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CENTAUREA CYANUS L. - A WEED WITH MEDICAL FEATURES

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Abstract

During 47 years (1960-2007) there were carried out profound and multilateral studies of the weeds in the Republic of Moldova. It was established that there were over 500 species of weeds, 10-20 of which dominated in crops. Their degree of hazard to the agricultural cultures is different. Some species (C. cyanus L.) when spread at a low weeds level, increased the wheat and rye crops. C. cyanus L. is part of genus Centaurea, which includes 550 species, 26 of which are spread on the territory of the Republic of Moldova. Different species of this genus (C. cyanus L., C jacea) are very important for folk medicine while are less important for the scientific one. Generally, the studies carried out in the field of chemistry demonstrated that the therapeutic actions of species were various and very fragmented and further thorough scientific research is necessary. From this point of view, the weeds must not be totally destroyed, but should be maintained at a low level of negative influence over the agricultural cultures (biological threshold of danger), protected and even cultivated for the medical purposes.

INTRODUCTION

The environmental role of the weeds conflicts with the traditional attitudes of the scientists studying herbs. They asess the presence of the *C. cyanus* L. weed and of other dominating species as exclusively negatively affecting the agricultural crops and insist on their complete destruction by means of herbicides [12,13,15].

The new concept (Susu Gh.) provides for an in-depth study of the weeds spieces [6] and of the grade of their aggressivness [9,18] towards the crops, their maintenance (but not the total distruction) at a very low level of the negative impact (biological threshold of danger) [9,19]. In some literature sources it is mentioned that a small amount of *C. cyanus* L. plants in the out of wheat and rye increases the crops. *C. cyanus* L. is a weed with the medical features [3,6]. From this point of view, some of the non-aggressive weed species shall be protected and even cultivated for the medical purpose.

The objectives of the work

- Study of the weed species in the Republic of Moldova during 48 years (1960-2008);
- Study of the species of the *Centaurea* genus of medical importance spread

on the country's territory.

MATERIAL AND METHODS

Identification of the levels of weeds in the crops in the Republic of Moldova was carried out during 1960-2008 in the field crops (SuSu Gh.); while during 1981-1988 weeds' mapping on the entire territory of the country was carried out under methotodological instructions by I. Liberştein and G. Susu. The final results had been systematized by the special electronic programme "Glia" by the programme coordinators from Moscow [12, 15]. All the data obtained experimentally in compliance with the single methodology for all 15 republics of the former USSR had been processed manually and electronically and formed a rich database at the State Agrarian University of Moldova and a branch of TINAO that submitted these results annually to Moscow [12, 15].

The behavior of all weed species in all kinds of crops in the Republic of Moldova had been analyzed in correlation with the temperature and rainfalls in different years, soil texture, soil types, main systems of soil processing, applied systems of herbicides, crop rotation, the management of fertilizers etc. In this way the species that were dominant in crops, the degree of their hazard, possibilities for segetal species' adaptation to the diverse climate and soil conditions etc., had been studied from the agronomic, ecological, economic and energy points of view [6,9,18,19].

The plant species from the *Centaurea* genus have been studied under different aspects: morphologic, area of spread in the Republic of Moldova, and use in medicine.

RESULTS AND DISCUSSION

In the Republic of Moldova have been identified more than 500 weed species [6], in Romania – 711, in Ukraine – 1800 [4]. The weeds represent a great hazard for the agriculture. Because of this in the former USSR the scientific research in the area of herbs study was directed towards their complete destruction from crops by herbicides [12, 15]. Intensification and especially over-chemicalisation of the agriculture resulted in a reduction in numbers of weeds and of the wild birds [10]. A change of the old concept of the total combating of weeds for a new concept of an in-depth study of the relationship between spontaneous and cultivated plants in the Republic of Moldova (Susu Gh. 1991, 1996) for a strict ecological monitoring of the weeds (ecological management) is not possible without a detailed knowledge of the degree of their hazard [6].

The experimental data for the Republic of Moldova for 1960-2008 years, partially summarized by the "Glia" programme in Moscow in 1981-1988, demonstrate that *C. cyanus* L. specie, as a dominant weed had been found only in cereal crops

(wheat, rye, barley, oats) and corn for silage. In the autumn wheat and rye crop it became a specialized weed [12, 15].

