Scientific Papers. Series B, Horticulture. Vol. LVII, 2013
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

RESEARCH ON FACTORS AFFECTING RASPBERRY PLANT GROWTH

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Abstract

The paper presents the results and observations made in Moldova in the period 2002-2010 on the factors that influence plant growth and development phenological phases of 29 introduced raspberry variety. It was established as the beginning of flowering until early fruit maturation medium passes in 27-47 days. After assessing the extent of fruiting plant varieties revealed the Pathfinder, Hybrid Bulgarian, Lloyd George, Rubin Bulgarian, The Latham. The average weight of the raspberry fruits is a criterion for assessing their quality and which highlighted these varieties Hybrid Bulgarian, Rubin, September, Delbard Magnific, Lazarevscaia. Study after winter hardiness of raspberry variety introduced revealed the most resistant to Pathfinder, June, Cayuga, Solnisco, Lazarevscaia, Balsam. Varieties that showed an increased resistance to drought are Stolicinaia, Malling Promise, Lloyd George. Among disease-resistant varieties (Bean and Septoria) have revealed Kuthbert, Indian Summer, Hybrid Bulgarian, St. Walfried, The Latham

Key words: *raspberry, phonological phases, weight of berries, plants resistance, Republic of Moldova.*

INTRODUCTION

Hydrological regime is one of the factors limiting raspberries crop. Raspberry shoots during the growth and fruits ripening period, especially needs a large amount of moisture. Insufficient or excess of water during this period not only adversely affects the fruits and shoots at the moment, but also largely determine their viability, harvest of next year (Kazacov and Kicina, 1980).

All varieties of raspberry strength are closely related to temperature regime during the growing season determine the plant status during the resting state. So now, plant growth in the summer, in wet conditions and high temperatures leads to branching stems and prevents wood cooking at ramifications arising prematurely, which freezes in winter. Most varieties not withstand temperatures below minus 25°C (Belîh et al,, 2004; Kondratenco and Nadtocii, 2002).

Deep raspberry plantations thrive fungal diseases, bacterial, viral, especially bean, Septoria, rust, bacterial cancer. Land too acidic and rich in nitrogen, bean grows more quickly, especially in dense bushes (Hoza, 2005; Bogdanova, 2011).

MATERIALS AND METHODS

Studies on the impact of growing conditions and plant development, deployment phenological development stages of raspberry varieties introduced and the influence of climate on crop of fruits quality. The research was conducted in the experimental field of the Institute of Horticulture as recognized and approved methods for studying small fruits. The plantation was established in 2000 on land without irrigation after planting distance of 2.5x0.5 m

The study included 29 introduced varieties of raspberry: Barnauliscaia, Rubin, Delbard Magnific, Stolicinaia, Kirjaci, Pathfinder, President, Kuthbert, Indian Summer, Hybrid Bulgarian, June, Marfilk, Kobfuller, Cayga, Malling Promise, Solnishco, Lazarevscaia, Balsam, Brigantine, Meteor, Red Wadenswil, Lloyd George, Bulgarian Rubin, Paul Camerzid, September, St. Taylor, Walfried, Latham, Malling Jewel. Varieties were assessed by the degree of fructification with note 1 (low fructification) up to grade 5 (high fructification), the degree of resistance to bean, Septoria, frost and drought were rated at 0 (unaffected) and Note 5 (strongly affected).

RESULTS AND DISCUSSIONS

Raspberry is a very demanding crop in soil moisture due to shallow the root system. In the absence of rainfall during critical periods of plant development (growth period of shoots and fruit formation) and to avoid adverse effects on raspberry fruit crop requires irrigation plantation. Still made on rainfall data from the period of observation during the years 2002-2010 are included in Table 1.

Table 1. Rainfall during the research period (mm)

Months	2002	2003	2004	2005	2006	2007	2008	2009	2010
III	58.7	12.4	31.0	14.8	89.1	33.7	35.6	70.8	29.0
IV	30.6	34.9	28.0	49.5	36.6	36.5	43.2	2.7	45.1
V	10.4	20.6	75.0	75.8	97.1	19.0	42.6	33.3	69.2
VI	60.1	21.6	11.0	104.8	81.6	23,7	62.8	39.0	85.0
VII	133.4	17.4	10.0	17.6	53.0	3.6	50.2	67.2	67.2
VIII	80.6	27.4	25.6	150.9	67.7	33.8	30.8	32.6	53.0
IX	47.1	52.7	69.6	4.9	57.8	24.8	77.7	21.7	46.7
X	84.2	62.1	33.4	11.0	13.6	71.0	16.0	29.6	68.9
IV-IX	446.4	236.7	374.6	429.3	491.5	246.1	358.9	297.4	464.1
year	618.0	376.4	651.9	660.3	560	474.4	460.5	455.1	735.2

According to Table 1 analysis of data on rainfall amount shows that the minimum annual precipitation that has accumulated in 2003 year was 376.4 mm, and the largest amount was collected in 2005 year in the amount of 660.3 mm, although rainfall during the year and the vegetation period were uniformly distributed, including during critical periods of growth and development of the raspberry plant. The highest of monthly precipitation fell in August, 2005 in the amount of 150.9 mm, in July 2002 year to 133.4 mm, in June 2001 year to 129.5 mm.

