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RESEARCHES ON THE IMPACT OF CHEMICAL FRUIT THINNING WITH ETHREL UPON FRUITS' QUALITY OF SOME PEACH AND NECTARINE VARIETIES CULTIVATED IN THE WESTERN PART OF ROMANIA

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Abstract

The peach tree is one of the most appreciated fruit species cultivated in the temperate climate because of the special qualities of its fruits and also because of tree's particularities. In this article we present the impact of chemical thinning with Ethrel in different concentrations upon the content of soluble dry substance, rephractometrical determined, sugars, determined by soluble dry substance method, total acidity, determined by juice extraction and titration with NaOH, and gluco-acidimetric index. The data were collected in 2006 from 2 varieties of peach – Spring Lady and Maja, and 2 nectarine varieties – Caldesi 2000 and Nectaross cultivated in conditions of Periam, Timis County. The trees were planted at a distance of 4.0 x 2.5 m, having a density of 1000 trees/ha and the crown system is Palm Spindelbusch. The soil was maintained clean by mechanical hoes and Roundup 360 SL herbicide. Chemical thinning was done at 25 days after fruit binding, moment when the ovule (the future stone seed) had 10-12 mm, being done in four different concentrations: 125 ppm, 250 ppm, 350 ppm and 500 ppm. The results obtained showed that sugars increase in those variants where thinning was more severe (500 ppm and 350 ppm), than in those with slightly thinning (125 ppm and 250 ppm), while in the control variant the values obtained were the smallest. Total acidity had higher values in the control variant and smaller when using 500 ppm Ethrel. The differences between the varieties are given by their genetic nature and by some phenological differences at the moment of treatment. Severe chemical thinning is not recommended in commercial orchards because it reduces very much the number of fruits remained on the trees, even though they will have better physical-chemical features, having a bad impact upon the production obtained. We recommend moderate chemical thinning done with Ethrel in concentrations of 250-350 ppm, which have a good impact at the same time upon the qualitative and quantitative productions.

Key words: *acidity, chemical thinning, nectarine, peach, sugars.*

INTRODUCTION

Peach tree is one of the most appreciated fruit species cultivated in the temperate climate because of the special qualities of its fruits and also because of tree's particularities.

Peaches, as flavour, are placed after grapes, oranges and apples, having a complex chemical composition and can be eaten both fresh and processed into syrup, jam, juice, nectar, distilled etc. [2].

Standardization of production technology is a major operation and is achieved by: fructification pruning, chemical standardization of flowers and fruits; manual or mechanized fruit thinning. Fructification pruning is the main rate-setting operation of a load of fruit, but for peach tree this operation does not fully solve the problem because the species is auto-fertile, the percentage of binding being up to 94% of all flowers. Physiological fall of fruits does not resolve entirely the thinning process, as it occurs later in time and its effect upon fruits' size and quality is minor [3, 5].

Chemical thinning can be done with Ethrel 350-500 ppm, depending on the variety, applied at 15-30 days after flowering. The effect is satisfying after 2-3 weeks [8].

Thinning determines modifications of fruits' size, their weight and proportion between main

components, respectively pulp and stone. For small fruits there is an insufficient pulp development, and the skin is thin and very pubescent [4, 7].

MATERIAL AND METHOD

The experiment done on chemical thinning with Ethrel was placed in 2006 in a private orchard in Periam locality, an area in the western part of Romania, well-known for its tradition in cultivating peach trees.

The biological material consists in 2 varieties of peach trees: *Spring Lady* and *Maja* and two varieties of nectarine trees: *Nectaross* and *Caldesi 2000*, which were planted at a distance of 4m between the tree rows and 2.5 m between the trees on a row, giving a density of 1000 trees/ha. These trees have the same crown system: simple palmet, the same orchard floor management (ploughing on the interval and disc tillage and weed control with Roundup 3-4 l/ha on the tree rows), the same fertilization system (approximate doses of 90-100 kg/ha N, 60-80 kg/ha P_2O_5 and 100-120 kg/ha K_2O), the same treatment scheme (done according to the prognosis for pests and diseases, being done 8-12 treatments/year) and the same irrigation method (water is applied according to the needs by applying 2-4 watering).

In this article we present chemical thinning done with Ethrel (ethephon) on all four peach varieties, using four concentrations, which determined the experimental variants:

V1 – 125ppm
V2 – 250ppm
V3 – 350ppm
V4 – 500ppm
V5 – Not thinned, control variant

Chemical thinning was done at 25 days after fruit binding, moment when the ovule (the future stone seed) had 10-12 mm.

