Altissima* Tzagolova (in Bot. Mater. Gerb. Inst. Bot. Akad. Nauk Kazahsk. SSR Vyp. 10 (1977) 14) is available because it is typified on *A. altissimum* Regel. However, it can be concluded from the words of description, as well as from the very different characters of the species involved (*A. altissimum* Regel, *A. iliense* Regel, *A. schubertii* sensu auctt. Fl. Asiae Centr., *A. caspium* (Pallas) M. Bieb.), and from the circumstances of publication, that this series should comprise those Kazakh species of subgen. *Melanocrommyum*, which were neither included in the simultaneously described series *Oreophila* and *Verticillata*, nor mentioned under ser. *Decipientia* by OMELCZUK (1962), in order to have them all filed. I regard series *Altissima* in the sense of Tzagolova to be more a "national Kazakh" than a taxonomic group.

Other species initially included in sect. *Megaloprason*

The greater part of the species included by WENDELBO (1969, 1971) has been dealt with now. Two out of the three short-stemmed species, *A. brachscapum* Vved. and *A. scotostemon* Wendelbo, seem to me most probably to belong to sect. *Thaumasioprasum* Wendelbo, where they could represent together with *A. monophyllum* Vved. an own subgroup. The insufficiently known *A. badakhshanicum* Wendelbo as the third species is difficult to interpret; it might belong to one of the groups of sect. *Acmopetala* R. M. Fritsch comprising smaller species, as *A. chitralicum* Wang & Tang might also belong to, or to sect. *Miniprasum* R. M. Fritsch. *Allium chelotum* Wendelbo could be one of the species like *A. komarowii* Lipsky having broad and obtuse leaves combined with rather small and dense inflorescences composed of great flowers. It is still under discussion in which section they should be included, whereas *A. giganteum* Regel and *A. macleeanii* Baker clearly belong to sect. *Compactoprason* R. M. Fritsch, and *A. suworowii* Regel and its near relative *A. fibriferum* Wendelbo to sect. *Acmopetala*.

Key for determination of living plants in flowering stage

- | | |
|---|--------------------------|
| 1. Scape at least in its lower part lengthwise prominently ribbed (subsect. <i>Costatae</i>) . . . | 2 |
| 1a. Scape smooth | 4 |
| 2. Scape narrowly ribbed, ribs in the upper part of the scape less remarkable, but present. Leaves 4-8(10), laminae narrow lanceolate, 10-35 mm broad, basal part distinct canaliculate, upper part becomes quickly lax and hangs down, lower side with broad ribs. Tepals arcuately reflexed. Filaments uniformly rose-lilac or basal part somewhat darker | |
| | A. jesdianum |
| 2a. Scape distantly ribbed, ribs in the upper part mostly missing. Rarely more than 4-6 leaves | 3 |
| 3. Plants stout. Laminae rather erect, 1/2-2/3 as long as scape. Inflorescence dense, half-orbicular, finally suborbicular. Tepals 7-9 mm long, 2-2.5 mm broad. Filaments whitish-pinkish to purplish throughout | A. hollandicum |
| 3a. Plants slender. Laminae arcuately reflexed, 2/3-3/4 as long as the scape. Inflorescence moderately dense, initially broadly ovate, finally orbicular. Tepals 8-10 mm long, 1.5-2 mm broad, arcuately reflexed. Filaments basal pinkish, the subulate part striking white | A. angustitepalum |
| 4. Leaves (3)4-8(19), laminae (20-)30-80(-120) broad, smooth, scabrid, or pubescent, basally only slightly tapering. Tepals brightly pinkish to purple (rarely white). Inflorescence rather dense (subsect. <i>Elatae</i>) | 5 |

- 4a. Leaves (1)2-4(6), laminae (10-)15-50(-65) broad, basally distinctly tapering. Inflorescence loose. Tepals inconspicuously silvery-pinkish (subsect. *Megaloprason*) 7
5. Plants flowering in May. Laminae rather broad, sideways bent, mostly pubescent or scabrid along the margin (sometimes fully smooth). Inflorescence longitudinally flattened, orbicular. Tepals 10-12 mm long, 1.3-1.8 mm broad. Dilated bases of inner filaments 1.2 times as broad as those ones of the outer filaments ... **A. stipitatum** s.str.
- 5a. Plants flowering in June. Laminae stiff erect, completely glabrous. Tepals 6-7 or 8-9 mm long, 2-2.5 mm broad. Broadened bases of inner filaments 1.4-1.7 times as broad as those ones of the outer filaments 6
6. Scape 80-120 cm high. Laminae up to 5 cm broad. Inflorescence contains not very much flowers, up to 9 cm in diameter. Tepals 6-7 mm long, (dark) purple .. **A. altissimum**
- 6a. Scape 120 to 180 cm high. Lamina up to 15 cm broad. Inflorescence contains very much flowers, up to 12 cm broad. Tepals 8-9 mm long, pink to faint purplish-violet
A. aflatunense s.str.
7. Lamina longitudinally folded, the outer leaf long-ovate, up to 10 cm broad, of the inner leaves much narrower, margins basally overlapping and collar-like outside bent. Upper part of the ovary with oblique-upwards directed and radially elongated outgrowths
A. sarawschanicum
- 7a. Laminae yellowish green, not longitudinally folded, gradually tapering towards a petiole-like basis, the outer leaf up to 6 cm broad, the inner leaves slightly narrower. Ovary without elongated outgrowths 8
8. Scape 40-50 cm high. Laminae \pm adpressed to the earth, tapering towards a narrow base
A. rosenbachianum s.str.
- 8a. Scape 60-80 cm high. Laminae strictly erect, basally slightly tapering
A. rosenbachianum subsp. **kwakense**

