

## Effect of the Chemical Weed Control on the Vegetative Habits of Newly Planted Peach and Nectarine Orchards

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**Abstract:** The studies were carried out in 2005 – 2006 in a experimental plantation of the Fruit-Growing Institute – Plovdiv. The effect of the chemical weed control on the vegetative habits of young peach and nectarine trees was investigated. Early in the spring, before vegetation, the soil within the row of the plantation was treated with the soil herbicide pendimethalin – Stomp 33 EC – 4,0 l/ha. During vegetation two treatments with the total leaf contact herbicide diquat – Reglone forte – 3,0-3,5 l/ha were applied against secondary weed infestation.

External symptoms of phytotoxicity and obvious disturbances of the tree growth after the treatment with pendimethalin (Stomp 33 EC – 4,0 l/ha) were not observed. Significant changes in the content of the leaf pigments were not established. Any depressing effect on the tree growth, reported as a length of the annual shoot increment, enlargement of the stem cross section area and increase of the crown volume, was not detected.

In newly planted peach and nectarine orchards the following weed control system can be recommended: early spring treatment with pendimethalin – Stomp 33 EC – 4,0 l/ha, and, during vegetation – with diquat – Reglone forte -3,0-3,5 l/ha .

**Key words:** herbicides, peach, nectarine, vegetative habits, *a*, *b* and *a+b* chlorophyll.

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### Introduction

Creating optimal conditions for fruit tree growth and development especially in the first years after planting the orchard, was the prerequisite that guaranteed the successful start of their further cultivation (Stamatov et al. 1982; Petrov, Grigorov, 1981). The strong agricultural background also required an efficient weed control as the basic limiting factor of growth. In that aspect weed control in the collection plantations was needed with the aim of promoting

favorable conditions for the manifestation of the vegetative and initial productive habits of the studied cultivar samples.

It was known that stone fruit species, including peach and nectarine, were more susceptible to herbicide application (Mitchell, 1987; Mitchell and Abernethy 1989; Ben-Arie, 1992; Omafra, 2006). That necessitated the investigation on the effect of different active substances on the growth and development of newly planted orchards of stone fruit species.

The aim of the present study was to establish the effect of the chemical weed control on the vegetative habits of newly planted peach and nectarine orchards.

### Material and Methods

The experiments were carried out in 2005/2006 in a experimental plantation on the territory of the Fruit-Growing Institute – Plovdiv. The Bulgarian peach cultivar Ognianka, introduced cultivar Filetta and the selected elites No. 482 and No. 23-15, the latter being nectarine, were included in the study. Both elites were established at the Fruit-Growing Institute – Plovdiv as a result of the breeding programme for improving the peach and nectarine cultivars, which programme started in 1989 (Zhivondov, 1994). All the cultivar samples were grafted on peach seedling rootstocks. The plantation was established in 2005 at a planting distance of 5 x 3 m. In spring before the beginning of vegetation the soil within the row was treated with the soil herbicide pendimethalin – trademark name of Stomp 33 EC – applied at the rate of 4.0 l/ha. The following variants were studied: 1. Ognianka (control); 2. Ognianka – treated; 3. Elite No. 482 – control; 4. Elite No. 482 – treated; 5. Filetta – control; 6. Filetta – treated; 7. Elite No. 23-15 – control; 8. Elite No. 23-15 – treated.

The experiment was set by the long plot design in three repetitions. During vegetation the strip within the row was treated twice for control of the late (secondary) weed infestation with the leaf contact herbicide diquat (trademark Reglone forte – 3,0-3,5 l/ha) by direct spraying with a sprayer with protectors for preserving the tree leaf mass. During vegetation (15-20 June) the absolute dry matter (in weight) was analyzed, as well as the  $a$ ,  $b$  and  $a+b$  chlorophyll content (spectrophotometrically) in mean leaf samples of the separate variants. At the end of vegetation (in October) the following biometrical characteristics were reported: length of the annual shoot increment (cm), stem cross section area ( $S - \text{cm}^2$ ) and crown volume ( $V - \text{m}^3$ ). The results obtained were processed by the methods of dispersion analysis.

### Results and Discussion

The soil herbicide pendimethalin (Stomp 33 EC) at a rate of 4,0 l/ha exerted an efficient control of the annual weed species (*Veronica hederifolia* L., *Sinapis arvensis* L., *Lamium amplexicaule* L., *Lamium purpureum* L., *Polygonum aviculare* L., *Xanthium strumarium* L., *Chenopodium album* L., *Amaranthus retroflexus* L.) forming the weed association in the strip within the row of the plantation. The post-effect duration of the herbicide pendimethalin was 90 days. That eliminated the

competition for water and nutrient substances in the first months of tree vegetation when they were most susceptible. An efficient control against secondary weeding was provided by twice application of diquat during vegetation (July and August).

External symptoms of phytotoxicity and obvious suppression of the tree growth were not established.

