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BEHAVIOUR OF SOME NEW ROMANIAN PEAR DISEASE RESISTANT GENOTYPES CULTIVATED IN BUCHAREST AREA

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Abstract

In the last 30 years, pears orchards area diminished dramatically in Romania due to several factors, the most important being the sensitivity to some pests (pear psylla - Cacopsylla pyricola Förster) and diseases (fire blight - Erwinia amylovora Burrill). In the same time, the market demand for pears is increasing and the prices are continuously high. The aim of this study is to present the behaviour of some new Romanian pear disease resistant genotypes, produced at the Voineşti Research Station for Fruit Growing and planted in the Experimental Orchard of the Faculty of Horticulture within USAMV Bucharest. Six varieties and two new hybrid selections grafted on quince (CTS 212), on pear (Farold 40) and on own roots, in vitro propagated, were analysed. The planting distances varied from 3.0 x 0.8 m, for Parallel U to 3.0 x 1.6 m, for Trident canopy. The study presents the comparative biometrical data for each genotype respectively: average tree height, type, number and average length of annual fruiting shoots, trunk cross sectional area. Estimation of yield and fruits characteristics at the harvest moment are detailed.

Key words*: Pyrus communis, varieties, rootstock, canopy, Trident, Parallel U, fruits parameters.*

INTRODUCTION

In the last 30 years, pears orchards area diminished dramatically in Romania due to several factors, the most important being the sensitivity to some pests (pear psylla - *Cacopsylla pyricola* Förster) and diseases (fire blight - *Erwinia amylovora* Burrill). In the same time, the market demand for pears is increasing and the prices are continuously high. The aim of this study is to present the behavior of some new Romanian pear disease resistant genotypes, produced at the Voineşti Research Station for Fruit Growing and planted in the Experimental Orchard of the Faculty of Horticulture within USAMV Bucharest.

Pear breeding program had as objectives new varieties with disease resistance (*Venturia pirina*, *Erwinia amylovora*), tolerance to black and white spot (*Fabraea maculate*, *Mycosphaerella sentina*), fumagine (*Capnodium salicinum*) and *Psylla* sp.; extended period for winter season, good fruit appearance, high biological potential and adaptability (Andreieş, 2002; Andreieş, 2017). Few studies were presented with the new varieties from Voinesti pear breeding program, most of them with the pomological characterization of the cultivars.

MATERIALS AND METHODS

The trees were planted in 2014. Six varieties and three new hybrid selections 'Corina', 'Cristal', 'Euras', 'Orizont', 'Romcor', 'Tudor', H12/83/79, H5/5/84, R3/146 grafted on quince (CtS 212), on pear (Farold 40/Pear seedling) and on own roots, *in vitro* propagated, were analysed.

The planting distances varied from 3.0 m x 0.8 m, for Parallel U to 3.0 m x 1.6 m, for Trident canopy.

'Corina' is resistant to scab and tolerant to fire blight with medium vigour tree. Fruits have medium size, conical shape, yellowish - green skin colour, white flesh, fondant pulp. Ripening time is between October - November.

'Cristal' is resistant to scab and to fire blight with medium vigour tree. Fruits have medium-large size, conical shape, yellowish-green skin colour, white flesh, fondant pulp. Ripening time is between October-November.

'Euras' is resistant to scab, tolerant to fire blight and *Psylla* sp., medium tree vigour, fruits

