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Effect of Some Soil Herbicides on The Vegetative Habits of Walnut Seedlings (*Juglans Regia* L.)

Zarya Rankova

Fruit-Growing Institute, Plovdiv, Bulgaria

Abstract: The effect of the soil herbicides napropamid, pendimethalin, terbacil, metolachlore, linuron, oxyfluorofen, oxadiargyl and isoxaflutol on the vegetative habits of walnut seedlings, cv. Kuklenski was studied in a model pot experiment under controlled conditions.

The depressing effect on seedling development expressed in growth suppression and significant decrease of the aboveground plant mass was established after treatment with pendimethalin – Stomp 33 EC - 400 ml/da, metolachlore – Dual gold 960 EC - 150 ml/da and oxyfluorofen – Galigan 240 EC – 200 ml /da.

When applying napropamid – Devrinol 4 F – 400 ml/da, terbacil – Sinbar – 80 WP – 100 g/da, linuron – Afalon 45 SC – 300 ml/da and isoxaflutol – Merlin 750 WG – 5 g/da phytotoxicity expressed in suppressing the vegetative habits was not established in walnut seedlings.

Key words: soil herbicides, walnut, vegetative habits.

Introduction

The seeds of fruit species, which are used for rootstocks, are susceptible to the application of soil herbicides. The possible habits are growth suppression and obtaining non-standard rootstocks that prevents from their being grafted on and producing good quality planting material (Wazbinska,1997; Kaufman, Libek, 2000; Rankova, 2004; Rankova, 2006).

The aim of the present experiment was to study the effect of some soil herbicides on the vegetative habits of walnut seedlings under controlled conditions.

Material and methods

The study was carried out in 2005/2006 at the Fruit-Growing Institute – Plovdiv.

Stratified walnut seeds (stones) of Kuklenski cultivar were planted (by 5 seeds) in pots of a volume 1 kg of soil (alluvial-meadow, pH - 7,2, P_2O_5 - 21,6 mg/100g of soil, K_2O - 25,0 mg/100g of soil). Treatment with soil herbicides was applied immediately after planting. Nine variants in 5 replications were set.

Variants: 1. Control (untreated); 2. Napropamid – Devrinol 4 F – 400 ml/da; 3. Pendimethalin – Stomp 33 EC - 400 ml/da; 4. Terbacil – Sinbar – 80 WP – 100 g/da; 5. Metolachlore – Dual gold 960 EC - 150 ml/da; 6. Linuron – Afalon 45 SC – 300ml/da; 7. Oxyfluorofen – Galigan 240 EC – 200 ml/da; 8. Oxadiargyl - Raft 800 WG – 25 g/da; 9. Isoxaflutol – Merlin 750 WG – 5 g/da.

The plants were grown in a glass-house for 60 days under controlled conditions (temperature of 20-25⁰ C and relative air humidity of 65 – 70 %). During that period observations were carried out on seedling sprouting, their development and external characteristics of toxicity. At the end of the period the following biometric indices were reported: stem height /h - cm/, aboveground mass (g) /stem+leaves/ and number of leaves /n/ -in average per plant.

Results and discussion

Differences in the rate of seedling sprouting were not established between the variants treated with herbicides and those of the control. External characteristics of toxicity (chlorosis, necrosis, stem and leaf withering) did not develop. Later in the plants of the variants treated with pendimethalin (Variant 3), metolachlore (Variant 5) and oxyfluorofen (Variant 7) delayed development of the seedlings was observed.

