THE STATE OF POPULATION OF CROCUS BANATICUS J. GAY IN THE TRANSCARPATHIAN REGION OF THE TISZA VALLEY

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Abstract. This paper presents the results of the investigation of a *Crocus banaticus* J. Gay population in the Transcarpathian area of the Tisza valley. Data are given about range of distribution, phytocenotic thriven species, age structure of the population and seed production. Some data are also presented on the biology of the species, and certain aspects of generative reproduction of *C. banaticus* are analyzed. We give suggestions to the protection and re-establishment of natural area of this species in Carpathian region.

Key words: Iridaceae, Crocus banaticus, population biology, protection.

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Introduction

In order to develop the effective protection and natural area re-establishment of rare and disappearing plants, there is a need for complex studies of ecological and biological characteristics of these species. The ephemeroid elements of the natural flora are most sensitive to anthropogenic influence. One of them is *Crocus banaticus* J. Gay that is under full destruction threat. Large quantities of its flowers are picked, corms are digged up and transplanted. In the last decade the population size of *C. banaticus* has been drastically reduced as a consequence of wood-felling and melioration. The area decreases, some populations completely disappeared, the individual numbers in populations decreased to critical level. The *Crocus banaticus* is highly decorative, flowers in autumn, and is pollinated by bee.

Material and Methods

Studies on *C. banaticus* were carried out in 3 isolated populations in Tisza valley:

1. Village Bushtino environs, Tyachiv district, 250 m a.s.l.;
2. Village Onok environs, Vinogradovo district, 300 m a.s.l.;
3. Village M. Kopanya environs, Vinogradovo district, 400 m a.s.l.;

Area and state of local populations were measured, description of plant communities with the presence of *C. banaticus* was done by route method. Plants were collected to study the morphological features and seed production.

Population size, ontogeny and age structure were determined in different ecological-phytocenologic conditions with transects laid down by random method (Smirnova et al., 1976). Age classes were determined according to Rabotnov (1950a) and Smirnova et al. (1976).

Seed production was measured according to Rabotnov (1950b) and Vainagy (1974). The potential seed production (PSP) -- number of seedbuds in fruit, actual seed production -- seed number in fruit, and seeding percentage (SP) -- proportion of seedbuds developing to seed were determined on 25 randomly marked individuals in each population. Standard variance analysis statistics were calculated (Zaitsev, 1973; Schmidt, 1984).

Results and Discussion

The *Crocus banaticus* J. Gay (syn.: *C. iridiflorus* Heuff.; *C. byzanthinus* Herb.) is an autumnal flowering ephemeroid plant from Iridaceae A.L. de Jussieu family. As many

hysteranthous geophytes, it is also related to Mediterranean flora (Dafni et al., 1981). It is Sub-Dacian floral element (Randejlovic et al., 1990). It occurs in Rumania (Beldie, 1967), Serbia (Hayek, 1933; Jávorka, 1964; Randjelovic et al., 1990), from northern Transsylvania to the Balkans (Priszter 1974). In Ukrainie it occurs only in Transcarpathia, the north-eastern border of its area. *C. banaticus* grows in zonal oak and beech forests and sometimes, for example, in Transsylvanian mountains Erc, reaches 1000 m above sea-level (Bernátsky, 1911).

C. banaticus prefers semishaded places, grows in oak and beech forests, brushwoods. The investigated populations were in *Festuco-Quercetum roboris* association of *Quercetea robori-petraeae* Br.-Bl. et Tx. 43 class, *Fago-Carpinetum* association of *Carpino-Fagetea* Jakucs 67 class, *Robinietum pseudoacaciae* association of Robinietea Jurko ex Hadac et Sofron 80 class (Krichfalushiy and Mihály, 1993).

The corm of *C. banaticus* is round, slightly flattened at the top and bottom, its width waries from 14 to 16 mm, and the height from 8 to 9 mm. The colour is dirty-brown. Flowers are significantly different from those of other *Crocus* species. Size of inner petals is the half of that of outer ones, and their color is violet. Anthers are yellow, stigma is blue-violet, and is very branched (number of branches ranges up to 50). Flowers of 10-12 cm bloom in September-October (sometimes even in the beginning of November). Leaves and fruits appear next spring. The sprout is very weak and brittle during the flowering, mechanical strength is given by the associated leaves. Fruits are three-sided capsules. In each of the three cavities the seeds are arranged in two rows. Seeds are redish-brown, elliptical, lemon like acuminates are at the ends, 4-4.5 mm in length. Generative individuals have three green leaves, but senile ones have only 1-2. Leaves are lanceolate, erect, 15-25 cm in length and 13-15 mm in width. Apex of leaf is slightly blunt. Fruit opens with three parts. Seeds germinate in autumn. Flowering occurres in the 4-5th year.

Ontogenic stages of *C. banaticus* are: juvenile (j), immature (im), virgin (v), generative (g) and senile. Age structure of the populations studied is given in Table 1 and Fig. 1.

Group of juvenile plants prevails over all populations, juvenile and immature individuals are over 70 % in all populations. A rather low number of generative individuals should be explained with frequent flower picking. The Bushtino and M. Kopanya populations are fully arthrous, normal by Rabotnov (1950) scheme. The share of senile plants is very low. The three populations may be classified as young, normal, close to invasional.

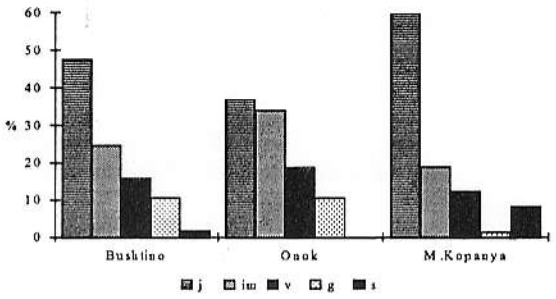

Fig. 1. Age structure of Crocus banaticus populations.