The smallest amount of monthly precipitation fell in July 2007 to 3.6 mm, in September 2005 to 4.9 mm in August 2001 to 5.4 mm. Air temperature and soil moisture are important on development and deployment of raspberry phenological phases. Temperature during the observation period is presented in Table 2.

Table 2. Air temperature during research, (0C)

Months	2002	2003	2004	2005	2006	2007	2008	2009	2010
III	7.2	1.0	5.4	2.3	2.6	7.1	7.2	3.2	3.4
IV	10.4	8.5	10.8	10.5	10.9	10.6	11.0	12.2	11.0
V	17.9	11.5	14.8	16.5	15.6	18.9	15.5	16.4	16.8
VI	20.1	1.2	19.3	18.6	19.7	23.6	20.9	21.1	21.0
VII	24.3	21.6	21.7	27.7	22.1	25.8	22.3	23.9	23.1
VIII	21.3	22.6	21.1	21.8	22.2	23.9	23.8	23.0	24.9
IX	16.6	15.6	15.9	18.3	17.1	16.7	15.5	18.7	16.1
X	9.5	9.2	11.4	17.2	12.1	11.3	12.5	11.6	7.5
III-X	17.2	15.7	16.43	18.66	17.1	18.69	17.36	18.13	17.20
year	11.0	9.0	10.29	11.43	10.2	11.5	11.4	11.3	10.62

The 2003 year was marked by the lowest average of temperatures during the growing season aier, which reached only the value of 15.71°C, compared to the highest values of 18.69 º C, set in 2007.

It also showed the lowest average annual temperature of only 9°C in 2003, compared with the highest temperature of 11.5°C, recorded in 2007.

Air temperature during 2007 for June, July and August with corresponding values of +23.6, 25.8, 23.9°C, which was the highest for the entire period of observations. Especially in summer air temperature ranged between +17.9 and +27.7 values and C. Phases phenological development of raspberry plants depends on the variety and other factors, but in particular on climatic conditions of the year, Table 3.

According to phenological observations (Tables 1, 2, 3), and meteorological data recorded in 2003 year, fell the least amount of annual rainfall-376.4 mm was recorded and the lowest average annual temperature +9°C, and in vegetation period + 15.71 º C, which led to the late burgeoning of raspberry plant at April 21 during the researches.

Air average temperature higher than usual, recorded in February by + 4.9 º C and +7.2 º C in March of 2002 year contributed to the early budding of raspberry plant from March 20.

Phenological phases carrying the raspberry plants, during research

Table 3. Phenological phases carrying the raspberry plants, during research

Phenological phases	2002	2003	2004	2005	2006	2007	2008	2009	2010	mean
beginning of vegetation	20.03	21.04	25.03	10.04	09.04	29.03	05.04	24.03	03.04	
Duration between phases	44	28	51	39	42	43	30	46	45	46
flowering	02.05	18.05	13.05	19.05	21.05.	10.05	04.05	08.05	18.05	
Duration between phases	43	31	34	27	30	36	47	35	35	33
Fruit maturation	14.06	19.06	15.06	14.06	19.06	15.06	20.06	12.06	22.06	

Raspberry plants flowering usually begins in early May, although some delays may occur up in the second half of May, depending on the amount of assets accumulated temperature needed to start the phenological phases. Length of time between phenological stages of budding and flowering varies between 28-51 days. Since the beginning of flowering until early fruit maturation medium passes in a period of 27 to 47 days.

Figure 1. Flowering period of raspberry fruits

Period, which lasts from the beginning of vegetation, to fruit maturation, varies between 59-87 days. Raspberry fruit ripening usually begins in the second-the third decade of June, with some deviations depending on the temperatures set in this period.

Raspberry reacts negatively to lack of moisture during fruit formation and growth, which can lead to fruit weight reduction, fruit quantity and quality.