with medium size, ovoid shape, semi-fondant pulp at full maturity. Ripening time is in October-April.
'Orizont' is resistant to scab, tolerant to *Psylla* sp., medium tree vigour, fruits with medium-large size, globular shape, yellow skin colour, semi-fondant pulp. Ripening time is between December-February.
'Romcor' is resistant to scab, no fire blight attack symptoms and tolerant to *Psylla* sp. The tree has middle to strong vigour. Fruits have medium to large size, conical shape, yellow-green skin colour, fondant pulp. Ripening time is between October-January.
'Tudor' is tolerant to scab, fire blight and *Psylla* sp. with medium to strong vigour of tree. Fruits have large size, pyriform, light yellow covered with bright red on about half of the fruit. Ripening time is between September-October (Andreieș, 2017; Branişte et al., 2007; Ghena et al., 2004; Asănică & Hoza, 2013; Grădinariu, 2002; Branişte et al., 2008).
Farold 40 (Daygon) is one of american OHF Selection (Old home x Farmingdale). The grafted cultivars have high vigour and good productivity (Hoza, 2000; Ghena & Branişte, 2003; Cimpoieș, 2018).
CTS 212 is a quince rootstock obtained in Italia (Pisa), with a good rooting system, high productivity to cultivars grafted on it and good fruit quality (Grădinariu, 2002; Cimpoieș, 2018).
The present study presents the comparative biometrical data, in 2018-2019 periods, for each genotype, respectively: average tree and trunk height; trunk cross sectional area; type, number and average length of annual flowering shoots. Estimation of yield and fruits characteristics at the harvest moment are detailed.

RESULTS AND DISCUSSIONS

Tree vigour

'Orizont' cultivar grafted on Farold 40 registered the biggest tree high (3.33 m). 'Tudor' on own roots had the smallest hight (1.38 m) (Figure 1). The cultivars self-rooted presented smallest heights than the cultivars on rootstocks.

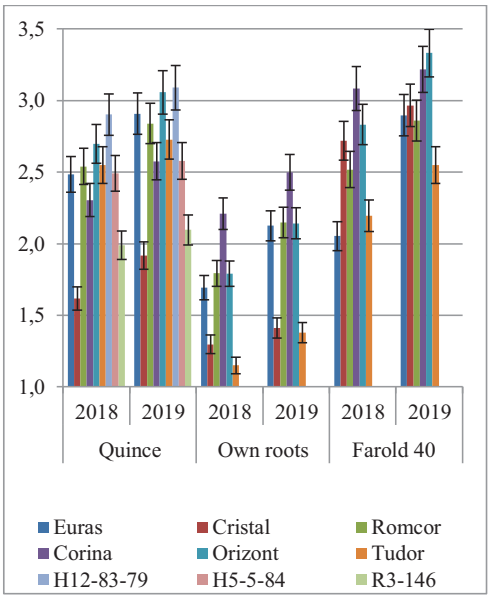

Figure 1. Comparison of tree height between varieties and rootstocks (m)

The cultivars self-rooted presented the smallest values also for trunk height comparing with the cultivars on rootstocks (Figure 2). Trunk height was bigger on Farold 40 rootstock for al cultivars and hybrids excepting 'Cristal', were quince rootstock registered for trunk height a bigger value.
The results are similar with the findings of Cimpoieș (2018), Ghena et al. (2004), Ghena and Branişte (2003), Hoza (2003).

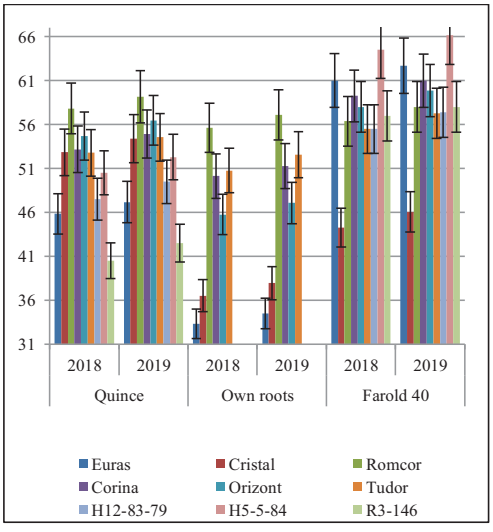

Figure 2. Trunk height influenced by cultivar and rootstock

Farold 40 rootstock led to more vigorous tree than the quince and self-rooted one, excepting 'Tudor'. The cultivars self-rooted presented the smallest values for trunk cross sectional area (TCS) comparing with the rootstocks used (Figure 3).