On the basis of identification of weeds species for each particular crop in 15 republics of the former USSR Isaev V. (1990) had systematized this material of the scientific value for the first time on the most modern for those times electronic machinery and suggested to destroy all the dominant weed species from each particular crop only with herbicides, planning, in this way, a long list of herbicides in maximum dozes [12]. For example, for the complete destruction of *C. cyanus* L. alongside with other 8 species from those dominant in the spring wheat corps had been recommended 14 herbicides in dozes up to 12 kg/ha; in the autumn wheat corps – 11 herbicides in dozes up to 12 kg/ha; for barley – 10 herbicides in dozes up to 6 kg/ha; for rye – 6 herbicides in dozes up to la 4 kg/ha; for oats – 9 herbicides in dozes up to 10 kg/ha; for grain maize – 16 herbicides in dozes up to 10 kg/ha; for corn for silage – 13 herbicides in dozes up to 10 kg/ha [12]. This anti-environment system that had been compulsory in all 15 republics of the former USSR and that led to a complete danger for the human, animal and soil microorganisms health, had been replaced in the Republic of Moldova by a new environmentally balanced system [18, 19]. The experimental data from 1986 demonstrate that in Moldova the wheat fields had not contained much weeds and there was no need to process 97% of crops with herbicides. At the same time, in other republics the level of weeds had been high, while it was suggested to process with herbicides: only 52% in Russia, in Belarus – 56%, and in Ukraine – 58% [12, 15]. This strict and compulsory planning had been imposed by the rapid growth of herbicides production (that had yet a military significance: in the former USSR in 1960 had been produced – 3 thousand tones of herbicides, in 1970 – 47 thousand tones, in 1980 – 113 thousand tones, in 1987 – 155 thousand tones, while in the USA in 1986 272 thousand tones of herbicides had been produced).

The experimental (1960-2008) by Susu Gh. demonstrate that the abusive use of herbicides led to the environment pollution and to a speedy growth of species resistant to these substances. The composition of weeds in the territory of the Republic of Moldova has significantly changed and new species completely resistant to the triazine herbicide group appeared (*Panicum capillari* L.). Some species disappeared. *C. cyanus* L. specie can be rarely found in wheat crops, especially in the dry years, while in those wet it becomes a dominant plant in some crops with the primitive processing. It shall be mentioned that *C. cyanus* L. in 1974-1999 years was the 21st species from those 30 dominating in Ilfov county of Romania, while in 2000-2001 it cannot be found on this list [5]. Currently this plant is not included into the list of dominating in the crops weeds in the Republic of Moldova, but could be found spontaneously throught the whole territory of the country [11].

Up to now more intensively *C. cyanus* L. species is being studies [14], but it is

necessary to consolidate the scientific research on other species of this genus. *Centaurea* genus belongs to the *Asteraceae* family, that originates from the temperate regions of Europe, America, North Africa and Asia. It includes more than 550 species of the annual, biannual and perennial plants, spread in Eurasia, Africa, America, Australia (1 specie). In the Republic of Moldova there are identified 26 species [2,7,8,11], from which:

- Spread throughout the country's territory (solitary or in associations), 10 species: *C. solstitialis, C. diffusa, C. orientalis, C. cyanus, C. trinervia, C. stenolepis, C. jacea, C. rhenana, C. besseriana, C. bieberstenii*;
- Spread throughout the country's territory, but rarely met, 8 species: *C. stereophylla, C. scabiosa, C. apiculata, C. pseudophrygia, C. substituta, C. pseudomaculosa, C. arenaria, C. adpressa;*
- Very rarely met, only in some localities, 6 species: *C. adamii, C. iberica, C. trichocephala, C. caprina, C. marschilliana, C. pannonica;*
- On the way to disappear, included into the Red Book of the Republic of Moldova, 2 species: *C. thirkei, C. angelescui.*

