

## Problems of the taxon *Hesperis unguicularis* Boiss.

Problematika taxonu *Hesperis unguicularis* BOISS.

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Abstract — The taxa *Hesperis hyrcana* BORN. et GAUBA 1940 : 254 and *Hesperis unguicularis* Boiss. 1856 : 21 are two subspecies of the species which, according to the international rules of botanical nomenclature, should be named *Hesperis unguicularis* Boiss.

### Introduction

BOISSIER (1856) described the taxon *H. unguicularis*. In my previous study (DVOŘÁK 1965) I explained that the synonym of *H. unguicularis* is *H. transcaucasica*, described by CVĚLEV (1959).

The establishment of the variability of the taxon and the specification of the relation to the species *H. hyrcana* BORN. et GAUBA was made possible by large and carefully arranged collections of the genus *Hesperis* coming from the Armenian Soviet Republic (ERE), supplied through the kindness of Mrs. AVETISJAN. The publication of AVETISJAN (1963) became the basis for the present study. It contains the results of the investigation of the first three groups according to the classification of AVETISJAN.

In the description of the trichomes I have used a terminology which refers only to their shape. I abide by BISCHOFF's work (1833 : 563—564). The following types of hairs are found in the indumentum of the investigated taxa: pili eramosi simplices subulati — simple awl-shaped hairs — briefly awl-shaped hairs (BISCHOFF 1833, Fig. 2110, 2114); pili ramosi furcati — branching forked hairs — briefly forked hairs (BISCHOFF 1833, Fig. 2146); pili eramosi simplices phragmigeri — simple phragmiger hairs — briefly phragmiger hairs (Bischoff 1833, Fig. 2134). The terminal globular cell of the third category of hairs is glandular.

### Specimens

The first group of plants according to AVETISJAN's classification: Okr. Džanatlu: 9. 5. 1961 TACHTADŽJAN, MULKIDŽANJAN i AVETISJAN; ERE No 69183 and 69185. — Artašatskij r., Džanatlu: 7. 6. 1957 E. AVETISJAN, V. AVETISJAN i GABRIELJAN; ERE No 69194 and 69195. — Kotajkskij r.: okr. Garni: 19. 5. 1957 GABRIELJAN; ERE No 69221. — Ušcelje r. Garni-čaj: 23. 5. 1926 ŠELKOVNIKOV; ERE No 5279. — Baš-Garni, v sadu: 13. 6. 1931 TAMAMŠJAN; ERE No 5280. — Alaverdskij r.: okr. Dzoragesa, pereval: 25. 7. 1960 AVETISJAN i GABRIELJAN; ERE No 67305. — Kotajkskij r.: Garni, slijanije r. Milli s r. Azat: 10. 8. 1958 GABRIELJAN; ERE No 69226. — Noemberjanskij r.: Lambalu: 22. 7. 1960 AVETISJAN i GABRIELJAN; ERE No 67306. — Kotajkskij r.: okr. monastyrja Gechard, pr. bort r. Azat: 22. 5. 1961 AVETISJAN, TACHTADŽJAN, ABAVAKJAN i GABRIELJAN; ERE No 69218, 69219 and 69220. — Vedinskij r.: Garpinskij zapovednik, 2000 m s. m.: 8. 7. 1960 MULKIDŽANJAN, POGOSJAN i MANJAKJAN; ERE No 77247.

The second group of plants according to AVETISJAN's classification: Kaladibinskoje uročišće: 1960 AVAKJAN; ERE No 69190. — Gechard, bereg r. Azat: 3. 7. 1961 AVETISJAN; ERE No 69217. Abavakjanskij r.: Gechard: 10. 6. 1963 GABRIELJAN; ERE No 79615—79619. — Selimskij pereval, jugo-vostočnyj makrosklon: 14. 6. 1957 AVETISJAN i GABRIELJAN; ERE No 69177. — Kafanskij r.: Kadžaran, bort Ochči-čaja, g. Allu, 2300 m s. m.: 15. 8. 1955 GABRIELJAN; ERE No 69171. — Kafanskij r.: Bartasskij zapovednik, 1850 m s. m.: 8. 9. 1959 GRIGORJAN; ERE No 69170. — Kafanskij r.: Bartasskij zapovednik: 3. 6. 1959 GRIBORJAN; ERE No 69172. — Chosrovskoje uročišće: 30. 5. 1960 AVAKJAN; ERE No 69166 and 69167. — Daralagez: verchovje r. Vost. Arpa-čaj, okr. s. Kučug, 2100 m s. m., vost. sklon: 28. 6. 1946 DOLUCHANOV; ERE No 37850.