The main chemical substances in peaches' composition are sugars, organic acids, pectic substances, tannins, vitamins and minerals [6].

The content of dry soluble substance was determined with the digital rephractometer, sugars content was determined by calculation according to the soluble dry substance (4 x s.d.s. / 100 – 4,25), and total acidity was determined by juice extraction and titration with NaOH, expressed in malic acid [1].

At the same time there was calculated the sugars-acidity index, which expresses the taste quality of fruits, so that for high values of this index fruits have a low acidity and they don't quench thirst, and for higher values of this index the fruits are too sour, they quench thirst, but the taste is too strong, especially when and if there is a large quantity of tannins.

The data were collected in 2006 from all the varieties, for each experimental variant, they were calculated and interpreted as shown below.

RESULTS AND DISCUSSIONS

In 2006, for *Spring Lady* variety the soluble dry substance ranged from 8.8% in variant 1 up to 9.5% in variant 3, determining a total sugars content from 6.85% in variant 1 to 7.59% in variant 3 (350 ppm). Total acidity had the highest value of 0.54% in the control variant and the smallest value of 0.45% in variant 4. We can observe that in those variants with a more severe thinning the acidity is more intensively metabolised. In conclusion, the sugars-acidity index had a value of 12.88 in the control variant and of 16.64 in variant 4 (Table 1).

For *Maja* variety, there was determined a higher content of sugars, than in the fruits of the previous peach variety and a smaller content of acidity, which shows that this variety has a better quality. The soluble dry substance ranged from 12.00% in variant 5 – the control up to 13.30% in variants 3 and 4, determining a total sugars content from 10.25% in variant 5 – the control to 11.63% in variants 3 (350 ppm) and 4 (500 ppm). Total acidity had the highest value of 0.42% in variant 1 and the smallest value of 0.38% in variant 4, so that the sugars-acidity index had a value of 25.00 in the control variant and of 30.61 in variant 4 (Table 2).

Table 1. Fruits' chemical composition for Spring Lady variety

Variant	Soluble dry substance (%)	Total sugars (%)	Acidity (malic acid %)	Sugars-acidity index
V1-125ppm	8.8	6.85	0.49	13.98
V2-250ppm	9.2	7.28	0.47	15.48
V3-350ppm	9.5	7.59	0.47	16.16
V4-500ppm	9.4	7.49	0.45	16.64
V5-Not thinned	8.9	6.96	0.54	12.88

Table 2. Fruits' chemical composition for Maja variety

Variant	Soluble dry substance (%)	Total sugars (%)	Acidity (malic acid %)	Sugars-acidity index
V1-125ppm	12.40	10.68	0.42	25.42
V2-250ppm	12.90	11.21	0.39	28.73
V3-350ppm	13.30	11.63	0.39	29.82
V4-500ppm	13.30	11.63	0.38	30.61
V5-Not thinned	12.00	10.25	0.41	25.00

Nectaross nectarine variety gave better results than *Caldesi 2000* variety considering the chemical compositions, so that the soluble dry substance ranged from 11.7% variant 5 – the control up to 12.30% in variant 4, determining a total sugars content from 9.93% in variant 5 – the control and 10.57% in variant 4 (500 ppm). Total acidity had the highest value of 0.45% in the control – not thinned variant and the smallest value of 0.41% in variant 4, so that the sugars-acidity index had a value of 22.07 in the control variant and of 25.78 in variant 4 (Table 3).

For *Caldesi 2000* variety, the soluble dry substance ranged from 10.30% in variant 5 – the control up to 11.40% in variant 4, determining a total sugars content of 8.44% in variant 5 – not thinned and 9.61% in variant 4 (500 ppm), while total acidity had the highest value of 0.36% in the control – not thinned variant and in variant 1 and the smallest value of 0.35% in all the other thinned variants (V2, V3 and V4). According to this, sugars-acidity index had a value of 23.45 in the control variant and of 27.46 in variant 4 (Table 4).

