

## RESEARCH AND STUDIES REGARDING THE BEHAVIOR OF CERTAIN RASPBERRY VARIETIES WITHIN BUCHAREST REGION

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### Abstract

*The experiment was conducted within the teaching field of the Horticulture Faculty during 2012-2014, with 5 genotypes of raspberry: 'Heritage', 'Opal', 'Gustar', 'Elite 89' and 'Malling Promise', out of which the first four with biannual fructification, planted at a distance of 2.2 m between rows, with a plant management system in the shape of lane, with espalier with two rows of double wire. The culture technology applied was specific for the raspberry plantations. The analyzed varieties had a different behaviour from the point of view of the vegetative growth, production capacity and fruit quality. The 'Gustar' variety had the highest capacity to produce root shoots; 'Elite 89' had the highest number of inflorescences per strain, while 'Malling promise' had the highest number of fruit per inflorescences. From the quality point of view, the 'Heritage' and 'Elite 89' varieties recorded higher content in dry substance; 'Opal' recorded the highest content in vitamin C, while 'Gustar' and 'Malling Promise' recorded higher content in carbohydrates.*

**Key words:** raspberry, production, quality.

### INTRODUCTION

The raspberry (*Rubus idaeus* L.) is a rustic species that grows spontaneously in the mountain region and in clearings in forests, but also one that is cultivated both within individual gardens and within commercial plantations (Hoza, 2000). The fruit obtained from an organic culture have a higher antioxidant capacity than the ones from a conventional culture (Jin et al., 2012). It represents a species of a major food and sanogeneous importance, the fruit have a complex biochemical composition, and its antioxidant components contribute to the protection of cells against serious diseases. The biochemical composition of fruit (soluble dry substance, acidity, phenol and antioxidant content) is influenced by the cultivar variety (Zhang et al. 2010, Mazur et al., 2014). The raspberry based extracts have a neuroprotective role by inhibiting the peroxynitrite that determines the effects on the DNA (peroxynitrite-induced DNA damage) (Chen W. and al., 2012). Raspberry is a species that bearsly deals with the soluble salts from the soil and especially with chlorine (Neocleous D., and Vasilakakis M., 2007); the soils with secondary salinization must be avoided. It is

one of the species with high capacity to produce root shoots and with an anti-erosion protection role (Chira, 2000).

### MATERIALS AND METHODS

The objective of this study was to evaluate the behavior of several Romanian varieties ('Opal', 'Gustar' and 'Elite 89-15-3') compared to the varieties 'Heritage' and 'Malling Promise', in the pedo-climatic conditions from the Bucharest area, a region with temperate-continental climate, with temperatures low during winter and high during spring and an amplitude of more than 50°C. The soil from the plantation is reddish brown, with a moderate degree of mineral supply and a weakly acid pH. The experiment was conducted within the teaching field of the Faculty of Horticulture Bucharest, during 2013-2014, within a four-year-old raspberry culture, with a distance between rows of 2.5 m and a width of 40 cm for the band along the row. Five raspberry varieties were analyzed: 'Heritage', 'Opal', 'Gustar', 'Malling Promise' and 'Elite 89-15-3', out of which only the variety Promise. The length of the fruit growing strains was limited to 120 cm through pruning. The study method used was in field stationary and several biometric parameters were

determined, while for the laboratory measurements related to quality the HPLC system was used HPLC (Agilent Technologies). The measurements evaluated the growth and fructification of the five genotypes in terms of: capacity to produce root shoots, capacity to form fertile shoots, number of flowers per inflorescence, fruit size, production and quality.

## RESULTS AND DISCUSSIONS

The capacity to produce root shoots was influenced by the variety, number of root shoots per linear meter of band was between 14.3 shoots/linear meter for the variety ‘Malling Promise’ and 45.1 shoots/linear meter for ‘Gustar’, compared to an average of the varieties of 32.12 shoots/linear meter (Figure 1). Three varieties, ‘Heritage’, ‘Opal’ and ‘Gustar’, had a higher capacity to produce root shoots, above average (32.12 shoots/linear meter), while two varieties, ‘Malling Promise’ and ‘Elite 89-15-3’, had a weak capacity, less than 26 shoots/linear meter.

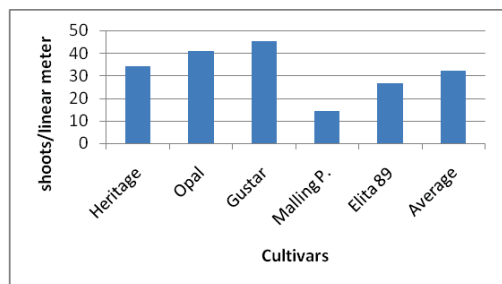


Figure 1. The capacity to produce root shoots for several raspberry varieties

The number of fertile shoots per strain was influenced by the variety, being higher for the varieties ‘Gustar’, 14.7 fertile shoots/strain, and ‘Malling Promise’, 11.3 fertile shoots/strain. Comparing the capacity of the varieties to produce fertile shoots to the average, three varieties, ‘Gustar’, ‘Heritage’ and ‘Elite 89-15-3’, had higher values, while ‘Opal’ and ‘Malling Promise’ had lower values (Figure 2). The number of flowers per inflorescence varied among the studied varieties, with values from 7.15 flowers for ‘Opal’ and 10.56 flowers for ‘Elite 89-15-3’, compared to the average of 8,68 flowers (Figure 3).

