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Some Remarks on *Hesperis* series *Matronales* in Caucasia and Transcaucasia

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With 6 Figures

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1. Introduction

BUSCH 1910 described two species of the genus *Hesperis* from Caucasia and Transcaucasia that belong to the series *Matronales* TZVELEV 1959: 121, *H. steveniana* DC. and *H. matronalis* L. In *H. matronalis* he distinguished the following infraspecific taxons:

1. var. *matronalis*
2. var. *runcinata* auct. — non WALDST. & KIT.
3. var. *glabra* TRAUTVETTER 1881: 411
4. var. *meyeriana* TRAUTVETTER 1878: 408
5. var. *hirsutissima* BUSCH 1910: 664
5. var. *robusta* BUSCH 1910: 664

TZVELEV 1959 linked the first and the third varieties given by BUSCH. He presumed that they form several ecology and geography races. The names of the second and fourth varieties, according to BUSCH's 1910 list are specified by TZVELEV as synonyms of the taxon

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H. voronovii BUSCH 1936: 358. TZVELEV's specification of *H. matronalis* L. var. *runcinata* auct. — non WALDST. & KIT. as the given synonym, as will be explained later, is not correct. TZVELEV classified the fifth and sixth varieties in the list into the taxonomic category of the species. He described newly two species, coming from Caucasia, Ciscaucasia and Transcaucasia, of the series *Matronales: H. adzharica* TZVELEV 1959: 144; *H. transcaucasica* TZVELEV 1959: 130. TZVELEV gives altogether seven species of the series *Matronales*, namely: *H. adzharica* TZVELEV, *H. hirsutissima* (BUSCH) TZVELEV, *H. matronalis* L., *H. pycnotricha* BORB. & DEG., *H. steveniana* DC., *H. transcaucasica* TZVELEV, *H. voronovii* BUSCH.

BORNMÜLLER & GAUBA described *H. hyrcana* BORNM. & GAUBA 1940: 254 from the northern Iran.

2. Material and method

The method of the study of the number of the chromosomes: for the study I used root tips; fixation: 3 portions of C_2H_5OH (96%): 1 portion of icy CH_3COOH; time of fixation: 10 min.; maceration: 1 portion of HCl (37%): 1 portion of C_2H_5OH (96%): time of maceration: 10 min.; rinsing in water: 10 min. Coloured by acetocarmine. Microscope Meopta, immersion object-glass 100 ×, ocular 15 ×. Microphotography: immersion object-glass 100 ×, ocular FU 6,3.

The plants were studied from the herbarium of the following institutions.

BRNU = Katedra botaniky přírodovědecké fakulty university JEP, Brno;
BP = Természettudományi Muzeum Növenytara, Budapest;
LE = Akademija nauk SSSR, botaničeskij institut imeni V. L. KOMAROVa, Leningrad;
W = Naturhistorisches Museum, botanische Abteilung, Wien, Austria;
P = Muséum national d'histoire naturelle, laboratoire de phanérogamie, Paris;
G = Conservatoire et Jardin botaniques, Genève.

At my work I used a genetic method (supplemented by a biometric research of the pollen grains) and a morphological-geographical method.

3. The results of the study

3. 1. Research of the number of the chromosomes

H. pycnotricha BORB. & DEG.: 2n= 14 (DVOŘÁK (in press a),

H. steveniana DC.: 2n = 14 (DVOŘÁK, in press b).

H. hyrcana BORNM. & GAUBA: 2n = 28. Fig. 1 a and 1 b.

The seeds from the institution: Akademija nauk SSSR. Glavnyj botaničeskij sad Moskva (sub *H. matronalis L.)*. I sowed the seeds on an research plot of the experimental section of the Botanical Gardens in Brno in 1963. The shape of the lower bottom leaves of the plants

