

EFFICACY OF POST-EMERGENCE HERBICIDE FLAZULFURON FOR WEED MANAGEMENT IN STONE FRUIT ORCHARDS

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Abstract

Due to their longevity and the long distance between rows, orchards are infested every years by annual and perennial monocotyledonous and dicotyledonous weeds species, some of them being very difficult to control. In Romania, in the integrated weed control management, herbicides play an important role together with the other control methods. This paper provides data on weed control in stone fruit orchards with herbicide Flazulfuron. Flazasulfuron is a new sulfonylurea herbicide which inhibits the acetolactase synthase enzyme in susceptible plants, to control a wide range of annual and perennial weeds. Trials were carried out in a drip – irrigated apricot and peach orchard at Agigea, Constanta county, Romania. Experimental plots were placed in randomized complete blocks design, in four repetitions on a vermi – calcic chernozem soil with a clay loam texture, in 2019. Flazasulfuron (250g/l active ingredient) was applied in post emergence at the doses of 0.04, 0.06 and 0.08 kg/ha. Standard reference (Glyphosate 360g/l) was applied at the dose of 4 l/ha. The major weed flora in the experimental fields included: Capsella bursa-pastoris, Lamium purpureum, Fumaria officinalis, Fallopia convolvulus, Matricaria sp., Chenopodium album, Xanthium sp., Malva sylvestris, Veronica sp., Papaver rhoeas, Setaria sp. The results demonstrated that the different rates of Flazasulfuron provide good efficacy on annual dicotyledonous and monocotyledonous weeds in stone fruit orchards, depending on weeds infestation and climatic conditions. The results of herbicide Flazasulfuron were similar to the standard reference.

Keywords: weeds, stone fruit orchard, flazasulfuron, effectiveness

1. INTRODUCTION

Fruit growing plays an essential role in our agriculture due to the fact that in Romania there are favourable soil, environmental conditions and established high yield potential fruit growing areas. However, peach and apricot cultivated areas have decreased a lot in recent years, as in 2017 there were cultivated only 1693.28 ha with peach and 2361.81 ha with apricot (*2018). The stone fruit orchards production is constrained by several factors including those of diseases, weeds, insect pests, soil erosion, and other biotic and abiotic factors (Mousavi, 2001; Tursun et al., 2009). Stone fruit orchards are yearly infested by mono and dicotyledonous annual, biennial and perennial weed species, some of them being very difficult to fight (Chirila, 2001). These weed species compete with the fruit trees for nutrients, space, moisture, light and adversely affect growth, vigour, fruit set, flower initiation, yield, fruit quality and winter hardiness (Majek et al., 1993; Punia et al., 2004.) and thereby directly reducing the productivity of fruit trees. Weeds also provide shelter to various pathogens by becoming an alternate or collateral host of invaded crops by a number of fungal, bacterial and viral diseases (Lipecki, 2006; Hussain et al., 2018). They also secrete root exudates in soil which adversely affect the plant growth and ultimately the yield (Kaur et al., 2009). Weeds infest the stone fruit orchards and decrease its productivity and quality. The primary goal of weed management is to optimize yield by minimizing weed competition. Herbicides may play a significant role for weed management in stone fruit. It was known that stone fruit species, including peach and nectarine, were more susceptible to herbicide application (Mitchell, 1987; Mitchell & Abernethy 1989; Ben-Arie, 1992; Omafra, 2006). That necessitated the investigation on the effect of different active substances on the growth and development of newly planted orchards of stone fruit species (Zhivondov & Rankova, 2008).

