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SEED GERMINATION AND MORPHOLOGICAL PROPERTIES OF SEEDLING GENOTYPES OF CORNEL FROM UPPER POLIMLJE REGION

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Abstract

The results of seed germination and morphological characteristics of 11 seedling genotypes of cornel (*Cornus mas* L.) taken from natural population of Upper Polimlje Region from 2000 through 2004. Cornel is a long-lived plant, but is exceptionally slow at the beginning of growth. Seeds do not germinate in the first year. They germinate afterwards. The seedlings grow very slowly. Cornel starts producing fruit after 8, 9 or 11 years. The seeds of tested genotypes hardly germinated in the second year. The best germination was with the seed of genotype BP 25 – 48 %. Seedlings of cornel grow very slowly, especially in the first year, in the second year their growth is considerably faster. The average height of one-year-old seedlings is 27,54 cm, and two-year-old ones are 80,27 cm. The diametar of two years old seedlings was between 0,5 cm (genotype BP 36) and 1,16 cm (genotype BP 16). The maximum uniformity with respect to the diameter of two-year-old seedlings was found in genotype BP 07 (*Cv*=7,85%), and in terms of height in genotype BP 16 (*Cv*=9,38%).

Key words: cornel, seed germination, morphologhy, seedlings

Introduction

Wild fruit species present a genetic potential of huge importance for selective breeding. (Kojić and Mratinić, 1997) Their cultivation would significantly enrich the diversity of cultivated fruit species. Benčat and Blaho (2001) claimed that cornel is the tree which grows slowly, but have a long life span, from 100 to 200, even up to 250 years. There are no cornels as cultivars throughout the world, on the other hand, this fruit in natural populations is present in large areas. The cornel (*Cornus mas* L.) was described by the authors who wrote about wild flora and medical plants. They put emphasis on the healing and beneficial effects of teas which are made from almost every part of this plant or from its fruit products. A small number of them paid attention on a cornel as a fruit species which could be cultivated on fruit fields (Jaćimović and Božović, 2003).

The cornel's multiplication can be both generative and vegetative. Generative multiplication is used for getting seedlings for park decorations as well as getting rootstock for their grafting. The aim of this work is getting cornel genotypes from natural population from Upper Polimlje area which could be good as generative rootstocks.

Materials and methods

The results of seed germinations and morphological properties of seedlings of the 11 cornel (*Cornus mas* L.) genotypes, which were selected from natural population of Upper Polimlje area during 2000 to 2004, have been presented in this work. The seeds were gathered in the time of full technological fruit maturity. The seeds were taken from the fruits and, after being dried, stratified in plastic bags in the fridge, at the temperature of 2 - 4 ^{o}C during winter, with the wet control.

Before sowing the seed was soaked in 0,03 % ortocid. Sowing was done in spring, in March-April, with 70 cm distance between rows and 4 cm in rows.

Seed germination has been calculated by determining the ratio between the total number of sowed seeds and the sprout plants, and is presented in percents. The diameter of one-year and two-year seedling is taken just above the root collar.

The collected data were statistically analyzed in SPSS for Windows, version 7,5. Statistical analysis included the analysis of variance and testing the significance of differences among genotypes using Duncan test. The differences in height and diametar of the seedlings is done with Coefficient of variation (CV).

Results and discussion

The cornel seed germination and seedlings initial growth was after two years. The average seed germination during testing was 31,24 % (Table 1.). The best average seed germination had the genotype BP 25 – 48 % and the worst the genotype BP 07 – 10,66 %.