The results about the absolute dry matter and  $a$ ,  $b$  and  $a+b$  chlorophyll content are presented in Table 1.

Table 1. Chlorophyll content in the leaves (mg/g to the absolute dry matter)

| Variants                       | Chlorophyll – mg/g to the absolute dry matter |      |      |       |
|--------------------------------|-----------------------------------------------|------|------|-------|
|                                | Absolute dry matter - %                       | $a$  | $b$  | $a+b$ |
| 1. Ognyanka (Control)          | 40,13                                         | 1,33 | 1,00 | 2,33  |
| 2. Ognyanka (Treated)          | 39,97                                         | 1,57 | 0,96 | 2,53  |
| 3. Elite No. 482 (Control)     | 37,19                                         | 2,09 | 1,15 | 3,24  |
| 4. Elite No. 482 (Treated)     | 35,10                                         | 2,89 | 1,05 | 3,34  |
| 5. Filetta (Control)           | 42,80                                         | 1,18 | 0,64 | 1,82  |
| 6. Filetta (Treated)           | 39,88                                         | 1,60 | 0,83 | 2,44  |
| 7. Elite No. 23-15 (Control)   | 39,30                                         | 1,32 | 0,66 | 2,18  |
| 8. Elite No. – 23-15 (Treated) | 37,64                                         | 1,29 | 0,94 | 2,23  |

n.s.

Significant effect on the content of leaf pigments was not established after the application of pendimethalin. The differences to the respective control variant were statistically insignificant. However, there was a tendency to an increased content of leaf pigments in the plants treated with pendimethalin. It showed the absence of any depressing effect exerted by the active substance on the physiological status of the trees.

Data of the biometrical measurements were analogous throughout the years of the study and they were discussed as mean values. For all the three peach variants and for the nectarine elite variant treated with herbicides, the trees had bigger annual increment compared to those of the untreated control variants (Fig. 1). The differences to the control variant were statistically significant only in nectarine variants( var.7 and var.8 ).

On the grounds of those results it could be assumed that the application of pendimethalin – Stomp 33 EC – 4,0 l/ha did not exert depressing effect on that biometrical characteristics.

The results about the effect of pendimethalin on the cross section area and the crown volume were analogous (Fig. 2 and Fig. 3). The trees of the treated variants had higher or closer values of the two studied biometrical characteristics compared to the control.

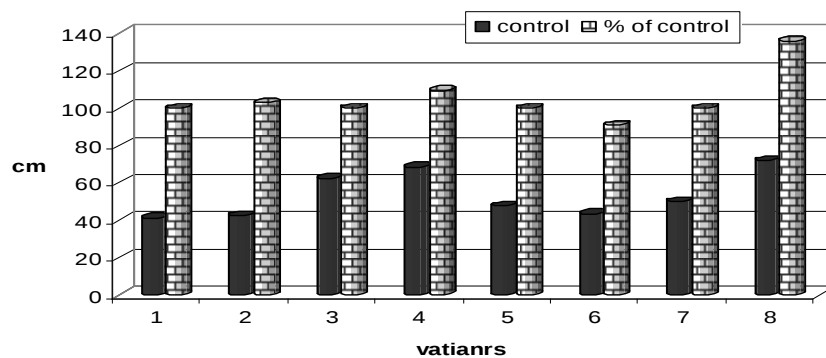
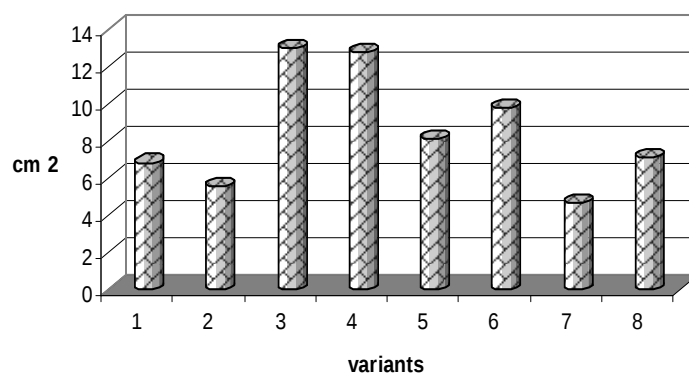
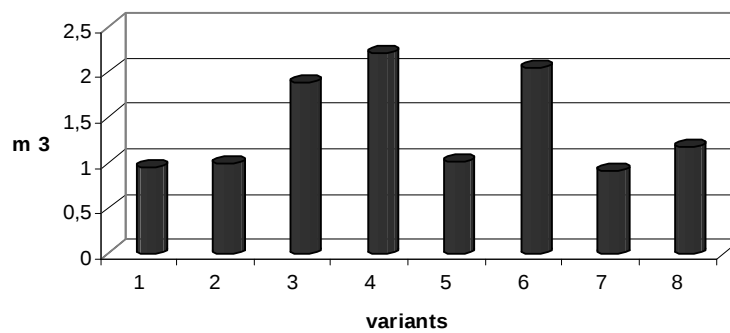