However, very few studies are available on weed control in apricot orchards (Tursun et al., 2018). A study indicated that more than 50 weed species infested the apricot orchard, and important among these were *Euclidium syriacum* (L.) R. Br., *Veronica polita* Fr., and *Polygonum aviculare* L (Marwat & Hussain1988). Glyphosate application and mechanical weed control are important among the current weed control practices in apricot and peach farming. Given that evolution of herbicide resistance in weeds, environmental pollution and controversy about the renewal of approval of active ingredient glyphosate at European Union level, there is a great need to identify new post-emergence herbicides for orchards. Also, we need to introduce and to use new herbicides with lower application rate and less negative environmental effects (Samedani et al., 2008). Flazasulfuron is a new sulfonylurea herbicide which inhibits the acetolactase synthase enzyme in susceptible plants. It is known to control a wide range of annual and perennial weeds when applied pre and early postemergence (Grove, 2011; Balneaves & Cosslett 1983; Sanders & Rahman 1994, James et al., 1997). Against this background, this paper provides data on weed control in stone fruit orchards with herbicide Flazulfuron in a drip – irrigated apricot and peach orchard at Agigea, Constanta county, Romania.

2. MATERIALS AND METHODS

The trials were carried out at in Romania at S.C. Agrotterra S.R.L. from Agigea, Constanta county in stone fruit orchards (Figure 1 and Figure 2). The experiments were conducted in 2019, in randomized complete block, in apricot (*Prunus armeniaca*) orchard, Augustin variety and in peach (*Prunus persica*) orchard, Springcrest variety, both six years aged. The planting design in these two orchards is 4 meters row spacing and 3 meters spacing within row, 833 trees on hectar density. The apricot is rootstocked on wild apricot (*Armeniaca vulgaris* L.) and peach is rootstocked on almond (*Prunus amygdalus*).

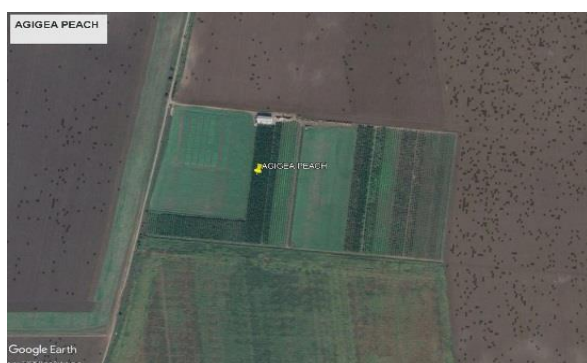


Fig. 1. Peach orchard



Fig. 2. Apricot orchard

The experiments were placed in 4 repetitions with plot area of 10 m² on a vermi-calcic chernozem soil with a clay loam texture, pH of 7.5 and an organic matter content of 2.5% with a good fertility and a CO₃ content of 7.59%. Each experimental block included an untreated plot and one standard reference. In order to provide an overview of floral composition in the experimental field, the untreated check was located adjacent (control side by side of each treated plot).

Flazasulfuron (250g/l active ingredient) was applied in post emergence at the doses of 0.04, 0.06 and 0.08 kg/ha. Standard reference (Glyphosate 360g/l) was applied at the dose of 4 l/ha. All treatments were applied in the spring, when stone fruit orchards were on the stage of BBCH 73 (second fruit fall). Treatments were applied by sprayer pump with nozzles when air temperature was 13 °C and soil temperature was 12 °C on April the 23th. The maintenance of apricot orchard and peach orchard is shown in table 1 and table 2. In April, May and June drip irrigation was applied for both stone fruits. Water volume was 250 lh during 4-5 hours depending on plant necessity. Drip irrigation is of particular importance, as adequate moisture can increase fruits size and improve trees growth. Beside this, it is well known that Dobroudja region (where Agigea is located) is the driest agricultural area in

Romania where irrigation system in orchards is required to be set up in order to obtain high crops. Orchards soil were fertilized with Mono Ammonium Phosphate (MAP) 12-61-0, 80kg/ha and Urea 46-0-0, 150kg/ha at the end of March.

