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PHENOLOGY RESEARCH ON BLACKBERRY DEVELOPMENT IN REPUBLIC OF MOLDOVA

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Abstract

The paper presents research results and observations made on the development of phenological stages and plant development of blackberry varieties Darrow, Smoothstem, Thornfree studied during the years 2010-2012 in the Republic of Moldova. It was established that during the period between budding and flowering was 31-46 days and fruit ripening begins at 55 -64 days from the beginning of flowering. The varieties studied during fruit maturation until early vegetation ranges from 88 to 114 days. The average length of blackberry shoots ranged from 1.18 to 3.29 m and the average number on bush was 8-11. pcs. The average mass of blackberry fruit settled in the amount of 2.9 to 4.9 g. Bush fruit number ranged from 224 pcs. to 483 pcs.

Key words: *blackberry, varieties, phenophases, fruit mass.*

INTRODUCTION

Small fruits have and continued to have an important role in the national economy and in creating a cleaner environment and beneficial as everyday living. Blackberry bush culture have a great importance because of taste qualities, herbal capacities, being rich in content of tannins, flavones, organic acids, vitamin C, pectic substances etc. (Cociu, Oprea, 1989; Chira, 2000).The Importance of blackberry bush is subject to a number of advantages over other fruit crops. One of these advantages is that blackberry bush easily and quickly multiply. He enters and gives early bearing crops rather large. The yields are obtained from plants of blackberry in the 3-4 - third year after planting. Because blackberry bush blooms later, the flowers not affect by spring frosts (Mladin, 1992). Blackberry bush, early varieties, blooms during the last decade of May and the first days of June to late varieties. Flowering duration is 5-8 days. While most varieties are autogamous, cross pollination ensures maximum yields and high quality. Fruit maturation occurs gradually, and the during of ripening is related to the particular variety, which varies from 20 to 25 days for early varieties and from 50 to 80 days for late varieties. Usually, the first fruits of blackberry, which matures on bush are the largest (Cociu, Oprea, 1989; Babuc, 2012).

MATERIALS AND METHODS

The research has been conducted on demonstration experimental field of Small fruits laboratory in the Technological-Experimental Station 'Codru' of IP ISPHTA. As research objects was included 3 varieties of blackberry: Darrow, Smoothstem, Thornfree. Blackberry plantation was established in 2007 year after planting distance of 3.0 x 1.5 m, number of plants of each variety in the each iteration was 20. Scientific study was performed according to field and laboratory methods under accepted and approved program for small fruits (Cociu, Oprea, 1989; Miciurinsc, 1973).

RESULTS AND DISCUSSIONS

Swelling buds, that usually occurs in March, with some variation from year to year, the sum of active temperatures reach 60-80°C for blackberry varieties (from a biological threshold +5°C). Blackberry varieties budding begins when, the sum of active temperatures varies from 80 to 150°C (Balan, Cimpoieş, Barbăroşie, 2002). In the first half of 2012 year

observations were made on phenological development phases of blackberry varieties. Evidence of harm caused by low winter temperatures was conducted in spring, during the accelerated growth of plants. The impairment of blackberry plants by low winter temperatures was established as a result of observations and appreciated as middle with the note 3.The climate conditions on Republic of Moldova are quite complicated. Insufficient rainfall during the year and especially during the growing season but besides all these, there are also unevenly distributed, especially during critical periods of plant development, and when the air temperatures are too high. Data accumulated rainfall amount and temperature established during the vegetation period are included in Table 1.

Table 1. Climatic conditions during the vegetation period of research

Month	2010		2011		2012		Year average	
	Rainfall (mm)	Air temp (ºC)	Rainfall (mm)	Air temp (ºC)	Rainfall (mm)	Air temp (ºC)	Rainfall (mm)	Air temp (ºC)
IV	45.1	11.0	57.6	9.9	16.4	13.2	39.7	11.4
V	69.2	16.8	56.4	16.4	65.3	19.2	63.6	17.5
VI	85.0	21.0	161.3	20.1	20,2	23.3	88.83	21.5
VII	67.2	23.1	15.5	23.0	36.03	26.0	57.03	24.03
VIII	53.0	24.9	16.1	21.1	27.4	22.4	32.2	22.8
IX	46.7	16.1	8.2	19.1	38.9	19.2	31.3	18.1
X	68.9	7.5	36.4	9.5	46.9	12.9	50.7	10.0
Sum (mm) Average (ºC) IV-X	435.1	17.2	351.5	17.01	303.5	19.46	363.4	17.9