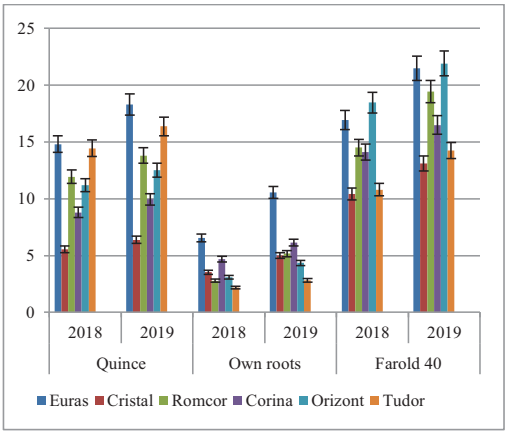

Figure 3. TCS comparison between varieties and rootstocks

The flower shoots number increased in 2019 comparing with 2018, influenced by cultivars, climatic factors and technology.

One of the main characteristic of these new cultivars is the production mainly on short flowering shoots, excepting 'Orizont' cultivar with long flowering shoots (Figures 4-8) (Andreieș, 2017; Asănică & Hoza, 2013; Grădinariu, 2002).

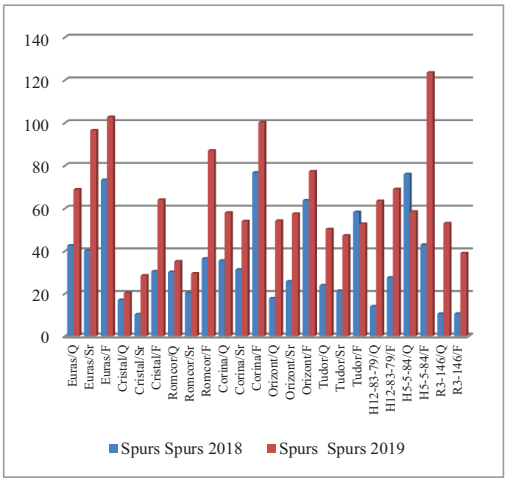

Figure 4. Spurs number between 2018-2019

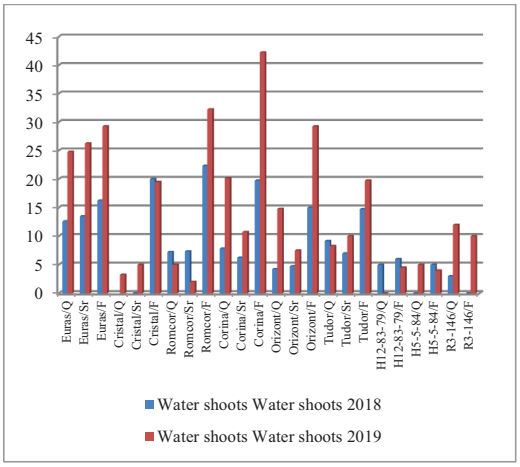

Figure 5. Water shoots number between 2018-2019

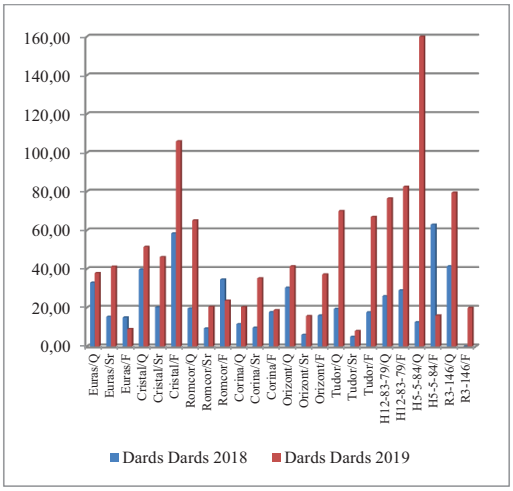

Figure 6. Dards number between 2018-2019

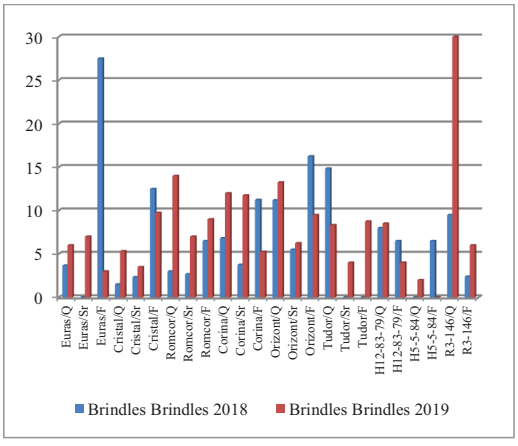

Figure 7. Brindles number between 2018-2019

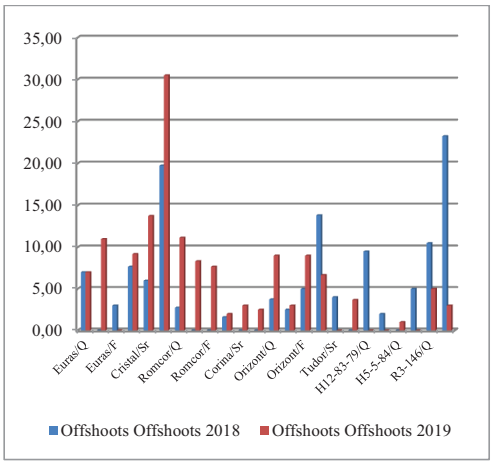

Figure 8. Offshoots number between 2018-2019