For the ephemeroids, characteristic are the complete, left sided basic spectra, in which pregenerative individuals dominate over generative and senile ones. This can be explained with the long persistence of virgin period of ontogeny, as well as the dominance of seed germination over vegetative reproduction in population dynamics.

Interspecific competition has rather low effect on ephemeroid populations, its manifestation is obvious near the border of the population distribution. In such conditions the individual number of populations decreases abruptly, and the strong deformation of their age spectra can be observed (Shorina and Smirnova, 1976).

C. banaticus propagates itself generatively

Table 1. Age structure of Crocus banaticus populations. Individual numbers per m^2 and percentage are given.

Population	Community	density of individuals ind/m^2	Age group						
			j	im	v	g	s	j+im	v+g+s
Bushtino	Festuco-Quercetum roboris	183	87	45	29	19	3	132	51
		%	47.54	24.59	15.85	10.38	1.64	72.13	27.87
Onok	Robinietum pseudoacaciae	144	53	49	27	15	-	102	42
		%	36.80	34.03	18.75	10.42		70.83	29.17
M.Kopanya	Fago-Carpinetum	74	44	14	9	1	6	58	16
		%	59.46	18.92	12.16	1.35	8.11	78.38	21.62

Table 2. Potential and actual seed productions of C. banaticus populations studied.

Population	PSP			ASP			SP
	$\bar{x}$	$s\bar{x}$	min-max	$\bar{x}$	$s\bar{x}$	min-max	%
Bushtino	35.13	1.47	22-56	23.23	2.26	3-47	66.13
Onok	40.97	1.68	26-63	34.47	1.99	14-57	84.13
M.Kopanya	28.59	1.19	18-44	18.93	1.31	4-34	66.21

very easily and fast by means of seeds, but vegetative propagation is quite week. The number of pregenerative individuals depends on the soil seed bank that is connected to the seed production of the population (Komendár and Német, 1980). Table 2. summarizes the seed production of *C. banaticus* in the thre populations studied.

Some conclusions of the investigations: the number of germs is considertably stable than that of seeds. Differences between germ numbers of each populations are less then those between seed numbers. Actual seed production depends mainly on environmental conditions, but potential seed production is less dependent, that referrs to its genetic background.

Population of M. Kopanya is most threatened, it is situated close to the highway. Here the flowers are collected, mainly the largest ones ("artificial selection" takes place: the weakest and smallest individuals remain in the population).These facts could explain the low seed production and the small number of generative individuals in the population: this population is degrading under anthropogenic influence.

Protection of *C. banaticus* is wery important in Transcarpathia, because here is the north-eastern border of its area. *C. banaticus* is present in the Red data book of Ukaraine and USSR. It is a disappearing species, area of which is decreased under human pressure. *C. banaticus* is an endangered species not only in Ukrainian Carpathians but in other regions. The most effective protection and reestablishment of its populations should be in natural habitats, and with establishing nature reserves.

References

Beldie, A. (1967): Flora si vegetatia Muntilor Bucegi. - SA RS Romania, pp. 309.

Bernátsky, J. (1911): A hazai *Iris*-félék. - Math. Term.tud. Közlem. 31-32.

Dafni, A., Shmida, A. and Avishai, M. (1981): Leafless autumnal-flowering geophytes in the Mediterranean region. Phytogeographical, ecological and evolutionary aspects. - Pl. Syst. Evol. *137*, 181-193.

Hayek, A. (1933): Prodromus florae peninsulae Balkanicae. - Feddes Rep. Spec. Nov. *3*, 107-117.

Jávorka, S. (1964): Hazai *Crocus*-aink. - Bot. Közl. 51, 177.

Komendar, V.I. and Német, I.I. (1980): K izucheniju ephemeroidov Ukrainskih Karpat. - Botan. Zhur. *65*, 240-249.

Krichfalushiy, V.V. and Mihály, A. (1993): Horologichni ta ekologo-phytocenotychni osoblyvosti ephemeroidnyh geophitiv Ukrainskyh Karpat. - Ukr. Botan. Zhurn. *50*, (in press).

Priszter, Sz. (1974): Hagymás kerti virágok. - Bp., pp. 114-115.

Rabotnov, T.A. (1950a): Voprosy isuchenija sostava populacij dlja celej phytocenologii. - Problemy botaniki, Moskow *1*, 465-483.

Rabotnov, T.A. (1950b): Zhiznennyi cikl mnogoletnih travjanistyh rastenij v lugovyh cenosah. - Tr. bot. In-ta AN SSSR. Geobot. *6*, 7-204.

Randjelovic, N., Hill, D. and Randjelovic, V. (1990): The genus *Crocus* L. in Serbia. - SANU *66*, 44.

Schmidt, V.M. (1984): Matematicheskie metody v botanike. - Leningrad.

Shornia, N.I. and Smirnova, O.V. (1976): Vozrastnye spectry cenopopulacij nekotoryh ephemeroidov v svjazi s osobennostjami ih ontogeneza. - Cenopopulacii rastenij. Moskow, pp. 166-201.

Smirnova, O.V., Zaugolnova, L.B., Toropova, N.A. and Falikov. L.D. (1976): Kriterii vydelenija vozrastnyh sostojanij i osobennosti hoda ontogeneza u rastenij razlichnyh biomorf. - Cenopopulacii rastenij. Moskow, pp. 14-43.

Vainagy, I.V. (1974): O metodike izuchenija semennoj produktivnosti rastenij. - Botan. Zhurn. *53*, 826-831.

Zaitsev, G.N. (1973): Metodika biometricheskih raschetov. - Nauka, Moskow.