Taxon	2 n	Pollen grains (in μ) Lenght		Breadth		Specimen
		$\bar{x} \pm 3 . S_{\bar{x}}$	± s	$\bar{x} \pm 3 . S_{\bar{x}}$	± s	
Hesperis hirsutissima (BUSCH) TZVEL.		24,81 ± 3.0,125	± 0,882	23,26 ± 3.0,109	± 0,757	LE: "Okr. s. Nasyrvaz. 19. 6. 1931 KARJAGIN & SAFIEV".
Hesperis pycnotricha BORB. & DEG.	14	24,32 ± 3.0,047	± 0,466	21,96 ± 3.0,040	± 0,040	411599 BRNU: "Belogorskij r. 23. 5. 1961 KOTOVA"
Hesperis transcaucasica TZVEL.		30,04 ± 3.0,165	± 1,433	27,69 ± 3.0,206	± 1,783	LE: "Azerb. SSR, Ordubadskij r. 1956 JEGOROVA, TZVELEV & ČEREPANOV"
		27,66 ± 3.0,179	± 1,248	24,86 ± 3.0,151	± 1,054	W: "Turkey, prov. Kars 26. 6. 1957 DAVIES & HEDGE"
Hesperis hyrcana BORNM. & GAUBA	28	30,88 ± 3.0,096	± 0,681	22,56 ± 3.0,094	± 0,669	W: "Mont Amanus MANOOG HARDJIAN No. 344 et No. 2518."
		29,81 ± 3.0,100	± 0,548	24,41 ± 3.0,088	± 0,483	W: "BALANSA Plantes d'orient 1866 Lazistan."
		30,54 ± 3.0,219	± 0,692	24,01 ± 3.0,108	± 0,594	3254 W: "N. BUSCH Iter cauc. VIII No. 696"
Hesperis adzharica TZVEL.		29,70 ± 3.0,136	± 1,175	22,42 ± 3.0,126	± 1,092	LE: "Chočataurskij r. 1936 LORKIPANIDZE"
						LE: "Adžarija 6. 8. 1910 VORONOV."
Hesperis steveniana DC.	14	27,39 ± 3.0,109	± 1,096	25,70 ± 3.0,079	± 0,799	411605—411606 BRNU: "Krym mys Martjan."
Hesperis voronovii BUSCH		29,95 ± 3.0,126	± 0,892	23,80 ± 3.0,102	± 0,723	LE: "R-n g. Chasav-jurt 28. 6. 1897 ALEXEENKO"
						LE: "Hortus bot. Armeniae. Fl. sevanensis 1927 SHELKOVNIKOV."
						LE: "Conskaja kotlovina 1928 E. i. N. BUSCH."

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(Fig. 3) was different from those of *H. matronalis* L. (Fig. 4). The plants blossomed by two weeks earlier than the plants *H. matronalis* grown on the same plot. According to the morphological characters (including the measurement of the size of the pollen grains) these plants belong to the species *H. hyrcana*. Materials are deposited at No. 419407—419414 BRNU.

I infer from the comparison of the size of the pollen grains that *H. hirsutissima* belongs to evolutionally older diploid subseries. The species *H. transcaucasica, H. matronalis, H. voronovii* belong to the subseries *Polyploideae* (an evolution grade!).

3. 3. The areals of the species

Especially conspicuous is the disjunction area of the diploid tertiary circum-euxine geoelement *H. pycnotricha* BORB. & DEG. which is limited by its habitats to steppes and forest steppes. The polyploid *H. hyrcana* (together with *H. voronovii)* grows mostly on an area which, I presume (for inst. by KLEBELSBERG 1949), was not inhabited by today's flora until after the Würm glacial period (Map fig. 6).

