Notes on Astracantha marashica (Fabaceae)

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Abstract:
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Astracantha marashica is reduced to the synonymy under *Astragalus dipodurus*. The glands on the leaflets, which were considered to be important and characteristic for *Ac. marashica*, do not support the systematical separation of this species from *A. dipodurus*. Other diagnostic features, which were used for separation of this species from *A. dipodurus*, are shown to have no value in *Astragalus oleaefolius*-complex of sect. *Macrophyllium*.

Zusammenfassung:
Astracantha marashica wird zur Synonymie von *A. dipodurus* reduziert. Es wird gezeigt, daß die Drüsen, die für charakteristisch und wichtig gehalten worden waren, die taxonomische Trennung der obengenannten Arten nicht unterstützen. Außerdem sind andere diagnostische Merkmale, die für die Trennung dieser Arten verwendet worden sind, von keiner taxonomischen Bedeutung im *Astragalus oleaefolius*-Komplex.

Introduction

Of all species which were considered as members of *Astracantha* Podlech (abbreviated here as *Ac.*), *Astracantha marashica* Duman & Vural is the only name to be originally described under this genus (all other species were originally described as *Astragalus*). Thus no valid name for this species is available, after reducing the genus *Astracantha* to the synonymy under *Astragalus* (ZARRE & PODLECH, 1997). For this reason and in the course of monographic revision of tragacanthic species of *Astragalus* (by S. Zarre), we have examined many herbarium specimens of the species belonging to sect. *Macrophyllium*, especially of *A. deinacanthus* Boiss., *A. dipodurus* Bunge and *A. oleaefolius* DC. Moreover, we undertook some field studies at the type locality of *Ac. marashica* for examining the range of variability regarding some characters (see below) within the populations of *Ac. marashica*. Scanning electron microscopy was also used for clarifying the nature of glands in *Ac. marashica*, using a Philips scanning electron microscope "XL20" of the "Institut für Zoologie der Universität München".

Taxonomic and morphological aspects

Ac. marashica belongs to a very problematic complex of species within sect. *Macrophyllium*. This complex is refered here as *A. oleaefolius*-complex (after the oldest name in the

complex). Very large leaves and inflorescences in comparison to other tragacanthic species, and many-flowered axillary clusters (sometimes with more than 30 flowers in each axillary clusters) characterize sect. *Macrophyllium*. The biggest inflorescences within tragacanthic *Astragalus* are presented by some morphs in this complex. Therefore, this group has drown the attention of many taxonomists, who described many species, especially from the specimens with such inflorescences. Some of the frequently used names in *A. oleaefolius*-complex are *A. deinacanthus*, *A. gigantostrobus* Rech.f. & Aellen, *A. griseosericeus* Eig, *A. lagonyx* Fisch., *A. lagowskyi* Trautv. and *A. sofarensis* Thiébaut.

Within this complex four morphs with different geographical centres of distribution have been distinguished:

- Specimens which match the type of *A. oleaefolius* and are distributed from central Anatolia to Caucasus,
- specimens with main distribution area in south Anatolia, which match the type of *A. dipodurus*,
- specimens with distribution in Lebanon, Palestina and Syria, which match the type of *A. deinacanthus*, and
- specimens which match the type of *A. lagonyx* and with distribution in Iran and Iraq.

After analysing the herbarium material regarding some quantitative vegetative and floral characters, we have came to the conclusion, that the above named morphs can not be meaningfully treated as separate species (see fig. 1 and tab 1). One of the morphs, *A. deinacanthus*, is somewhat isolated in the scatter diagramm (fig. 4) using only two diagnostic characters, i.e. number of leaflet pairs on each leaf and inflorescence size. Even *A. deinacanthus* is not decisively different from the remainder of the complex, because there are many intermediates between this species and *A. oleaefolius*. Because of the frequency of these intermediates we refrain from assigning even subspecies rank to this morph.

A. dipodurus (including *Ac. marashica*) is the only species in our complex which can be systematically separated from other morphs by using a single autapomorphy regarding leaf indument. The leaves in this species are covered by spreading-villous hairs, though sometimes sparsely, and are gradually glabrescent (highlighted as closed objects on plots), whereas they are appressed hairy (only very young leaflets and rachides) and early glabrescent in remainder of the complex.

