

ALTERNATIVES TO HERBICIDES IN AN APPLE ORCHARD

Cristina Mihaescu*

* University of Pitești, Faculty of Science, Targu din Vale Street, No.1, Arges, Romania
E-mail: cristescu_cri@yahoo.com

Abstract

Pesticides have taken a long time the most important place among the means of combating pests. Their use often irrational abusive led to many negative secondary phenomena among which the pollution are the most important. Integrated control requires the use of chemicals especially those selective, with other methods which typically produces the effectiveness of the entire system. Knowledge of pesticides in terms of chemical, biological agricultural and environmental toxicology, have continuously progressed so that the last 40 years have founded a new discipline.

Keywords: apple, herbicides, weeds

1. INTRODUCTION

The concept of integrated fight (management) is based on the "threshold of tolerance" maximum load of weed trees that can bear without economic damage. Using herbicides is only when the tolerance threshold is exceeded. Setting thresholds weed is a difficult operation, demanding and requires much time. At present there is a tendency to use as an indicator thresholds for dose reduction than to not use herbicides, although this can be justified in some circumstances.

Thresholds are used as: competition is the density threshold at which begins competition generally zero; economic threshold which is valid for one year and covers the cost of weed density it is equal to the losses caused by their competition with trees; the optimum economic threshold refers to a species of weeds; the safety threshold is equal to 50%. The aim of combating and controlling weeds as I said is simply not crop or weed vegetation, but to maximize production in the presence of weed trees, where new concepts about fighting weeds, up to the equilibrium density.

2. MATERIALS AND METHODS

To weed seed good and very good results were obtained with a wide range of pre-emergent herbicides: Simadon 50 PU 5-6 kg/ha - the complex chemical manufactured in Romania Borzești; Simanex 50 SC, 2.5-3 liters/ha Makhteshim - Agan, Israel herbicides particular action on numerous annual and perennial weed seed but not control weeds already emerged weeds or perennial vegetation. Important to the success of pre-emergent herbicides there is sufficient moisture in the soil. There was no need for prior land preparation or incorporation into the soil, although the literature 5-6 years ago, it is still recommended dose of 8-10 kg/ha at 50 PU and preparation prior Simadon land, chopped leveled.

Besides the most popular herbicides were tested and doses experienced at least 2-3 years and 3-5 volumes solution to all parts of the country and fruit tree species - carefully not to waste, not polluting residues, to live within EU rules on sound ecological environment. Pre-emergence herbicides are newer Dual Gold - Syngenta, Switzerland dose of 1-1.2 liter /ha, with stronger action than the old Dual herbicide dose 2.4 l / ha, with full effect on weeds in monocots Seeds of annual weeds and partially on dicotyledonous seed. In terms of lower doses Dual Gold (S - metolachlor) record and a breakthrough in environmental protection remain after applying the layer of soil and does not leach.

This herbicide is not incorporated, and has a long duration of action that may act against the second wave of the emergence of new weed seed. If it was applied before emergence of the weeds as recommended, it can be administered no later than 1 to 2 true leaf stage of the weed.



Figure 1. The work field the aisle of trees



Figure 2. Field sprayer at intervals between rows of fruit

Another new preemergence herbicide Romania - DS is Vegepron the company ECOCHEM France that I have experienced at a dose of 6-8 l/ha (herbicide made of a mixture of two to. Simazine and diuron) with long action and broad spectrum of weeds controlled seed. It does not require incorporation. Pre-emergence herbicides have been administered 300-500 l of water/ha depending on the spraying equipment. These pre-emergence herbicides are very effective and the culture shrubs, strawberry and nurseries. Mono- and dicotyledonous weeds in annual and perennial vegetation to experience a wide range of herbicides, glyphosate with different names.

3. RESULTS AND DISCUSSIONS

One of the most worrying unintended effects is to create a selection pressure favoring the development of resistant populations of weeds by herbicides unilaterally without herbicide rotations etc. It is recommended strategy, and the alternation of herbicidal compositions as adjuvants. The test batches in production of 1-2 ha for each herbicide experienced and for soil maintenance variants row of trees as field work - each variant occupies 0.5 ha orchard in production. I noticed that there is interest and desire from farmers to apply the latest technological sequences to control weeds in orchards and especially that can make profits in horticulture and under less favorable economically and financially.

