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Studies regarding the morphological variability of some orchid species from Anina Mountains

Bîtea Nicoleta - Daniela[1]*, Madoşa, E [1], Ciulcă, S. [1], Popescu Sorina[1], Lazăr A. [1], Avădanei, C.[1], Velicevici, Giancarla[1]

[1] Banat's University of Agriculture Sciences and Veterinary Medicine Timisoara, Faculty of Horticulture and Sylviculture

* Corresponding author: Email: nicobitea@yahoo.com

Abstract The Anina Mountains is one of the areas where field literature indicates a whole variety of orchid species. Studies have focused on the general morphological features variability and morphological features of flower variability in species *Epipactis helleborine* (L.) Crantz*, Orchis mascula* (L.) L.and *Cephalanthera damasonium* (Mill.) Druce. These species have been identified in the forest where the dominant species were *Fagus sylvatica* L. Variability of features was assessed by biometric measurements made during the flowering season of species. For each feature was calculated the average, the deviation from the average and coefficient of variation. Species analyzed have decorative potential for both flower and leaves.

Key words

orchids, Anina Mountains, morphological features, variability

The *Orchidaceae* family is the largest botanical family assembling between 20,000 and 30,000 species. In Romania we have descriptions of 58 species [2] and in the Anina Mountains area, there have been identified for 33 species of orchids [7].

Orchids are well represented on the national red lists described by various authors. The Red List described by Olteanu includes all the family *Orchidaceae*. [6] The Red List described by Dihoru includes 18 species of orchids. [4] The Red List described by Boşcaiu includes 12 species of endangered orchids, 5 vulnerable, 3 rare plants and 1 unclassified. [1]

The Red Book of vascular plants in Romania includes 10 species of orchids of which 8 critically endangered, one endangered, and one with a low risk of endangerment [5]

The List of threatened species in the Carpathians includes a number of 18 species of orchids of which 14 are present in Romania [8]

The *in situ* conservation of orchids in the Anina Mountains is achieved in the already existing protected natural areas in this area. The northern and central parts of the Anina Mountains are included almost entirely in National Park Semenic – the Caras Gorges and the southern part is included in the National Park Nera – Beusnita.

Materials and Methods

The biological material examined was represented by 3 natural species of wild orchids found in the territory of the Anina Mountains. Determination of the discovered species was done in accordance with those presented by Ciocârlan (2009) and Flora Romania (1972). The main taxonomic criteria considered in determining these species, was the correlated appearance of the lip with that of the root system.

The identified and analyzed species were: *Epipactis helleborine* (L.) Crantz, *Orchis mascula* (L.) L. and *Cephalanthera damasonium* (Mill.) Druce.

Of *Epipactis helleborine* (L.) Crantz a population by Buhui Lake area was analyzed. Of *Orchis mascula* (L.) L a population located in the Ciclova Valley was considered. Of *Cephalanthera damasonium* (Mill.) Druce a population of Bei Valley area has been considered. All analyzed species have been identified in forest areas with *Fagus sylvatica* L.

The studies were conducted during the flowering of the species listed. Variability was assessed by biometric measurements made at the general morphological features and morphological features of the flowers.

General morphological features were analyzed: plant height, stem length, number of leaves/plant, leaf length and width, inflorescence length and number of flowers/inflorescence.

In the *Epipactis helleborine* (L.) Crantz and *Cephalanthera damasonium* (Mill.) Druce species, the following morphological features of flowers were analyzed: length and width of external tepals, length and width internal tepals, epichile length and width, and the length and width of the hypochile. In the species *Orchis mascula* (L.) L. the length and width of external tepals, the length and width of internal tepals, the lip length and width, the length and width of

median lobe of the lip length and width of the lip side lobes were all analyzed.

These were the statistical parameters that were analyzed: average and average deviation ($\bar{x} \pm s_{\bar{x}}$), coefficient of variation ($s_{\%}$). They have been calculated as given by Ciulcă (2002).

Results and Discussions

Table 1

General morphological features

Feature	*Epipactis helleborine*		*Orchis mascula*		*Cephalanthera damasonium*	
	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$
Plant height (cm)	56,4642 ± 2,8271	18,7346	31,2800 ± 1,2090	19,3257	34,1111 ±2,1856	27,1844
Stem length (cm)	45,6857± 1,9704	16,1383	20,6000 ± 0,7302	17,7256	24,4388 ±1,6696	28,9857
Number of leaves / plant	8,1428 ± 0,2310	10,6159	3,8800 ±0,1200	15,4639	8,9444 ±0,5743	27,2435
Leaf lenght (cm)	9,7357 ± 0,5802	22,2934	8,6840 ±0,3837	22,0971	5,255 ± 0,4539	36,6479
Leaf width (cm)	5,2071 ± 0,3415	24,5412	2,5080 ± 0,1035	20,6517	2,2777±0,1856	34,5870
Inflorescence length (cm)	10,7785 ± 1,2638	43,8740	10,6800±3,0648	28,6971	9,6166 ±1,0284	45,3745
Number of flowers / plant	14,2142 ± 1,7357	45,6914	25,5100 ±0,9867	22,9270	4,4444 ± 0,5315	50,7372

According to Table 1 we can observe that *Epipactis helleborine* (L.) Crantz presents the highest average value of the features plant height and stem length. These features are most variable to *Cephalanthera damasonium* (Mill.) Druce

The feature number of leaves / plant has the highest average and the largest variability to *Cephalanthera damasonium* (Mill.) Druce. The length and width of the leaf is observed as the largest average value in the species *Epipactis helleborine* (L.) Crantz. These features are most variable to the species *Cephalanthera damasonium (*Mill.) Druce.

