STUDIES ON THE SPECIES *PRIMULA OFFICINALIS* HILL. FOR THEPURPOSE OF ESTABLISHING ECOLOGICAL CULTIVATION TECHNOLOGY

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Abstract

These researches were carried out in order to introduce the species Primula officinalis into the culture and to establish an ecological cultivation technology.

The species Primula officinalis Hill., synonymous with Primula veris L., popularly known as cowslip, common cowslip or cowslip primrose, is a perennial, herbaceous species, being one of the 400 species of the Primula genus. In some countries from Europe, this species is on the verge of extinction, due to intensive harvesting from the spontaneous flora, grazing, deforestation and alpine herbicides. In Romania, Primula grows spontaneously, starting from the lowlands, on hills, pastures, alpine meadows, up to approximately 2300 - 2400 m altitude.

It is known in folk medicine as having multiple phytotherapeutic uses. Primula has been used since the Middle Ages for the treatment of gout, headaches, migraines. The saponins found in the rhizomes and flowers are used in the phytotherapeutic treatment of bronchitis and colds due to their expectorant effects.

The paper presents results regarding the influence of the nutrition space on some elements of growth and development in the species Primula officinalis, with a determining role in the amount of vegetable mass obtained.

Keywrds: *Primula officinalis Hill., phytotherapy, technology, nutrition space*

INTRODUCTION

Starting from the statements of Emil Racovita that "vegetable resources from the spontaneous flora should be rationally exploited, care must be taken that access to reserves does not lead to an exploitation that exceeds the limits that a resource can bear without damage" (Ștefuleac, 1976), instead of excessive harvesting, it is recommended to introduce into the culture some valuable species from a phytotherapeutic point of view, maintaining a sustainable ecosystem, thus avoiding their disappearance.

Popularly known as cowslip, common cowslip or cowslip primrose, *Primula officinalis*Hill., synonymous with *Primula veris* L., is one of the 400 species of the *Primula* genus.

In Romania, *Primula* grows spontaneously, starting from the lowlands, on hills, pastures, alpine meadows, up to approximately 2300 - 2400 m altitude.

Taxonomically, the species *Primula officinalis* Hill. it falls like this:

- Kingdom: *Plantae*
- Subkingdom: *Viridiplantae*
- Order: *Primulales*

- Family: *Primulaceae*
- Kind:*Primula*
- Species: *Primula officinalis* Hill.sau*Primula veris*L. (https: ro.wikipedia.org).

Primula officinalis Hill.it is a herbaceous plant, perennial, bush-like, 15-30 cm tall. The underground part consists of a cylindrical rhizome up to 10 cm long and 0.5 cm thick, with numerous roots, up to 15 cm long, thin, yellowish-white.

The leaves are arranged in a basal rosette, ovate, with a crenate or wavy edge, up to 15 cm long and 5 cm wide, with prominent veins on the lower side, green on the upper side and gray-green on the lower side due to the bristles; the petiole is long and winged.

The flowers are arranged in umbels, 6-18 at a time, they are on type 5, persistent calyx, gamopetalous corolla, golden yellow.

The fruit is an ellipsoidal capsule, 6 – 10 mm long, with a persistent calyx. It blooms in April – sometimes even in March (Muntean et al., 2007).

This species has been intensively studied in the last 150 years, due to its phytotherapeutic properties, but also from economic perspectives, the genus Primula offering multiple research topics to phytotherapists, geneticists, pharmacists and botanists from all over the world.

Primula officinalis Hill.is a medicinal plant rich in triterpenicsaponins, phenolic glycosides and flavonoids.

Pharmacological studies have shown that extracts from *Primula officinalis* Hill. they have strong anti-asthmatic, anti-inflammatory and antiviral properties (Jurca, 2015).

Fresh leaves used as a vitamin supplement for the preparation of vitamin C teas and concentrates have been tested for the treatment of avitaminosis, as well as in lethargy, loss of appetite and in the treatment of gum disease (Shabalina, 2009).

Primula may contain allergens; rare adverse reactions to saponins can be nausea or diarrhea, while some of the phenolic constituents are responsible for allergic skin reactions.

