

## INTEGRATED MANAGEMENT OF WEED IN STONE FRUIT ORCHARD

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**Abstract:** Every year the stone orchards are increasingly infested with weeds, both concurrent for trees and difficult to control. The concept of integrated management weeds control is based on “threshold tolerance” which means the highest number of weeds, with no injury effect on the trees or economic yield loss. In the new conditions of a sustainable agriculture, the integrated management of weeds in the stone orchards needs to be performed combining harmonically the agrotechnical, biological and chemical methods together with control and organizational means. This study tries to present some weeds control data and the observations were carried out in the apple orchard of RDIPP-Bucharest. To achieve the best results in weed controlling, and taking into consideration the compelling ecological demands for the environmental protection, we have carried out both agrotechnical (weeding, scything, mulching) and chemical methods (herbicides based on glyphosphat). The results of these observations lead to the conclusion that both agro-technical and chemical methods assured a good weeds control, of 80%. On the scything plot, though the weeds control was not completely diminished, after the three consecutive scything, the weeds were kept at not harmful growth level, for the trees. The weeds are also unable to store nutrient reserves to survive over the winter. On the mulching plot, this method assured a very good weeds control and could be easily applied with low costs. Unless it showed a good weeds control, especially on the perennial ones, mulching layer showed also to have a fertilizing effect on the soil, contributing to the organic enrichment of the ground. As chemicals for the weeds control plot we have used herbicides based on glyphosate, to protect the useful fauna and also because they showed to be easily degradable in soil and residual deposits free in fruits.

**Key words:** stone orchards, weeds, herbicides

### INTRODUCTION

Every year the stone orchards are increasingly infested with weeds, both concurrent for trees and difficult to control (*Amaranthus retroflexus*, *Chenopodium album*, *Polygonum* spp., *Stellaria media*, *Cirsium arvense*, *Elymus repens*, *Echinochloa crus-galli*, *Sorghum halepense*, *Digitaria sanguinalis*, *Setaria* spp., *Cynodon dactylon* etc.).

The concept of integrated management weeds control is based on “threshold tolerance” which means the highest number of weeds, with no injury effect on the trees or economic yield loss. In the new conditions of a sustainable agriculture, the integrated weed control in the stone orchards needs to be performed combining harmoniously the agrotechnical, biological and chemical methods together with control and organizational means.

This study tries to present some weeds control data and the observations carried out in the apple orchard of RDIPP- Bucharest. To achieve the best results in weed control, mostly the perennial ones and taking into consideration the severe ecological demands for the environmental protection, we have carried out both agro-technical (weeding, scything, mulching) and chemical methods (herbicides based on glyphosate).

The herbicide treatment was carried out with a new equipment designed by National Institute for Research - Development for Machines and Installations Designed to Agriculture and Food

Industry. The purpose of these studies was to replace the exclusive chemical control, mostly because herbicides show a low effect on the perennial weeds in the orchards.

## MATERIALS AND METHODS

The researches were carried out at the RDIPP- Bucharest stone -fruit orchard, on a brown forest soil, at neutral pH, in the absence of irrigation.

The experiment was designed in randomized plots, each of them in four replications. On the weeding (variant) plots through mechanical work two weeding were carried out. On other plots the weeds were scythed, and used as mulching vegetal layer. During the vegetation period this mulching layer was restored twice. On the scything variant, three scythings were carried out, so that weeds should not have seeds.

The chemical treatment was carried out post-emergency, using a herbicide based on glyphosate (Roundup), which showed no remanence in soil, and with a low environmental effect and being well accepted in the integrated control systems. Within this control strategy, the glyphosate treatment was used in two different ways: one of 4l/ha and the second one with two treatment applications: post-emergency I, when the perennial weeds were 15-20 cm high, and post-emergency II, when the soil was re-infested.

The observations about the efficacy of the control methods were recorded 30 and 60 days after treatment applications. The main weeds observed on the experimental plots were:

- annual grasses: *Echinochloa crus-galli* (L.) Pal Beauv., *Setaria glauca* Pal. Beauv., *Setaria viridis* Pal. Beauv, *Lolium perenne* Lam.;
- perennial grasses: *Cynodon dactylon* (L), *Agropyron repens* (L.) Pal. Beauv.;
- annual blw: *Stellaria media* (L.) Vill., *Amaranthus retroflexus* L., *Chenopodium album* L., *Solanum nigrum* L., *Galinsoga parviflora* Cav., *Portulaca oleracea* L., *Hibiscus trionum* L., *Polygonum aviculare* L., *Polygonum convolvulus* L., *Veronica hederifolia* L., *Lamium amplexicaule* L., *Lamium purpureum* L., *Capsella bursa-pastoris* L., *Matricaria inodora* L.;
- perennial blw: *Convolvulus arvensis* L., *Sonchus arvensis* L., *Cirsium arvense* (L.) Scop., *Taraxacum officinale* Web., *Trifolium repens* L., *Plantago major* L., *Rumex acetosella* L., etc.