3. 4. Study of morphology

3. 4. 1. *Hesperis hyrcana* BORNM. & GAUBA

I studied a topotype of the taxon deposited at P; label: "Herbar BUNGEanum. Iter persicum No. 64. *H. matronalis*. In montosis Astrabadensis pr. Siaret. 1858." Fig. 5. The habitat is given by BORNMÜLLER & GAUBA 1940: 254: "Nördliches Persien: Elburs, in Wäldern des Tschalus-Tales, zwischen Gorgan und Ziarat." BORNMÜLLER & GAUBA 1940 describe the taxon in the category of species, but in the conclusion of the chapter, where they evaluate its relation to *H. cladotricha* BORB. (is a synonym of *H. matronalis* L. — see DVOŘÁK 1964 a), *H. pycnotricha* BORB. & DEG. and *H. steveniana* DC., they write: "*H. hyrcana* stellt offenbar eine gute geographische Rasse der *H. matronalis* L. dar, die in dem Gebirge von Gilan und Masanderan (Gorgan) weit verbreitet ist ..." The main difference between *H. hyrcana* on the one hand and those on the other consists in the covering of the stem. The authors mainly underline these features: there are reversed, longer, mostly eglandular hairs in the covering of the stem, which are also on the petiole and on the primary vein of the leave; in the covering of the stem there are shorter simple glandular hairs. The covering of the flower stalk being described as follows: "... pedicellis dense breviter furcato-pilosis." As will result from the following part, the described indumentum of *H. hyrcana* coincides with the plants that were so far classified with *H. matronalis* in Near Asia. It has also an identical shape of the lower bottom leaves.

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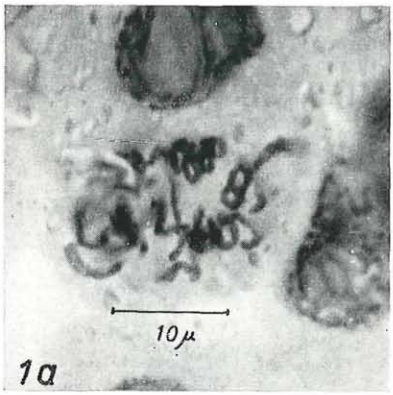

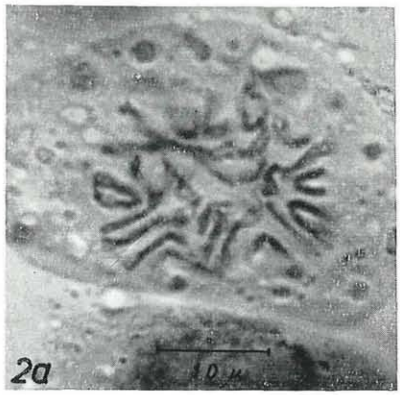

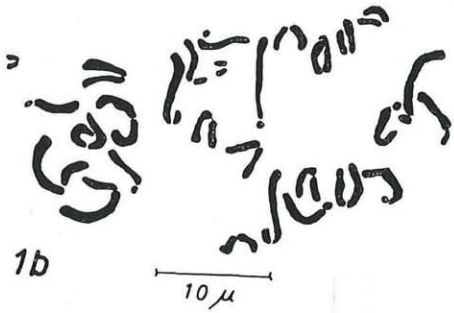

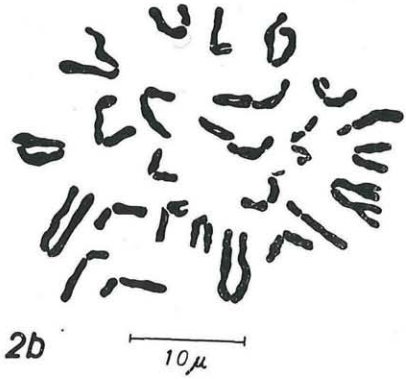

Fig. 1. *Hesperis hyrcana* Bornm. & Gauba. Chromosomes. a: Microphoto Ambrož, b: Drawing del. Dvořák. — Fig. 2. *Hesperis matronalis* L. Chromosomes. a: Microphoto Ambrož, b: Drawing del. Dvořák.