Primulae radix is an expectorant, applied in infections of the throat, pharynx and bronchi. The flowers (*Primulaeflos*) are added to compositions of expectorants and diuretic mixtures. Extracts from rhizomes, roots and flowers of *Primula officinalis* Hill.are components of many herbal preparations, marketed globally, such as: pectoral tea and bronchitic tea, Bronchicum Elixir S, Pectosol, Tussipect and Sinupret (Neubauer&März, 1994; Strzelecka& Kowalski, 2000; Muntean et al., 2007, hypericum-plant.ro/; www.plafar.com/.)

Since ancient times, the people of the villages have given it various medicinal uses. Tea from the flowers has been used to relieve headaches.

In the Apusenimountains, the decoction of the plant was used against eye pain. To treat swellings, the plant was boiled, with the obtained decoction washing the affected area.

In the villages of Moldova, it was practiced to swallow 3 flowers in order to get rid of tonsils. To combat colds, grind the whole plant, including the root, mix it with water and drink the resulting must.

To treat kidney diseases, especially kidney stones, the root was boiled and the decoction was taken 3 cups a day (Muntean et al., 2007).

This species of plants has an old tradition in the Romanian popular culture, it was noted that those who found flowering cowslip plants on their way, had good luck and their cultivation in the garden of the

house brought protection to the respective household, protect the animals and the members of that household from diseases, charms, spells and any negative event (https universulflorilor.com).

Also symbolically, the petals of these flowers were associated with woman, birth, initiation, perfection and death. Moving from myth to reality, *Primula* can be seen on the popular coins of the Austrians (adelaparvu.com). In the language of flowers, Primulas given as gifts symbolize youth, first love and ardent love (gradinamea.ro).

About the "soul" of plants hidden in active substances, about their great capacity for giving, about their supreme sacrifice, the words of one of the Romanian martyrs in the faith, Vladimir Ghika, tell us: "Flowers go so far with their goodness, that they perfume the hands of those who crush them " (Bojor & Răducanu, 20011).

Cultivation of medicinal and aromatic plants has recently been revived, covering larger areas in the last decade, obtaining high and quality yields requires technical knowledge, interest, passion and a lot of work.

General knowledge about the cultivation of medicinal plants is not enough, because they present a very large variety of species, have different vegetation periods, propagation is different from one species to another, the habitus of the plant differs greatly, and harvesting, drying and conditioning are done depending on the part of the plant used.

All these aspects were the basis of the start and the objectives of the research regarding the aspects of biology, the identification of some elements of technology, with the aim of introducing the *Primula officinalis* Hill species into culture.

MATERIALS AND METHODS

Trial was performed in the experimental field of the National Institute of Research and Development for Potato and Sugar Beet Braşov, the Laboratory of Technology and Good Agricultural Practices, the Department of Medicinal and Aromatic Plants.

The experimental field is located in the Braşov Depression (Tara Bârsei), at 25°45' east longitude and 45°42' north latitude. The altitude at which the experimental field was located is 520 m (Mihai, 1975).

The biological material, on which the research was carried out, was brought in the spring of 2016 from the spontaneous flora of Brașovcounty. After acclimatization of the material, before the establishment of the field experiments, a rigorous selection was carried out, choosing the most uniform plants in number of leaves, height and health status.

Different planting distances were tested, which would allow maintenance work to be mechanized, in order to establish the optimal nutritional requirement, the optimal spatial interval for development, but also profitable productions per ha.

Factors and graduations studied were: Factor A – distance between rows with graduations: 25 cm, 50 cm, 75 cm; Factor B – distance between plants in a row with graduations: 10 cm, 25 cm, 50 cm; The interaction with the density of 25/10 cm is considered the witness of the experience.

RESULTS AND DISCUSSIONS

Analyzing the influence of the interaction between the distance between rows (A) and the distance between plants per row (B) on the mass of leaves, in 2017, it results that factor A, the distance between rows, had a favorable effect on the

average mass of leaves, compared to the distance of 25 cm, taken as control. In the A3B1 variants planted at the distances of 75/10, the differences were distinctly significant, the values being higher than the control by 7.33 g. The plants whose distance between the rows was greater (A2B2, A3B2), registered significant differences, respectively distinctly significant, with values above the control, of 7.00 g and 8.33 g (table 1). The experimental variants A2B3 and A3B3 had insignificant productions in relation to the control.