The data included in Table 1 allow us to state that during the growing season of 2012 year was the lowest amount accumulated rainfall amounting to 303 mm and the average temperature of air was the highest of 19.46°C. The highest amount of rainfall in the amount of 435 mm accumulated during the growing season of 2010 year, and the average temperature comparatively low reached 17.2°C. Research conducted according to methods field and laboratory work allowed registration data covering the period of vegetation phenological phases blackberry varieties that have been exposed in Table 2. The vegetation blackberry plant occurs in early spring, at the end of March and beginning of April when on temperatures 2-4 º C begin the roots to rise and adventitious buds activate the root of the neck (Mladin Gh., Mladin P., 1992).

From making observations on plant development in terms of new development and conduct phenological phases of blackberry varieties has been established as a satisfactory general condition of the plants, the plants showed good development of the leaf and phenological phases were conducted in normal as characteristic peculiarities of varieties and climatic conditions during the research. In the first half of the year were aimed plant disease resistance blackberry variety, the result of which has been established that all studied varieties are resistant to mildew.

As shown in Table 2, the earliest variety of blackberry that first begins vegetation Darrow, then later start in vegetation Thornfree and Smoothstem varieties. According to observations made in the conditions of 2012 year blackberry plant growth and phenological phases were conducted with 6-10 days earlier than in 2011 year and 7 to 16 days earlier than in 2010 year.

Blackberry plants budding took place in the period from 08.04 until 12.04. The earliest blooming the variety Darrow, followed by variety Smoothstem with 10-12 days later, and the variety Thornfree blooms with 15 to 18 days later than the variety Darrow. Duration of budding and flowering periods of blackberry plant varies from 31 to 46 days.

Blackberry varieties flowering takes place relatively late, when temperatures of aier are stable positive. The time difference between the time of flowering of early varieties and late varieties was 20 days (Mladin Gh., Mladin P., 1992).

According to observations made, besides the characteristic features of blackberry varieties studied, flowering phenological phase depends mainly on climatic conditions laid down in the corresponding period phenological stage of development. Blackberry varieties start flowering took place at 10.05. up to 01.06. and lasted from 28.05 until 21.06. The duration of flowering plants blackberry varieties included in the study ranged from 16 to 23 days.

Blackberry fruit maturation takes place in the last days of June to the first decade of September. During fruit ripening at different blackberry varieties is almost three months, which is very important to provide fresh fruits (Hapova S., 2003).

The results obtained allowed to establish that blackberry fruit ripening took place over 55-64 days from the beginning of flowering (Figure 1). The varieties studied during the early vegetation until fruit maturation period ranged between 88 and 114 days. Early maturing varieties of blackberry took place at 21.06. up to 28.07. and lasted from 29.07 until 09.09. During the period of ripening blackberry plant on varieties included in the study ranged from 30 to 46 days (Figure 2).

As a result of measurements made at varieties of blackberry plants studied were obtained data on capacity development and fruiting blackberry plants that have been included in Table 3.

The variety Darrow is from the group cumanica and is an early variety, very productive, with the ability to suckers, has erect stems, but with a drawback, are endowed with sharp thorns and bend the tip, which creates inconvenience to harvest fruit.

According to the data in Table 3 was established that the average length of strains on the blackberry variety Darrow reached values ranging from 1.15 m in 2011 year until 1.21 m on 2012 year.

The variety Smoothstem average length of the strains corresponding ranged between 1.58 m and 2.13 m. The variety Thornfree reached the highest values, the average length of the strains was corresponding 3.03 m and 3.55 m, data from the emerge as the most vigorous variety.