NOTE

A recent visit of the Uzbek part of Kugitang range (Southern Pamir-Alai) in common with Dr. Khassanov enabled us to study *Allium ecornutum* F. O. Khassanov and I. I. Maltzev on its locus classicus. We detected, that *A. ecornutum* has a ribbed scape, and that it is only a form of *A. angustitepalum* Wendelbo growing in the dense shadow of *Juniperus* forests. It should be sink into synonymy under *A. angustitepalum* and is only distantly related to *A. sarawschanicum* Regel. *Allium jesdianum* Boiss. & Buhse is not growing there.

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REFERENCES

- ANONYMUS (1976). *Hortus third. A concise dictionary of plants cultivated in the United States and Canada*. Macmillan Publ. Co., Inc., New York, etc., 1290 pp.
- BOISSIER, P. E. (1882). *Flora orientalis sive enumeratio plantarum in Oriente a Graecia et Aegypto ad Indiae fines hucusque observatarum*. Tomus 5, 1. Basel, Genève, H. Georg, 428 pp.

- EKBERG, L. (1969). Studies in the genus *Allium* II. A new subgenus and new sections from Asia. *Bot. Not.* 122: 57-69.
- FEDTSCHENKO, B. (1904). Novitae florum Turkestanicae. *Bull. Herb. Boiss. sér. 2*, 4: 917, cum tab. VII post p. 956.
- FRITSCH, R. M. (1990a). Lectotypifications in *Allium* L. (Alliaceae) subg. *Melanocrommyum* (Webb et Berth.) Rouy. *Taxon* 39: 501-510.
- FRITSCH, R. (1990b). Bericht über Sammelreisen in Tadschikistan (1983-1988) zum Studium von mittelasiatischen Vertretern der Gattung *Allium* L. *Kulturpflanze* 38: 363-385.
- FRITSCH, R. M. (1992). Infra-subgeneric grouping in subgenus *Melanocrommyum* (Webb et Berth.) Rouy. In: HANELT, P., K. HAMMER & H. KNÜPFER (Eds.), The genus *Allium* — taxonomic problems and genetic resources. *Gatersleben*: 67-75.
- FRITSCH, R. (1993). Anatomische Merkmale des Blütschaftes in der Gattung *Allium* L. und ihre systematische Bedeutung. *Bot. Jahrb. Syst.* 115: 1-35.
- GAFFAROV, G. & I. TURAKULOV (1991). Novyj vid luka (*Allium*) iz Turkestanskogo khrebta. *Uzbek. Biol. Žurn.* 2: 69.
- HUXLEY, A., M. GRIFFITHS & M. LEVY (Eds.) (1992). *The new Royal Horticultural Society Dictionary of Gardening*. Macmillan Press Ltd., London, etc., 815 pp.
- KAMELIN, R. V. (1973). *Florogeneticheskij analiz estestvennoj flory gornoj Srednej Azii*. Leningrad, Izd. Nauka, 356 pp.
- KAMELIN, R. V. (1976a). Novyj vid luka (*Allium* L.) iz yuzhnogo Uzbekistana. *Bot. Mater. Gerb. Bot. Inst. Akad. Nauk SSSR* 13: 42-44.
- KAMELIN, R. V. (1976b). Novyj vid luka iz khrebta Syrdar'inskogo Karatau (Kazakhstan). *Bjull. Moskovsk. Obšč. Isp. Prirod. Biol.*, N.S., 81: 138-139.
- KAMELIN, R. V. (1980). Nove taksony roda *Allium* (Alliaceae). *Bot. Žurn.* 65(10): 1459-1465.
- KHASSANOV, F. O. & I. I. MALTZEV (1988). Novyj vid roda *Allium* L. iz Kugitanga. *Uzbek. Biol. Žurn.* 4: 42-43.
- KIT TAN & F. SORGER (1986). Even more new taxa from South and East Anatolia I. *Pl. Syst. Evol.* 154: 111-128.
- KOLLMANN, F. (1984). 11. *Allium* L. In: DAVIS, P. H. (Ed.), *Flora of Turkey and the East Aegean Islands*, vol. 8: 98-211.
- KOYUNCU, M. & F. KOLLMANN (1978). Two new *Allium* species from Turkey. *Israel J. Bot.* 27(2): 90-93.
- KRASOVSKAJA, L. S. (1982). Novyj vid roda *Allium* iz Chatkal'skogo khrebta. *Bot. Mater. Gerb. Bot. Inst. Akad. Nauk Uzbeksk. SSR* 20: 14-17.