The third group of plants according to AVETISJAN's classification: Herbarium prov. Lori. Daračičag Alibek: 19. 7. 1928 ARARATJAN; ERE No 8031. — Martuninskij r.: g. Janych na senokosach: 2. 7. 1939 NARINJAN; ERE No 27882. — Uklovy Kegart: 30. 5. 1927 ŠELKOVNIKOV i KARA-MURZA; ERE No 12025. — Artašatskij r., g. Ilandag: 27. 5. 1959 TAČHTADŽJAN, MULKIDŽANJAN i GABRIELJAN; ERE No 69193. — Kotajkskij r.: okr. s. Kjankan: 14. 6. 1960 MULKIDŽANJAN; ERE No 69227 and 69228. — Kotajkskij r., Elar čingily: 14. 6. 1960 MULKIDŽANJAN; ERE No 69222. — Garni, uščelje r. Azat: 19. 5. 1957 GABRIELJAN; ERE No 69223. — Jugo-zap. Zangezur: Bass. r. Megraget, meždu s. Bagravar i s. Kačevan: 25. 5. 1947 ASLANJAN; ERE No 37846. — Gegamskij r.: na uklonach Ketan dag: 18. 6. 1940 FEDOROV; ERE No 28114. — Nachičevan Kipčak: 7. 6. 1934 Ter-MINASJAN; ERE No 29258. — Gukasjanskij r.: uščelje r. Achurjan v okr. s. Pokr Senasar: 18. 7. 1957 MULKIDŽANJAN i AVETISJAN; ERE No 69204. — Kotajkskij r. levjy bort. r. Azat: 3. 7. 1961 AVETISJAN; ERE No 69225.

## Results of the study

### (1) Pollen grains

First group of plants: no = 600; polar axis: 29.17  $\mu$ ; equatorial diameter: 24.90  $\mu$ ; P : E = 1.16. % of abortive pollen grains (n = 2600): 5.2.

Second group of plants: n = 700; polar axis: 27.15  $\mu$  equatorial diameter: 24.49  $\mu$ ; P : E = 1.11. % of abortive pollen grains (n = 3000): 6.6.

Third group of plants: n = 1200; polar axis: 28.55  $\mu$ ; equatorial diameter: 24.68  $\mu$ ; P : E = 1.15. % of abortive pollen grains (n = 4000): 9.7.

### (2) The specimens of the first group

The specimens belong to the taxon:

*Hesperis unguicularis* BOISS. subsp. *hyrcana* (BORNM. et GAUBA) DVOŘÁK comb. nova

Basionym: *Hesperis hyrcana* BORNM. et GAUBA Fedde's Repert. Spec. nov. 49 : 254, 1940.

Characters of the subspecies:

- subprolate pollen grains: polar axis 29.17  $\mu$ ; equatorial diameter 24.90  $\mu$ ; P : E = 1.16;
- the purple colour of the flowers turns dark purple when dried;
- basal leaves and lower cauline leaves are lyrate;
- forked hairs in the indumentum of leaves and pedicles;
- upper cauline leaves are shortly stipitate, having a attenuate base.

In my earlier paper (DVOŘÁK 1964a) I gave reasons why I do not identify the plants growing in the Caucasus, Transcaucasus and in the adjacent areas with *H. matronalis* L. A cytological investigation and an investigation of the plants growing on the experimental plot showed a difference between *H. matronalis* L. and *H. unguicularis* BOISS. By crossing these taxa (DVOŘÁK 1967a) I obtained plants having shorter pods with a very low number of seeds. Diploid species *H. steveniana* DC. (DVOŘÁK 1967b) and *H. pycnotricha* BOB. (DVOŘÁK 1964b) grow in the surroundings of Novorossijsk. Their interbreeding gave good results (DVOŘÁK 1966). The habit of the F<sub>1</sub> generation of these hybrids (DVOŘÁK in press) was identical with that of *H. unguicularis* BOISS. subsp. *hyrcana*. It differed, however, cytologically. This trend of evolution of the species *H. unguicularis*, even if very likely, must be substantiated by further experimental investigation.

