

RESEARCH ARTICLE

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Evaluation of the Production Diversity of some Cowslip Populations (*Primula veris* L.) in the Territory of Kosovo

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Abstract

As one of the most important aromatic and medicinal plants, that are grown in the territory of Kosovo, cowslip (*Primula veris* L.), has an increasing demand in the domestic and foreign markets for use in the pharmaceutical industry [1]. Given the importance of this medicinal plant, during last years there has been a tendency to change from the collection of the wild plants in nature, to the cultivation of some cowslip populations which have high parameters in the production of flowers, and roots also. In this context, are studied 20 cowslip populations, collected in the two main regions of the country, respectively in the eastern part (Rrafshi i Kosoves), and in the western part (Rrafshi i Dukagjinit). Plant populations collected in their natural habitat, were placed in a comparative trial in the open field in the village of Gilloboçica of the Kaçanik area in Kosovo. The experiment was set up in three replications, with 20 variants (populations) distributed randomly. The study was conducted for two years (2017-2018). The production of fresh and dry flower mass, has been measured for each population and for each year, and at the end, an average yield for each population has been calculated. Analyzed data, show that there is a high diversity among populations in terms of flower production (fresh and dry mass). Populations with the highest production are those that are collected in the “Rrafshi i Dukagjinit”, in “Rroshkodol 1” location, and the population collected in “Stankaj 2”, with respectively 951.03 kg / ha and 906.9 kg / ha fresh mass, while in the “Rrafshi i Kosoves” the populations collected in “Globocica” and “Izvor” locations, with respectively 1058 kg / ha and 905 kg / ha fresh mass.

Keywords: Population, diversity, dry mass, fresh mass, randomized distribution.

1. Introduction

Kosovo is characterized by a relatively large diversity in terms of agro-climatic conditions and for that reason, this area is characterized by a great diversity in aromatic and medicinal plants [2]. Among many other plants, cowslip (*Primula veris* L.) has a high diversity and is spread in many parts of the country [3]

Collected and analyzed populations are taken in the two main regions of the country. “Rrafshi i Dukagjinit”, which is located in the west part of Kosovo, with a length of 70 km, 40 km wide and 300-500 meters above sea level. This area is surrounded by mountains of 2000 - 2500 m above sea level. The other region, where the populations are collected is

“Rrafshi i Kosoves” that lies in the eastern part of Kosovo, which is 88 km long, 35 km wide, 305-720 m

above sea level, and is surrounded by mountains with altitudes 800- 2450 m above sea level [3]

In the “Rrafshi i Dukagjinit” region, the plants which are collected for each population are taken at points over 1000 m above sea level, while in the “Rrafshi i Kosoves”, plants are collected below 1000 above sea level. Cowslip is grown spontaneously and since many years is collected and used for scientific and economic purposes (pharmaceutical industry). During last years, many farmers and private companies have started the cultivation of cowslip, to produce flowers and roots which are used for production of phenolic components [4][11]. The objective of this study was to determine the diversity of production in the cowslip populations, how this production is affected by the climatic conditions of the area where it is cultivated, and how the agro-technology affects the production of fresh and dry flower mass [5] [10]. The obtained and

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analyzed data, as well as the conclusions for each population, will serve as a good base for farmers who intend to cultivate cowslip in their farms. The identified populations, which have high productivity capacities, could be used by farmers for cultivation in the future.

2. Materials and Method

Cowslip seeds have difficulties in germination because of seed dormancy [6]. For that reason seeds need a period of chilling to break dormancy, and therefore need to be sown in late summer or autumn. As the seeds are very delicate, sometimes planting of cowslip has failed, and 90 % of the seeds did not germinate [9]

[13]. For this reason, the comparison trail for the diversity production among populations, was established through collection of some individual plants, for each population and planting them in a permanent place in open field.

The trail was set up according to randomized block with 20 variants (population) in three replications [14]. The size of a variant was 2 m². (2m x 1m). Planting distances within the row are 12.5 cm, and between rows 30 cm. The number of plants for each variant is 50. Distribution of the variants (populations) in the replication is shown in the following scheme (Figure 1).

REPLICATION I

Pop*.1 (V** 1)	Pop. 3 (V3)	Pop. 5 (V5)	Pop. 7 (V7)	Pop. 8 (V8)	Pop. 2 (V2)	Pop. 4 (V4)	Pop. 9 (V9)	Pop. 6 (V6)	Pop. 10 (V10)
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*Population; **Variant

REPLICATION II

Pop.3 (V. 3)	Pop.5 (V. 5)	Pop.7 (V. 7)	Pop.8 (V. 8)	Pop.1 (V. 1)	Pop.4 (V. 4)	Pop.6 (V. 6)	Pop.2 (V. 2)	Pop.10 (V. 10)	Pop.9 (V. 9)
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REPLICATION III

Pop.5 (V. 5)	Pop.7 (V. 7)	Pop.1 (V. 1)	Pop.3 (V. 3)	Pop.10 (V. 10)	Pop.9 (V. 9)	Pop.2 (V. 2)	Pop.4 (V. 4)	Pop.6 (V. 6)	Pop.8 (V. 8)
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Figure 1. Distribution of the variants (populations) in the replication

Experimental field was established in the southeastern part of Kosovo in the village of Glloboçice, in the Kaçanik area, at 960 m above sea level. The agricultural land, where the plants have been planted, has been cultivated with potatoes and maize for several years. During the vegetation are carried out some agronomic services such as, irrigation, fertilization (manure) etc.