Total vegetative length of flowering shoots incresed also in 2019 comparing to 2018.
Farold 40 rootstock led to the highest vegetative growth to all cultivars. 'Corina' (2,496 cm), 'Cristal' (2,330 cm), 'Romcor' (2,221 cm) and 'Orizont' (2,220 cm) had the biggest values. Most of the quince grafted cultivars had bigger vegetative growth than the self-rooted ones (Figure 9).

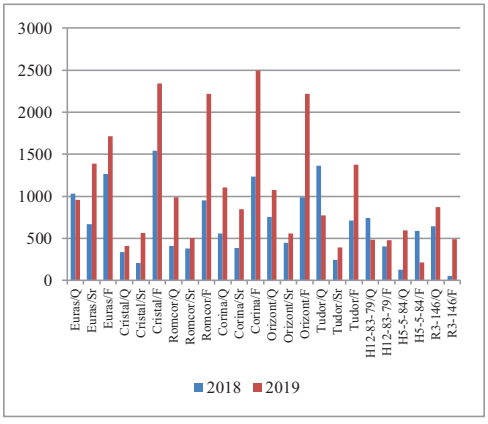

Figure 9. Total vegetative length between 2018-2019

'Euras' cultivar confirmed its characteristic to produce on short flowering shoots (Figure 10). Farold 40 grafted plants had the biggest values at spurs length followed by self-rooted once.

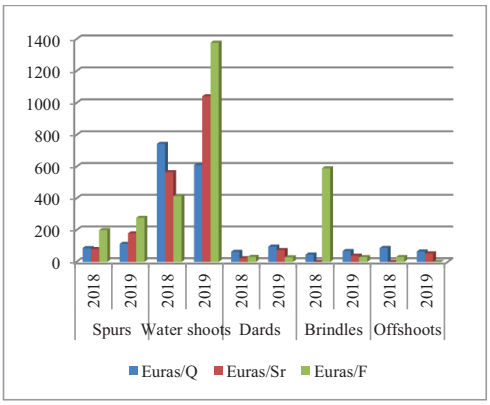

Figure 10. Total flowering shoots length to 'Euras' cultivar

'Cristal' presented significant vegetative growth on offshoots. Farold 40 led to the highest vegetative growths and quince to the smallest (Figure 11).

