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MORPHOLOGICAL AND POMOLOGICAL TRAITS VARIABILITY OF ALMOND GENOTYPES FROM SLANKAMEN HILL POPULATION

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Almond production in Serbia is much lower then needs and possibilities and its growing are limited on garden plots. Short period of biological rest is characteristic of almond tree. Because of that its growth can be successful only in some locations in Serbia. One of such places is Slankamen hill, where almost every garden plot has almond seedlings. Spontaneous almond population from Slankamen hill has great variability of morphological and pomological traits. After several years of visiting this location and evaluating of more than 300 almond seedlings, 20 genotypes with good and regular cropping have been selected. During the 2003-06, their morphological and pomological traits were examined. Description was given on the basis of almond descriptor (GÜLCAN, 1985). The research, selection and collection of almond genotypes from this locality should contribute expansion of almond tree growing area in

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Serbia. Genotypes 1 and 19 with medium fruit and regular crop, as well as the late-blooming genotypes 29 and 13 were selected.

Key words: almond, morphology, pomology, traits, variability

INTRODUCTION

Usage of the almond fruit has great value. Insufficient production, high kernel price, medium production expenses, place almond in a group of fruit trees, which are lucrative for growing.

Almond production in Serbia is much lower then needs and possibilities and its growing are limited on garden plots (MIŠIĆ, 2002). According to NINKOVSKI and ŽIVALJEVIĆ (1996) in the period of winter rest, almond can shortly tolerate temperature of -30^{o}C, so it is grown also in the countries with more severe climate such as Hungary, Chez Republic, Bulgaria and Romania. Short period of biological rest is characteristic of almond tree. Because of that its growth can be successful only in some locations in Serbia. One of such places is Slankamen hill, where almost every garden plot has almond seedlings (ČOLIĆ *et al*., 2005).

CEROVIĆ *et al*. (2005) note that one of the long-term programs of the scientific research are collecting, examining, preserving, and using of the genetic resources of fruits. BOTU (1998) note that in Romania in the end of 80's for the purposes of a gene bank, the researchers have started evaluation of an almond population. In the 90's, they also started a breeding program in order to develop the **autochthonous** genotypes that are self-fertile, resistant to the low winter temperatures and late spring frost.

A goal of the research presented in this paper was to study late-blooming almond genotypes (selected from a spontaneous population), which gave fruit in the Slankamen hill even in the years with severe winter and late spring frost. The best valued almond genotypes from the genetically heterogeneous population from the Slankamen hill will be collected and examined in the field trials and compared with the standard almond cultivars.

MATERIALS AND METHODS

After several years of visiting of Slankamen hill and evaluating of more than 300 almond seedlings, 20 genotypes with good and regular cropping have been selected. During the 2003-06 their morphological and pomological traits were examined. Tree habit, vigour and ramification, color of the flowers, nut size and shape, yield and marking of the shell were determined on the basis of the International almond descriptor (GÜLCAN, 1985). Size of the flower was visually evaluated with a grade from 1 to 3. Standard for the grade 1 (small flower) was cv Marcona (KESTER and GRADZIEL, 1996). The blooming time was shown as an average date of the blooming beginning.

RESULTS AND DISCUSSION

Morphological characteristics of tree habit and the flower of the almond selection from the Slankamen hill population are shown in the table 1.

Tree habits of the examined selections are very different. Most of the selections (10) have spreading, seven have upright, two have drooping and one has weeping tree habit. Dominant selections are the ones with strong vigour (14) and dense tree habit (13).

Table 1. Morphological characteristics of tree habit and the flower of the almond selection from the Slankamen hill population

Genotype	Tree habit	Vigour	Ramification	Beginning of bloom	Duration of bloom	Flower color	Flower size
1	3	7	9	5.4.	10	1	3
4	5	3	7	8.4.	18	3	1
10	5	3	7	5.4.	15	2	1
11	5	7	7	5.4.	12	2	1
12	3	7	7	7.4.	10	2	3
13	7	7	5	13.4.	16	3	1
14	5	7	9	5.4.	15	2	3
15	5	7	7	7.4.	15	3	3
16	5	7	7	8.4.	16	3	3
17	3	7	7	9.4.	12	3	3
18	5	7	5	7.4.	12	3	5
19	3	7	3	3.4.	10	3	3
23	5	3	5	6.4.	16	3	3
24	3	5	7	6.4.	12	2	1
25	5	5	7	6.4.	12	3	3
27	9	7	7	6.4.	15	1	3
28	7	7	7	7.4.	18	2	3
29	5	7	7	13.4.	15	1	5
A/04	3	5	5	9.4.	12	2	3
1/05	3	7	7	6.4.	16	2	3

Tree habit: 1- extremely upright 3-upright, 5-spreading, 7-drooping, 9-weeping; Vigour: 3-weak, 5-intermediate, 7-Strong; Ramification: 0-absent, 3-sparse, 5-intermediate, 7-dense, 9-extremely dense Color of flower: 1-white, 2-light pink, 3-pink; Flower size: 1-small, 3-medium, 5-big

Almond cultivars can be separated in three groups depending on the blooming time: early, intermediate and late (BULATOVIĆ, 1985). Blooming time of the almond, which lasts 5 to 25 days, depends of the cultivar, rootstock, latitude, altitude and temperature, spring and winter humidity. BULATOVIĆ (1985) also

notes that blooming rhytm is not examined enough and it should be precisely established for each region.