Table 4. Development indices and the degree of resistance raspberry plant, years 2002-2006

Variety	Degree of fructification, note	Average fruit weight grade,g	degree of Bean damage, note,	Degree of septoria damage, note	Degree of frost damage, note	Degree of drought damage, note
1.Barnauliscaia	2	2.0	2	1	2	3
2.Rubin	3	3.2	5	3	2	4
3.Delbard Magnific	3	2.9	3	3	1	5
4.Stolichnaia	4	2.5	4	3	1	0
5.Chirjaci	4	2.0	4	3	1	4
6.Paphinder	5	1.6	2	3	0	2
7.President	1	2.5	2	2	1	-
8.Kuthbert	1	1.6	0	0	4	3
9.Indian Summer	3	1.6	0	0	2	2
10.Hybrid Bulgarian	5	3.5	0	0	1	3
11.June	1	1.3	1	1	0	4
12.Marfilk	1	2.0	2	2	2	-
13.Kobfuller	4	2.4	-	-	1	2
14.Cayga	3	2.5	1	1	0	-
15.Malling Promise	4	2.1	3	2	2	0
16.Solnishco	3	2.2	1	1	0	4
17.Lazarevscaia	4	2.7	4	4	0	1
18.Balsam	3	2.3	1	2	0	1
19.Brigantine	3	1.9	2	2	1	2
20.Meteor	1	1.6	2	2	1	4
21.Red Wadenswil	4	1.6	1	1	2	1
22. Lloyd George	5	2.7	2	3	1	0
23.Rubin Bulgarian	5	2.5	3	2	2	4
24.Paul Camerzid	2	2.4	-	-	2	3
25.September	4	3.2	4	4	1	5
26.St. Walfried	4	1.7	0	0	2	1
27.Taylor	1	2.0	2	2	3	1
28.The Latham	5	2.1	0	1	1	1
29.Malling Jewel	2	2.2	3	2	2	3
Variation limits	1-5	1.3-3.5	0-5	0-4	0-4	0-5

Raspberry varieties capacity to adapt to the new conditions of growth and development of plants is different, and lack of rainfall can affect the quantity and quality of the harvest, reduce fruit weight, if necessary measures are not related to irrigation. As a result of research conducted on plant development, degree of fruiting, fruit weight, degree of damage by disease, frost and drought were assessed raspberry varieties on irrigated land, and the data obtained are presented in Table 4.

Appreciation fruiting varieties studied by the ability to highlight varieties allowed Pathfinder, hybrid Bulgarian, Lloyd George, Rubin Bulgarian, Latham, who showed top marks in the grade 5 on level fruition.

The average weight of the fruits of raspberry is a criterion for assessing the quality varieties. The results obtained on fruit size allowed to highlight the following varieties of fruits largest: Hybrid Bulgarian-3.5 g, Rubin, September-3.2 g, Delbard Magnific-2.9 g, Lazarevscaia – 2.7 g. Small fruit varieties from 1.3 to 1.6 g were: June, Meteor, Pathfinder, Red Wadenswil, Indian Summer, Kuthbert, St. Walfred.

Figure 2. Maturation period of raspberry fruits, variety Delbard Magnific

Research on winter hardiness of raspberry variety introduced, included in the study and appreciation revealed the 0 score of the toughest as: Pathfinder, June, Cayuga, Solnishco, Lazarevscaia, Balsam. Varieties showed an increased resistance to drought are Stolicinaia, Malling Promise, Lloyd George. Among disease-resistant varieties (bean and Septoria) were highlighted: Kuthbert, Indian Summer, Hybrid Bulgarian, St. Walfried, The Latham.

CONCLUSIONS

As a result of scientific research conducted on developing varieties introduced raspberry established that:

Budding is usually between 20.03-10.04, although there are some variations until 21.04.

Early flowering begins average over 28-51 days. Early flowering usually occurs in early May at 02.05.

Early fruit ripening occurs on average at 27-47 days after the beginning of flowering.

Maturation begins usually in the second-the third decade of June from 12 till 20.06. depending on the year.

After assessing the extent of fruiting plant varieties revealed the Pathfinder, Hybrid Bulgarian, Lloyd George, Rubin Bulgarian, The Latham.

The average weight of the fruits of raspberry is a criterion for assessing their quality and which highlighted the following varieties as Hybrid Bulgarian-3.5 g, Rubin, September-3.2 g, Delbard Magnific-2.9 g, Lazarevscaia-2 7 g.

Study regarding the raspberry varieties introduced after winter hardiness revealed the most resistant as: Pathfinder, June, Cayuga, Solnishco, Lazarevscaia, Balsam. http://agriculturefor life.usamv.ro:9080/UserArticle#

Varieties which showed a high resistance to drought are Stolicinaia, Malling Promise, Lloyd George.

The disease-resistant varieties (bean and Septoria) have revealed Kuthbert, Indian Summer, Hybrid Bulgarian, St. Walfried, The Latham.

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