Evidence of the medical qualities of yet other species of *Centaurea* genus would speed up not the total destruction, but cultivation of these plants on the large areas. In order to pass to the cultivation of the medical species of this genus it is needed to examine in detail the dependence of the chemical composition of their biology and ecology. It is well known from the specialized literature that all the plants are adaptable to a particular environment that is being characterized by a particular combination of the environmental factors [3, 6, 9]. For example, some species (*C. solstitialis*, *Amaranthus blitoides*, *Aristolochia clematitis*, etc.) have high requirements towards the temperature, while others – lower requirements towards the temperature (*C. cyanus*, *Chenopodium album*, etc.). Perennial hemicryptophyte species *C. spinulosa* have their regeneration gemmas underground close to the surface, perennial geophytes (*Aristolochia clematitis*, *Elymus repens* etc.) have their regeneration gemmas at great depths in the soil, xerophyte plants (*C. solstitialis*, *Amaranthus blitoides*, *Cynodon dactylon* etc.) are adapted to survey through relatively long dry periods [3, 6]. Such plants, as *C. cyanus, Thlaspi arvense* indicate the soil saturated by the nitrogen in medium quantities, while *Chenopodium album, Amaranthus retroflexus* strongly develops only in the over fattened and very rich with the nitrogen soils. It is obvious that the therapeutic action of the same *Centaurea* specie in different climate, soil and agrotehnic conditions will be different. Depending on the locality the content of toxic alkaloids significantly changes: *Hyoscyanus niger* in Moghilev region contains 0,013% of toxic alkaloids, while in Saratov region (dry climate) – 0,173%. *Centaurea repens* (A*croptilon repens*) in the steppe zone of Ural is not a

toxic plant for animals, while in swamp zones of Uralului – extremly toxic. *C. cyanus* L. is a Mediterranian and submediterranian plant, while *C. diffusa* – Black Sea - Balkan species [3]. Extension of the weeds areas is being favored by two major factors:

1. the possibility to adapt segetal species to very different soil and climate conditions (the extension is more rapid when the genetic features of the specie allow an easier adaptation to the specific environment factors);
2. commercial exchanges that rapidly extend the area of specie's spread (in case the country quarantine system is weak).

The individual density per an area unit is determined by the optimum temperature and rainfall for each particular specie. Due to this the study of the therapeutic effect shall be carried out in parallel with an in-depth study of the environmental requirements. Weeds with the medical features shall be "healthy", not attacked by diseases and pests, not treated by herbicides and other pesticides, not to be in the Cernobyl affected zone. Only after the implementation of the above listed limitations the spontaneous plants can be used in medicine after a detailed scientific analysis.

The mostly well-known *Centaurea* species that are used for medical purposes are included into the following table:

Table 1

Best-known *Centaurea* species used for medical purposes

Plant name	***C. cyanus***			***C.diffusa***	***C. jacea***		***C. solstitialis***			***C. iberica***	
Parts used / **Therapeutic effects**	**herba**	**folia**	**flores**	**herba, folia**	**radix**	**flores**	**radix**	**flores, folia**	**flores**	**radix, folia, fructus**	**herba**
diuretic	+		+			+				+	
anti-inflammatory	+										
antibacterial	+		+	+				+			+
wound healing activity		+									

Plant name	*C. cyanus*			*C.diffusa*	*C. jacea*		*C. solstitialis*			*C. iberica*	
Parts used / **Therapeutic effects**	**herba**	**folia**	**flores**	**herba, folia**	**radix**	**flores**	**radix**	**flores, folia**	**flores**	**radix, folia, fructus**	**herba**
desinfectant			+								
the CNS stimulant			+								
analgesic			+								
laxative			+								
antifungal				+							
antipyretic			+		+		+		+		
GIT diseases	+		+				+				
headache	+		+			+					
liver diseases			+								
kidney diseases			+								

CONCLUSIONS

1. It is necessary to pass from the old concept about the complete destruction of the weeds from crops and other places to the environment management and their maintenance in crops at the biological hazard threshold. This will lead to the systematic monitoring and management of the relations between weeds and cultivated plants that will allow preserving their genetic wealth for the future generations.
2. An in-depth and multi-aspect study of the *Centaurea* genus will allow using the therapeutic features of the weeds in the Republic of Moldova in the traditional medicine. The import of these weeds' species from other countries will lead to the cases of intoxication or absence of the curative

effect due to the ecology of the weeds.

3. A future mapping of the territory of the Republic of Moldova with the objective to identify the most important weeds with the medical features will allow the State to assume a strict control over harvesting of these species by random people. In this way it will be possible to make of the transfer to population from the chemical very toxic medicine to biological medicine.

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