I consider the presence of longer awl-shaped hairs in the indumentum of leaves, sporadic phragmiger hairs in the indumentum of leaves and sessile upper cauline leaves to be characters caused probably by a  $\pm$  introgression of another taxon. It is evidenced by the specimen no 69220 with the largest percentage of abortive pollen grains (12,2%); from the locality near to that of No 69220 come plants having also phragmiger hairs in the indumentum of the pedicles.

### (3) Comparison of the specimens of the first and second group

#### A. Morphological characters

The plants of the second group always have an addition of phragmiger hairs in the indumentum of the stem.

The upper cauline leaves of the plants of the second group are mostly sessile, having a half-cordate and half-amplexical base.

The indumentum of leaves of plants from the second group is often denser, in the indumentum there are mostly awl-shaped hairs; more often an addition of phragmiger hairs.

This definition shows an uninterrupted transition from the specimens of the first group to the specimens of the second group.

#### B. Pollen grains

The length of the polar axis approaches to that of the taxa *H. hirsutissima* (BUŠ) CVĚL. and *H. voronovii* BUŠ:

- a) subprolate of the first group;
- b) prolate spheroidal of the second group.

The percentage of abortive pollen grains (6.6%) is higher than that of the first group. Specimen No 69172 has a high percentage of abortive pollen grains (44.7%). The pollen in the flowers, which are numerous in the specimen, is imperfectly developed. The pods are short and thin. It may be of a hybrid origin.

#### C. Distribution

The localities of the specimens of the first group are situated in the northern and central part of the ASSR (Idževanskij distr.: 2; Jerevanskij distr.: 5). The localities of the specimens of the second group are situated in the central and south-eastern part of the ASSR (Jerevanskij distr.: 3; Daralagez: 2; Zangezur — Kafanskij distr.: 2).

Some localities of the specimens of the second group may be situated near the localities of the second group are situated under the taxon *H. voronovii* BUŠ. Besides the couple No 69172 — No 69170, mentioned earlier, I give also the specimens No 96166 and No 69167. They come from the locality "Chosrovskoje uročišče, redkolesje, poljana..." From the locality "Chosrovskoje uročišče, u brega Darband" come the specimens subsumed under the taxon *H. voronovii* BUŠ.

#### D. Conclusions

I subsumed the specimens of the second group under the taxon *H. unguicularis* BOISS. subsp. *hyrcana* (BORNH. et GAUBA) DVOŘÁK. I infer that a introgression of a taxon with phragmiger hairs in the indumentum and with a spheroidal seu prolate spheroidal shape took place there. Equally the colour of the flowers (even if in one specimen) passes from a dark purple to a purple colour.

### (4) Comparison of specimens of the first and third group

#### A. Morphological characters

The lower part of the stem has not been preserved in two out of 13 specimens belonging to the third group. From the remaining eleven specimens only one (No 12025) can be evaluated as a biennial plant. The lower part of the plant, flowering a year earlier, was preserved in specimens No 69223, 27882, 28114 and 29285. Thus in this character there is no difference between the plants of the first and third groups.

The average height of plants of the third group (66 cm) is near to the average height of plants of the first group (70.8 cm).

The lower cauline leaves are lyrate; I have not found oblong ones. The first group has the same shape of leaves. The middle and upper cauline leaves of the plants of the first group are ovate or even narrow-ovate; the middle ones are shortly stipitate, the upper ones sessile or very shortly stipitate with the attenuate base. The plants of the third group have the same shape of the middle leaves, they are sometimes also oblong; the leaves are sessile, their base is attenuate, rounded, rarely even half-cordate or half-amplexical.

