

SOME MORPHOLOGICAL DIFFERENCES BETWEEN
SPECIES *CORNUS AUSTRALIS* C. A. MEYER AND *C.*
HUNGARICA KÁRPATI (CORNACEAE)

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In this paper the main characteristics of the shape thickness and distribution of hairs for the species of the genus *Cornus* L. are given with special regard to the differences between the species *Cornus australis* and *C. hungarica*. By the analytico - graphical method it is found that these two species are completely different in the property "the length of hairs", while the property "the number of hairs per a surface unit" varies the most likely depending upon the micro-climatic conditions of the habitat. From the above said it results that the length of compass-hairs which in *C. australis* is 0.302 mm and in *C. hungarica* is 0.613 mm (the arithmetic mean) can serve as the very reliable property to distinguish the mentioned species.

Key words: Morphological differences, *Cornus hungarica*, *C. australis*

U radu se navode osnovne značajke oblika, gustoće i rasporeda dlaka kod vrsta roda *Cornus* L., s posebnim osvrtom na razlike između vrsta *C. australis* i *C. hungarica*. Analitičko-grafičkom metodom je utvrđeno da se te dvije vrste u potpunosti razlikuju u svojstvu "dužina dlaka", dok svojstvo "broj dlaka po jedinici površine" varira najvjerojatnije u zavisnosti od mikroklimatskih uvjeta staništa. Iz navedenoga proizlazi da dužina kompas-dlaka koja je kod *C. australis* 0.302 mm, a kod *C. hungarica* 0.613 mm (aritmetička sredina) može poslužiti kao vrlo pouzdano svojstvo za razlikovanje navedenih vrsta.

Ključne riječi: morfološke razlike, *Cornus hungarica*, *C. australis*

INTRODUCTION

For the hairy species it is found that hairs are quite often significant in the determination of particular species, so since long time ago great attention has been paid to the study of the morphology (and the anatomy) of plant hairs (CANNON, 1870, BELLING, 1914, SAYRE, 1920, WILLIAMS, 1925, UPHOF, 1962, ROE, 1971, MARTINIS, 1974). In addition to their shape and

their structure, in a large number of cases the disposition of hairs can also be useful not only for the determination of particular species but for the distinction between genera, too. As far as the thickness of hairs is concerned, it is found that it can vary within one species and besides that the thickness of hairs changes during the life time of one and the same individual. Thus, the hairy species is reported to have the thicker cover

when growing in a dryer habitat and the poorer cover when growing in a more humid habitat. Similarly, if a plant with thick (felt-like) hairs is moved from a xerothermal habitat into a mezophyl habitat such as, for instance, a botanical garden, after some time it will lose its thick cover and it suggests that the thickness of hairs depends upon the ecological conditions. However, a hairy plant by nature does not become bare under the influence of the ecological factors, so the hairiness can be deemed genetically conditioned.

If these general knowledges are applied to the genus *Cornus* L., it can be said that the hairs on the underside of a leaf are very important for the distinction of the species of this genus. In the dendroflora on the Republic of Croatia, the genus *Cornus* is represented with two species complexes - *Cornus mas* and *C. sanguinea* s. l. According to the type of hairiness, these two complexes differ to such the extent that practically they cannot be mistaken one for the other at all, especially since they are quite well distinguishable ecologically, too.

In the species *C. mas* (cornel), leaves on their underside along the midrib and in the corners of the ribs have the tufts of woolen hairs.

In the congeneric circle *C. sanguinea* s. l. (cornelian cherry), there are no tufts of woolen hairs in the corners of ribs. In the region of Europe three species from the said congeneric circle are known, namely:

C. sanguinea L., the first species described which is connected to the area of the Central, West and South

Europe with the Atlantic climate or the moderate continental climate.

C. australis C. A. MEYER described from the very east edge of the Europe, from the surroundings of Istanbul, which is connected to the eastern part of the Balkan Peninsula, the northern part of the Asia Minor, the Crimea and the southern part of the Ukraine (comp. MEUSEL et al., 1978, PALAMAREV, 1979). The westernmost habitat of this species presently known is in the eastern Serbia (comp. JOVANOVIĆ, 1973).

C. hungarica KÁRPATI described the last and which, according to the number of its habitats known until now, is limited in the first place to the Pannonian basin having the continental climate with the Pannonian characteristics. It is known from Poland, Czechoslovakia, Hungary, Romania and the western Ukraine. For Bosnia and Vojvodina, it is reported in Serbia by HOLUB (1981) and the most recently it has been discovered in Croatia in several localities situated in its continental part (TRINAJSTIĆ & ZI. PAVLETIĆ, 1989, TRINAJSTIĆ, 1990, FRANJIĆ, 1991), but the preliminary researches suggested its presence in the region of the bay of Kvarnerski zaljev, too (Plomin and Opatija).

With regard to the formation and differentiation of the species of the congeneric circle *C. sanguinea* s. l., and on the basis of the data known until now about their spreading, it can be concluded that each of the said taxons is typical for a particular, ecologically specific and more or less isolated area and that each of them is developed allopatrically (TRINAJSTIĆ, 1990).