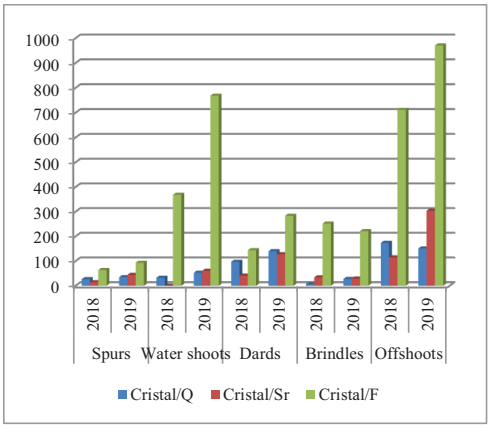

Figure 11. Total flowering shoots length to 'Cristal' cultivar

Spurs and brindles had significant growth at 'Corina' cultivar (Figure 12) similar to Andreieș (2017).

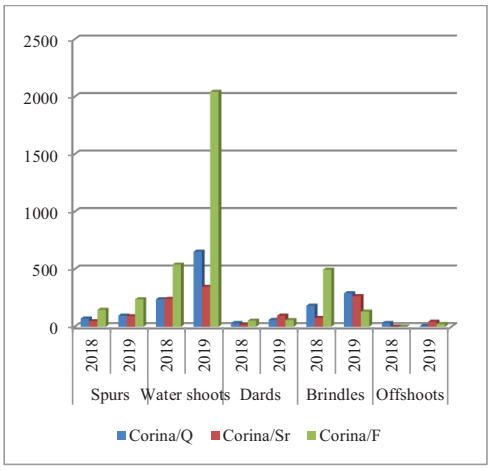

Figure 12. Total flowering shoots length to 'Corina' cultivar

'Romcor' presented significant values for brindles and offshoots (Figure 13). Quince grafted plants had bigger vegetative growth then the other two variants.

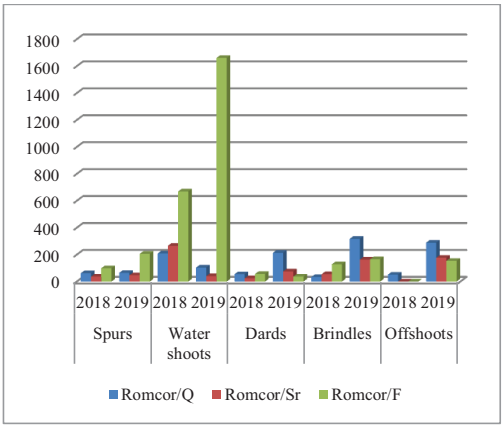

Figure 13. Total flowering shoots length to 'Romcor' cultivar

'Orizont' had brindles and spurs with the biggest growths (Figure 14).

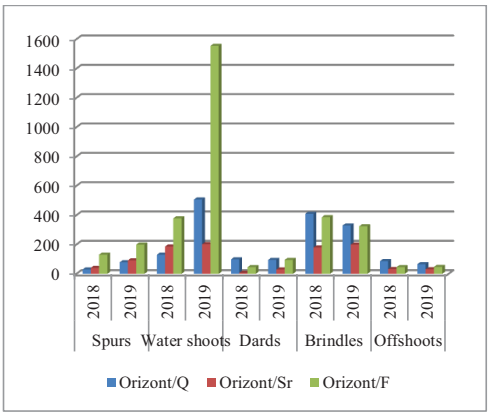

Figure 14. Total flowering shoots length to 'Orizont' cultivar

Spurs and brindles at 'Tudor' presented significant growths for the flowering shoots similar with Andreieș (2017) (Figure 15).