3. Results and Discussion

At the flowering stage, all the plant flowers were gathered, for each variant (population) and for each replication. The collected flowers are weighed, as well as the weight of fresh mass and dry mass is calculated for each population. Based on the collected data, is made the calculation of yield for one hectare of fresh mass flowers and dry flowers. The experiment was

conducted for two years and the data are presented in the Table 1 and Table 2.

Referring to the above data, it is noted that the fresh mass yield of populations belonging to the “Rrafshi i Dukagjinit” area, ranges from 700 kg/ha to 950 kg/ha, while for populations of “Rrafshi i Kosoves” area, there is a larger production variation, ranging from 690 kg/ha to 1058 kg/ha.

Table 1. Production of the populations, collected in the “Rrafshi i Dukagjinit” area (average weigh, 2017-2018)

Populati on	Locatio n	Fresh mass 2017		Dry mass 2017		Fresh mass 2018		Dry mass 2018		Average (2017-2018)			
		Gr/ varian t	Yield kg/ha	Gr/ varia nt	Yield kg/ha	Gr/ varia nt	Yield kg/ha	Gr/ varia nt	Yield kg/ha	Fresh mass		Dry mass	
										Gr / varia nt	Yield kg/ha	Gr / varia nt	Yield kg/ha
1	Rrosh.1	14.50	773	1.73	92.27	21.17	1128	3.78	201.5	17.83	951	2.75	146.9
2	Rrosh 2	15.00	800	1.89	0	15.61	832	2.95	157.0	15.3	816	2.42	128.9
3	Leq 1	12.00	640	1.60	85.33	15.05	802	3.01	160.4	13.5	721	2.30	122.9
4	Leq 2	14.00	746	1.83	97.60	17.66	941	3.46	184.6	15.8	844	2.65	141.1
5	Stank 1	13.00	693	1.58	84.27	16.54	882	3.01	160.3	14.7	787	2.29	122.3
6	Stank 2	15.50	826	2.02	3	18.51	987	3.62	193.1	17.0	906	2.82	150.4
7	Istog 1	10.50	560	1.36	72.53	15.83	844	3.09	165.0	13.1	702	2.23	118.7
8	Istog 1	10.50	560	1.37	73.07	20.33	1084	3.97	211.5	15.4	822	2.67	142.2
9	Istog 2	9.50	506	1.26	67.20	18.80	1002	3.74	199.3	14.1	754	2.50	133.2
10	Istog 2	11.00	586	1.45	77.33	19.23	1025	3.81	202.9	15.1	806	2.63	140.1

Table 2. Production of the populations, collected in the “Rrafshi i Kosoves ” area (average weigh, 2017-2018)

Popu latio n	Locat ion	Fresh mass 2017		Dry mass 2017		Fresh mass 2018		Dry mass 2018		Average 2017-2018			
		Gr/ variant	Yield kg/ha	Gr/ variant	Yield kg/ha	Gr/ variant	Yield kg/ha	Gr/ variant	Yield kg/ha	Fresh mass		Dry mass	
										Gr/ variant	Yield kg/ha	Gr/ variant	Yield kg/ha
11	Gillob	17.00	906	2.18	116.27	22.7	1211	4.37	232.9	19.8	1058	3.27	174.5
12	Ivaje	13.50	720	1.76	93.87	18.2	971	3.57	190.4	15.8	845	2.67	142.1
13	Izvor	13.50	720	1.80	96.00	20.4	1090	4.09	218.1	16.9	905	2.95	157.0
14	Vllas al	14.00	746	1.87	99.73	19.6	1050	3.94	210.0	16.8	898	2.90	154.8
15	Dabis	13.00	693	1.67	89.07	18.7	998	3.60	192.0	15.8	845	2.64	140.5
16	Prapa	13.00	693	1.73	92.27	17.2	919	3.45	183.9	15.1	806	2.59	138.1
17	Kova	11.00	586	1.47	78.40	15.0	801	3.01	160.3	13.0	694	2.24	119.3
18	Picel	13.00	693	1.67	89.07	18.7	998	3.60	191.9	15.8	845	2.64	140.5
19	Rad 1	11.00	586	1.41	75.20	16.6	890	3.21	171.1	13.8	738	2.31	123.1
20	Rad 2	12.00	640	1.45	77.33	17.4	927	3.16	168.6	14.7	783	2.31	123.0