DUMAN & VURAL (1990) used following differences for characterizing *Ac. marashica*: Leaves with 11–12 leaflet pairs, presence of sessile glands on leaflets, presence of some sterile leaves at the top of the inflorescence, and a very large inflorescence, which consists of 500–700 flowers. As it is shown on the scatter diagramm (fig. 4), the type material of *Ac. marashica* is an extremely large plant with big inflorescences, but our new collections from the type locality (distributed under numbers 157, 173 and 175 in hb. Sh. Zarre) show transitions regarding two characters used in the scatter diagramm. Moreover, in many tragacanthic species of *Astragalus*, the apical buds produce some sterile leaves after a certain period of floral activity. The pattern of the activity of buds depends on environmental conditions in most cases. Therefore, the presence of such sterile leaves is a common phenomenon in many tragacanthic species, and also occurs in other members of the *A. oleaefolius*-complex.

The nature of the gland-like elements in *Ac. marashica*

The term gland is often used for glandular trichomes, which are involved in the secretion of various substances, e.g. gums (FAHN 1990). Since the glands cited by DUMAN & VURAL (1990) are secreted substances, rather than secretory trichomes, we use here the term gland-like elements for these appendages.

The gland-like elements in *Ac. marashica* are almost spherical or amorphous and variable in

size (60–120 µm in diam.) (fig. 2). They are not connected to any epidermal appendages such as trichomes, and are distributed randomly across the leaf surface. Some leaflets in the population are densely covered by these elements, while others are very sparsely so. On some leaflets the gland-like elements can be absent, but they are generally found on some leaflets of each plant in a population.

All of the above named features agree with a non-glandular nature of these secreted substances. They seem physically very similar to the plants' own gum: They are hard, easily separable from the leave surface, yellowish to green in colour and soluble only partially in water and alcohol (70%). However, it remains to examine, whether they are made of the same polysaccharid compound as gum tragacanth, or not. Such gland-like elements can be seen also in some other populations of *A. dipodurus* (e.g. specimen *Nydegger 42523* from Turkey, C6 Urfa), but very sparsely and mostly on the lower leaflet surface (fig. 3).

Type locality of *Ac. marashica* is located in a valley near Çaglyancerit in Turkey, C6 Karamanmaras, with warm and humid climate (mediteranean climate), where most of the other tragacanthic species of *Astragalus* (e.g. *A. amblolepis, A. diphterites, A. gummifer, A. pycnocephalus* and *A. stromatodes*) show also luxuriant growth, i.e. in this region they also have larger leaves and inflorescences in comparison to other specimens from northern and eastern part of Anatolia. Moreover, all of the above named species and also *A. marashica* in this area produce higher quantity of gum than populations from colder regions. It is possible that this high amount of gum is excreted from intercellular spaces onto the plant surface. More anatomical studies on the origin of this gland-like elements and the possible cell groups which deal with producing these substances are necessary. However, these elements are certainly made of only secreted substances and are not a specialized form of glandular trichomes. Therefore, most probably they are not systematically important, as one of us believed previously.

Conclusion

As a result of our studies we reduce *Ac. marashica* to the synonymy:

Astragalus dipodurus Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16) 88. 1868. in clave et l.c. 15(1): 156. 1869 ≡ *Tragacantha dipodura* (Bunge) Kuntze, Revis. Gen. 2: 944. 1891 ≡ *Astracantha dipodura* (Bunge) Podlech, Mitt. Bot. Staatss. München 19: 9. 1983. Lectotype (here designated): [Turkey, C6 Gaziantep] in Syria bor., circ. Aintab, 20.6.1865. *Haussknecht 47* (P!; Iso: G-BOIS!, JE!, LE!, W!)

= *Astracantha marashica* H.Duman & M.Vural, in Doga, Turk. J. Bot. 14: 40. 1990. Holotype: Turkey, C6 Karamanmaras: Çaglayancerit-Bozlar, c. 1000 m, 2.9.1988, *Duman & Vural 3826* (ANK!; Iso: GAZI!, MSB!).

The taxonomical treatment of other taxa belonging to the *A. oleaefolius*-complex is in preparation (by S. ZARRE).