Table 1. Seed germination in the genotypes of Cornel, Upper Polimlje,2000-2004

Genotype	2000/2002 (%)	2001/2003 (%)	2002/2004 (%)	*Average* (%)
BP 01	24,0	36,0	28,0	29,33 *abcd**
BP 04	16,0	32,0	32,0	26,66 *abc*
BP 06	44,0	40,0	36,0	40,00 *bcd*
BP 07	12,0	12,0	8,0	10,66 *a*
BP 16	12,0	16,0	40,0	22,66 *ab*
BP 17	36,0	40,0	56,0	44,00 *cd*
BP 21	24,0	32,0	36,0	30,66 *abcd*
BP 22	44,0	20,0	16,0	26,66 *abc*
BP 25	48,0	56,0	40,0	48,00 *d*
BP 36	48,0	15,0	40,0	34,33 *bcd*
BP 40	40,0	32,0	20,0	30,66 *abcd*
Average	31,63	30,09	32,0	31,24

*Values marked with different letters are statisticaly different at the level P=0,005 (Duncan's test)

The genotype BP 07 was put in the first group with the smallest number of germinative seeds and statistically significantly different from the genotypes BP 06, BP 36, BP 17 i BP 25 using Duncan test, whereas genotype BP 25, with the highest number of germinative seeds and statistically significantly different from the genotypes BP 04, BP 16, BP 22 i BP 07.

It is very hard for cornel seed to germinate in natural conditions and it usually happens in the second year. For the seeds to germinate, a period of delayed ripening has to pass, the so called

jarovization, which is one of the reasons why cornel is poorly represented in the form of plantations (Meženski, 2005).The period of ripening is between 20 and 200 days and depends on the species and cultivars (Ognjanov, 1991), and according to Vujanic-Varga (1987) sometimes cornel seed to a full 29 months. Our results show that the nonstratified seed, sown in autumn, sprouts no earlier than in spring of the second year. The autumn sowing of mature seed is also called the „dead" one because in the following vegetative period the result is not seen. The cornel seed, as a rule, germinates and grows around a year or a year and a half. This is the consequence of hard cornel seed. The hard endocarp is the obstacle for germination. Many researchers have studied the possibility of accelerating germination of seeds so that they act on the endocarp mechanical, physical or chemical scarification. But none of those ways proved to be reliable (Dudukal et al., 1990).
The average height of one-year old seedlings was 27,54 cm and the diameter 0,26 cm (Table 2). The smallest height of two-year old seedlings was 64,66 cm at genotypes BP 40. And the biggest 97,33 cm at genotype BP 22 (Table 3). The average height of all two-year-old seedlings of every genotypes was 80,27 cm. The diameter differed from 0,5 cm (genotype BP 25) to 1,15 cm (genotipe BP 07). The maximum uniformity in diameter of the two year old seedlings was seen at the genotype BP 07 (*Cv*=7,85%), and in height at the genotype BP 16 (*Cv*=9,38%).

Table 2. Morphological properties of one year seedlings of Cornel, 2002-2004

Genotype	2002		2003		2004		*Average* 2002-2004.			
	heigh (cm)	*diametar (cm)*	*heigh (cm)*	*diametar (cm)*	*heigh (cm)*	*diametar (cm)*	*heigh (cm)*	CV (%)	heigh *(cm)*	CV (%)
BP 01	38,59	0,41	31,33	0,24	32,56	0,31	34,16 *c*	11,01	0,32 *c*	36,28
BP 04	33,07	0,21	24	0,2	25,43	0,18	27,50 *abc*	15,38	0,19 *a*	7,43
BP 06	32,52	0,27	23,33	0,3	25,63	0,27	27,16 *abc*	24,57	0,28 *abc*	26,51
BP 07	28,7	0,19	21	0,25	22,78	0,2	24,16 *a*	25,94	0,21 *abc*	21,39
BP 16	28,19	0,22	21,66	0,3	23,65	0,24	24,50 *a*	27,04	0,25 *abc*	23,94
BP 17	24,08	0,34	29,33	0,29	23,57	0,3	25,66 *ab*	28,17	0,31 *bc*	18,01
BP 18	30,83	0,29	37	0,28	30,66	0,27	32,83 *bc*	21,57	0,28 *abc*	13,73
BP 22	23,05	0,21	28,33	0,27	23,11	0,22	24,83 *ab*	19,63	0,23 *abc*	25,06
BP 25	31,09	0,2	23,66	0,22	25,23	0,2	26,66 *abc*	23,91	0,21 *a*	8,01
BP 36	24,45	0,21	31,66	0,22	25,88	0,2	27,33 *abc*	24,68	0,21 *ab*	5,62
BP 40	28,02	0,22	29,33	0,42	27,13	0,3	28,16 *abc*	23,57	0,31 *c*	59,99
Average	29,32	0,25	27,33	0,27	25,77	0,25	27,54	23,45	0,26	33,56