Table1. Herbicides commonly used in weed control in orchards and their remanence

Trade name	Dose l/ha	Application mode	Active substance	Concentration	Toxicity group	Remanence
Simadon 50 PU	5-6	preem	simazin	50%	Rv	12 months
Dual gold	1-1,2	preem	S-metolaclor	960 g/l	Rv	3 months
Treflan 48	1,5-2	preem	trifluralin	480 g/l	Rv	3 months
Venzar	3	preem	lenacil	80%	Rv	3 months
Vegepron D.S.	6-8	preem	simazin + diuron	80g/l+ 125 g/l	Rv	3 months
Goal2E	5	preem	oxifluorfen	240 g/l	Rv	3 months
Galigan 240 EC	5	preem	oxifluorfen	240 g/l	Rv	3 months
Caragard Combi.	5	preem	terbutilazin + terbumeton	25% + 25%	M	6 months
Stomp 330 CE	5	preem	pendimetalin	330 g/l	Rv	2,5 months
Roundup	3-4	postem	glyphosat	360 g/l	Rv	-
Glyphogan	3-4	postem	glyphosat	360 g/l	Rv	-
Touchdown	4	postem	glyphosat + trimesium	480 g/l	Rv	-
Gramoxone	3-3,5	postem	paraquat	200 g/l	M	4 weeks
Basta	5	postem	glufosinat	200 g/l	Rv	2 weeks

To move towards agriculture - in our case horticulture as modern must substantiate any action technologically and economically and ecologically we propose ensuring food security through the fruits that we produce a decent standard of living for us all in terms of preventing all forms of pollution and repairing damage to the environment already.

This strategic framework will serve farmers and private growers and research to be enriched with new data. Detache here some conclusions, namely: Romania pomiculture currently has a very high degree of weed for which in any upcoming spring not leave weeds to invade orchards and produce seed - must be fought - until this stage to avoid or reduce competition and choice and use of methods, means and hence the complex control measures in the area, farm, plot, growing fruit

growing, not forgetting economic efficiency and technical effect of the methods of fighting and practicing alternative techniques in harmony with environment. .

Worldwide tend to farm without deep plowing and turning furrow "non tillage" - for the return swath is not considered so useful. In these conditions, weed control hoeing mechanically or manually is not enough. In Romania, traditional fruit production practices basically is "non tillage" and fruit growing with every grass is a variant of "non tillage" - where only the row of trees soil is field work: optional mechanically especially classic handmade and only in the last 25 years all chemical often worked strips. Experiments with herbicides from the orchard showed that soil water can be kept equally in land kept loose by repeated during vegetation works as the land treated with herbicides and mechanical work for 4-5 years herbicides, destroying weeds, conserve soil and water as usual prășilele. Also by applying herbicides row of trees is kept structure and other physical features - trees with favorable conditions for growth and fruiting.

Apple and plum production quality according to herbicides applied

Competition trees - weeds out of control, especially when infestation "weed problem" - perennial is over 30%, although the negative effect is not visible immediately, fruit production fall, trees are suffering, especially during critical periods (tying the fruit, intense growth of shoots, fruit maturation) and yields will be lower quality and quantity. During the experimental period fruit harvest was reduced due to infestation "weed problem" and the level of weed high, a 9-scale EWRS recorded in the variant V2 untreated unhoeing control II decrease - 30% apple and 60% to plum. I have chosen and studied quality fruit production in 7 variants, the most widely used herbicides. Analyzing dynamic soil maintenance solutions to both species of fruit among worked as a field stands with herbicides increased production with improved weed control efficacy, EWRS note 1 scale with post-emergence herbicides associated preemergence + postemergence or Roundup 2000 was higher than classic herbicide Roundup, 400 g / 1 gliphosat. As regards the selectivity of herbicides it was found that the herbicides studied: Simadon 50 PU - dose 5 to 6 kg / ha; Roundup - dose 3-4 l / ha; Basta - dose 5 l / ha alone or combined in applications across the entire row of trees in spring and / or summer, if only in hearths (patches) were well tolerated in both species apple fruit bearing species. There were no reported symptoms of phytotoxicity in any variant and any species or variety (Note 1 scale EWRS).

The analyzed data leads us to understand that economic efficiency is the key factor that depends on choosing the most useful soil maintenance solutions row of trees and weed control. Ephemeral weeds in early spring without significant damage fruit trees, perennials are very harmful: *Cirsium arvense*, *Convolvulus arvensis*, *Elymus repens*, *Cynodon dactylon*, *Sorghum halepense* and annual weeds "problem": *Amaranthus retroflexus*, *Chenopodium album*.

To elucidate how herbicides affect the quality of fruit, they were made determinations regarding their influence on fruit content in the main biochemical components. The water content of apples had higher values compared with untreated control variants herbicides, unhoeing. Total dry matter content of plums in untreated control II, unhoeing was higher (19.0%) compared with its V4 - 2000 Roundup 4 l / ha (16.0%) in both varieties. Soluble solids content was not noticeably affected by the application of herbicides. The highest values being in untreated control variant II, unhoeing which occurred earlier maturation both apples and plums.