In areas where the said species from mixed populations the hybrids appear which, with regard to the frequency of particular types of hairs on the leaf underside, are classified into the systematic units given below (comp. HOLUB, 1981).

hairs typical for the species *C. sanguinea* and so called compass - hairs typical for the species *C. australis* and *C. hungarica* (comp. WILLARD, 1978, HOLUB, 1981, TRINAJSTIĆ, 1990). The special problem were the so called compass - hairs which appear in these

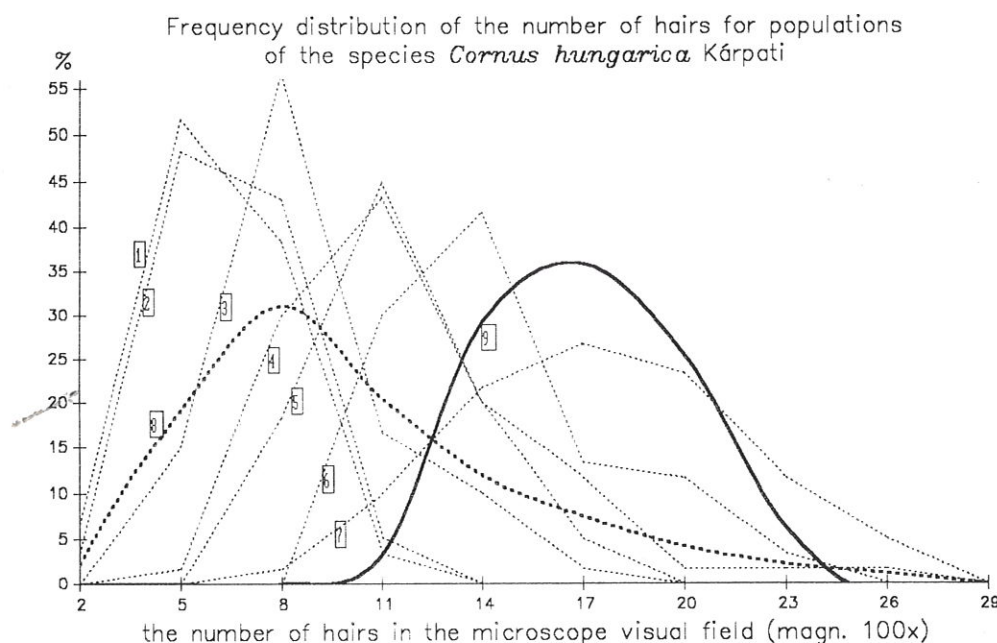


Fig. 1. Frequency distribution of the number of hairs for populations of the species *Cornus hungarica* Kárpati in relation to the species *C. australis* C. A. MEYER

C. hungarica: 1. Maksimir forest - Zagreb, 2. Limbuš, 3. Đurđenovac, 4. Lipovljani, 5. Turopoljski lug, 6. Ozalj, 7. Krapje dol, 8. The equalized curve and 9. The equalized curve for the species *C. australis* - Beograd forest (Istanbul, Turkey).

Due to the great resemblance in the appearance of all three taxa of the congeneric circle *C. sanguinea* s. l., the hairs on the underside of leaves remain as one of the most reliable indicators for the morphological differences between the said species. According to the shape of hairs, there are distinguished two main types, namely the single-armed protrusive

two last mentioned species but differ in each of them by their length and thickness. In order to establish the degree of reliability of these parameters for the determination of the observed species, measurements of hair length and of the number of hairs per a surface unit have been made.

MATERIAL AND METHODS

For the analysis purpose it was used the herbarial material of the species *C. hungarica* gathered in various localities in Croatia (Maksimir forest - Zagreb, Limbuš, Đurđenovac, Lipo-

in a microscope visual field with magnification of 100 times, and the length of hairs. The length of hairs was measured by the objective-micrometer with the microscope "Spencer Buffalo".