In the first year of growing, according to SloviC (1960), the fastest growing ones are, for example, peaches (92,57 cm) as short-lived fruit species, a bit slower are long-lived fruit species, such as wild pear (32,33 cm), walnut is slower (17,02 cm) and the slowest are wild forest trees – Macedonian oak (11,81 cm) and black pin (1,99 cm). This was also true in the case of cornel seedlings in the first year. As a result of this the grafting of two-year old seedling was shown in the paper of Bijelic at al. (2013). The average height of two-year old cornel seedlings was 80,27 cm, and that means that they need two years more to be like peaches.

Table 3. Morphological properties of two year seedlings of Cornel, 2000-2004

Genotiype	2003		2004		*Average*			
	heigh (cm)	diametar *(cm)*	*heigh (cm)*	diametar *(cm)*	*heigh (cm)*	CV (%)	diametar *(cm)*	CV (%)
BP 01	95,9	1,1	89,42	1	92,66 *a*	18,35	1,05 *bc*	10,96
BP 04	79,16	0,8	82,16	0,75	80,66 *a*	35,93	0,78 *abc*	38,43
BP 06	76,46	0,81	75,54	0,79	76,00 *a*	39,93	0,80 *abc*	67,29
BP 07	73,43	1,17	67,89	1,13	70,66 *a*	20,47	1,15 *c*	7,85
BP 16	87,95	1,15	94,05	1,16	91,00 *a*	9,38	1,16 *c*	46,57
BP 17	89,95	0,69	90,71	0,71	90,33 *a*	14,06	0,70 *abc*	11,19
BP 18	77,66	0,93	84,34	0,96	81,00 *a*	25,05	0,95 *abc*	39,25
BP 22	96,51	0,82	98,15	0,84	97,33 *a*	16,73	0.83 *abc*	59,59
BP 25	61,66	0,68	75,00	0,71	68,33 *a*	25,69	0.70 *abc*	17,32
BP 36	70,18	0,50	70,48	0,52	70,33 *a*	9,67	0,51 *a*	20,4
BP 40	61,12	0,62	68,20	0,65	64,66 *a*	28,94	0,64 *ab*	30,01
Average	79,09	0,84	81,44	0,83	80,27	23,64	0,84	38,79

The seedling growth is the result of all internal and external factors. The internal ones are in genetic basis. Using seeds obtained very variable seedlings with little similarity. By sowing seeds of large cornel fruit forms obtained offspring that shows great variability (Meženski, 2005).

Heterozygose hereditary basis influences the variability and results with different quality of the material obtined. In order to preserve all the varietal characteristics their multiplication should necessarily be vegetative.

Conclusion

The cornel is a long-lived fruit, but with extremely slow growth and development in the first years. The seeds do not germinate in the first year, they start growing the next year, and seedlings grow slowly. Therefore, it is necessary to produce seedlings, to which best selectios from this region shoul be grfted, which would ensure first fruits in the second or third year after grafting. The examined seed genotypes germinated in the second year, and the best one was BP 25. During the first months they need to be in the shadow. The cornel seedlings are slow in growth, so grafting can be done on two-year or three-year old seedlings

The average height of one-year-old seedlings was 27,54 cm, and two-year-old ones 80,27 cm, which means that they need two more years to grow like peaches. The diameter of two-year-old seedlings was between 0,5 cm (genotype BP 25) and 1,16 cm (genotype BP 16). The maximum uniformity with respect to the diameter of two-year-old seedlings was found in genotype BP 07 (*Cv*=7,85%), and in terms of height in genotype BP 16 (*Cv*=9,38%).

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