Table 1. Maintenance of apricot orchard

Date	Type	Product Name	Form Unit	Rate	Rate Unit
5-11-18	FUNG	Bouillie bordelaise WDG	gA/kg	5	kg/ha
22-1-19	INSE	OVI PRON TOP EC	800	25	L/ha
14-3-19	FUNG	ALCUPRAL 50 PU	500	5	kg/ha
25-3-19	FUNG	CHORUS 50 WG	500	0,75	kg/ha
4-4-19	FUNG	SCORE 250 EC	250	0,15	L/ha
15-4-19	FUNG	ORIUS 25 EW	250	1,0	L/ha
15-4-19	INSE	FASTAC 10 EC	100	0,15	L/ha
26-4-19	FUNG	SCORE 250 EC	250	0,15	L/ha
15-5-19	INSE	CALYPSO 480 SC	480	0,2	L/ha
5-6-19	FUNG	MERPAN 80 WDG	800	2	kg/ha

Table 2. Maintenance of peach orchard

Date	Type	Maintenance Product Name	Form Unit	Rate	Rate Unit
6-11-18	FUNG	Bouillie bordelaise WDG	gA/kg	5	kg/ha
23-1-19	INSE	OVI PRON TOP EC	800	25	L/ha
15-3-19	FUNG	ALCUPRAL 50 PU	500	5	kg/ha
22-3-19	FUNG	ALCUPRAL 50 PU	500	2,5	kg/ha
6-4-19	FUNG	SCORE 250 EC	250	0,15	L/ha
30-4-19	FUNG	SYLLIT 400 SC	400	2	L/ha
30-4-19	INSE	MAVRIK 2 F	240	0,5	L/ha
20-5-19	FUNG	TOPSIN 70 WDG	700	0,7	kg/ha
20-5-19	INSE	CALYPSO 480 SC	480	0,2	L/ha
6-6-19	FUNG	MERPAN 80 WDG	800	2	kg/ha

Weed density was assessed in ground % and in plants number on square meter. Weed control (efficacy) was assessed at 1, 2 and 3 months after treatment application in % control compared to the untreated plots. Also, there were performed observations on the weeds present in the experimental plots before treatment, and selectivity - at each date of the efficacy assessments. Determination of segetal flora was performed on a square meter using a metric frame. Phytotoxicity on the stone fruit crops and percent weed control were visually evaluated based on a 0% - 100% rating scale where 0 is no injury to peach and apricot and 100 is complete death of stone fruit. Statistical preparation of the results was based on the analysis of ARM-9 software (P=.05, Student-Newman-Keuls).

3. RESULTS AND DISCUSSION

In the stone fruit orchards taken for study in this trial, weeds have found a suitable environment for development, due to the long distances between trees, applied fertilizers and drip irrigation. The weed species composition on the research sites was dominated by annual broadleaved weeds. In experimental plots from peach orchard there were found: *Amaranthus retroflexus* L., *Capsella bursa-pastoris* L., *Chenopodium album* L., *Fumaria officinalis* L., *Matricaria* spp., *Polygonum aviculare* L., *Polygonum convolvulus* L., *Stellaria media* (L.) Vill, *Sonchus* spp., *Veronica* spp. and *Xanthium* spp. Among the annual monocotyledonous species the dominant one was *Echinochloa crus-galli* (L.) P. Peauv. There were also present *Setaria* spp., *Festuca pratensis* Huds., *Digitaria sanguinalis* (L.) Scop., but their low density on square meter didn't pose any significant problem to be controlled. In apricot orchard there were present: *C. bursa-pastoris*, *C. album*, *F. officinalis*, *Lamium purpureum* (L.), *Malva sylvestris* (L.), *Matricaria* spp., *Papaver rhoeas* (L.), *P. convolvulus*, *Portulaca oleracea* (L.), *Veronica* spp. and *Xanthium* spp. Among the annual monocotyledonous weeds the dominant ones were *Setaria* species. There were also present perennial species, too, but in a low number: *Cardaria draba*, (L.) Desv., *Cirsium arvense* (L.) Scop., *Taraxacum officinale*, (L.) Weber., *Agropyron repens* (L.) P. Peauv and *Sorghum halepense* (L.) Pers. The dominant weed in the experimental fields was *P. convolvulus*, which had in peach orchard a density of 24 plants/m² in untreated check after three months after treatment. The ground % was higher than 30%. In apricot orchard its density was higher than 39 plants/m², ground % higher than 46%. Figure 3 presents *P. convolvulus* species evolution at untreated plots. *P. convolvulus* (black bindweed), syn. *Fallopia convolvulus* (L.) Á. Löve, *Polygonaceae* family, is an annual, herbaceous plant, with voluble stem. The species is spread over Asia, Europe and acclimated in North America. In our country the plant grows in different cultures