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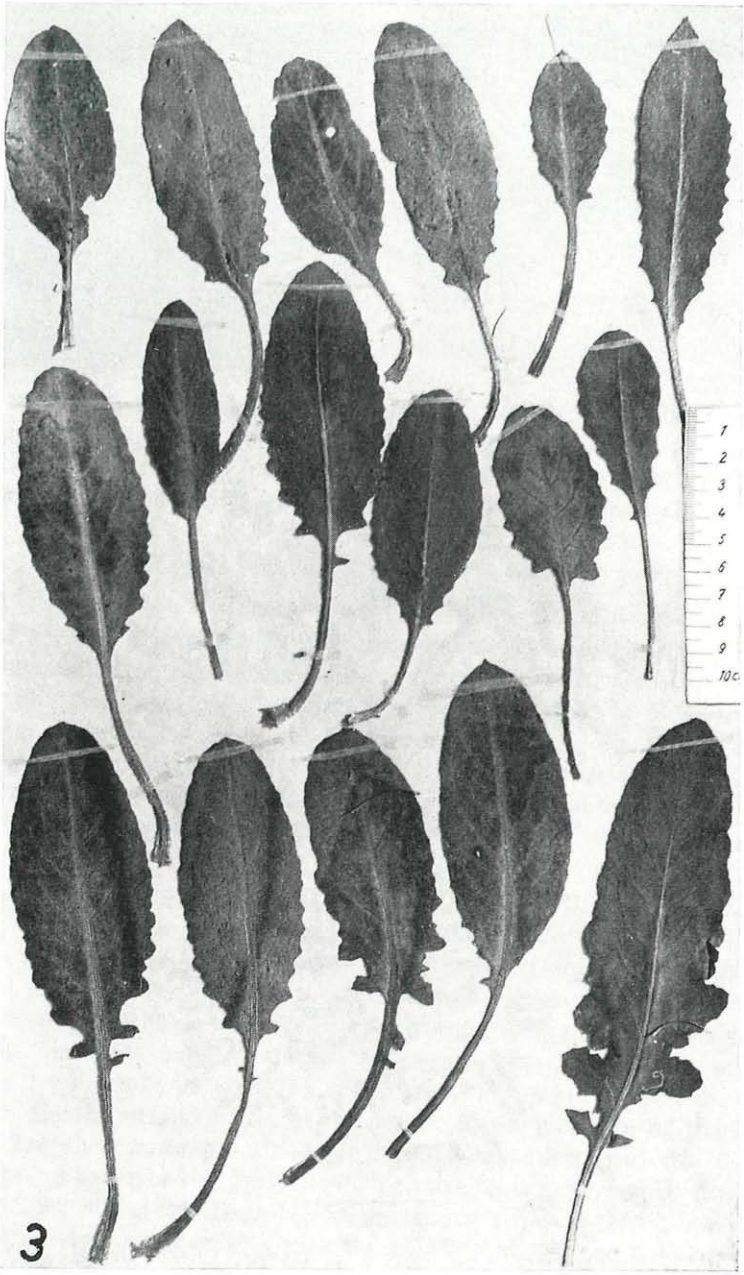

Fig. 3. *Hesperis hyrcana* Bornm. & Gauba. Lower bottom leaves of grown plants. Photo Nováček.