- KRASOVSKAJA, L. S. & I. G. LEVICHEV (1986). *Flora Chatkal'skogo zapovednika*. Izd. 'Fan', Tashkent, 174 pp.
- LIPSKY, V. I. (1900). Materialy dlya flory Srednej Azii. *Acta Horti Petrop.* 18: 1-146.
- OMELCZUK, T. Ya. (1962). Sistematchnij sklad tsibul Ukraini (rid *Allium* L.). *Ukrains'k. Bot. Žurn.* 19 (3): 66-73.
- REGEL, E. (1875). *Alliorum adhuc cognitorum monographia* ... Petropolis, 266 pp. (= *Acta Horti Petrop.* 3(2): 1-266.)
- REGEL, E. (1876). Turkestanskaya Flora ... Tetrade pervaya. In: FEDTSCHENKO, A. P., *Puteshestvie v Turkestan*. Vyp. 12, tom III. *Izv. Imp. Obšč. Ljubit. Estestv., Antrop. Etnogr.* 21, vyp. 2, 165 pp., 22 tab.
- REGEL, E. (1878-1886). Descriptiones plantarum novarum et minus cognitarum ... Fasciculus VI, VII, VIII, VIII suppl., IX, X. *Acta Horti Petrop.* 5: 575-646; 6: 287-583; 7: 541-690; 8: 269-279, 641-702; 9: 575-620.
- REGEL, E. (1881a). A. *Allium stipitatum* Regel. *Gartenflora* 30: 355, tab. 1062 fig. 1-3.
- REGEL, E. (1887). Allii species Asiae centralis in Asia media a Turcomania desertisque aralensibus et caspicis usque ad Mongoliam crescentes ... *Acta Horti Petrop.* 10: 279-362.
- STEARNS, W. T. assisted by E. CAMPBELL (1986). *Allium* Linnaeus. In: WALTERS, S. M., A. BRADY, C. D. BRICKELL, J. CULLEN, P. S. GREEN, J. LEWIS, V. A. MATTHEWS, D. A. WEBB, P. F. YEO & J. C. M. ALEXANDER (Eds.), *The European garden flora. A manual for the identification of plants cultivated in Europe, both out-of-doors and under glass. Vol. I. Pteridophyta, Gymnospermae, Angiospermae-Monocotyledons (Part I)*. Cambridge Univ. Press, Cambridge etc.: 233-246.
- TURAKULOV, I. (1986). Nove vidy luka (*Allium* L.) iz Kuraminskogo khrebta. *Dokl. Akad. Nauk Tadzh. SSR* 29(3): 180-182.
- TZAGOLOVA, V. G. (1977). K sistematike sektsii Molium G. Don Kazakhstanskikh lukov. *Bot. Mater. Gerb. Bot. Inst. Akad. Nauk Kazahsk. SSR* 10: 13-14.
- VVEDENSKY, A. I. (1935). Rod 267. Luk — *Allium* L. In: KOMAROV, V. L. (Red.), *Flora SSSR* 4: 112-280.
- VVEDENSKY, A. I. (1941). Rod 162. (7.) *Allium* L. — Luk. In: KUDRJASHEV, S. N. (Red. tomi pr.), *Flora Uzbekistana*, tom 1: 427-467, 543.
- VVEDENSKY, A. I. (1963). Sem. Amaryllidaceae. In: OVCHINNIKOV, P. N. (Gl. Red.), *Flora Tadzhikskoj SSR*, tom 2. Moskva — Leningrad, Izd. Akad. Nauk SSSR, 456 pp.
- VVEDENSKY, A. I. (1971). Luk. ... In: VVEDENSKY, A. I. (Nauchn. rukov.), KOVALEVSKAYA, S. S. (Red.), *Opredelitel rastenij Srednej Azii. Kriticheskij konspekt flory*, tom 2: 39-89, incl. "Appendix. Descriptiones plantarum novarum in tomo II Conspectus Florae Asiae Mediae commemoratarum": 311-328.

- WENDELBO, P. (1959). Liliiflorae. In: KØIE, M. & K. H. RECHINGER, *Symbolae Afghanicae* IV. *Biol. Skr.* 10(3): 150-191.
- WENDELBO, P. (1966). New taxa and synonyms in *Allium* and *Nectaroscordum* of SW. Asia. *Acta Horti Gothob.* 28: 15-55.
- WENDELBO, P. (1969). New subgenera, sections and species of *Allium*. *Bot. Not.* 122: 25-37.
- WENDELBO, P. (1971). Alliaceae. In: RECHINGER, K. H., *Flora Iranica*. No. 76. Graz, Akademische Druck- und Verlagsanstalt, 100 pp.
- WENDELBO, P. (1973). Contributions to the flora of Iraq, XII. New species and new combinations in the Liliaceae. *Kew Bull.* 28(1): 29-35.