

LUCRĂRI ȘTIINȚIFICE SERIA HORTICULTURĂ, 59 (2) / 2016, USAMV IAȘI  
**PRELIMINARY RESULTS REGARDING WEED  
MANAGEMENT IN FRUIT TREE NURSERY REGARDING  
MONOCOTYLEDONOUS POACEAE WEEDS AT APPLE  
SPECIES (*MALUS DOMESTICA*, BORKH)**

**REZULTATE PRELIMINARE PRIVIND COMBATEREA  
BURUIENILOR MONOCOTILEDONATE DE TIP GRAMINEE ÎN  
PEPINIERA POMICOLĂ LA SPECIA MĂR  
(*MALUS DOMESTICA*, BORKH)**

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*Abstract.* The field trial was established at Fruit Research Station Bistrita in a sandy-loam site, with optimum rainfall and thermal conditions in 2016. The main objective of the study was the applying of integrated weed management techniques in fruit nursery. The experimental design was polyfactorial and consisted in the application of two non selective herbicides with active compounds quizalofop p-tefuryl 40 g/L and glifosate acid 360 g/L at rootstocks M106, M26, M9 using two different leaf fertilizers in first year of rootstock development (Field 1). Main observed weeds were: *Avena fatua*, *Lolium temulentum*, *Echinochloa crus galli*, *Setaria glauca*, *Agropyron repens*. Control variant consisted in the applying of perforated black agro-textil mulch in the rootstock zone. Herbicides were applied using a conical PVC protection not to damage the main rootstocks during sprays. Research results showed that the applied herbicides and the control variant had different effects on rootstock growth.

**Key words:** fruit nursery, non selective herbicides, rootstock development, agro-textil mulch

*Rezumat.* Experiența a fost efectuată la Stațiunea de Cercetare Dezvoltare pentru Pomicultură Bistrița într-un sol luto-nisipos având condiții optime de temperatură și precipitații în anul 2016. Obiectivul central a fost aplicarea combaterii integrate a buruienilor în pepiniera pomicolă. Schema experimentală a fost polifactorială și a constat în aplicarea a două erbicide neselective având substanța activă quizalofop p-tefuryl 40 g/L și glifosat acid 360 g/L aplicate la portaltoi M106, M26, M9 utilizând doi fertilizanți foliari în câmpul I. Cele mai importante buruieni au fost *Avena fatua*, *Lolium temulentum*, *Echinochloa crus galli*, *Setaria glauca*, *Agropyron repens*. Varianta martor a constat în aplicarea unui mulci agrotextil negru, perforat în zona portaltoilor. Erbicidele au fost aplicate utilizând o protecție conică din PVC pentru a nu deteriora plantele. Rezultatele cercetării au arătat faptul că erbicidele aplicate și varianta martor au avut o influență diferită asupra creșterii portaltoilor.

**Cuvinte cheie:** pepiniera pomicolă, erbicide neselective, creșterea portaltoilor, mulci agrotextil

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The high quality demands of the certified planting material imposes an efficient weed management control (Wertheim *et al.*, 2003). In the fruit nursery the certified planting material should grow in good agrotechnical conditions without weed infestation. Growing process in the nursery field for the first year rootstock development is deeply influenced by the competition between the weeds and the rootstocks. The weeds influence negatively the growing process, development is shifted, the wood is not matured and the resulting planting material does not achieve the standard dimension for selling. Researches effectuated by researchers in Lithuania (Kviklys *et al.*, 2009) for a series of herbicides showed different effects on the nursery plants. Some of the applied pesticides affects the leaves with scorching, burning when directly applied, or causing development problems in the rootstock or young grafted trees (Altland, 2005). Some of the pesticides behaved well regarding the weed eradication but reduced the plants vigor. Some of the herbicides applied in the past can not be applied in the present due to legislation, or the regulations are different from country to country, some of the pesticides are not registered for nursery application just for vegetables, or other cultures, this fact makes more complicated the weed management system (Rankova, 2011). Thus the application of only herbicides in the fruit nursery is still a difficult problem. The objective of our research was to study and observe the behavior of two nonselective herbicides having the active compounds quizalofop p-tefuryl 40 g/L and glifosate acid 360 g/L applied in the first year of development of the rootstocks at apple (M106, M26, M9) and using other weed management techniques like agro textil mulching.