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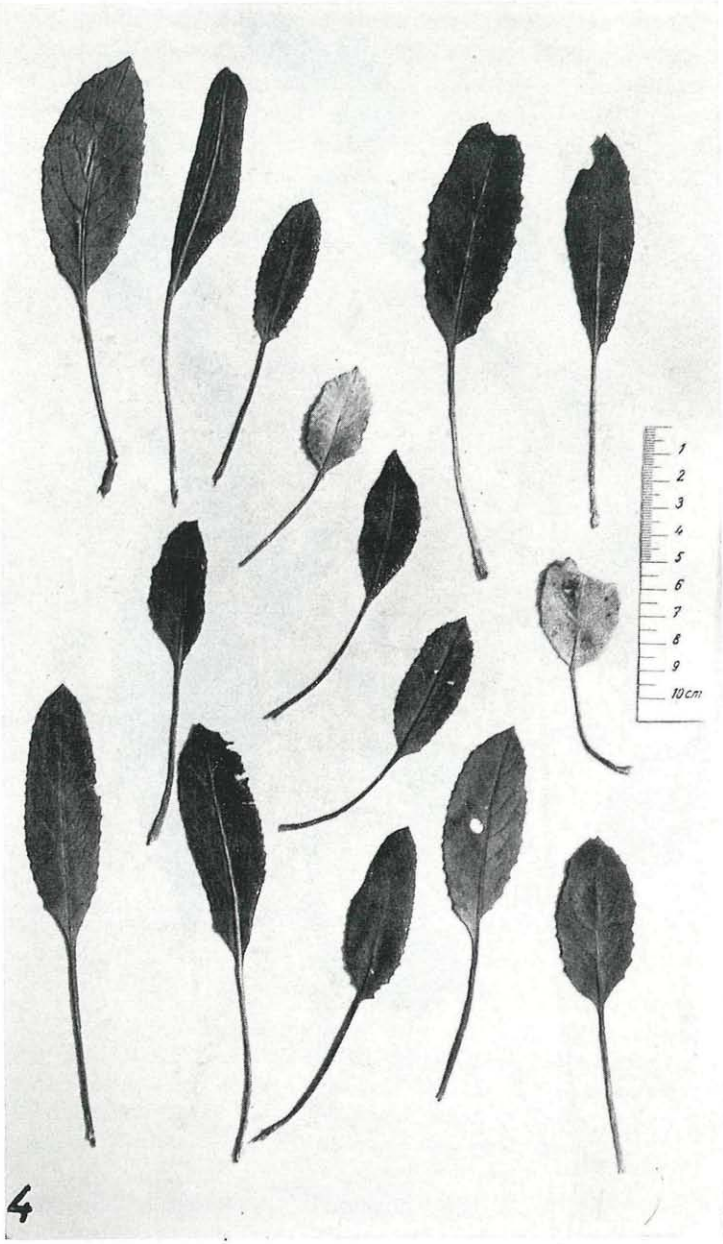

Fig. 4. *Hesperis matronalis* L. var. *nivea* (BAUMG.) PREISSM. Lower bottom leaves of plants from the habitat Vápenná in the Little Carpathians in Czechoslovakia. Photo NOVÁČEK.

