

## Раздел 2. Естественные науки

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### BIOLOGICAL AND POMOLOGICAL PECULIARITIES OF SOME VARIETIES OF RASPBERRY

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The biological and pomological peculiarities of the red raspberry cultivars ‘Marlboro’, ‘Polka’, ‘Polana’, ‘Fertodi Zamatos’ and ‘Ottawa’ were studied in Armenia. The period of maturity, fruit size, fruit color, soluble solids content and resistance of varieties to the most spread viruses and diseases were investigated. The obtained results will serve as a guideline in selection varieties for import and cultivation in different agro-climatic zones of the Republic.

**Keywords:** raspberry, yield, resistance, quality.

### БИОЛОГИЧЕСКИЕ И ПОМОЛОГИЧЕСКИЕ ОСОБЕННОСТИ НЕКОТОРЫХ СОРТОВ МАЛИНЫ

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Биологические и помологические особенности сортов красной малины 'Мальборо', 'Полька', 'Полана', 'Фертоди Заматос' и 'Оттава' были изучены в условиях Армении. Были исследованы период созревания, размер плодов, цвет плодов, содержание растворимых сухих веществ и устойчивость сортов к наиболее распространенным вирусам и болезням. Полученные результаты послужат ориентиром при выборе сортов для ввоза и выращивания в различных агроклиматических зонах республики.

**Ключевые слова:** малина, урожайность, устойчивость, качество.

Until very recent times the raspberry cultivation in Armenia was conducted only at the amateur level on small plots on homesteaded land. However, during the last decade the establishment of productive orchards and growth in raspberry production has been observed. Traditionally only one - two cultivars were cultivated, but more recently a dozen new cultivars have been imported mainly from Europe and served as a basis for establishment of new plantations and nurseries.

In connection with the introduction of new varieties, it became necessary to evaluate imported varieties under local agro-ecological conditions to determine which will meet the main demands of producers, processors and consumers. Most raspberries are cultivated under organic management systems and 75% of the crop is processed as frozen fruit, so it becomes necessary to choose cultivars that can be produced organically and that freeze well. Additionally raspberry cultivars must have high fruit quality and high resistance to the diseases and viruses.

**Methodology.** The experiments were carried out during two years in the experimental scientific production plantation of the

raspberry processing company “Tamara Fruit” located in Karbi village of Aragatsotn province of Armenia. The region is at 1200 m above sea level, with large fluctuations between night and day air temperatures (12 °C – 31°C) during the fruit-ripening period. The planting material was imported from Holland and Hungary. The experimental plantation was established with a 2.5 x 0.4 m planting scheme. Soil in the experimental plantation was fertilized by organic fertilizer (composted cow manure) - 50 t/hectare. The plants were trained to a three-wire vertical trellis. Organic cultivation best practices were followed, therefore, chemicals for disease control were not applied during the experience. The genotypes frost resistance and tolerance to *Botryotinia fuckeliana* (de Bary) Whetzel were determined under the field conditions. ELISA tests were used for determining virus existence, such as *Raspberry bushy dwarf virus*, *Raspberry ringspot virus* and *Arabis mosaic virus*. ELISA reagents for plant virus diagnostics were acquired from BIOREBA AG company (Switzerland).

**Results and Discussions.** ‘**Marlboro**’ is an American high yielding floricanе fruiting variety introduced in 1884 from a cross of a seedling of ‘Caywood’ and ‘Highland Hardy’. ‘Under intensive management, it may yield 15 t/hectare. It is early ripening variety with high frost resistance. Fruits are medium large (2.0-2.4 g) red, conical with light fine flavor. Marlboro’ has been cultivated in Armenia for many years. Experimental plants had vigorous upright canes, produced numerous root suckers and had moderate disease resistance. Primocanes become red purple in autumn and floricanes were brown. The leaves were medium large, dark green.

‘**Polka**’ is a Polish primocane fruiting cultivar that is an open pollinated selection from P89141, which has ‘Autumn Bliss’ in its derivation, it was selected in 1993 and released in 2001. During the experiences plants were medium growing, with upright vigorous canes that were resistant to diseases. Fruits were medium to medium-large (3.2 – 6.6 g), red, and with a sweet taste. Fresh fruits were shipped well. They are suitable for processing as well as for fresh use.

