Effect of Some Soil Herbicides on the Vegetative Habits of Mahaleb Cherry (*Prunus mahaleb* L.) Seedling Rootstocks

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Abstract


In 2001 - 2003 at the Fruit-Growing Institute - Plovdiv a field experiment was carried out on alluvial-meadow soil (Fluvisol) for studying the effect of the soil herbicides napropamid, pendimethalin, terbacil and metolachlore on the vegetative habits of Mahaleb cherry seedling rootstocks.

During the period of vegetation observations were carried out on plant growth and development - emergence and external symptoms of toxicity. In October the rootstock quality was determined reporting the following biometric indices: width in the grafting zone (mm), stem height (h-cm) and aboveground mass (g).

The results obtained showed that napropamid - Devrinol 4 F - 400-500 ml/da, pendimethalin - Stomp 33 EC - 400 ml/da and metolachlore - Dual Gold 960 EC - 150 ml/da could be applied in the production of Mahaleb cherry seedling rootstocks.

The soil herbicide terbacil (Sinbar 80 WP) had a strong toxic effect on the development of Mahaleb cherry seedlings causing their death.

The inhibiting effect of the soil herbicide metolachlore was expressed after the application of the highest rate of Dual Gold 960 EC - 187.5 ml/da.

Key words: *Prunus mahaleb* L., soil herbicides, vegetative habits

Introduction

The production of certified planting material necessitates the application of the proper agricultural technique in the fruit nursery, including an efficient weed control, with the aim of eliminating the weed/rootstock competition for water, light and nutrient substances. It was known that the seedlings of the fruit species were susceptible to herbicide treatment (Wazbinska, 1997; Abdul et al., 1998; Kaufman and Libek, 2000; Rankova, 2004). Data about herbicide application to seedling rootstocks of Machaleb cherry were not found. Although in the recent years new vegetative
rootstocks for cherries have been introduced in our fruit-growing practice, under our soil and climatic conditions. Prunus mahaleb L. species is still used as the major seedling rootstock for sweet and sour cherry cultivars.

The herbicide application in fruit nurseries in Bulgaria is limited. The weed control is realized mainly by hand weeding or mechanically soil-cultivation (Stamatov, 1982; Tonev, 2000). In our previous investigations the high economical results after using herbicides in the production of yellow plum and peach seedling rootstocks are established (Manolova and Rankova, 2005).

That necessitated the development of a system of chemical control against the weeds in the production of Mahaleb cherry seedling rootstocks.

The aim of the present study was to establish the effect of the soil herbicides napropamid, pendimethalin, terbacil and metolachlore on the vegetative habits of Mahaleb cherry (Prunus mahaleb L.) seedling rootstocks.

**Material and Methods**

The field experiment was carried out in the period 2001-2003 on the experimental site of the Fruit-Growing Institute - Plovdiv. The soil of the experimental plot was alluvial-meadow (Fluvisol), pH being 7.4, the mobile phosphorus content (P₂O₅) - 80 mg/100 g of soil and mobile potassium content (K₂O) - 90 mg/100 g of soil.

Stratified seeds (stones) of Mahaleb cherry were planted in the period 15-25 March on the experimental plot of an area of 1 m² for each variant (10 seeds per 1 m²) at 3-5 cm depth and 5-7 cm distance within the row. Soil herbicides were applied immediately after planting of the seeds. Four active substances of soil herbicides were used - napropamid, pendimethalin, terbacil and metolachlore - at three rate each. The following variants were set:

1. Control (untreated);
2. napropamid - Devrinol 4 F - 300 ml/da;
3. napropamid - Devrinol 4 F - 400 ml/da;
4. napropamid - Devrinol 4 F - 500 ml/da;
5. pendimethalin - Stomp 33 EC - 300 ml/da;
6. pendimethalin - Stomp 33 EC - 400 ml/da;
7. pendimethalin - Stomp 33 EC - 500 ml/da;
8. terbacil - Sinbar 80 WP - 75 g/da;
9. terbacil - Sinbar 80 WP - 100 g/da;
10. terbacil - Sinbar 80 WP - 125 g/da;
11. metolachlore - Dual Gold 960 EC - 112.5 ml/da;
12. metolachlore - Dual Gold 960 EC - 150 ml/da;

The experiment was set following the standard chess-board method in 4 repetitions.