Table 2. The efficacy and selectivity of studied herbicides for weed and apple production achieved (average varieties: Golden Delicious and Jonathan)

Variants	Doses l/ha	When applying	Weed control				Apple production	
			Phytotoxicity notes EWRS	% anuale	% perene	Efficiency notes EWRS	t/ha	%
V1 3-5 hoeing witness I	-	-	1	100	81,6	1	27,1	100
V ₂ untreated, unhoeing witness II	-	-	1	0	0	9	16,6	61
V3 Simazin	2500	preemergence	1	88,5	23,8	2	25,1	93
V ₄ Simazin + Glyphosat	2500+1080	preemergence + postemergence	1 1	96,4	90,8	1	31,8	117
V5 Glyphosat	1440	postemergence	1	98,1	96,4	1	32,2	119
V ₆ Simazin + Glufosinat	2500+750	preemergence + postemergence	1	97,8	95,5	1	30,9	114
V7 Glufosinat + Glufosinat	750+750	postemergence + postemergence	1	99,0	97,1	1	30,2	111

Titratable acidity of the apples and plums total was higher in variants with herbicides against witness throughout the growing season (V2 - untreated unhoeing). Vitamin C content of apples was positively influenced herbicide variants - higher values are determined from V4 version - Roundup 2000- 4 l / ha: Jonathan V2 - control II - 8.75 mg / 100 g and V4 - glyphosate 11.28 mg / 100 g; Golden Delicious V2 control II - 9.76 mg / 1 and 100 g V4 - glyphosate 12.68 mg / 100 g. The ratio juice / total titratable acidity is a synthetic indicator of the quality and the harvest was determined witness II with the highest values compared to manual work version march I and variants herbicides - because of the advanced stage of ripening apples . There was an advance of maturity for harvest 12-17 days, depending on the variety Golden Delicious crop year and 10-15 days for the variety Jonathan, to witness untreated neprășit compared with the best herbicide: V4 - Simadon 5 kg / ha + Roundup 3 l / ha, respectively V5 - 2000 Roundup 4 l / ha.

The advance was only harvesting the variety Golden Delicious 3-6 days and 3-4 days for the variety Jonathan version (V2) witness untreated unhoeing compared to V3 - Simadon 5 kg / ha / year. Variants V4 (Simadon 6 kg / ha + Roundup 4 l / ha) and V5 (Roundup 2000 4 l / ha compared to (V1) witnessed 3-5 hoeing / vegetation there were small differences even sensitive equal growth and ripening of fruits. The above should be considered in preparing the harvesting campaign (export any) to scaling this technological links important, depending on system maintenance soil among the trees. At harvest were statistically assured differences between variants regarding the main physical and biochemical properties of apples, highlighting the strong influence of herbicides: Roundup and Roundup Simadon + 2000, which defines the quality of production, the stage of ripening apples differently depending on the treatment.

Table 3. The efficacy and selectivity of studied herbicides for weed and prune production achieved Tuleu

Variants	Doses l/ha	When applying	Weed control					Plums production	
			Phytotoxicity notes EWRS	% anuale	% perene	Efficiency notes EWRS	t/ha	%	
V1 3-5 hoeing witness I	-	-	1	100	78,0	2	12,4	100	
V ₂ untreated, unhoeing witness II	-	-	1	0	0	9	4,9	40	
V3 Simazin	2500	preemergence	1	83,1	15,5	2	10,2	82	
V ₄ Simazin + Glyphosat	2500+1080	preemergence + postemergence	1	98,0	92,0	1	13,5	109	
V5 Glyphosat	1440	postemergence	1	100	98,0	1	12,9	104	
V6 Simazin + Glufosinat	2500+750	preemergence + postemergence	1	99,0	96,0	1	11,7	94	
V7 Glufosinat 4-	750+750	postemergence	1	98,0	96,0	1	12,3	99	

Average fruit weight was Golden Delicious variety at harvest ranged between 143 grams fruit to control untreated neprășit and 165-185 grams / fruit apples from the trees herbicides with Roundup 2000 - dose of 4 l / ha. Jonathan variety, the two variants fruit weight of 140-155 grams was / fruit towards witnessed II, 130 grams / fruit. Firmness of apples (determined by penetrometer Effegi) Golden Delicious ranged between 5.4 kgf / cm² to witness II, untreated unhoeing and 6.6 kgf / cm² variants V4 -Roundup 2000-4 l / ha and V5 - Simadon 5 kg / ha + Roundup 3 l / ha. Jonathan variety firmness recorded lower values, ranging from: 4.8 kgf / cm² to 6.0 kgf / cm². Maintenance ground row of trees with herbicides influenced least index the form of fruit so the apple (both varieties) the harvest had fruit that were within the typical form feature each variety hand.