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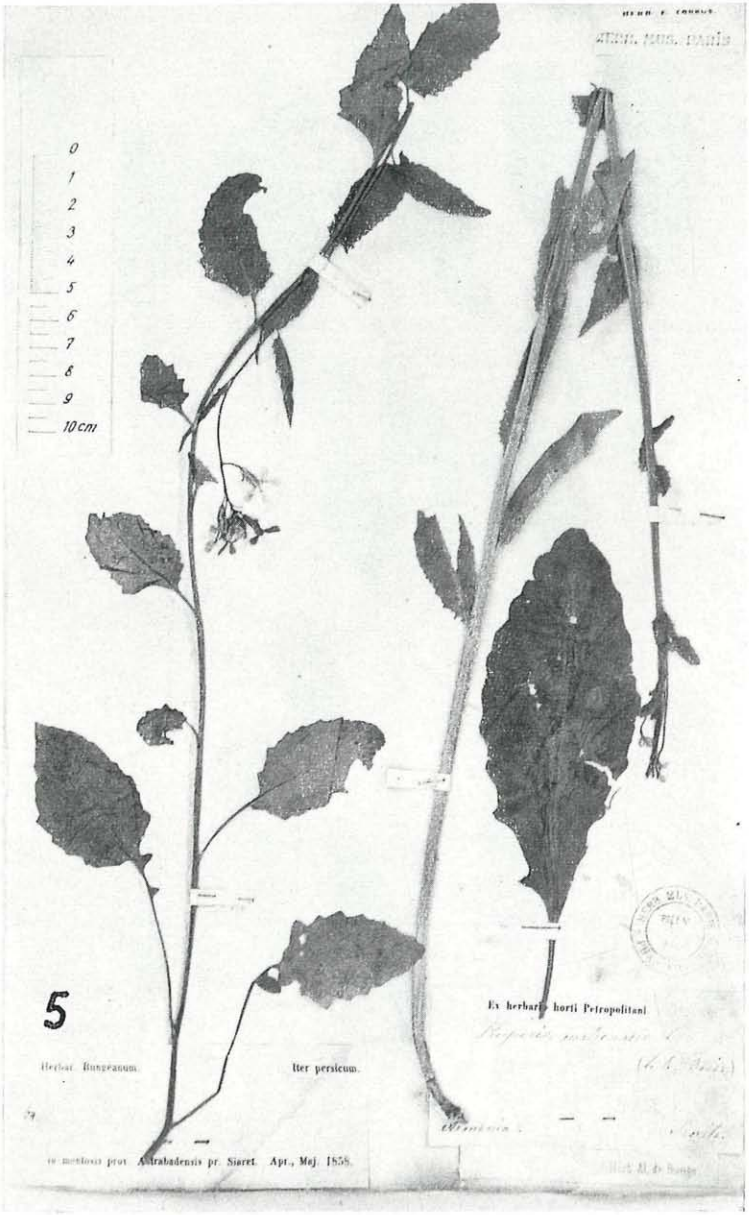

Fig. 5. *Hesperis hyrcana* Bornm. & Gauba. Plants from the habitat „In montosis Astrabadensis pr. Siaret". Photo Nováček.

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3. 4. 2. *Hesperis lapsanifolia* BORB.

BORBÁS 1903: 17 has given three habitats for the taxon: two of them are in the coastal north-west area of the Balkan Peninsula, the third one is situated in the northern promontory of the Caucasus. The linking of the Balkan plants with those of the northern Caucasus was not correct. From the area in the northern promontory of the Caucasus