The upper cauline leaves of the plants of the third group are also mostly oblong-ovate, with the base either attenuate or truncate, half-cordate and half-amplexical. CVĚLĚV (1959 : 130) wrote in the description of *H. transcaucasica* CVĚL., to which the plants of the third group belong: "... folia ... superiora sessilia vel subsessilia ...". On the same page he wrote about the characters differentiating *H. matronalis* L. from *H. transcaucasica* CVĚL.: "Ab *H. matronali* ... foliis superioribus sessilibus (non breviter petiolatis) ...".

According to the manner of attachment of the upper cauline leaves, a larger group can be discerned (No 12025, 69223, 69222, 69285, 69193, 37846, 69225, 69204, 69227, 69228) having small leaves corresponding rather to the description of the taxon *H. transcaucasica* CVĚL. and a less numerous group (no 27882, 83301, 28115) whose leaves correspond to the taxon *H. hyrcana* BORNM. et GAUBA.

An addition of phragmiger hairs in the indumentum of the leaves can be found in the plants of the second group, which I have subsumed under the subsp. *hyrcana*.

There are no phragmiger hairs in the indumentum of the pedicels of the plants of the first and second group. The plants of the third group always have phragmiger hairs in the indumentum of the pedicels.

A comparison of the size of the flower phyla (in mm) is given in table No. 1. It follows from the table that there is no difference in the size of the parts of the flowers between the plants of the first, second and third groups.

Table 1

	1st group	2nd group	3rd group
Pedicels (flowers)	(7) - 9 - (14) mm	(4) - 9,4 - (17) mm	(7) - 10 - (15) mm
Pedicels (siliquae)	(8) - 11 - (14) mm	(11) - 13 - (18) mm	(9) - 11 - (14) mm
Sepals	(6) - 6,9 - ( 8) mm	(6) - 7,5 - ( 9) mm	(5) - 7 - ( 9) mm
Claw of the petals	(9) - 10 - (12) mm	(8) - 10 - (11) mm	(10) - 11 - (12) mm
Blade of the petals	(6) - 8 - (12) mm × (5) - 6,8 - (8) mm	(8) - 9 - (11) mm × (5) - 5,5 - (7) mm	(8) - 9 - (12) mm × (4) - 6,8 - (9) mm

#### B. Geographical distribution

Aparanskij distr.: 1; Sevanskij distr.: 1; Gukasjanskij distr.: 1; Jerevanskij distr.: 7; Gekamskij distr.: 1; Megrinskij distr.: 1; Nachičevan. ASSR: 1; north-eastern Turkey, Artvin province: 3.

In the study (DVOŘÁK 1965 : 417) I mentioned the specimens with the following distribution: Sevanskij distr.: 1; Nachičevan. ASSR: 1; Turkey, Kars prov.: 1; Turkey between Erzeroum and Tortum: 1.

The specimens of the third group have their maximum distribution in the Jerevan distr. (8) and in the neighbouring Turkish province of Çoruh (= Artvin) (4). Plants both of the first group (5 specimens) and plants of the second group (3 specimens) grow in the Jerevan distr. I have not found plants corresponding either to the plants of the first group or of the second group in the Coruh province. I infer that the plants of the third group have their area partly separated in the southern direction.

#### C. Pollen grains

The maximum of the pollen grains of the third group have the same length of the polar axis and of the equatorial diameter as the specimens of the subsp. *hyrcana*. There is a greater variability of the length of the polar axis and of the equatorial diameter in plants of the third group.

Most pollen grains of the plants of the third group have the same shape as most pollen grains of the first group. There are substantially more pollen grains of a spheroidal shape.

The plants of the third group however, have, a rather high percentage of abortive pollen grains (9.7%), mainly in specimens No 69227 and No 69228. They also have a light purple colour.

#### D. Conclusions

The plants of the third group differ from *H. unguicularis* BOISS. subsp. *hyrcana* (BORNM. et GAUBA) DVOŘÁK by the indumentum of the pedicels, pro

parte by the manner of attachment of the middle cauline leaves. The upper cauline leaves have a base which is not only attenuate, but also rounded, rarely even half-cordatē and half-amplexical. The upper cauline leaves are mostly small.

The plants of the third group have their area partly separated in the southern direction.