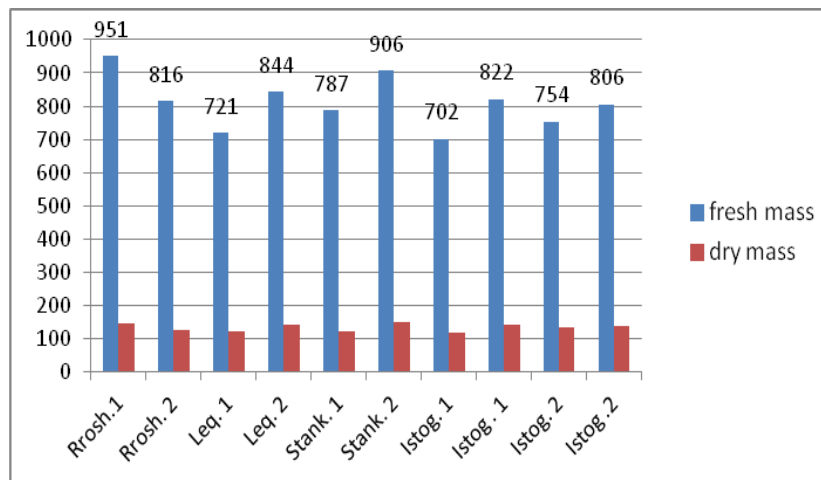


Figure 2. Yield kg/ha for populations of “Rrafshi i Dukagjinit”

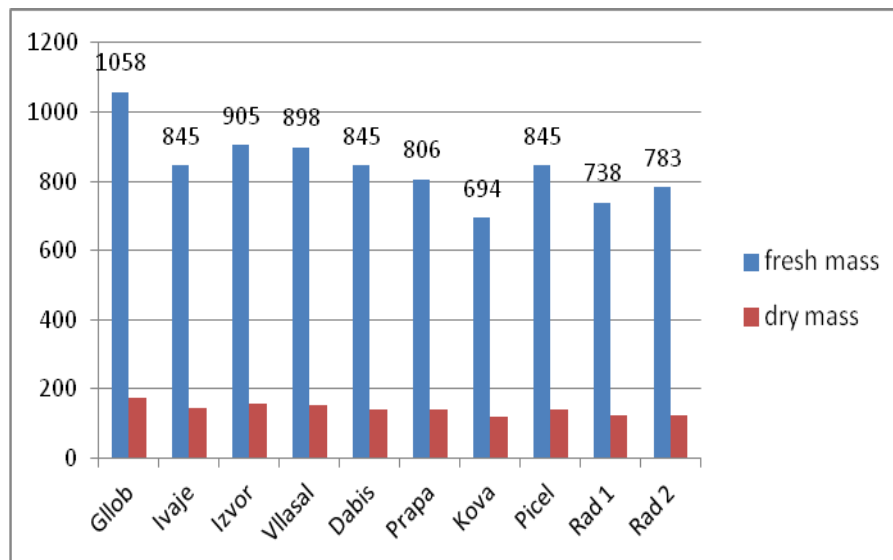


Figure 3. Yield kg/ha for populations of “Rrafshi i Kosoves”

Referring to the tables and graphs presented above, it is shown that in the area of “Rrafshi i Dukagjinit”, the plant population collected in the location “Rroshkodol 1” has a fresh mass production of 951 kg / ha, while dry mass production is approximately 150 kg / ha. In the area of “ Rrafshi i Kosoves” , the population collected in the location “Gilloboçica” has a fresh mass production of 1059 kg / ha and a dry mass production of approximately 175 g / ha.

4. Conclusions

- Obtained data from production comparative trials, show that there is a large variation between populations in relation to fresh and dry mass production per ha.

- Populations taken in the “Rrafshi Dukagjinit” area, at 1300-1600 m above sea level, have lower differences in production, while populations taken in the “Rrafshi i Kosoves” area, at 800-1000 m above sea level, have bigger differences in dry and fresh mass production.

- In the “Rrafshi i Dukagjinit” area, among the populations planted and tested in field comparative trials, the populations taken in “Rroshkodol 1” and “Stankaj 2” locations, have the highest yield, respectively 951.03 kg / ha, and 906.9 kg/ ha , flower fresh mass.

- In the “Rrafshi i Kosoves” area, among the populations planted and tested in field comparative trials , the populations taken in”

Gllloboçice” and “Izvor” locations, have the highest yield, with respectively 1058 kg / ha and 905 kg / ha, flower fresh mass.

- These populations can be included in planting material production programs (seed, seedlings), and can be used by farmers for massive production.

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