Table 1

The influence of the interaction between the distance between rows (A) and the distance between plants per row (B) on the mass of leaves in the species *Primula officinalis* Hill.in the year 2017

Symbol	Variant	Average	%	Dif.	Sig.
Experimental year 2017					
A1B1	25/10	23,00	100,0	0,00	Mt.
A2B1	50/10	22,67	98,6	-0,33	-
A3B1	75/10	30,33	131,9	7,33	**
A1B2	25/25	26,00	100,0	0,00	Mt.
A2B2	50/25	33,00	126,9	7,00	*
A3B2	75/25	34,33	132,1	8,33	**
A1B3	25/50	27,67	100,0	0,00	Mt.
A2B3	50/50	32,00	115,7	4,33	-
A3B3	75/50	30,67	110,8	3,00	-
DL (p 5%)			4,93		
DL (p 1%)			7,23		
DL (p 0.1%)			11,14		

In 2018, the influence of factor A (distance between rows) shows, through its interaction with factor B, a very significant increase in vegetative mass, with production differences between 11.67 g and 19.33 g compared to the control variants (table 2).

The interaction from factor A to factor B (table 3) in the 3rd year of vegetation of the *Primula* plants, notices significant differences in the A2B2 variant planted at a distance of 50/25, with 28.67 g compared to the control.

Table 2

The influence of the interaction between the distance between rows (A) and the distance between plants per row (B) on the mass of leaves in the species *Primula officinalis* Hill.in the year 2018

Symbol	Variant	Average	%	Dif.	Sig.
Experimental year 2018					
A1B1	25/10	26,00	100,0	0,00	Mt.
A2B1	50/10	40,33	155,1	14,33	***
A3B1	75/10	43,67	167,9	17,67	***
A1B2	25/25	26,33	100,0	0,00	Mt.
A2B2	50/25	41,00	155,7	14,67	***
A3B2	75/25	45,67	173,4	19,33	***
A1B3	25/50	30,67	100,0	0,00	Mt.
A2B3	50/50	42,33	138,0	11,67	***
A3B3	75/50	49,33	160,9	18,67	***
DL (p 5%)				24,76	
DL (p 1%)				37,03	
DL (p 0.1%)				59,16	

In the A2B3 variant, the differences are distinctly significant, with an increase of 46.00 g compared to the control variant (A1B3). The other density variants did not present significant values.

Table 3

The influence of the interaction between the distance between rows (A) and the distance between plants per row (B)on the mass of leaves in the species *Primula officinalis* Hill.in the year 2019

Symbol	Variant	Average	%	Dif.	Sig.
Experimental year 2019					
A1B1	25/10	24,33	100,0	0,00	Mt.
A2B1	50/10	49,00	201,4	24,67	-
A3B1	75/10	29,33	120,5	5,00	-
A1B2	25/25	32,67	100,0	0,00	Mt.
A2B2	50/25	61,33	187,8	28,67	*
A3B2	75/25	56,00	171,4	23,33	-
A1B3	25/50	31,33	100,0	0,00	Mt.
A2B3	50/50	77,33	246,8	46,00	**
A3B3	75/50	49,67	158,5	18,33	-
DL (p 5%)		24,76			
DL (p 1%)		37,03			
DL (p 0.1%)		59,16			

The influence of the interaction between the distance between rows (A) and the distance between plants per row (B) on the production of fresh herba (g/plant), in 2017, recorded significant differences (table 4) in the plots where the planting distance between rows of was 75 cm, respectively 50 cm. Following the interaction of the two factors (from A to B), it follows that the variant with 25 cm between plants in a row ensures high productions of herba, compared to the other variants studied.