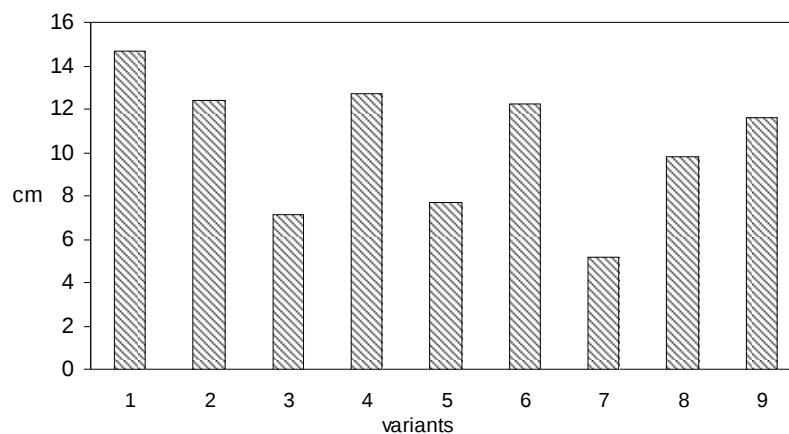
The results of the biometric analysis showed that the applied soil herbicides had different effects on the growth and development of the walnut seedlings. The plants of the variants treated with napropamid, terbacil, linuron and isoxaflutol /Variants 2, 4, 6 and 9/ had closer to stem height than the control /Fig. 1/. The differences were not statistical significance.

Stem height was lower in the plants of the variants with applied pendimethalin, metolachlore and oxyfluorofen (Variants 3, 5 and 7). The differences were with very good statistical significance. It was the reason to assume that the application of those soil herbicides suppressed the stem growth of the walnut seedlings.

The plants of all the variants treated with herbicides had smaller aboveground mass (Fig. 2).

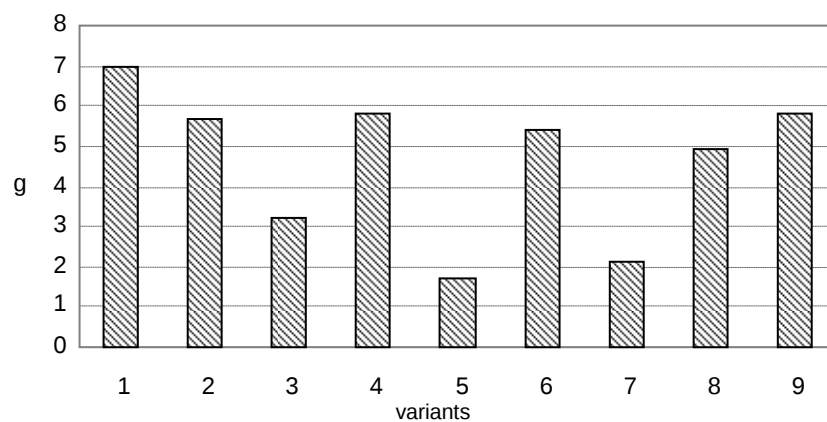
Values closest to the control were reported in the plants of variants 4 and 9.

The aboveground mass was also the smallest in the plants treated with pendimethalin, metolachlore and oxyfluorofen (Variants 3, 5 and 7). The differences to the control were with high statistical significance.



Gd 5%=4,44; 1%=6,08; 0,1 %=8,28

Figure 1. Effect of soil herbicides on stem height (h- cm)

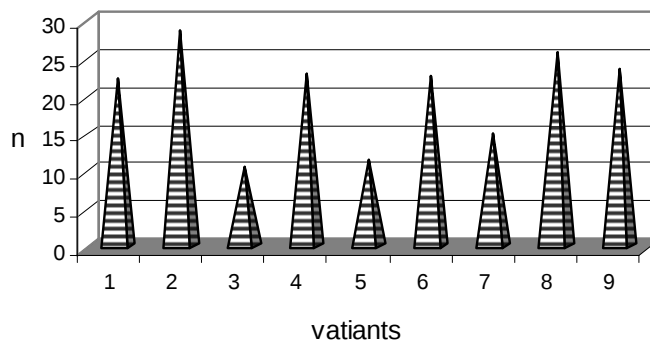


Gd 5%=1,51; 1%=2,07; 0,1 %=2,81

Figure 2. Effect of soil herbicides on the aboveground plant mass (g)

Thus, it could be assumed that those soil herbicides had a depressing effect on the growth of walnut seedlings.

That effect was also confirmed by the results about the influence of the herbicides on the mean number of leaves per plant (Fig. 3).