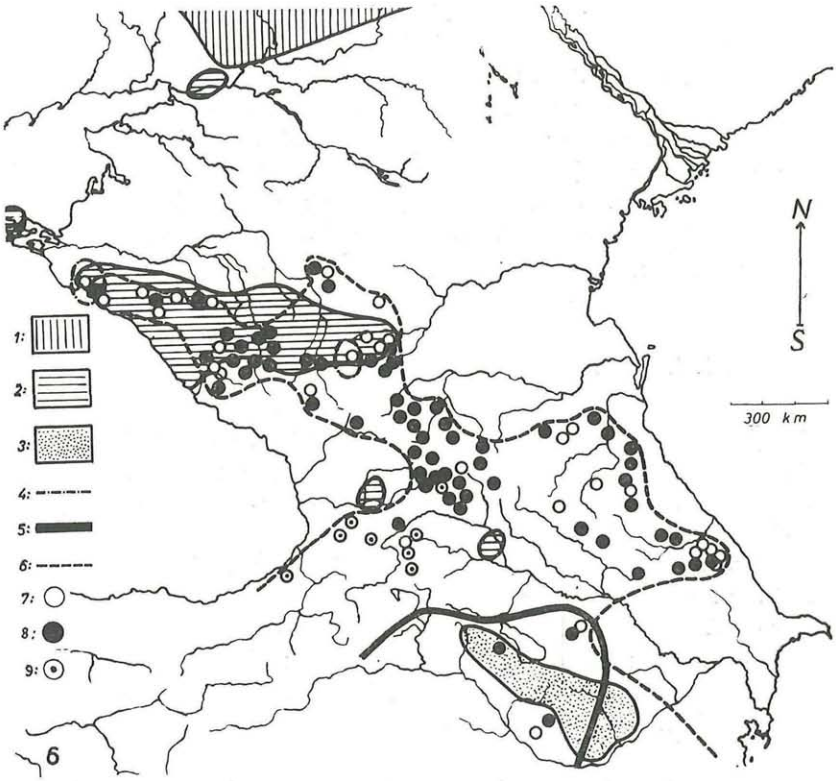

Fig. 6. Map demonstrating the area of 1: *Hesperis sibirica* L., 2: *H. pycnotricha* BORB. & DEG., 3: *H. hirsutissima* (BUSCH) TZVEL., the boundary of the area of 4: *H. steveniana* DC., 5: *H. transcaucasica* TZVEL., 6: *H. hyrcana* BORNM. & GAUBA, the habitations of 7. *H. voronovii* BUSCH, 8: *H. hyrcana* BORNM. & GAUBA, 9: *H. adzharica* TZVEL.

comes the plant on the sheet deposited at BP No. 144206; label (abbreviated): "HOHENACKER; Unio itiner. 1834. Herb. SADLER No. 21016." The Balkan plants differ from the North Caucasus ones mainly in the covering of the lower part of the stem, where, to longer, reversed simple eglandular hairs, glandular hairs are admixed. The shape of lower bot-

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tom leaves coincides both with the shape of the lower bottom leaves of *H. hyrcana* and with the shape of the lower bottom leaves of experimentally grown *H. hyrcana*.

3. 4. 3. *Hesperis matronalis* L. var. *runcinata* auct. — non WALDST. & KIT.

BOISSIER 1867 described the taxon too. Lectotype: G; label: "AUCHER-ELOY-Herbier d'Orient No. 4124; Djulfek". Planta dextra. The plant on the herbarium sheet is identical with the plants given in the items 3. 4. 1. and 3. 4. 2. I have studied further materials quoted by BOISSIER 1867. The author linked in his conception *H. runcinata* WALDST. & KIT. from the area of Orient flora with the plants that have nothing in common with the original WALDSTEIN's and KITAIBEL's 1805 plant. As I have found out BOISSIER's name associates incorrectly the taxons: *H. sylvestris* CRANTZ, *H. sibirica* L., *H. theophrasti* BORB., *H. graeca* DVOŘÁK and, of course, the plants included in Near Asia under the name *H. matronalis*.

3. 4. 4. Other *Hesperis* specimens from the Caucasus and Transcaucasus

They are these taxons: *H. matronalis* and *H. voronovii*. Through the favour of the LE workers I was able to make myself acquainted with them. *H. matronalis* and *H. voronovii*, as far as I could follow the herbarium sheets, had the shape of the lower bottom leaves identical with the grown plants *H. hyrcana*. Equally in the covering of the lower part of the stem, besides longer reversed simple eglandular hairs, there was also a ± addition of shorter glandular hairs (I quote for inst. the herbarium sheets: "Nachičevanskaja ASSR: bliz g. Bičenach"; "Gruzinskaja SSR: Meždu st. Dviletskoj i s. Kazbek"; "Severn. Kavkaz: Teberda"; "Na gore Savjan-Dag").

4. Discussion and conclusion

I specify the plants from the Caucasus, northern Ciscaucasus, from the Transcaucasus, from northern Iran and Asia Minor classified so far with the taxon *H. matronalis* L., *H. hyrcana* BORNM. & GAUBA and *H. matronalis* L. var. *runcinata* auct. — non WALDST. & KIT. as a separate species to which, according to The International Code of Botanical Nomenclature (DOSTÁL, POUZAR & RŮŽIČKA 1963) pertains the name *H. hyrcana* BORNM. & GAUBA. I give the following proofs:

I (1). By means of a genetic method I have found out in *H. hyrcana* BORNM. & GAUBA $2n = 28$. On the other hand *H. matronalis* growing on the territory of Europe besides Caucasus has $2n = 24$.