Table 4

The influence of the interaction between the distance between rows (A) and the distance between plants per row (B) on the production of fresh herb (g/plant) in the species *Primula officinalis* in 2017

Symbol	Variant	Average	%	Dif.	Sig.
Experimental year 2017					
A1B1	25/10	27,67	100,0	0,00	Mt.
A2B1	50/10	29,33	106,0	1,67	-
A3B1	75/10	36,33	131,3	8,67	*
A1B2	25/25	33,00	100,0	0,00	Mt.
A2B2	50/25	40,33	122,2	7,33	*
A3B2	75/25	41,67	126,3	8,67	*
A1B3	25/50	35,00	100,0	0,00	Mt.
A2B3	50/50	40,00	114,3	5,00	-
A3B3	75/50	38,33	109,5	3,33	-
DL (p 5%)				6,52	
DL (p 1%)				9,78	
DL (p 0.1%)				15,71	

The production of fresh herba (g/plant) in the species *Primula officinalis* achieved in 2018, as a result of the interaction of factor A with factor B, had distinctly significant and very significant meanings in all experimental variants, with differences of 12.33 g/ plant in the A2B3 variant planted at a distance of 50/50. The A3B1 variant planted at a distance of 50/50 recorded differences in plant mass of 22.67 compared to the control variant (table 5).

Table 5

The influence of the interaction between the distance between rows (A) and the distance between plants per row (B) on the production of fresh herb (g/plant) in the species *Primula officinalis* in 2018

Symbol	Variant	Average	%	Dif.	Sig.
Experimental year 2018					
A1B1	25/10	32,33	100,0	0,00	Mt.
A2B1	50/10	50,33	155,7	18,0	***
A3B1	75/10	55,00	170,1	22,67	***
A1B2	25/25	36,33	100,0	0,00	Mt.
A2B2	50/25	50,00	137,6	13,67	***
A3B2	75/25	55,67	153,2	19,34	***
A1B3	25/50	40,00	100,0	0,00	Mt.
A2B3	50/50	52,33	130,8	12,33	**
A3B3	75/50	57,67	144,2	17,67	***
DL (p5%)				5,6	
DL (p1%)				8,26	
DL (p0.1%)				12,88	

In 2019 (the 3-rd year of cultivation), the influence of the interaction between the distance between rows (A) and the distance between plants in a row (B) on the production of fresh herba (g/plant) ensured distinctly significant differences in variant A2B3 (50/50), variants A2B1 (50/10) and A2B2 (50/25) register significant increases and the other variants do not differ significantly from the control (table 6).

Table 6

The influence of the interaction between the distance between rows (A) and the distance between plants per row (B) on the production of fresh herb (g/plant) in the species *Primula officinalis* in 2019

Symbol	Variant	Average	%	Dif.	Sign.
Experimental year 2019					
A1B1	25/10	30,00	100,0	0,00	Mt.
A2B1	50/10	61,00	203,3	31,00	*
A3B1	75/10	37,00	123,3	7,00	-
A1B2	25/25	43,00	100,0	0,00	Mt.
A2B2	50/25	78,00	181,4	35,00	*
A3B2	75/25	67,33	156,6	24,33	-
A1B3	25/50	42,00	100,0	0,00	Mt.
A2B3	50/50	91,00	216,7	49,00	**
A3B3	75/50	64,33	153,2	22,33	-
DL (p 5%) 25,40 DL (p 1%) 37,80 DL (p 0.1%) 59,87					

CONCLUSIONS

From the analysis of the influence of factor A (the distance between the rows) it can be seen that the second variant of density ensures significant differences and the third variant distinctly significant differences. In the case of factor B (distance between plants in a row), in 2017, distinctly significant differences are found at both planting densities, compared to the control distance.

From the analysis of the influence of factor A (the distance between the rows) it can be seen that the second variant of density ensures significant differences, and the third variant distinctly significant differences. In the case of factor B (distance between plants in a row), in 2017, distinctly significant differences are found at both planting densities compared to the control distance.

The influence of factor A (the distance between the rows) in the two density variants (50 cm and 75 cm respectively) ensures very significant differences compared to the control, which means that a larger space between the rows determines, in the second year of vegetation , the formation of a significantly larger mass of leaves.

The third year of vegetation stands out for distinctly significant differences in the 50/50 cm nutrition space, with increases of 46 g compared to the control for leaf mass, respectively 49 g for herba production.

The comparative study of the influence of factors A and B on the production of fresh herba (g/plant), in the three experimental years, showed that the optimal distance of plants in a row is 25 cm and between rows, the distance of 50 cm gives the plant a sufficient nutrition space to ensure significantly higher yields compared to the control.

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