PARTIAL RESULTS REGARDING THE INFLUENCE OF SOME TECHNOLOGICAL ELEMENTS ON THE YIELD OF DRIED HERBA TO THE *PRIMULA OFFICINALIS* HILL. SPECIES

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ABSTRACT

Sustainable use of natural resources is one of the great challenges of our time. Thus, there is a return to nature, to homeopathic medicine and to phytotherapy. Primula officinalis Hill, has been used since ancient times in popular medicine due to its many healing properties. The main purpose of the study is the introduction into the culture of the species Primula officinalis Hill. The research started in 2016 by accumulating information on the existing genetic resources. The plants necessary for the establishment of the experiments were brought from the spontaneous flora of Brașov Country. The study aimed to establish the optimal breeding mode, the optimal planting time and nutrition space. These technological links influence the the plant yield but also on the content in active principles. The paper presents partial results regarding the elaboration of cultivation technology

INTRODUCTION

According to Richards (2003), the *Primula* genus has its genetic centers, mainly in the temperate or subalpine areas of the northern hemisphere, with the main center of species diversity in the

Chinese-Himalayan region and secondarily, in the large mountain ranges of the Circumboreal region.

Primula officinalis Hill. is known as an endemic plant, it grows spontaneously in our country, on poor, calcareous soils, with southern exposure. Being an endangered species, due to the irrational harvesting, it is necessary to be cultivate it areas of natural growth (Craciun et al., 1977, Păun, 1995).

This species is under partial legal protection in Poland. The plant can be harvested from areas where the species is widespread, in low hill areas and in lower mountain areas (Zajac and Zajac, 2001; Mirek et al., 2002).

Within the genus, the species *Primula officinalis* Hill. has received a lot of scientific attention, starting with Darwin's pioneering research (1877) on floral morphology and breeding biology of the species *Primula veris* L, synonymous with *Primula officinalis* Hill, *Primula vulgaris* and *Primula elatior* (Darwin, 1877.)

In the Middle Ages Primula officinalis it was known as St. Peter's or Petrella's plant, its leaves were consumed as food, in various preparations like salads or soups (wikivisually.com). Popular names are: cowslip, eagle, angelina, five bells, goose-mole, goat's teat, sheep's-teat, (Kothe, 2013).

Ecology and biodiversity conservation in Primula species have been approached over time by researchers as Van Rossum and Triest (2006) and Jimenez (2013), the floral and reproductive morphology of the species being studied by Nishihiro (2000). Primula officinalis is a medicinal plant rich in triterpenic saponins, phenolic glycosides and flavonoids. Phenolic glycosides and saponins are characteristic compounds of the Primula genus (Muller et al., 2005).

In our country, the species is cultivated experimentally, being taken and introduced from spontaneous flora on small surfaces, under controlled conditions. In the context of an sustainable agriculture, both from the point of view of cultivation and of use, based on the knowledge of the biological and morphological particularities of this species, the present paper intends to reach a complex of methods that will lead to the elaboration of cultivation technology.

MATERIAL AND METHOD

The studies were carried out at NIRDSB Brasov, within the Department of Technology and Good Agricultural Practices, in the Laboratory of medicinal and aromatic plants, between 2016 and 2019. The plants needed to establish the experience were brought from the spontaneous flora of Brasov Country.

After a period of acclimatization, the plants were selected, choosing healthy plants, equal in height and an equal number of leaves/plant. The experience was established according to the method of subdivided plots, each variant having three rows in three replicates.

The length of one variant was 200 cm and the paths were 100 cm wide.

Factor A - the distance between rows: 25 cm, 50 cm and 75 cm.

Factor B - the distance between plants in a row: 10 cm, 25 cm and 50 cm.

The dynamics of the emergence and growth of the foliar apparatus were followed until flowering, when three plants from each variant / repetition were harvested. For each plant harvested were made determinations regarding the dry herba mass. The average of the results represented the average of the experimental variants (photo 1).

In this paper are presented, by analysis of variance, results regarding the influence of the distance between rows and between plants in rows on dry herba yield (g/plant) average in 2017. For the analysis of the correlation coefficient "r" was used the model proposed by Hopkins (2013).