## **MATERIAL AND METHOD**

Researches were effectuated at the experimental micro-nursery of Fruit Research and Development Station Bistrita in 2016. The micro-nursery is located near Bistrita river, establishment of the first year rootstocks was on a sandy-loam site, well drained, with good thermal and rainfall conditions in 2016. The experiment followed a completely randomized block design with 3 repetitions per variant. Factor A was represented by rootstock type with graduations M106, M26, M9, factor B was represented by herbicide application (quizalofop p-tefuryl 40 g/L with a dose of 2l/ha and glifosate acid 360 g/L with a dose of 4l/ha both doses calculated for the research plot surface), factor C – foliar fertilizer application (Foliar fertilizer 1-NPK 19:19:19-dose:0.5% and Foliar fertilizer 2-0.2%-composition for 1L/ NPK: 0.2%:0.4%:0.02%+microelements Mg, Zn, Cu, Mn, B, Ca, Mo,+biostimulators). Foliar fertilizers were applied separately with another spraying equipment. Herbicides were applied with great care with a conical PVC protection not to damage the rootstocks. The herbicides were applied between the rows. The control variant was represented without herbicide and foliar fertilizer applications just only with agro-textil mulch application. At the final of the growth period in 2016 there were measured the shoot development length, there were counted the number of weeds, there were calculated the weed infestation amount and efficiency of herbicide application. The weed amount evaluation was effectuated based on the scientific literature (Rusu *et al.*

LUCRĂRI ȘTIINȚIFICE SERIA HORTICULTURĂ, 59 (2) / 2016, USAMV IAȘI 2012). The weed species were identified based on visual characteristics. The counting of weeds were effectuated using of measuring frame with a surface of 0.25 m<sup>2</sup>. Data obtained were registred in an observation card regarding the average number of weeds/m<sup>2</sup> for every species, making an average of the counted weeds at every repetition and dividing the sum at the total repetition number. The obtained value was multiplied with 4 in the case of measuring frame of 0.25 m<sup>2</sup> to obtain the number of total weeds per square meter. The registered data was statistically analyzed by the analysis of variance test and differences of limits Duncan's test.

## RESULTS AND DISCUSSIONS

Meteorological conditions were relatively optimum in the beginning of the growing period. Table 1 show that thermal conditions were ascendent in the spring during april-june 2016, average temperatures were between 12.4-19.8 °C, being relatively constant until the last part of summer (20.3-19.9). Lack of balance can be observed in the rainfall conditions, this factor fluctuated during spring and summer. In june 2016 a great amount of rainfall was observed (147mm), rootstocks had a good development and growth in the period of june and july (64 mm). In august 2016 rainfall amount was reduced, only 22 mm were registered. Maximum temperatures fluctuated between 25.8-32.5°C during april-august 2016 and were relatively constant.

Table 1

**Meteorological conditions registered at the meteorological station SCDP Bistrita**

2016	I	II	III	IV	V	VI	VII	VIII
<b>Average temperature in their °C</b>	-2.8	4.5	5.6	12.4	14.1	19.8	20.3	19.9
<b>Average minimum temperature</b>	-5.3	1.4	2.2	7.2	8.8	14.5	14.6	14.8
<b>Absolute minimum temperature</b>	-14.9	-6.5	-5.6	0.4	4.3	7.9	7.9	7.6
<b>Average maximum temperature</b>	0.7	8.8	11.3	19.3	20.2	26.1	26.8	26.3
<b>Absolute maximum temperature</b>	9.1	17.5	18.8	25.8	27.6	32.5	32.5	31.5
<b>Relative humidity %</b>	85.6	82.0	66.6	66.3	69.5	79.9	72.2	68.7
<b>Rainfall (mm)</b>	66.7	76.1	21.0	54.2	48.2	147.4	64.3	22.0