‘**Polana**’ was selected in 1981 in Poland from the cross ‘Heritage’ x ‘Zeva Herbsternte’ and released as a primocane-fruited cultivar in 1991. In experimental fields the bush was medium growing and dense with strong upright canes with medium disease resistance. The fruits were medium large (2.6-3.0 g) and red, with fine flavor. They are suitable for processing as well as for fresh use.

‘**Fertodi Zamatos**’ is a late-season Hungarian floricanefruiting cultivar that was selected in 1971 from the cross ‘Fertodi Hungaria’ x ‘Canby’ and released in 1986. In experimental plots variety produced high yield (12-18 t/hectare), had medium-large (4.1 g) red fruit with a sweet flavor. The berries had an excellent shelf life. Fruits are suitable for fresh use as well as for freezing. The bush had a numerous erect canes that were moderately spiny but are not difficult to handle.

‘**Ottawa**’ is a floricanefruiting Canadian cultivar with high frost tolerance that was selected from the cross ‘Viking’ x (‘Logan’ x ‘Ranere’) in 1931 and released in 1943. In our experiments, the variety produced 8-10 t/hectare. The bush was low growing with 1.5 m average height. Berries were medium-large (1.8-2.3 g), red, and round. Fruit shipped well. ‘Ottawa’ had low resistance to diseases and viruses.

‘Fertodi Zamatos’ and ‘Polka’ appeared to have the biggest fruit size and the ‘Marlboro’ the smallest (Table 1).

Table 1  
Major fruit properties and resistance to cane diseases in five red raspberry cultivars in trial

Cultivar	Fruit weight (g)	Fruit height (mm)	Fruit width (mm)	Crop load (1-5)	Soluble solids content %	Disease resistance (1-5)
Marlboro	2.21	17.3	18.42	2	10.20	3
Polka	4.10	23.2	20.71	3.4	10.25	3.5
Polana	2.92	20.7	18.72	2.7	10.10	2
Fertodi Zamatos	4.17	24.7	20.44	4	10.40	4
Ottawa	2.37	20.30	19.15	3.5	10.30	2

‘Polana’ and ‘Ottawa’ had similar fruit size and shape score. ‘Polka’ also had large fruit. ‘Fertodi Zamatos’ was estimated to have

the highest crop load (Table 1). 'Ottawa' and 'Polka' had similar crop load scores and both were better than those for 'Marlboro' and 'Polana'. The soluble solids contents were similar for all of the cultivars (Table 1).

'Fertodi Zamatos', 'Polka' and 'Marlboro' expressed high disease and virus resistance in field conditions. 'Polana' and 'Ottawa' demonstrated low resistance to diseases and viruses.

'Polka' and 'Fertodi Zamatos' were scored as having the most attractive fruit (Table 2). 'Fertodi Zamatos' was also scored to have the best flavor and aroma. 'Polana' was rated as having the poorest flavor and aroma. Each of the cultivars had a similar consistency. When the values for the organoleptic traits were totaled, 'Fertodi Zamatos' had the best score and 'Ottawa' and 'Polana' the worst (Table 2).

Table 2

Organoleptic evaluation of the fresh fruit of five red raspberry cultivars in trial

Cultivar	Appearance (0-6)	Taste (0-8)	Aroma (0-2)	Consistency (1-5)	Total
Marlboro	4	5	1.4	4	14.4
Polka	6	5	1.3	3.5	15.8
Polana	4	4	1.2	3	12.2
Fertodi Zamatos	6	6	1.6	4	17.6
Ottawa	4	4	1.4	3	12.4

ELISA tests did not detect any viruses or fungicide germs of *Verticillium* spp. in all investigated crops.

'Fertodi Zamatos' and 'Polka' were distinguished by their high fruit quality, high yields, high resistance to pests and ability to use them as fresh or frozen fruit. They were well adapted to the environment as well. 'Polana' and 'Marlboro' were not as good as the first two. Ottawa was not suitable for commercial production especially for organic production.

Results of the evaluation of introduced raspberry varieties revealed the necessity of introduction of new modern raspberry varieties with more favorable biological and technical properties, so that the growth in raspberry production in Armenia can be sustained.

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