Figure* 1. *Aspects from field during the vegetation period 2017 (photo original)

RESULTS AND DISCUSSION

Table 1 analyzed the variance of influence regarding the distance between rows and between plants in rows on the dry herba yield.

The calculated F value is higher than the table value (F5% and F1%), which shows that the effects of the variants on the yield of freshherba (kg /

ha) are real, true and are not the result of experimental errors.

Table 1

Analysis of the variance regarding the influence of the distance between rows (A) and between plants per row (B) on the average dry herba yield (g/plant) for the species *Primula officinalis* in 2017

Source of variation	Sum of squares	Degree of freedom	Medium square	Test F
A	5,62963	2	2,81482	13,818
B	9,18519	2	4,59259	7,086
AB	2,37037	4	0,59259	0,914
R	2,07407	2	1,03704	
AR	0,81481	4	0,20370	
BR	2,59259	4	0,64815	
ABR	5,18519	8	0,64815	
Error A	0,81481	4	0,20370	
Error B	7.77778	12	0,64815	
Total	27,85185	26		

Analyzing the influence of factors A and B on the dry herba yield (g/plant) average in the experimental year 2017, it is found that the distance 50 cm between rows ensures higher yields with 0.67 g compared to control variant having significant values and that of 75 cm between rows differs significantly, exceed ing the control by 1.11 g (table 2).

Factor B (the distance between plants per row) has a distinctly significant influence on the density at 25 cm between plants, with an increase of 1.33 g, the plants at 50 cm per row ensuring only significant differences.

Table 2

The influence of the interaction between rows (A) and the distance between plants in row (B) on the dry herba yield (g/plant) (Brasov, 2017)

Influence of A factor					
Symbol	Dist. between rows(cm)	Average	%	Dif.	Sign.
A1	25	6,33	100,0	0,00	Mt.
A2	50	7,00	110,5	0,67	*
A3	75	7,44	117,5	1,11	**
DL (p 5%)				0,59	
DL (p 1%)				0,98	
DL (p 0.1%)				1,83	
Influence of B factor					
Symbol	Dist. between plants in row (cm)	Average	%	Dif.	Sign.
B1	10	6,11	100,0	0,00	Mt.
B2	25	7,44	121,8	1,33	**
B3	50	7,22	118,2	1,11	*
DL (p 5%)				0,83	
DL (p 1%)				1,16	
DL (p 0.1%)				1,64	

Following the interaction of the number of plants per row with the distance between rows on the dry herba yield average (g / plant) in the first year of vegetation is observed that two variants provide significant differences (B2A2 and B3A2), the others having insignificant values (Table 3).

Table 3

The influence of the interaction between no. of plants per row (B) and the distance between rows (A) on the dry herba yield (g/plant) (Brasov, 2017)

Symbol	Variant	Average	%	Diference	Significance
B1 A1	10/25	5,67	100,0	0,00	Mt.
B2 A1	25/25	6,67	117,6	1,00	-
B3 A1	50/25	6,67	117,6	1,00	-
B1 A2	10/50	5,67	100,0	0,00	Mt.
B2 A2	25/50	7,67	135,3	2,00	*
B3 A2	50/50	7,67	135,3	2,00	*
B1 A3	10/75	7,00	100,0	0,00	Mt.
B2 A3	25/75	8,00	114,3	1,00	-
B3 A3	50/75	7,33	104,8	0,33	-

DL (p 5%) 1,43
DL (p 1%) 2,01
DL (p 0.1%) 2,84

The average dry herba yield in 2017 from the point of view of the interaction of factor A with factor B had positive significance only in the case of variants A3B1 and A3B2, both with differences of 1.33 g, the other variants registering insignificant differences compared to the control variant (table 4).