The weed control was maintained by hand weeding out three times at intervals of 30 days. During vegetation the rootstocks were grown following the standard technology (Technology of producing fruit-tree planting material, 1986, Fruit-Growing Institute - Plovdiv). During vegetation the following indices were followed up - seedling emergence, their growth and external characteristics of phytotoxicity caused by the herbicides (chlorosis, necrosis, withering and dying of the plants).

At the end of vegetation when the rootstocks were collected from the experi-
mental plot (20-25 October), the following biometric indices were reported: plant height (cm), width in the grafting zone (mm) and aboveground mass (g). Two-factor dispersion analysis was carried out on the results obtained (Lakin, 1990).

Results and Discussion

The observations on the habits of Mahaleb cherry seedlings treated with the respective active substances showed that they were strongly susceptible to the application of soil herbicides. The seeds treated with napropamid, pendimethalin and metolachlor at the rates mentioned sprouted at the same time as those of the control. Later a certain delay in the development of the plants was observed in the variant with the highest rate of metolachlor (Dual Gold 960 EC - 187.5 ml/da), (Var.13).

In the three years of the study the seedlings treated with terbacil (Var. 8, 9, 10) reacted similarly, i.e. the single plants that emerged had strongly delayed development. Later chlorosis was observed, followed by withering and dying of the plants.

Thus, it could be presumed that the soil herbicide terbacil was toxic to the Mahaleb cherry seedlings at all the three rates applied. Data of the biometric analysis were similar in the three years of study and the average results were discussed.

The biggest width in the grafting zone was measured in the plants treated with pendimethalin - Stomp 33 EC - 400 ml/da (Var. 6), napropamid - Devrinol 4 F - 400 and 500 ml/da (Var 4 and 5) and metolachlor - Dual Gold 960 EC -150 ml/da (Var.12), (Figure 1). The differences to the control were of high statistical significance.

Values about the width, similar to those in the control, were established in the plants of the variants treated with a low rate of napropamid (Var. 2). The differences were statistically insignificant. That could be explained by the poorer herbicide efficiency of the low rate applied and the existing competition between weeds and rootstocks for moisture, nutrient substances and light. Probably the same was the reason for the smaller width established in the plants treated with a low rate of metolachlor (Var. 11).

Lower values of that biometric index were also established in the plants of the variant treated with the highest rate of metolachlor - Dual Gold 960 EC - 187.5 ml/da (Var. 13). That was probably due to the depressing effect of the high rate of metolachlor on rootstock development.

Analogous results were obtained about the effect of the soil herbicides on stem height (Figure 2).

The plants of the variants, in which napropamid (Var. 2-4), pendimethalin (Var.
5-7), and metolachlore (Var. 11 and 12) were applied, were higher compared to those of the control. The differences were statistically significant. Values close to or lower than the control variant were established again in the plants of variants 2 and 13. That was probably due to the reasons already mentioned - weak herbicide effect of the lower rate of napropamid, the existing competition with the weeds (Variant 2) and the depressing effect of the high rate of metolachlore (Variant 13).

The influence of soil herbicides on the aboveground mass of the rootstocks was analogous (Figure 3).

The plants of all the variants treated with soil herbicides had bigger aboveground mass than those in the control. The differences to the control variant were statistically significant. That could be explained by the efficient weed control of the herbicides and the elimination of the competition in the first three months of the vegetation of the seedlings.

When comparing the habits of Mahaleb cherry seedlings with that of seedling rootstocks of other fruit species, it could be admitted that Prunus mahaleb L. species was more susceptible to the applied soil herbicides in comparison with yellow plum and peach (Rankova, 2004). The lack of phytotoxicity in the rootstocks after treatment with napropamid and pendimethalin at the applied rates showed analogous habits. The depressing effect of the active substance metolachlore in the plants of Mahaleb cherry was established only after applying the highest rate of Dual Gold 960 EC (Var. 13).

**Conclusion**

- It is recommended to apply napropamid - Devrinol 4 F - 400-500 ml/da, pendimethalin - Stomp 33 EC - 400 ml/da and metolachlore - Dual Gold 960 EC - 150 ml/da. in the production of seedling rootstocks of Mahaleb cherry.
The soil herbicide terbacil (Sinbar 80 WP) had a strong toxic effect on the development of Mahaleb cherry seedlings causing their death.

The inhibiting effect of the soil herbicide metolachlore was manifested when applying the highest rate of Dual Gold 960 EC - 187.5 ml/da.

References


Technology of producing fruit-tree planting material, 1986, Fruit-Growing Institute - Plovdiv