Fruit color was slightly influenced by herbicides. Generally fruit witness II untreated unhoeing was more advanced in age at harvest presenting the colors characteristic of the variety (straw - Golden Delicious and yellow covered with red variety Jonathan) compared with variants V4, V5, V6, V7 where they applied herbicides different eras and different doses, which often had shades of yellow-green.

Table 4. Influence of herbicides on the main physical characteristics of apples at harvest - variety Golden

Variant	Dose l/ha	Application Period	The average weight of the fruit *	Firmness kgf /cm	Index form	Form	Color
V1-3-5 hoeing witness I	-	-	172 d	4.6	0.91	conical	yellow
V2- untreated, unhoeing witness II	-	-	143 f	5.4	0.93	conical	yellow
V ₃ -Simadon	6	preemergence	158 e	5.8	0.92	conical	yellow
V4-Simadon + Roundup	6 + 3	preem. + postem	175 c	6.2	0.92	conical	yellow
V5-Roundup	4	postem.	185 a	6.6	0.94	conical	greenish yellow
Vâ-Simadon + Basta	6 + 5	preem. + postem.	180 b	6.6	0.94	conical	greenish yellow
V7-Basta + Basta	5 + 5	postem. + postem.	181 b	6.4	0.93	conical	greenish yellow

*test Student Newman Keuls

Table 5. Influence of herbicides on the main physical characteristics of apples at harvest - variety Golden

Variant	Dose l/ha	Application Period	The average weight of the fruit *	Firmness kgf /cm	Index form	Form	Color
V ₁ 3-5 hoeing witness I	-	-	145 d	5.5	0.86	spherical cone	covered with red card
V ₂ - Untreated, unhoeing witness II	-	-	130 f	4.8	0.86	spherical cone	covered with red card
V ₃ -Simadon	6	preem.	140 e	5.4	0.88	spherical cone	covered with red card
V ₄ -Simadon + Roundup	6 + 3	preem. + postem	147 c	5.6	0.88	spherical cone	covered with red yellow green
V5-Roundup	4	postem.	155 a	6.0	0.90	spherical cone	covered with red yellow green
V6-Simadon + Basta	6 + 5	preem. + postem.	150 b	5.8	0.90	spherical cone	covered with red yellow green
V7-Basta + Basta	5 + 5	postem. + postem.	149 b	6.0	0.90	spherical cone	covered with red yellow green

*test Student Newman Keuls

4. CONCLUSIONS

Horticulture systems not preclude the use of herbicides in weed control, promoting obligatory environmental standards on: boxes, shapes, types of herbicides time of application to degrees and types of weeds; The degree of weed infestation tolerable for fruit and simultaneously economic, so-called economic threshold of pest (PED) is determined depending on the eco-climatic every year and refers to the density at the cost of weed equals losses caused by their competition with fruit; Factors influencing weed and PED are state plantation, no. goals, vigor trees, climatic conditions and vigor that year under orchard weeds.

5. ACKNOWLEDGEMENTS

We recommend using optimal doses of herbicides moderate less polluting, within minimum and maximum limits approved eliminating unjustified overdose or under dosing trends, taking into account the time pause before harvest.

6. REFERENCES

- Amzăr, V., Teodorescu, G., s.a.. (1997). Rezultate obținute în domeniul producției pomilor, arbuștilor fructiferi și căpșunului în perioada 1992-1996. *Lucr. Științifice, I.C.D.P. Mărăcineni*, vol.XIX;
- Baicu, T.A., Săvescu, A. (1986). Sisteme de combatere integrată a bolilor și dăunătorilor pe culturi. Ed. CERES . București;
- Bălan, V., Dejeu, L., Chiara, A., Ciofl, R. (2003). Horticultura alternativă și calitatea vieții, Ed. GNP Minischool, București;
- Cepoiu, N. (2002). Pomicultura aplicată. Ed. Științelor Agricole;
- Ghena, N., Braniște, N. (2003). Cultura specială a pomilor, Matrix Rom., București;
- Sumedrea, D., Sumedrea. M. (2003). Pomicultură, Ed. Academiei de Înalte Studii Militare, București;
- Teodorescu, G., Trandafirescu, M., Cîrdei, E., Man, L., Frasin, L., (2003). Protecția fitosanitară a ecosistemelor pomicole. Ed. Tiparg, Pitești;