## RESULTS

The weeds infestation level of the orchard was very high, exceeding 200 plants/m<sup>2</sup> (Tables 1 and 2).

On the weeding variant plots, the control efficacy passed over 90%. This control method though proved to be very good, can not always be properly applied, due to various climatic conditions.

In the scything variant plots the control efficacy was over 87% (variant 2). On the plots (variant 3) where the weeds have only been scythed, even of at the beginning weeds control efficacy was satisfactory, for the entire vegetation period, the control level did not surpass 50%; this method was used so weeds should not have seeds and do not compete trees in terms of water and nutrients consumption.

**Table 1**

Weeds control in the stone- fruit orchard at 30 days following chemical treatment application

Variant	Grasses		Blw		Total	
	Nr.pl./m <sup>2</sup>	E%	Nr.pl./m <sup>2</sup>	E%	Nr.pl./m <sup>2</sup>	E%
V1-weeding	4,0	90,8	13,0	91,1	17,0	91,0
V2-scything+mulching	5,0	88,5	18,0	87,7	23,0	87,9
V3-scything	18,0	58,8	45,0	69,2	63,0	66,8
V4- Roundup 3l/ha	8,0	81,6	21	85,6	29,0	84,7
V5- Roundup 4l/ha	3,0	93,1	9,5	93,5	12,5	93,4
V7- control standard	43,7	-	146,5	-	190,2	-

As expected the best results 30 days following chemical treatment application were obtained at the rate of 4l/ha, the efficacy surpassed 92%. The relevant glyphosate treatment effect showed 12 to 15 days following application by gradual weeds yellowing until plants dieing. The *Cynodon dactylon* was not completely removed at the rate of 4l/ha glyphosate. 30-40 days after the chemical treatment

annual weeds grow from the seeds, and the renewal of annual blw (perennial weeds) begin after 50-60 days, and consequently a second treatment is needed.

Taking into account these observations, on the variant plots where Roundup was used 3l/ha, post emergency a second treatment was carried out at the same rate. Table 3 presents the efficacy of these treatment applications with the best results in weeds control. Though at the beginning the weeds control level seems to be higher at the rate of 4l/ha, by applications of the two treatments of 3l/ha each it is ensured a better stone orchard protection against weeds competition for a longer period of time.

**Table 2**

Weeds control in the stone- fruit orchard 60 days following chemical treatment application

Variant	Grasses		Blw		Total	
	Nr.pl./m <sup>2</sup>	E%	Nr.pl./m <sup>2</sup>	E%	Nr.pl./m <sup>2</sup>	E%
V1 - weeding	4,0	92,5	10,0	93,8	14	93,5
V2 - scything+mulching	7,0	87,0	20,0	87,7	27	87,5
V3 - scything	27,0	50,0	83,0	49,2	110	49,4
V4 - Roundup 3l/ha	15,0	72,2	40,0	75,5	55	74,7
V5 - Roundup 4l/ha	10,0	81,4	25	84,7	35	83,9
V7- control standard	54,0	-	163,7	-	217,7	-

**Table 3**

The glyphosate efficacy 30 days from the second post emergence treatment application

Variant	Grasses		Blw		Total		EWRS notes	
	Nr.pl./m <sup>2</sup>	E%	Nr.pl./m <sup>2</sup>	E%	Nr.pl./m <sup>2</sup>	E%	Selec- tivity	Effica- cy
V4-Roundup 4l/ha	8,0	66,6	16,5	74,1	24,5	72,0	1	3
V5-Roundup 3l/ha+3l/ha	1,2	90,5	7,0	89,0	8,2	90,6	1	1.5
V7-control standard	24,0	-	63,7	-	87,7	-	1	9

## CONCLUSIONS

The observations noted in this experiment lead to the conclusion that both the agro-technical and chemical methods ensure a high weeds control level, the weeds control efficacy level exceeding 80%. On the scything variant plots the efficacy of weeds control level is lower, but the three times weeding keep the weeds at a growth level not harmful for the orchard trees. At the same time the weeds do not succeed to accumulate nutrients survive during wintertime.

The mulching method ensures a very good weeds control; it is easy to apply it at low costs. Besides the high level of weeds control, especially the perennial weeds, the mulching layer is also a fertilizer, thus improving organic matter in soil.

In terms of chemical control it was considered the use of herbicides based on glyphosate, which do not damage the useful fauna and are rapidly degraded in soil, with no residues issued in fruits.

The herbicide treatment was carried out with new equipment designed by INMA.

The best results were achieved with two glyphosate treatment applications 3l/ha each: post emergence I, when the weeds were 15-20 cm high, and post emergence II, when soil was re-infested.

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