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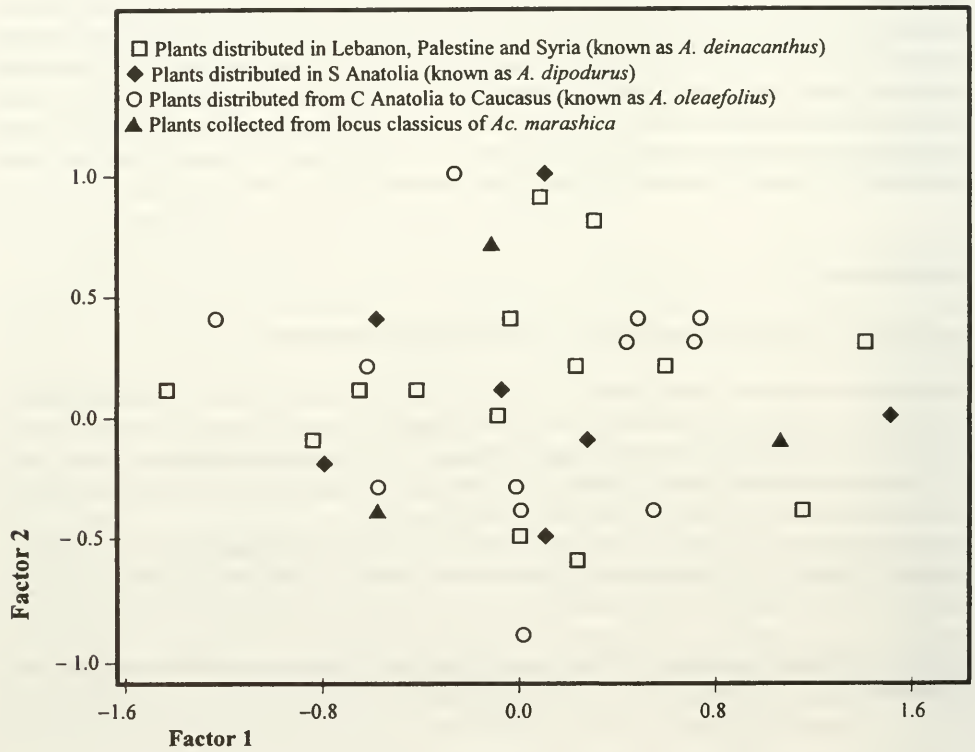

Fig 1. Plot of the first two principal components resulting from the analysis of 10 not correlated vegetative and floral characters in *A. oleaeifolius*-complex (*A. lagonyx* is excluded). Open objects: young leafles appressed hairy, closed objects: young leaflets spreading hairy. Matrix data for this plot were modified into a similarity matrix after standardizing by using product-moment correlation as the coefficient, then 2 first principal component axes for the resulted matrix were extracted and the objects were projected onto PCA axes (program package NTSYS-pc ver. 1.60 written by ROHLF 1990 were applied).

	A. deinacanthus	*A. diopodorus*	*A. oleaefolius*	*Ac. marashica*
Leaves				
1. Type of indumentum	appressed or glabrous	spreading	appressed or glabrous	spreading
2. leaflet pairs	7.57±1.55	10.00±1.29	10.25±1.71	7.67± 5.86
3. length	17.75±6.49	29.29±6.75	26.37±4.93	28.33±7.64
Leaflets				
4. length	23.00±7.17	31.43±6.88	34.83±10.28	36.67±7.60
5. weidth	7.00±3.33	13.86±3.34	10.83±4.82	18.33±1.53
Calyx				
6. length	16.36±2.34	16.14±2.19	13.00±0.74	13.67±1.15
7. teeth length	8.00±1.62	7.00±1.63	5.17±1.11	4.67±0.58
Bract				
8. length	14.29±2.76	16.29±2.21	12.67±1.77	12.67±0.58
Standard				
9. length	23.29±2.09	25.29±3.35	23.79±3.59	25.33±1.53
Wing				
10. length of limb	8.32±1.10	9.14±1.07	9.37±1.58	9.33±0.58
Inflorescence				
11. length	6.89±1.86	9.18±2.97	7.62±2.97	9.67±3.5

Tab 1. Characters used for distinguishing *A. deinacanthus*, *A. dipodorus, A. oleaefolius* and *Ac. marashica* (see fig. 1). The mean ± the standard deviation is given for each quantitative character.