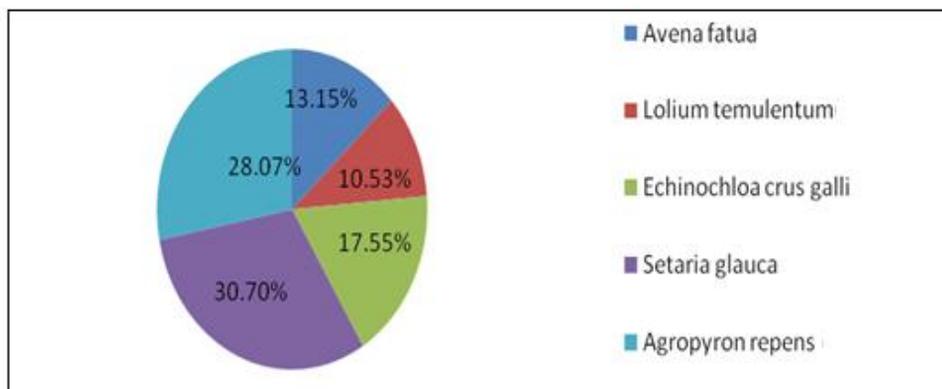
In the spring period there were effectuated the identification and evaluation of weed infestation degree and the counting of weeds per species and category. In table 2 there are shown synthetically the number of weeds per weed category. Based on the registered data the most important species is the couch grass (*Setaria glauca*) with a 30.7 % degree infestation.

Table 2

**Analysis of main weed species, counting the average number of weeds, degree of weed infestation in may 2016 at SCDP Bistrita micro-nursery before herbicide application**

Identified weed	Number of weeds	
	Number of weeds /m <sup>2</sup>	Weed infestation degree %
<b>Annual monocotyledonous weeds with early germination</b>		
1. <i>Avena fatua</i> (wild oat)	15	13.15
2. <i>Lolium temulentum</i> (darnel)	12	10.53
<b>Annual monocotyledonous weeds with late germination</b>		
1. <i>Echinochloa crus galli</i> (barnyard grass)	20	17.55
2. <i>Setaria glauca</i> (yellow foxtail)	35	30.70
<b>Perennial monocotyledonous weeds</b>		
1. <i>Agropyron repens</i> (couch grass)	32	28.07
<b>TOTAL</b>	<b>114</b>	<b>100</b>

After the most important yellow foxtail weed (*Setaria glauca*) follows closely the couch grass (*Agropyron repens*) with a 28.07% and the barnyard grass (*Echinochloa crus galli*) with 10.53% infestation degree and finally the wild oat (*Avena fatua*) 13.15% .



**Fig. 1** Compositional distribution of annual and perennial monocotyledonous weeds in the experimental plot

In figure 2 it can be observed the high degree of weed infestation between the rows, and the control variant with the perforated agro-textil mulch. Close to the mulched row it can be observed the plentiful weed vegetation.



**Fig.2** Aspect from the fruit nursery before herbicide application, plentiful yellow foxtail (*Setaria glauca*) weed infestation

In the frame of the researches the most important research parameter was the average height of rootstocks after a year of growing and development. In the research block of M106 rootstock the research results showed that in repetition 1 and repetition 3 there were no significant differences but in repetition 2 there were significant differences between the variants.

Table 3

**Average of M106 rootstock height (cm) of research variants**

Experimental variants	R1	R2	R3
V1- M106/ quizalofop p-tefuryl 40 / Foliar 1	84.250 a	87.750 a	86.250 a
V3- M106/ glifosate acid 360 g/l / Foliar 1	84.500 a	84.500 a	84.500 a
V2- M106/ quizalofop p-tefuryl 40 g/Foliar 2	80.750 a	83.750 a	89.750 a
V4- M106/ glifosate acid 360 g/l /Foliar 2	81.750 a	76.250 b	85.250 a
V5-Control variant	82.750 a	82.500 ab	83.750 a
Pr > F	0.850	0.020	0.316
Significant	No	Yes	No

In repetition 2 the greatest height was achieved by variant 1 by using quizalofop p-tefuryl 40 g/L and the applying of foliar 1 fertilizer. In this variant the quizalofop p-tefuryl 40 g/L presented a better result than glifosate acid with foliar fertilizer 2. Intermediate result was achieved with the control variant

LUCRĂRI ȘTIINȚIFICE SERIA HORTICULTURĂ, 59 (2) / 2016, USAMV IAȘI regarding the height of plants. This is an important result because the agro-textil mulch allows the water to penetrate the material and do not allows the weeds to grow. The microclimate under the agro-textil mulch is improper for the development of weeds , photosynthesis being not possible due to the black not transparent material so, the achieved average height of the plants in this variant being 82.5 cm.