and uncultivated areas, from plain up to the subalpine zone (Olaru et al., 2014). Apart from competing with the crop, it also causes lodging and other losses because of its vine-like characteristics. Because of its extensive root system, it is relatively resistant to drought and low pH. While it may be found in a wide variety of soils, the highest densities often occur in soils with a high clay component. The seeds of the species do not germinate or emerge simultaneously; rather, they emerge gradually during the crop cycle. This makes it difficult to combat *Polygonum* because some individuals will escape herbicide applications or other control measures, and will produce seeds.

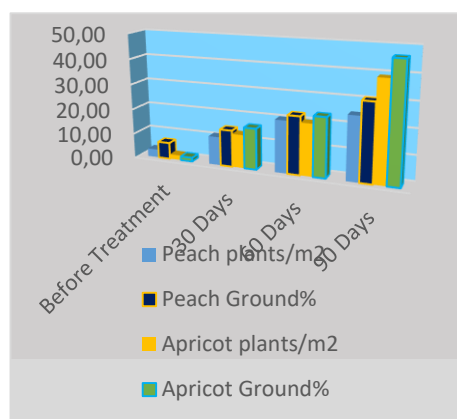


Fig. 3. Density of *P. convulvulus* in untreated plots



Fig. 4. Peach Orchard



Fig. 5. Apricot Orchard

In these conditions of weed infestation, the Flazasulfuron herbicide had a good efficacy in control of *P. convulvulus* and provided good results in stone orchards against annual dicotyledonous and monocotyledonous weeds. One month after treatment the herbicide Flazasulfuron applied in postemergence had a very good efficacy in control of weed in stone fruit orchards at all tested doses (table 3 and 4). In peach, at rate of 0.04 kg/ha Flazasulfuron, the lowest efficacy was for *C. bursa-pastoris* (64.2%), which had a density of 11.8 plants/m² and a ground % >14%. In apricot, at the same rate, the lowest efficacy was 63.7% in case of species *C. bursa-pastoris*, 60.0% for *Veronica* spp., 56.2 % for *Xanthium* spp. In Romania, the species *Veronica persica* Poir and *Xanthium italicum* Moretti are invasive species that, under favourable conditions of growth and development, can cause great damage and pose serious challenges in control. *V. persica* affects habitually wheat and rape crops but they are spread in vineyards, orchards and vegetables crops, too. *X. italicum* is spread almost over all crops, also in all agricultural areas. It has become a problem noxious weed species especially in Southern Romania, being a sturdy species with large dispersion and propagation capacity (Gradila & Jaloba 2018).

Table 3. The efficacy of herbicides in peach after 1 month of treatment

Treatment name	Dose L or Kg/ha	Efficacy (% control in comparison with the untreated plots)											
		Crop stage majority: second fruit fall. (BBCH 73)											
		Weeds stage majority (BBCH)											
		65	67	61	47	60	37	37	61	69	14	19	18
		CABBP	STEME	FUMOF	POLCO	MATSS	CHEAL	XANSS	POLAV	VERSS	AMARE	SONSS	ECHCG
Untreated (plants/m2)		11.8a	9.0a	5.39a	11.25a	9.10a	6.73a	4.74a	7.27a	7.50a	3.49a	1.01a	4.0a
Untreated (ground %)		14.7a	11.50a	7.50a	14.43a	12.33a	8.78a	6.67a	9.32a	9.28a	6.00a	1.65a	3.62a
Untreated		0.0c	0.0b	0.0c	0.0c	0.0b	0.0b	0.0b	0.0c	0.0b	0.0b	0.0b	0.0b
Flazasulfuron	0.04	64.2b	82.5a	69.1b	75.0a	87.0a	87.5a	78.7a	85.3ab	87.5a	93.7a	75.0a	90.0a
	0.06	77.1b	92.5a	71.6b	90.0ab	98.6a	91.2a	62.5b	91.9ab	93.7a	100a	87.5a	95.0a
	0.08	100a	100a	100a	91.2ab	100a	95.0a	81.2ab	98.6ab	96.2a	100a	100a	100a
Glyphosate	4.0	100a	100a	100a	97.5a	95.0a	95.0a	100a	100a	100a	100a	100a	100a
LSD P=Various		6.4-21.6	19.77	8.2-27.5	12.57	10.5-15.7	17.2	16.44	8.9-19.2	15.13	6.08	23.22	12.63
Standard Deviation		10.06	13.54	13.54	8.61	13.01t	11.8	11.26	11.95	10.36	4.16	16.13	8.66