Fig 2. Scanning electron micrograph of the lower surface of leaflets in *Ac. marashica* (isotype: MSB). Scale bar: 200 µm.

Fig 3. Scanning electron micrograph of the lower surface of leaflets in *A. dipodurus* (*Nydegger 45253*, MSB). Scale bar: 200 µm.

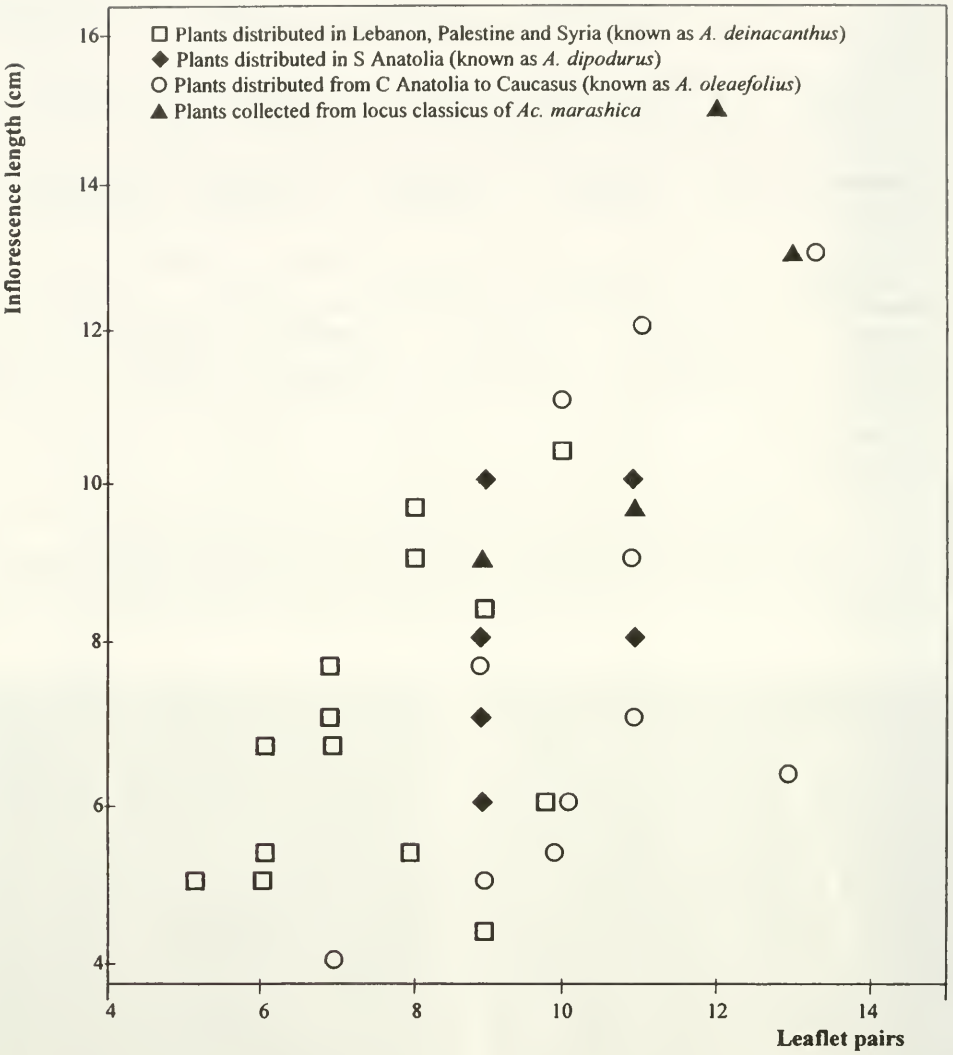

Fig 4. A scatter plot of the specimens belong to *A. oleaefolius*-complex (*A. lagonyx* is excluded), using two characters: Leaflet pairs and length of inflorescence, which were considered as diagnostic characters for separating *Ac. marashica*. Open objects: young leafles appressed hairy, closed objects: young leaflets spreading hairy.