The length of the polar axis and the equatorial diameter permits a close relationship to be inferred between plants of the third group and those of the first and second group. The great variability of the shape of the pollen grains, the considerably higher number of pollen grains of a spheroidal or almost spheroidal shape, the increased percentage of abortive pollen grains and the high percentage of these pollen grains in some specimens provides evidence of an introgression of a taxon characterized above all by spheroidal or nearly spheroidal pollen grains and by a phragmiger hairs in the indumentum. Light-coloured flowers of the specimens No 69227 and No 69228 with a high percentage of abortive pollen grains indicate that another character of the taxon that had caused the introgression was a white colour. It is probably the taxon

#### *H. voronovii* BUŠ.

The introgression probably led to the evolution of a geographical race which occupies an area partly separated from the area of subsp. *hyrcana* in the southern direction. CVĚLĚV (1959) evaluated this taxon as *H. transcaucasica* CVĚL. In my previous study (DVOŘÁK 1965) I showed that it is a synonym of the taxon *H. unguicularis* BOISS. (1856, 1867).

The present paper, however, shows that the taxa *H. unguicularis* BOISS. and *H. hyrcana* BORN. et GAUBA are only two subspecies of the same species. According to the international code of botanical nomenclature the name *H. unguicularis* BOISS. belongs to these taxa.

#### Note

As I have explained in my earlier study (DVOŘÁK 1964a) the area of the taxon *H. voronovii* BUŠ is not separated from that of *H. unguicularis* BOISS. subsp. *hyrcana* (BORN. et GAUBA) DVOŘÁK. A hybridization probably takes also place in other parts of the area. In the area of *H. unguicularis* BOISS. subsp. *hyrcana* (BORN. et GAUBA) DVOŘÁK and elsewhere plants can be found with ± an addition of phragmiger hairs, also in the indumentum of the pedicels. The subsp. *unguicularis* differs from these plants by the size and by the manner of attachment of the upper cauline leaves.

#### Specification of the description of *H. unguicularis* BOISS. subsp. *unguicularis*

The mentioned material leads to further specification of the description of the taxon. In my study (DVOŘÁK 1965) I published an emended description of the indumentum of this taxon. In the present study I specify the following characters:

(1) It has been so far questionable whether it is a biennial or perennial taxon. BOISSIER (1856 : 21, 22) did not mention this point. In his later work (BOISSIER 1867 : 232) he used the symbol: "perennial". BORN. et GAUBA (1910 : 232) used the following words: "... die zweijährige *H. unguicularis* BOISS. ..." CVĚLĚV (1959 : 130): "Planta biennis ..." The investigation of the specimens mentioned in the present work showed that *H. unguicularis* subsp. *unguicularis* is mostly a perennial, more rarely a biennial plant.

(2) Length of the pedicels. BOISSIER (1856 : 21): "... pedicellis calyci aequilongis ..." We can read the same in another work (BOISSIER 1867 : 232): "... pedicello calyci aequilongo ..." CVĚLĚV (1959 : 130) "sepala 5—7 mm lg. ... pedicellis glanduloso-pilosus subaequilonga ..." The measuring itself: pedicelli (flores): (7)—10—(15) mm; calyx: (5)—7—(9) mm.

(3) Height of the plants. Measures of the height of the plants mentioned in the present work: (47)—64—(90) cm. CVĚLĚV (1959 : 130): "Planta ad ... 80—100 cm alt." It follows that the

maximum height of the plants is probably a little higher than the values measured by the present author.

(4) Lower cauline leaves are lyrate. CVĚLEV (1959 : 130) wrote: "... folia radicalia et caulina inferiora . . . oblonga . . . interdum lyrata . . ." I consider it necessary to specify the description in the following manner: "Folia basalia caulinaque inferiora lyrata . . . rarius oblonga."

Souhrn

*Hesperis hyrcana* BORNM. et GAUBA 1940 : 254 a *Hesperis unguicularis* BOISS. 1856 : 21 jsou dvě specíe druhu, kterému podle mezinárodních pravidel botanické nomenklatury přísluší jméno *Hesperis unguicularis* BOISS.

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Recensenti: E. Daumann, J. Holub