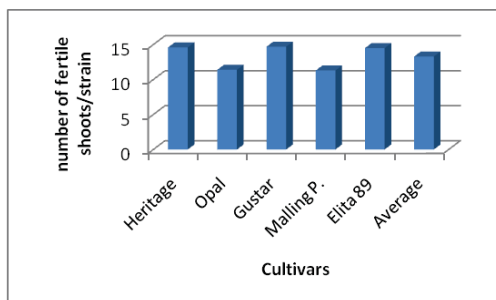


Figure 2. Capacity to form fertile shoots for several raspberry varieties

It was interesting that for these varieties, a strong positive correlation was highlighted between the number of fertile shoots and the number of flowers per inflorescence, expressed through  $r^2 = 0.683$  (Figure 4), which showed that these two characteristics are dependent on the variety and biologically controlled.

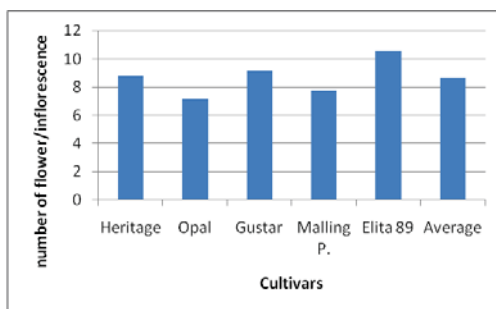


Figure 3. Number of flower per inflorescence for several raspberry varieties

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The production capacity was variable and recorded values between 1.45 kg/l.m. (linear meter of fruit growing band) for the variety Opal, a variety with smaller fruits, and 3.15 kg/l.m. for ‘Gustar’, as maximum value. The average of the experiment was 2.3 kg/l.m.; the varieties ‘Gustar’, ‘Elite 89-15-3’ and ‘Heritage’ had values higher than the control, while the varieties ‘Opal’ and ‘Malling Promise’ recorded lower values (Figure 5).

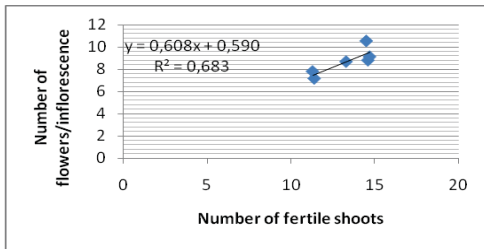


Figure 4. Correlation between the number of fertile shoots and the number of flowers per inflorescence

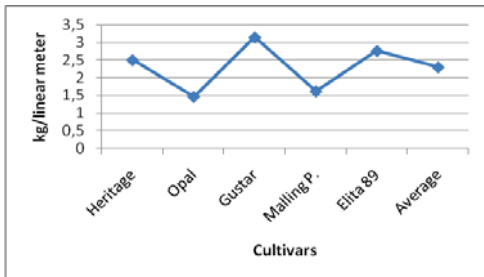


Figure 5. Production capacity for several raspberry varieties (kg/l.m.)

Fruit quality is important for capitalization, but also for the consumer. Differences were recorded among the varieties related to the content in soluble dry substance (SDS), content in vitamin C and carbohydrates (table 1). From the point of view of the content in dry substance, a higher content was recorded for the varieties ‘Heritage’ and ‘Elite 89-15-3’, 14.2 respectively 13.7%, the differences being statistically ensured by the variance analysis as very significant, while a lower content was recorded for the varieties ‘Gustar’ and ‘Malling Promise’, with very significant negative differences compared to the average. The content in vitamin C was higher for the varieties ‘Gustar’ (28.4 mg/100 g p.p.), the difference being very significant positive, and for ‘Opal’ (24.1 mg/100 g p.p.) with a significant positive difference from the control, compare to the other varieties (Table 1). The carbohydrate content varied according to the variety.

Table 1. Biochemical characteristics of the fruit for several raspberry varieties

Variety	S.U.S. (%)	Vitamin C (mg/100 g p.p.)	Fructose (mg/100 g p.p.)	Glucose (mg/100 g p.p.)	Sucrose (mg/100 g p.p.)
‘Heritage’	14.2***	17.7 <sup>00</sup>	3.7	3.0	1.2
‘Opal’	12.1 N	24.1**	4.0	2.7	1.2
‘Gustar’	10.7 <sup>000</sup>	28.4***	4.0	3.0	1.6
‘Malling promise’	11.2 <sup>000</sup>	18.5 <sup>00</sup>	3.7	2.9	1.8
‘Elite 89-15-3’	13.6***	19.9 <sup>0</sup>	3.63	3.12	1.3
Average	12.36 Control	21.72	3.80	2.94	1.42

DL 5%                    0.32%                    1.31 mg/100 g p.p.  
DL 1%                    0.54%                    2.17 mg/100 g p.p.  
DL0.1%                1.01%                    4.07 mg/100 g p.p.

## CONCLUSIONS

From the present study, the following conclusions can be drawn:

The analyzed varieties had a good behaviour in the specific conditions of Bucharest area; they can be recommended for industrial cultures or cultivating them as a hobby

The capacity to produce root shoots was different and dependent on the variety; the varieties ‘Opal’ and ‘Gustar’ had a high capacity, over 40 root shoots per linear meter of band, while the rest of the varieties recorded lower values.

The number of fertile shoots per strain was higher for the varieties ‘Heritage’, ‘Gustar’ and ‘Elite 89-15-3’, over 14 shoots per strain, while lower numbers were recorded for ‘Opal’ and ‘Malling Promise’.

The production capacity was higher for the varieties ‘Gustar’, ‘Elite 89-15-3’ and ‘Heritage’, with more than 2,5 kg per linear meter of band, while the varieties ‘Opal’ and ‘Malling Promise’ recorded smaller productions.

Fruit quality depended on the variety. The varieties ‘Opal’ and ‘Gustar’ had higher values for the content in vitamin C.

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