Gd 5%=7,26; 1%=9,96; 0,1 % =13,56

Figure 3. Effect of soil herbicides on the mean number of leaves per plant

The mean number of leaves per plant was also the smallest in the plants of the variants with the following soil herbicides applied – pendimethalin, metolachlore and oxyfluorofen (Variants 3, 5 and 7). The differences were also with high statistical significance.

In previous experiments, the effect of those soil herbicides applied at the respective rates, on the vegetative habits of walnut seedlings was studied under the conditions of sand culture and the results obtained showed the same tendencies. In the present investigation, similar characteristics about the growth depressing effect, including plant dying, were established after the application of those three herbicides (Rankova, in press). It gave the grounds to assume that in the production of seedling rootstocks treatment of walnut seedlings with the herbicides pendimethalin, metolachlore and oxyfluorofen was undesirable due to the manifestation of phytotoxicity. The lack of an inhibiting effect on seedling growth after treatment with napropamid, terbacil and isoxaflutol at the rates applied (Variants 2, 4 and 9) was also confirmed, which could be explained by the physiological selectivity of the active substance.

Under the conditions of sand culture strong phytotoxicity was reported after treatment with linuron, expressed in plant dying. Under soil conditions, growth suppression was observed, expressed in less aboveground mass produced by the plants, without inhibition of the stem growth and decreased number of leaves being established. Consequently, the effect of soil as a factor determined the phytotoxic effect of that active substance (Tonev, 2000).

Habits of walnut seedlings after treatment with pendimethalin were of special interest. After applying the same rate in other fruit tree species (peach, yellow plum, mahaleb) growth depression was not observed and the seedling rootstocks obtained were of good quality and suitable to be grafted on (Rankova, 2004; Rankova, 2006). After treatment of walnut seedlings growth inhibition was established both under conditions of sand culture and under soil conditions. Consequently, it could be assumed that the selectivity of the fruit species to the active substance was due to physiological reasons.

Growth suppression after treatment with metolachlore was also detected in seedlings of other fruit tree species – yellow plum, peach (Rankova, 2004). After applying the mentioned rates of napropamid and terbacil to those crops in field conditions, good quality planting material was obtained, which was suitable to be grafted on in the year of planting the seeds.

Conclusions

The depressing effect on walnut seedlings, expressed in growth suppression and significant decrease of the aboveground mass of the plants, occurred after treatment with pendimethalin – Stomp 33 EC - 400 ml/da; metolachlore – Dual gold 960 EC - 150 ml/da and oxyfluorofen – Galigan 240 EC – 200 ml/da.

Toxicity expressed in suppression of the vegetative habits was not established in walnut seedlings after applying napropamid – Devrinol 4 F – 400 ml/da, terbacil – Sinbar – 80 WP – 100 g/da, linuron – Afalon 45 SC – 300ml/da and Isoxaflutol – Merlin 750 WG – 5 g/da.

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UTICAJ NEKIH ZEMLJIŠNIH HERBICIDA NA VEGETATIVNI RAZVOJ SADNICA ORAHA (*Juglans Regia L.*)

- originalni naučni rad -

Zarya Rankova

Institut za voćarstvo, Plovdiv, Bugarska

Rezime

U radu je proučavan uticaj zemljišnih herbicida napropamida, pendimetalina, terbacila, metolahlora, linurona, oksifluorofena, oksadiargila i izoksaflutola na vegetativni razvoj sadnica oraha, sorte Kuklenski gajenih u saksijama u kontrolisanim uslovima.

Nakon tretmana sa pendimetalinom – Stomp 33 EC – 400 ml/da, metolahlorom – Dual gold 960 EC - 150 ml/da i oxyfluorofenom – Galigan 240 EC – 200 ml /da uočena je depresija u razvoju sadnica izražena kroz usporen porast i značajnu redukciju nadzemne biomase.

Upotrebom napropamida – Devrinol 4 F – 400 ml/da, terbacila – Sinbar – 80 WP – 100 g/da, linurona – Afalon 45 SC – 300 ml/da i izoksaflutola – Merlin 750 WG – 5 g/da nije uočena fitotoksičnost odnosno zaustavljanje vegetativnog razvoja sadnica oraha.