

## SECTION XI. SCIENCES AGRONOMIQUES ET ALIMENTATION

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### INFLUENCE OF SOIL HERBICIDES APPLICATION ON APPLE TREES QUALITY IN NURSERY

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Improving the quality of planting material and increasing the productivity of orchards is an important task in the development of the Ukrainian horticultural industry, so the development and implementation of new elements of planting material production is a topical issue today. One of such elements is an effective weed control system in fruit tree nursery. Research results in this direction indicate that weeds are able to absorb much of the water and nutrients from the soil, slowing the growth of fruit trees and lowering their quality [1].

Traditional technology for fruit trees production in nursery offers two ways to solve this problem: systematic inter-row tillage or the use of herbicides. Mechanical cultivation in nursery involves the use of special tractors and special cultivators), which often leads to damage to trees and does not provide the desired level of weed control [2].

The organization of manual weeding in large areas of the nursery, which are often located in remote areas, is inefficient and very time-consuming [1].

In addition, the mechanical destruction of weeds in Western Ukraine provides only a short-term result - from 10 to 15 days or until the next rain, after which a new wave of weeds begins to germinate. There is also a significant increase in the biomass of ephemeral weeds in the autumn-spring period - the soil at this time is wet and the use of machines is impossible [3].

Aim of the research was to find soil herbicides with a long period of action non-toxic for apple trees in nursery. There are no current recommendations for the use of soil herbicides in the apple nurseries in the Lviv region.

The hypothesis of the experiment was as follows – the technology of field crops growing involves the use of highly effective soil herbicides, some of which may be used to weed control in apple trees production in nursery without harm to them. The experiments were performed in the fruit tree nursery using apple rootstock M.26, which were budded with the apple variety Florina. The plants spacing in the nursery 0.9 x 0.3 m (37 thousand plants / ha). A variant with manual systematic weeding was used as a standard.

The most common soil herbicides were included in the experiment: Zencor (metribuzin), Racer (fluorochloridone), Gezagard (prometryn), Butizan (metazachlor) and Dual Gold (metolachlor). Herbicides were applied in the rates recommended by the manufacturer in the spring, before the leaf development, by spraying of weed-free soil. The soil of the test field of the Horticulture Department is dark gray, podzolic, light loam, with medium level of mineral nutrients, humus content is 2.3%, pH = 6.2.

During the experiment such parameters were measured: weed and dynamics of weeds per unit area of soil, intensity of photosynthesis of rootstock and trees leaves, growth dynamics of rootstocks and grafted trees, residual amounts of herbicides in soil, yield of standard apple seedlings. Analysis of weed development in the apple nursery after herbicides application (Table 1) showed that more effective and long-term weed control action, among the all herbicides was provided by Zencor.

Table 1

**Influence of soil herbicides on the weeds development in apple nursery, an average for 2019-2021.**

Test variant	Total amount of weeds per m <sup>2</sup>					
	01.04	01.05	01.06	01.07	01.08	01.09
No herbicide (st)	34,8	145,5	218,4	160,1	128,1	166,0
Zencor 70 WG	1,6	2,2	5,4	9,9	15,4	22,5
Gesagard 500 FW	4,1	10,0	44,2	102,0	117,7	149,6
Dual Gold 960 EC	3,4	13,7	65,0	118,6	134,7	162,5
Racer 25 EC	2,2	5,5	7,5	12,4	38,1	52,6
Butizan 400 KC	3,1	22,8	126,6	109,9	147,9	175,0

Field birch, thistle and veronica proved to be resistant to its action, which did grow in single arrays and did not compete with cultivated plants. The herbicidal action of Zencor decreased until the end of August - beginning of September, which made obvious by the emergence of seedlings of dicotyledonous weeds: quinoa, galinsoga, phlegm, field purslane and from the group of cereals: meadow bluegrass and thin-legged meadow.

Other studied herbicides (Racer, Dual Gold and Butizan) also showed good action, but its effective duration was much shorter – active germination of dicotyledonous weeds began in the third decade of June and lasted during the summer months, indicating a lack of effective action and the need for additional soil treatment to kill weeds. Analysis of the obtained data showed that the application of the above herbicides did not cause growth inhibition or death, both rootstocks in the first field and trees in the second field of the nursery.

On rootstocks treated with Racer herbicide, a slight change in color (redness) of the edge of the leaf blade of the lower 2-3 leaves was observed. After treatment with Dual Gold and Zencor, drying of the leaf blade edge and chlorosis of the lower 2-3 leaves were noted during heat periods. These symptoms were not observed every year, they were admitted in 5-17% of plants from their total number, 4-6 weeks after treatment and only during a drought. The intensity of growth of rootstocks and trees was not affected (Table 2). The higher placed leaves and the point of growth had a typical color and shape and did not differ from the plants in standard variant. The take of the budded chips also did not differ from the standard variant and ranged from 81-89%.

Analysis of rootstocks and grafted trees growth depending on the applied soil herbicides illustrates high efficiency of this method of weed control. The best results were obtained with Zencor herbicide (1 kg / ha in 600 l of water / ha).

As a result of testing, it was found that usage of soil herbicides in the early stages (before the bud break) by spraying the soil in apple tree nursery did not have a depressant effect on rootstocks and grafted trees. Among the studied soil

herbicides the best result was obtained with the Zencor - increased diameter and height of rootstocks in the first field of the nursery and trees in the second field of the nursery were more developed, amount of standard trees per hectare increased as well.

Table 2

**Influence of soil herbicides on rootstocks growth and apple variety Florina grafted on rootstock M.26, average for 2019-2021.**

Test variant	Rootstocks developement		Trees developement		Total amount of standard trees	
	diameter, mm	height, cm	diameter, mm	height, cm	thousand pieces per hectare	% to standard
No herbicide (st)	8,5	45,8	14,2	141,2	20,4	100,0
Zencor 70 WG	12,2	58,7	18,1	162,1	26,8	131,4
Gesagard 500 FW	9,1	47,1	15,6	149,7	22,4	109,8
Dual Gold 960 EC	8,8	46,6	14,9	146,7	21,7	106,4
Racer 25 EC	9,8	50,3	16,3	154,4	23,4	114,7
Butizan 400 KC	8,4	42,4	14,6	143,1	21,1	103,4

The analysis of the residual amount of Zencor (metribuzin) in the soil at the time of digging out trees (in November) showed a negative result.

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