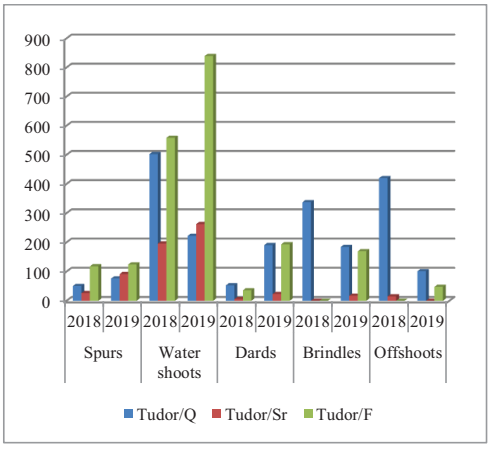

Figure 15. Total flowering shoots length to 'Tudor' cultivar

Production

Productivity was influenced by the rootstock. Farold 40 led to the highest production followed by quince and self-rooted trees excepting 'Euras' were quince led to bigger values. 'Cristal' presented the highest productivity on seedling rootstock, 'Euras', 'Romcor' and 'Orizont' on quince and 'Corina' on self-rooted rootstock. Seedling rootstock generally led to bigger production. Self-rooted trees registered the smallest values for production (kg/tree) (Figure 16).

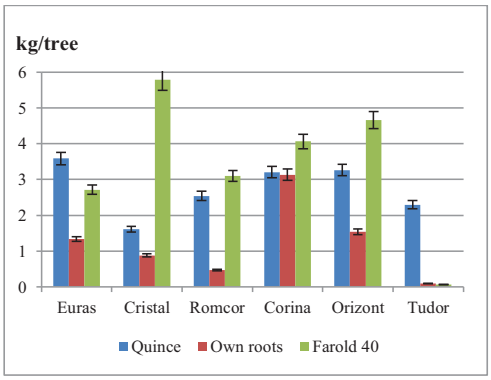

Figure 16. Estimation of yield/tree for each variety analysed

The highest productivity index was on 'Corina' and 'Orizont' self-rooted (0.67 kg/cm^2, respectively 0.50 kg/cm^2) and 'Cristal' on Farold 40 (0.56 kg/cm^2) (Figure 17)

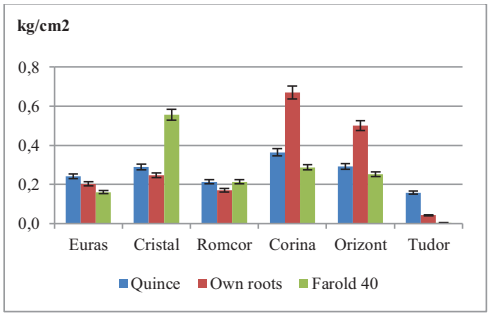

Figure 17. Productivity index influenced by cultivars and rootstock

'Romcor' cultivar self-rooted presented an average weight of 237 g/fruit, similar with the cultivar description (Andreieș, 2017); 'Corina' on Farold 40 (143.75 g/fruit) had also values according to the pontential of the cultivar (Figure 18). Similar with Wertheim (2002) it couldn't be registered a correlation between rootstock and fruit weight.

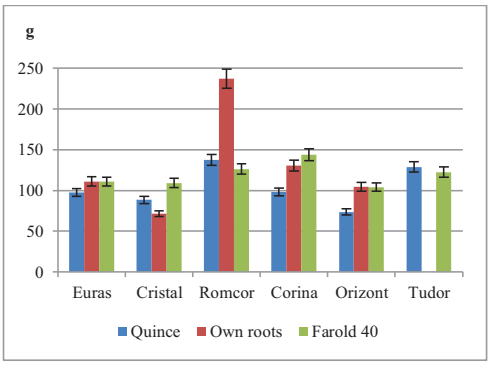

Figure 18. Fruit weight according to cultivars and rootstock

Fruit characteristics at the harvest moment

Rootstock influenced the fruit index form at 'Euras' and 'Tudor' cultivar (Table 1).

Table 1. The influence of cultivar and rootstock on fruit Index form

Cultivar	Form Index		
	Quince	Own roots	Farold 40
'Euras'	1.15	1.05	1.08
'Cristal'	1.08	1.08	1.07
'Romcor'	1.00	1.10	0.98
'Corina'	1.02	1.04	1.08
'Orizont'	0.98	0.98	0.96
'Tudor'	1.26	-	1.08
R3-146	-	-	0.96
H5-5-84	-	-	1.12
H12-83-79	1.04	-	1.08

The quince grafted cultivars presented the biggest values for firmness at the harvest moment comparing with the other two variants (Figure 19).