Table 3. Fruits' chemical composition for Nectaross variety

Variant	Soluble dry substance (%)	Total sugars (%)	Acidity (malic acid %)	Sugars-acidity index
V1-125ppm	11.8	10.04	0.44	22.81
V2-250ppm	11.9	10.14	0.42	24.15
V3-350ppm	12.1	10.36	0.42	24.66
V4-500ppm	12.3	10.57	0.41	25.78
V5-Not thinned	11.7	9.93	0.45	22.07

Table 4. Fruits' chemical composition for Caldesi 2000 variety

Variant	Soluble dry substance (%)	Total sugars (%)	Acidity (malic acid %)	Sugars-acidity index
V1-125ppm	10.7	8.87	0.36	24.64
V2-250ppm	10.8	8.98	0.35	25.64
V3-350ppm	11.2	9.40	0.35	26.86
V4-500ppm	11.4	9.61	0.35	27.46
V5-Not thinned	10.3	8.44	0.36	23.45

Considering the most important chemical features – sugars and acidity, there was done a comparison between the four varieties. We can see that sugars content for all variants was higher for Maja variety from the peaches' group and for Nectaross variety from nectarines' group. The values increase accordingly to the concentration use, so that in the not thinned variants and the ones thinned with Ethrel in concentration of 150 ppm the values were smaller and they increase in variants 2 (250 ppm), 3 (350 ppm) and 4 (500 ppm). We can notice that for Spring Lady variety in variant 1 there was determined the smallest content of sugars – 6.85%, this value being surpassed even by the fruits in the not thinned variant – 6.96%. For Maja variety there was obtained the highest content of sugars, and this value was the same in variant 3 and variant 4 – 11.63%, this being the best peach variety considering this quality element (Fig. 1).

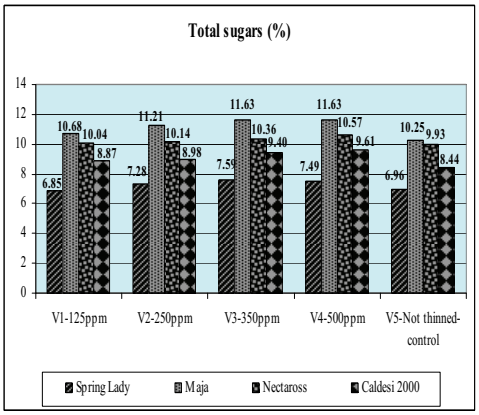

Fig. 1. Sugars content of peaches and nectarines

By analysing the acidity and the values obtained from the fruits of the four varieties in each variant, we can observe that for most of the varieties this element had the highest values in variant 5 – not thinned, especially for Spring Lady variety – 0.54%. Very close values to the ones obtained in the control variant were obtained in variant 1, for Maja variety being even higher with 0.01%. In fruits it is important that there is a good balance between the acidity and the sugars content, so that the fruits' would have a good taste. For this element, we remark the smallest values obtained from all the variants in variant 4, followed at equal values by variants 3 and 2 (Fig. 2).

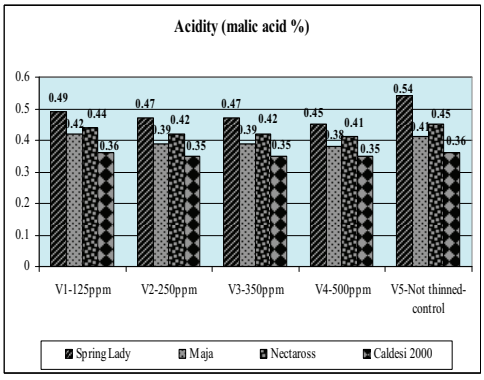

Fig. 2. Acidity content of peaches and nectarines

CONCLUSIONS

For all the elements determined we can say that the differences between the varieties are due to their genetical nature, and sometimes due to some phenological differences.

Sugars and acidity content in fruits are determined by the technological links applied in culture, but mainly by the genetical structure of the varieties and their behaviour in the culture area.

For all four varieties there was noticed a smaller content of sugars and soluble dry substance in the control – not thinned variant and higher values in variant 4 – 500 ppm Ethrel. His can be explained as the trees feed a smaller number of fruits, which grow better and have a better quality.

In reverse, total acidity had higher values in the control – not thinned variant and smaller values in variant 4 – 500 ppm Ethrel.

We recommend moderate chemical thinning done with Ethrel in concentrations of 250-350 ppm, which have a good impact at the same time upon the qualitative and quantitative (not presented in this article) productions.

Among the peach varieties, *Maja* variety remarked by the high quantities of sugars and small amounts of acidity in fruits, which was also observed for *Nectaross* nectarine variety.

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