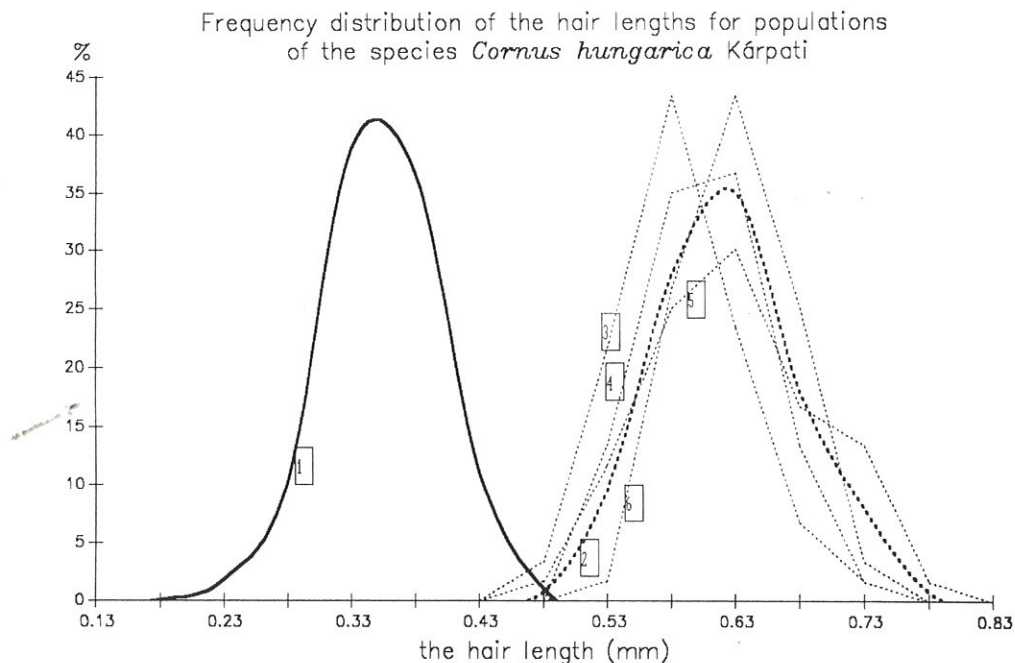


Fig. 2. Frequency distribution of the hair lengths for populations of the species *Cornus hungarica* Kárpáti in relation to the species *C. australis* C. A. MEYER

1. The equalized curve for the species *C. australis* - Beograd forest (Istanbul, Turkey), *C. hungarica*: 2. The equalized curve, 3. Turopoljski lug, 4. Lipovljani, 5. Maksimir forest - Zagreb and 6. Limbuš.

vljani, Turopoljski lug, Ozalj and Krapje dol), as well as the herbarial material of the species *C. australis* gathered in Beograd forest near Istanbul in Turkey (Hb. Dr. I. TRINAJSTIĆ-ZA).

For both species on the leaf underside two properties have been examined, namely the number of hairs,

The number of hairs in the microscope visual field was counted for the species *C. hungarica* on the material originating from all said localities, each population being represented by six offshoots with one sprouting leaf each. On each leaf there were chosen at random 10 points in which hairs were counted. For the

species *C. australis*, a single population was examined (Beograd forest) represented by three offshoots with six leaves each and on each leaf 10 points were chosen at random in which hairs were counted. For the species *C. hungarica* the length of hairs was measured on the material originating from four populations i. e. Turopoljski lug, Lipovljani, Maksimir forest-Zagreb and Limbuš, each of them being represented by six offshoots with one leaf each. On each leaf 10 points were selected at random and in each point the length of one hair only was measured. For the property "the hair length" for the species *C. australis* there was used the same material as for the previous property and the same method as for the species *C. hungarica*.

The measured data are shown graphically for each population observed (fig. 1 & fig. 2), those for the species *C. hungarica* as the unequalized frequency distributions with their mean value being equalized by means of the normal (Gaussian) distribution (PRANJIĆ, 1986). For the species *C. australis*, the equalized curve only has been shown since it serves for the comparison purpose.

RESULTS AND DISCUSSION

The results of measured properties are shown graphically, for each population, as the frequency distribution with classes of certain

width (comp. PRANJIĆ, 1986). By reducing all populations to the level of species (the equalization by means of the normal distribution), the significant difference in both properties between two observed species is noted.

If the property "the hair length" is observed (fig. 2) then it can be seen that the difference is great, i. e. that the highest class of the species *C. australis* corresponds to the lowest one of the species *C. hungarica*. As far as the property "the number of hairs" is concerned (fig. 1), the distribution of the species *C. australis* is approximately unimodal (the arithmetic mean = mod = median) while for the species *C. hungarica* these three middles do not correspond, instead the arithmetic mean is higher than the median and the mode, i. e. it is moved to the right so that there is the right asymmetry.

The relation of distributions for particular populations has not the expected regularity, although the number of hairs per a surface unit was expected to decrease in the direction east-west due to the conditions of the markedly higher humidity in the west part of the observed range thus making it possible to suppose that the number of hairs is subject to the strong genetic control or that it is conditioned by a certain micro-climatic factor (the most likely by the moisture).

CONCLUSION

By using the analytico-graphical method it is found that the species *Cornus hungarica* and *C. australis* differ in their observed properties (the length of hairs and the number of hairs per a surface unit).

For the property "the length of hairs" (fig. 2) the great difference between these two species has been noted, i. e. the highest class of the species *C. australis* corresponds to the lowest class of the species *C. hungarica*. With regard to the property "the

number of hairs per a surface unit" (fig. 1), the species *C. australis* has approximately unimodal distribution, while in the species *C. hungarica*, the measures of the central middle do not coincide, instead the arithmetic mean is higher than the median and the mode, i. e. the right asymmetry exists.

From the above said it results that the length of compass-hairs which in *C. australis* is 0.302 mm in *C. hungarica* 0.613 mm (the arithmetic mean) can serve as the very reliable property for the differentiation of the said species.

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Received March 14, 1992