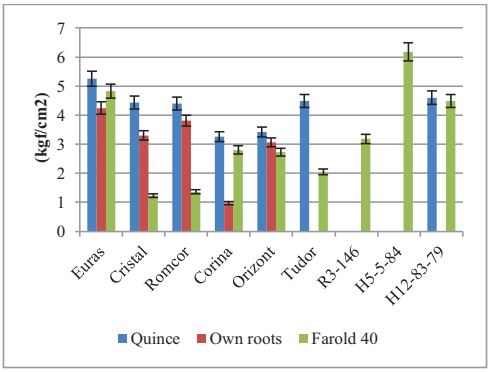

Figure 19. Fruit firmness at the harvest moment

Dry matter content varied between 17.28% ('Corina' self-rooted) and 27.06% ('Cristal' on Farold 40) (Figure 20). Quince grafted varieties presented similar values for dry matter.
The values were bigger than Ghena and Branişte (2003) and Andreieş (2017).

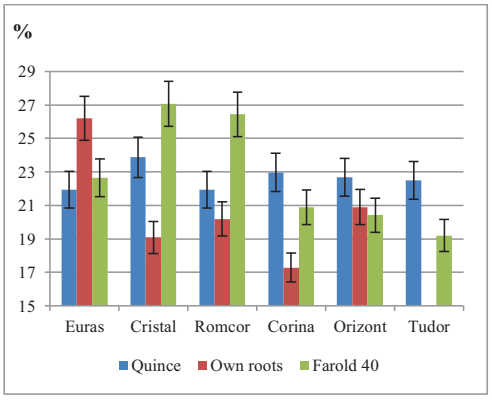

Figure 20. Dry matter influenced by cultivar and rootstock

Total soluble sugars at the harvest moment were between 12.66% ('Corina' on Farold 40) and 6.63% ('Orizont' on quince).
'Euras' registered the highest values comparing with other cultivars. Significant differences were on cultivars 'Corina' and 'Orizont' between quince and the other two experimental variants (Figure 21).
Quince grafted cultivars presented highest values for total soluble sugars, excepting 'Romcor'.

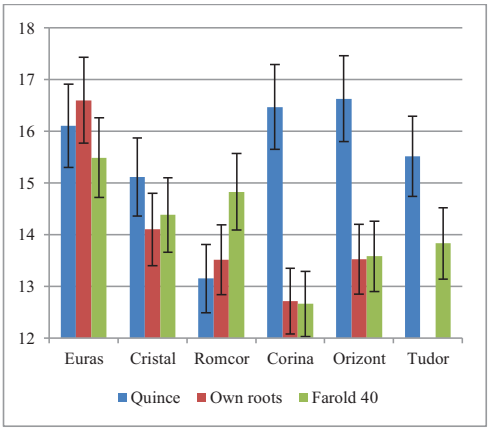

Figure 21. Total soluble sugars on pear cultivars

The results are similar with Ghena and Branişte (2003), Stănică and Branişte (2011), Hoza (2003), Grădinariu (2002), Cimpoieş (2018). 'Euras' presented higher values for total soluble sugars (more than 11%).

CONCLUSIONS

This research presents the first results of new Romanian pear disease resistant cultivars tested within the Experimental Orchard of USAMV Bucharest.
Results confirmed the biggest growth given by Farold 40 and also the characteristic of these new cultivars to produce mainly on short flowering shoots, excepting 'Orizont' cultivar.
Varieties grafted on Farold 40 presented the highest production followed by quince and self-rooted trees excepting 'Euras' were quince led to bigger values.
There wasn't noticed a correlation between rootstock and fruit weight.
Dry matter content varied between 17.28% and 27.06%, significantly higher than in other studies (14-16%). Quince grafted cultivars presented similar values for dry matter.
Total soluble sugars at the harvest moment were between 12.66% and 16.63%. Quince grafted cultivars presented highest values for total soluble sugars, excepting 'Romcor'.
The new Romanian pear resistant cultivars presented valuable qualities and can be promoted with success for intensive production.

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