Figure1. Effect of the applied herbicides on the length of the annual increment (cm)

Figure 2. Effect of the applied herbicides on the stem cross section area (S-cm<sup>2</sup>)Figure 3. Effect of the applied herbicides on the crown volume (V-m<sup>3</sup>)

The results obtained gave the grounds to conclude that the application of the systematic soil herbicide pendimethalin at the rate of 4,0 l/ha from the trademark Stomp 33 EC in newly planted peach and nectarine orchards did not have a depressing effect on tree growth. The higher values of the biometrical characteristics in the treated variants resulted from the absence of herbicide phytotoxicity as well as from the elimination of the weed competition for water and nutrient substances. In previous studies it was established that pendimethalin applied at a similar rate did not have a depressing effect on the vegetative habits of apricot seedling rootstocks (Rankova, 2004). In that case, the tree habits under the effect of the systematic soil herbicide pendimethalin were analyzed because the leaf total herbicide diquat (Reglone forte) applied for control against late weed infestation had a contact mechanism of action, and, when improperly used, could cause only external symptoms of phytotoxicity manifested as necrosis.

Table 2. Vegetative habits on trees, treatment with herbicides

| Variants                       | Length of the annual increment (cm) |    | Stem cross section area (S-cm <sup>2</sup> ) |    | Crown volume (V-m <sup>3</sup> ) |   |
|--------------------------------|-------------------------------------|----|----------------------------------------------|----|----------------------------------|---|
| 1. Ognyanika (Control)         | 41.37                               | b  | 6.83                                         | b  | 0.94                             | a |
| 2. Ognyanika (Treated)         | 43.03                               | b  | 5.53                                         | b  | 0.88                             | a |
| 3. Elite No. 482 (Control)     | 62.50                               | ab | 13.03                                        | a  | 4.01                             | a |
| 4. Elite No. 482 (Treated)     | 68.43                               | b  | 12.80                                        | a  | 3.98                             | a |
| 5. Filetta (Control)           | 47.87                               | b  | 8.17                                         | ab | 1.01                             | a |
| 6. Filetta (Treated)           | 43.50                               | b  | 9.93                                         | ab | 2.04                             | a |
| 7. Elite No. 23-15 (Control)   | 50.17                               | b  | 4.72                                         | b  | 0.91                             | a |
| 8. Elite No. – 23-15 (Treated) | 72.03                               | a  | 7.13                                         | b  | 1.16                             | a |
| Gd 5 %                         | 15.8                                |    | 5.14                                         |    | 2.91                             |   |

### Conclusions

- Treatment with the systematic soil herbicide pendimethalin (Stomp 33 EC – 4,0 l/ha) did not cause neither external symptoms of phytotoxicity, nor tree growth suppression.
- Significant effect on the content of leaf pigments was not established but there was a tendency of a bigger a, b and a+b chlorophyll content in the plants of the treated variants.
- Depressing effect on the tree growth affecting the length of the annual shoot increment, the stem cross section area and the crown volume was not reported.
- When growing newly planted peach and nectarine orchards the following system of weed control can be recommended: early spring treatment with pendimethalin – Stomp 33 EC – 4,0 l/ha and during vegetation – application of diquat – Reglone forte – 3,0-3,5 l/ha.

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## **UTICAJ HEMIJSKOG SUZBIJANJA KOROVA NA VEGETATIVNI RAST MLADIH ZASADA BRESKVE I NEKTARINE**

- originalni naučni rad -

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### **Rezime**

Istraživanja su obavljena u periodu 2005-2006 godine u eksperimentalnom zasadu Instituta za voćarstvo – Plovdiv. Ispitivan je uticaj hemijskog suzbijanja korova na vegetativni rast mladih voćaka breskve i nektarine. Tokom ranog proleća, pre vegetacije, zemljište unutar redova zasada tretirano je zemljišnim herbicidom pendimetalinom – Stomp 33 EC – 4,0 l/ha. Tokom vegetacije, primenjena su dva tretmana totalnim herbicidom za tretiranje listova dikvatom – Reglone forte – 3,0 – 3,5 l/ha u cilju suzbijanja sekundarne zakorovljenosti.

Spoljašnji simptomi fitotoksičnosti i očigledni poremećaji rasta voćaka nakon tretmana pendimetalinom (Stomp 33 EC – 4,01 l/ha) nisu primećeni. Nije bilo značajnih promena sadržaja lisnih pigmenata. Nije zabeleženo ni smanjenje rasta voćaka, u pogledu dužine godišnjeg porasta izdanaka, povećanja površine poprečnog preseka stabla i porasta krošnje.

U mladim zasadima breskve i nektarine, može se predložiti sledeći sistem za suzbijanje korova: tretman pendimetalinom – Stomp 33 EC – 4,0 l/ha tokom ranog proleća i tretman dikvatom – Reglone forte – 3,0 – 3,5 l/ha tokom vegetacije.