Fig. 3 Control variant with agro-textil mulch

Table 4

Average of M26 rootstock height (cm) of research variants

Experimental variants	R1	R2	R3
V6-M26/ quizalofop p-tefuryl 40 g/L Foliar 1	67.250 ab	66.000 a	67.750 a
V7-M26/ quizalofop p-tefuryl 40 g/LFoliar 2	62.000 c	65.750 a	64.750 a
V9-M26/ glifosate acid 360 g/L /Foliar 2	68.500 a	62.750 a	64.500 a
V10-Control variant	64.500 abc	64.250 a	64.000 a
V8-M26/ glifosate acid 360 g/L / Foliar 1	63.500 bc	63.500 a	61.750 a
Pr > F	0.049	0.455	0.361
Significant	Yes	No	No

Analyzing table 4 we can conclude that in the case of rootstock M 26 lower heights were measured, due to the vigor of the rootstocks and just in the first repetition were observed significant differences between the variants. The highest plants were obtained at V9 variant with glifosate acid and foliar fertilizer 2 followed by the V6 variant M106/quizalofop p-tefuryl 40 g/L Foliar 1. Decreased heights were observed at the other variants. At M26 rootstock it seems

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 that the glifosate acid had a better result. This variant sprayed with foliar fertilizer 2 had a good development result.

Table 5

Average of M9 rootstock height (cm) of research variants

Experimental variants	R1	R2	R3
V11- M9/quizalofop p-tefuryl 40 g/L / Foliar 1	33.500 a	38.250 a	38.500 a
V14- M9/ glifosate acid 360 g/L /Foliar 2	34.500 a	34.500 ab	33.500 bc
V15- Control variant	32.500 a	32.500 b	36.500 ab
V12- M9/ quizalofop p-tefuryl 40 g/L /Foliar 2	32.250 a	33.500 b	34.250 bc
V13- M9/ glifosate acid 360 g/L /Foliar 1	32.500 a	33.250 b	31.000 c
Pr > F	0.219	0.052	0.007
Significant	No	No	Yes

The measurement results at rootstock M26 in the nursery in repetition 3 showed that there are significant differences between the variants, higher values of height were achieved in variant 11 with quizalofop p-tefuryl 40 g/Foliar fertilizer 1. The second rank was occupied interestingly by the control variant V15 with agrotexil mulch (36.5 cm). It seems that at the low vigor rootstock M9 the presence of the agrotexil mulch helps the elimination of weeds and contributes probable for the maintaining of a relative humidity favorable for the development of the plants. Intermediate results were obtained at V12 - quizalofop p-tefuryl 40 g/L-Foliar 2 (34.2 cm) and V14 M9/ glifosate acid 360 g/L /Foliar 2 (33.5 cm).

## CONCLUSIONS

1. The variants quizalofop p-tefuryl 40 g/L and Foliar fertilizer 1 influenced significantly the growth and development of the plants by removing the monocotyledonous weeds in the research plot.

2. At the applying of herbicides very careful precautions were made, the studied herbicides were total and non selective. The herbicides were not applied directly on the plants just between the rows using a special conical PVC protection not to damage the plants, being careful that sprays does not achieve the leaves of the rootstocks.

3. The glifosate acid 360 g/L and Foliar fertilizer 2 treatments was successful at M26 rootstock

4. The perforated black agro-textil mulch gave also good results by removing the weeds non directly underneath the textil material.

5. When accidentally herbicide drops achieved on rootstock leaves, there observed burning, discoloration and finally the plants dried out. Thus, the studied herbicides are hard to apply, present research results are preliminary and further

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researches will be made in order to make conclusions on possibility of applying these integrated weed management techniques in the field.

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