Table 2. Pomological characteristics of the almond selections from the Slankamen hil

Genotype	Nut size	Nut shape	Shell color	Marking of shell	Yield
1	5	4	5	5	5
4	1	2	3	3	3
10	1	3	5	7	3
11	3	3	5	5	3
12	3	3	5	5	3
13	3	4	5	5	3
14	1	3	5	3	5
15	3	3	5	5	5
16	3	4	3	5	3
17	3	4	3	7	3
18	1	3	5	3	3
19	5	2	7	5	5
23	3	5	5	5	3
24	3	3	5	5	3
25	3	3	7	5	5
27	5	4	5	7	3
28	5	4	1	3	3
29	3	4	5	5	5
A/04	1	3	5	3	3
1/05	3	2	5	5	5

Nut size: 3-small, 5-medium, 7-large, 9-extremely large; Nut shape: 1-round, 2-ovate, 3-oblong, 4-cordate, 5-extremely narrow; Shell colour: 1-extremely light, 3-light, 5-intermediate, 7-dark
Marking of shell: 0-without pores, 3-sparsely pored, 5-intermediate, 7-densely pored, 9-scribed
Yield: 3-low, 5-intermediate, 7-high

NINKOVSKI *et al.* (1991) take April 6, as an average date of the blooming beginning for some almond cultivars in the Pančevo swamp. After years of research, ZEC *et al.* (1999) concluded that under the conditions of the Pančevo swamp, almond cultivars Troito, Marcona and Texas started to bloom on the April 5, 5-7 days after late-blooming apricots started to bloom. Average of almond cultivars' blooming time was 15 days.

Blooming of the selections on the Slankamen hill starts in the interval of 10 days. Average date of the blooming beginning of examined selections is April 8. The earliest blooming has selection 19 (April 3), while selections 13 and 29 have the latest (April 13) blooming. Late blooming is an important characteristic of the new almond cultivars. The goal of most of the almond breeding programs is developing of the late-blooming cultivars (avoiding of frost damages) especially during the time of higher temperatures that are more suitable for pollination and

fertilization. (Cit. SOCIAS and COMPANY, 1997). Blooming phenophase of the examined selections lasts 10 to 18 days.

In the group of examined selections the most dominant is medium size (13 selections) and pink color of the flower (17 selections). Three selections have white and two selections have big flower.

NINKOVSKI *et al*. (1991) concluded that an average nut mass of the cultivar Texas is 2.74*g*, while Marcona is 4.78*g*. The mass of the examined almond selections varied from 2.74*g* to 5.29*g*. Small nuts like Texas (GÜLCAN, 1985) are characteristic of most of the examined almond selections (11), while big nuts like Marcona (GÜLCAN, 1985) have four selections. Most dominant is oblong shape (9 selections) and medium dark shell colour (14 selections) intermediate pored.

Yield for most of the selections (13) is small, while seven selections have medium yield. It needs to be considered that these trees grow extensively, without pruning, fertilizations and pesticide applications.

CONCLUSION

Spontaneous almond population from Slankamen hill has great variability of morphological and pomological traits. The highest variability was established for the tree habit, nut shape and colour of the shell (four grades). Prevalent are vigorous genotypes with dense and spreader tree habit. Blooming starts between April 3 and April 13. This interval of 10 days indicates high variability of the material. Considering that beginning of the blooming is one of the essential factors for growing, evaluation of the best selections on the other locations is necessary.

Pink color and medium size of the flower is prevalent. Nut is usually small, oblong, medium dark coloured and intermediate pored. Selections 1 and 19 that have medium size nut and medium yield, as well as selections 29 and 13 with late blooming beginning, stand out.

Selection of the best genotypes, their expanded production and usage in the breeding programs can contribute expansion of almond tree growing area in Serbia.

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VARIJABILNOST MORFOLOŠKIH I POMOLOŠKIH OSOBINA GENOTIPOVA BADEMA IZ POPULACIJE SLANKAMENAČKOG BREGA

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I z v o d

Proizvodnja badema u Srbiji daleko zaostaje za potrebama i mogućnostima, a njegovo gajenje se ograničava na okućnice. Badem se odlikuje kratkim periodom biološkog mirovanja, zbog čega se može uspešno gajiti samo na pojedinim lokalitetima u Srbiji. Jedan od takvih lokaliteta je Slankamenački breg, na kome se sejanci badema masovno gaje na okućnici. Spontana populacija badema na području Slankamenačkog brega odlikuje se velikom varijabilnošću u pogledu morfoloških i pomoloških osobina. Višegodišnjim obilaskom ovog lokaliteta i evaluacijom preko 300 stabala sejanaca badema izdvojeno je 20 genotipova koji se odlikuju dobrom i redovnom rodnošću. U periodu 2003-2006. godina ispitivane su njihove morfološke i pomološke osobine. Opis je dat na osnovu deskriptora za badem (Gülcan, 1985). Proučavanje, selekcija i kolekcionisanje genotipova badema sa ovog lokaliteta. može da omogući proširenje areala gajenja badema u našoj zemlji. Izdvojeni su genotipovi 1 i 19 koje se odlikuju srednje krupnom jezgrom i redovnim prinosom, kao i genotipovi 29 i 13 koji se odlikuju kasnim cvetanjem.

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