Table 4

The influence of the interaction of distance between rows (A) and the distance between plants per row (B) on the dry herba yield (g/plant) (Brasov, 2017)

Symbol	Variant	Average	%	Diference	Significance
A1B1	25/10	5,67	100,0	0,00	Mt.
A2B1	50/10	5,67	100,0	0,00	Mt.
A3B1	75/10	7,00	123,5	1,33	*
A1B2	25/25	6,67	100,0	0,00	Mt.
A2B2	50/25	7,67	115,0	1,00	-
A3B2	75/25	8,00	120,0	1,33	*
A1B3	25/50	6,67	100,0	0,00	Mt.
A2B3	50/50	7,67	115,0	1,00	-
A3B3	75/50	7,33	110,0	0,67	-

DL (p 5%) 1,31
DL (p 1%) 1,89
DL (p 0.1%) 2,83

Analysis of the correlation coefficient (r) regarding the interaction between the distance between rows (A) and the distance between plants per row (B) on the average of dry herba yield (g / plant) in 2017, shows the strong link between the two factors. The degree of association of the points on the graph indicates a positive direction. The value r = 0.79 signifies the very high association of the two analyzed factors, the linear form being directly proportional to the value of the correlation coefficient (fig. 2).

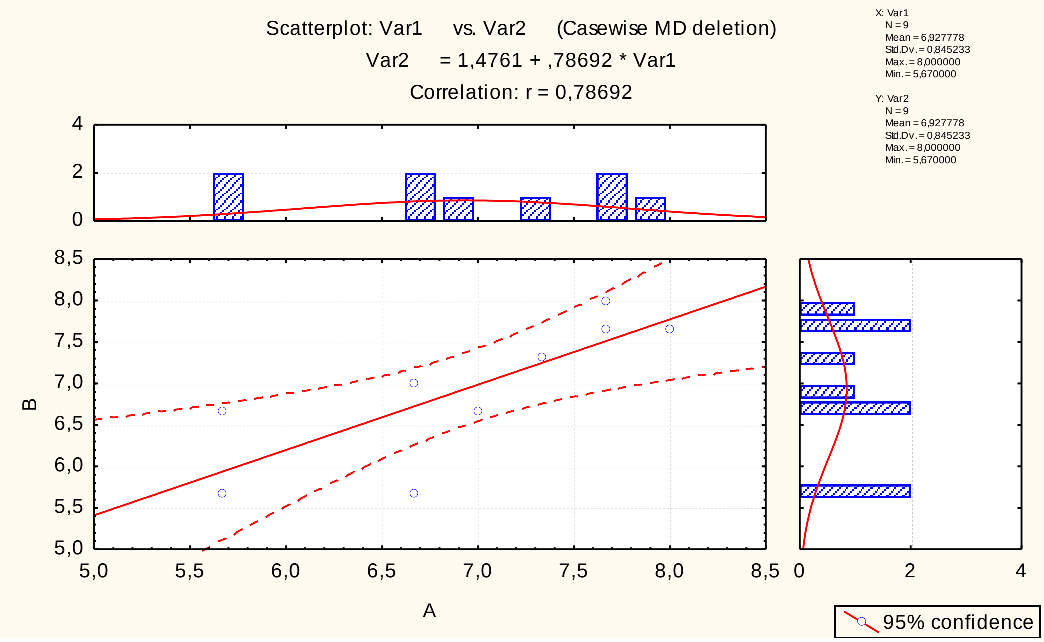

Figure 2. Correlation of the interaction regarding the distance between rows (A) and distance between plants per row (B) on the average dry herba yield (g / plant) in 2017

The interaction regarding the distance between rows (A) and the distance between plants per row (B) on the average dry herba yield (g / plant) generated an average of 6.93 g. Standard deviation (the value with which the calculated average deviates from the average of the population from which the group was taken the measurements were made) had the value of 0.85 g, with a minimum amplitude on each variant of 5.67 g and a maximum of 8.00 g.

CONCLUSIONS

In the climatic and soil conditions of NIRDPSB Brasov, *Primula officinalis* finds good conditions for growth and development.

If a high yield of dry herba is followed, a minimum distance between rows of 50 cm ensures to the plant an optimal nutrition space.

Yield of herba (g / plant) was very good to the variants planted at a distance of 50 cm and 75 cm between rows.

The statistical analysis regarding the interaction of the two factors (the distance between rows and the distance between plants in a row) demonstrated that the distance between rows significantly influences the dry herba yield (g/plant).

Correlation coefficient (r) of the interaction regarding the distance between rows (A) and the distance between plants in a row (B) over the average yield of dry herba show that the value r = 0.79, indicate a very large association between the two analyzed factors, the linear form being directly proportional to the value of the correlation coefficient.

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