Table 2. Phenological stages of plant development in blackberry varieties

The variety, years	Beginning of budding	Phenophases period	Flowering			Phenophases period	Fruits maturation				
			beginning	end	duration		beginning	in mass	end	duration	Duration formation
Darrow											
2010	15.04	**32**	17.05	02.06	**16**	**56**	12.07	05.08	19.08	**37**	**93**
2011	10.04	**34**	19.05	06.06	**17**	**59**	17.07	30.07	16.08	**30**	**89**
2012	08.04	**32**	10.05	28.05	**18**	**57**	21.06	05.07	29.07	**39**	**96**
Smoothstem											
2010	21.04	**34**	22.05	09.06	**18**	**62**	23.07	18.08	08.09	**46**	**88**
2011	20.04	**33**	23.05	08.06	**16**	**59**	21.07	15.08	05.09	**45**	**114**
2012	10.04	**42**	22.05	12.06	**21**	**61**	15.07	08.08	28.08	**44**	**105**
Thornfree											
2010	28.04	**31**	29.05	21.06	**23**	**60**	28.07	19.08	09.09	**43**	**103**
2011	26.04	**36**	01.06	18.06	**17**	**55**	26.07	17.08	07.09	**42**	**97**
2012	12.04	**46**	28.05	19.06	**22**	**64**	21.07	17.08	02.09	**42**	**104**

The average length of stems varied between 1.18 and 3.29 m, and the limit of changes deviated from 1.15 to 3.55 m.

Average number of strains of the blackberry bush varieties has varied on years from 8 shoots on the variety Smoothstem and up to 11 pcs. on the variety Darrow. The average mass of blackberry fruit ranged from 2.9 g to 4.9 g Darrow variety to variety Thornfree. Limit of variation from the average mass of blackberry fruit ranged from 2.7 to 5.1 g The average values of fruits on the blackberry bushes ranged from 224 pcs. on the variety Smoothstem up to 483 pcs. on the variety Thornfree. Limit of variation deviated between 195-540 fruits/bush.

Figure 1. Flowering period and blackberry fruit growth

Figure 2. Maturation period of blackberry fruits, variety Darrow

Table 3. Plants development and fructification capacity of blackberry varieties

The variety	Presence of thorns	Average length of stems, m	Number of stems m/bush, pcs.	Average weight of a fruit (g)	Number of fruits/bush, piece.
Darrow 2011 2012	thorns branches	1.15 1.21	**9** **11**	2.7 3.1	216 355
Mean		**1.18**	**10**	**2.9**	**286**
Smoothstem 2011 2012	branches without thorns	1.58 2.13	**8** **8**	3.9 4.2	195 252
Mean		**1.86**	**8**	**4.1**	**224**
Thornfree 2011 2012	branches without thorns	3.03 3.55	**9** **9**	4.7 5.1	426 540
Mean		**3.29**	**9**	**4.9**	**483**
Limit of variation		**1.15-3.55**	**8-11**	**2.7-5.1**	**195-540**

The variety Smoothstem average length of the strains corresponding ranged between 1.58 m and 2.13 m. The variety Thornfree reached the highest values, the average length of the strains was corresponding 3.03 m and 3.55 m, data from the emerge as the most vigorous variety. The average length of stems varied between 1.18 and 3.29 m, and the limit of changes deviated from 1.15 to 3.55 m.

Average number of strains of the blackberry bush varieties has varied on years from 8 shoots on the variety Smoothstem and up to 11 pcs. on the variety Darrow.mass of blackberry fruit ranged from 2.9 g on variety Darrow to 4.9 g on variety Thornfree. Limit of variation from the average mass of blackberry fruit ranged from 2.7 to 5.1 g. The average values of fruits on the blackberry bush ranged from 224 pcs. the variety Smoothstem up to 483 pcs. the variety Thornfree limit of variation deviated between 195-540 fruits / bush.

CONCLUSIONS

As a result of research carried out at the discretion Darrow blackberry varieties, Smoothstem, Thornfree included in the study - found that:

The period between budding and flowering varies between 31-46 days flowering period from 16 to 23 days.

Fruit maturation takes place between 55-64 days from the beginning of flowering.

During the ripening of blackberry fruit is between 88 to 114 days.

The average length of blackberry stems settled in variety Darrow 1.18 m, 1.86 m in variety and variety Smoothstem Thornfree 3.29 m

Average number of strains of the blackberry bush was 8 pcs. on the variety Smoothstem, 9 pcs. on the variety Thornfree, and 10 pcs. on the variety Darrow.

The average weight of blackberry fruits, settled in the amount of 2.9 g on variety Darrow, on

the variety Smoothstem 4.1 g, and 4.9 g on variety Thornfree.

Number of fruits on bush ranged from 224 pcs. on the variety Smoothstem, 286 pcs. on the variety Darrow and 483 pcs. on the variety Thornfree.

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