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(2). *H. hyrcana* is polyploid. In contrast to *H. matronalis* (the karyotype: Fig. 2 a and 2 b) it evidently has not the same diploid species from which it had developed. While *H. matronalis* has with the greatest probability *H. sylvestris* and *H. pycnotricha* as its mother diploid species, with *H. hyrcana* is only *H. pycnotricha,* as follows from the study of the area (map fig. 6) and from the comparison of the karyotypes evidently one of the parental species also of *H. hyrcana.* But the second one cannot be *H. sylvestris.* I explain it by the fact that this species developed in Central Europe from *H. sibirica* L. (DVOŘÁK 1964 b) probably only owing to the isolation caused by the Würm glacial period. I presume that the second parental species, that gave rise to the evolution of *H. hyrcana,* is *H. sibirica* L. Its habitat reaches as far as Rostov and Sarepta. It is possible that this species formerly spread farther to the south.

(3). There are even morphological differences between *H. matronalis* and *H. hyrcana.* The plants *H. hyrcana* have usually a greater admixture of glandular hairs. These hairs are relatively very frequent, especially on the lower part of the stem. Both compared taxons differ by the shape of the lower bottom leaves.

(4). An important conclusion, which refers to the area of the species *H. matronalis* and *H. hyrcana,* follows from the analysis BOISSIER's taxon *H. matronalis* var. *runcinata. H. matronalis* is bound by its habitation to the Fagetum of the mountain grade. The eastern boundary of the area in Europe is represented by the eastern Carpathians and by the Balkans. By the revision of the herbarium materials I have found out that *H. matronalis* is spread most south-easterly in the territory of Gabrovo-Balkan. I did not find this species in eastern Bulgaria. In Strandža planina in Bulgaria and probably also in the european part of Turkey there grows *H. graeca.* The adherence of the plants from the surroundings of the town of Samsun to the species *H. matronalis* remains so far not answered. Even if these plants belonged to *H. matronalis,* the disjunction between the european habitats and those of Asia Minor amounts to at least 800 km (in beeline). There is even a greater disjunction between the natural habitation of *H. matronalis* in the eastern Carpathians and the habitation of the plants *H. hyrcana* on the northern promontory of the Caucasus. The existence of this disjunction is another basis for the separation of a distinct species *H. hyrcana.*

II. According to the morphological features and its habitat *H. voronovii* BUSCH is probably not a separate species. It may be an infraspecific taxon of *H. hyrcana.* It is nevertheless possible, similarly as was the case with *H. matronalis* L. var. *nivea* (BAUMG.) PREISSM. on the european territory, that further independent species, differing by the

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glandular hairs of the pedicels, developed from the white blossoming either variety or subspecies *H. hyrcana*.

III. *H. adzharica* has a partially separated area. It is probably an evolutionally old species whose separation from *H. hyrcana* I consider correct.

5. Summary

The work explains the separation of the plants of Near Asia classified so far with the species *Hesperis matronalis*, which has the name *H. hyrcana* BORNM. & GAUBA 1940: 254 according to The International Code of Botanical Nomenclature. *H. hyrcana* differs from *H. matronalis* by morphological features (by the shape of the lower bottom leaves and by the indumentum of the lower part of the stem); it has a separated habitat. The number of the chromosomes is in *H. hyrcana* 2n = 28. I presume that *H. pycnotricha* BORB. & DEG. and *H. sibirica* L. are diploid maternal species of polyploid *H. hyrcana*. *H. matronalis* L. var. *runcinata* auct. — non WALDST. & KIT. according to the study of an authentic BOISSIER's material is a name that links the following taxons: *H. sylvestris* CRANTZ, *H. sibirica* L., *H. theophrasti* BORB., *H. graeca* DVOŘÁK and *H. hyrcana* BORNM. & GAUBA. From the morphological characters I conclude that *H. voronovii* BUSCH is probably not a separate species, but an infraspecific taxon (p. p.!) of the species *H. hyrcana* BORNM. & GAUBA.

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— (in press b): *Hesperis steveniana* DC. 2 n = 14.

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