Values of averages in the inflorescence length were close for the 3 species. The greatest variability for this feature was observed in the *Cephalanthera damasonium* (Mill.) Druce species.

In the number of flowers / inflorescence feature, we may distinguished the species *Orchis mascula* (L.) L. with a 25.5100 average. In this species there was also observed the lowest value of the coefficient of variation.

Table 2

Morphology of the flowers

Feature	*Epipactis helleborine*		*Orchis mascula*		*Cephalanthera damasonium*	
	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$	$\bar{x} \pm s_{\bar{x}}$	$s_{\%}$
0	1	2	3	4	5	6
Length of external tepals (cm)	1,0857 ±0,0311	10,7516	1,1960 ± 0,0323	13,5423	1,5555±0,5337	14,6630
Width of external tepals (cm)	0,4535±0,0177	14,6400	0,2840 ± 0,0137	24,2250	0,5111±0,0332	27,5788
Length of internal tepals (cm)	0,8464 ±0,0357	15,7936	1,0400 ± 0,0432	20,7716	1,3166 ±0,0389	12,5610
Width of internal tepals (cm)	0,4178± 0,0178	15,9899	0,2480 ± 0,0117	23,6268	0,4444±0,0184	17,6360
Length epichile (cm)	0,2607 ± 0,0197	28,3246			0,377±0,0172	19,3787
Width epichile (cm)	0,1821±0,0153	31,5886			0,7388 ±0,0244	14,0332
Length hypochile (cm)	0,6750±0,0244	13,5499			0,6166±0,0121	8,3431

0	1	2	3	4	5	6
Width hypochile (cm)	0,3678±0,0178	18,1633			0,8500±0,0232	11,5904
Length lip (cm)			1,2000± 0,0310	12,9546		
Width lip (cm)			1,0600 ± 0,0489	23,1083		
Length of median lobe of the lip (cm)			1,2040±0,0302	12,5687		
Median lobe width of the lip (cm)			0,3840 ± 0,0398	51,9094		
Length of lateral lobe (cm)			0,8320 ± 0,0292	17,5963		
Side-lobe width (cm)			0,3300±0,0197	29,9857		

Table 2 shows that the highest average length of external tepals is the at species *Cephalanthera damasonium* (Mill.) Druce. Between the species *Epipactis helleborine* (L.) Crantz and *Orchis mascula* (L.) L. close values of average were observed.

The feature width external tepals is most remarkable in the species *Cephalanthera damasonium* (Mill.) Druce. *Orchis mascula* (L.) L. has presented the lower average.

Species *Cephalanthera damasonium* (Mill.) Druce and *Orchis mascula* (L.) L. show the large variability for this feature.

The average length of internal tepals exhibited the highest value to the species *Cephalanthera damasonium* (Mill.) Druce and lower in the species *Epipactis helleborine* (L.) Crantz. All species have a medium variability for this feature.

The width of the internal tepals presented similar averages in both *Epipactis helleborine* (L.) Crantz. and *Cephalanthera damasonium* (Mill.) Druce species. In these species the variability of this feature was medium.

The length and width of the epichile present a medium variability in the *Cephalanthera damasonium* (Mill.) Druce species and high variability in *Epipactis helleborine* (L.) Crantz.

The length of hypochile has low variability in *Cephalanthera damasonium* (Mill.) Druce and medium in *Epipactis helleborine* (L.) Crantz. L. The width of the hypochile presents medium variability in both species.

Orchis mascula (L.) L. has a high variability in the median lobe width of the lip. These features had a medium variability: the length of the lip, the length of the median lobe and the length of the side lobes.

Conclusions

The *Epipactis helleborine* (L.) Crantz species is characterized by the highest average values features: plant height, stem length, leaf length and width.

Orchis mascula (L.) L has the highest average value for the features number of flowers / plant.

The length of inflorescence gives similar values in all the three species analyzed.

Species *Epipactis helleborine* (L.) Crantz and *Orchis mascula* (L.) L. both show the medium variability for these features: plant height, stem length, number of leaves / plant.

The feature of length and leaf width is characterized by high variability in the *Epipactis helleborine* (L.) Crantz and *Orchis mascula* L (L.) species and very high in the *Cephalanthera damasonium* (Mill.) Druce.

Inflorescence length and number of flowers / plant species have very high variability in *Epipactis helleborine* (L.) Crantz and *Cephalanthera damasonium* (Mill.) Druce and high in the species *Orchis mascula. (L.) L.*

Species *Cephalanthera damasonium* (Mill.) Druce has the greatest variability of all species studied for general morphological features and the highest average values for features of the flowers.

The morphological analysis showed that the studied species have ornamental potential. *Orchis mascula (L.) L.* presents the greates potential for flower and *Epipactis helleborine* (L.) Crantz for leaves.

Cephalanthera damasonium (Mill.)

Orchis mascula (L.) L.

Epipactis helleborine (L.) Crantz

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