Another competitive and hard to get rid of weed identified in apricot was *M. sylvestris* species, a weed that is among the most common and problematic weeds in the world and that can form very harmful infestations in perennial crops, such as vineyards and orchards. Being a herbaceous, biennial or perennial plant, with erect stem up to 1 meter height, once established, it can be very difficult to eradicate. Research has shown that common mallow has deterrent effects on other plants. In the leaves of common mallow it was found tannin and there is a remarkable amount of glaze in all organs of common mallow, including L-rhamnose and L-arabinose, D-galacturonic acid and other materials which are capable of preventing the growth of plants that grow along with common mallow (Zahedi & Ansari 2011; Gasparetto et al., 2012.). *M. sylvestris* is a medicinal plant but also an important invasive weed (Ansari et al., 2016).

Table 4. The efficacy of herbicides in apricot after 1 month of treatment

Treatment name	Dose L or Kg/ha	Efficacy (% control in comparison with the untreated plots)											
		Crop stage majority: second fruit fall. (BBCH 73)											
		Weeds stage majority (BBCH)											
		65	67	61	47	60	37	37	61	69	61	18	
		CABBP	LAMPU	FUMOF	POLCO	MATSS	CHEAL	XANSS	MALSI	VERSS	PAPRH	SETSS	
Untreated (plants/m2)		5.11a	6.65a	2.41a	13.14a	8.10a	6.73a	4.26a	2.17a	5.56a	2.46a	3.77a	
Untreated (ground %)		6.48a	8.72a	3.43a	16.21a	10.23a	10.23a	6.34a	3.62a	7.69a	3.67a	5.50a	
Untreated		0.0c	0.0b	0.0b	0.0c	0.0b	0.0c	0.0c	0.0b	0.0c	0.0b	0.0b	
Flazasulfuron	0.04	63.7b	75.0a	87.5a	73.7a	75.0a	75.9b	56.2b	71.2a	60.0a	85.3a	78.7a	
	0.06	81.2ab	80.0a	93.7a	99. a	83.7a	91.0 ab	62.5 b	78.7a	90.0a	96.1a	86.2a	
	0.08	87.5ab	93.7a	100a	100a	87.5a	93.6ab	81.2ab	92.5a	88.7a	98.3a	100a	
Glyphosate	4.0	100a	100a	100a	100a	92.5a	100a	100a	100a	100a	98.3a	100a	
LSD P=Various		21.54	21.95	17.10	16.1	17.00	7.7-18.8	21.00	21.3	18.8	11.3-17.4	17.02	
Standard Deviation		14.76	15.04	11.72	11.05	11.64	11.05t	16.44	14.6	12.9	13.49t	11.66	

Subsequent observations confirmed the good efficacy of flazasulfuron in weed control, in comparison with the untreated plots, the best results being obtained at the rate of 0.08 kg/ha. Thus, after two months after treatments, the control % of *P. convolvulus* species at the lowest rate was only 60.4 % in peach orchard and in apricot was 50.7%. Excessive development of *P.convolvulus* species was favoured by soil, irrigation and by the fact that some weed species that had emerged in early spring (*Capsella*, *Veronica*, *Lamium*, *Fumaria*, *Stellaria*, *Papaver*) completed their life cycle in June or July leaving enough space for spreading of this species (Table 5 and 6).

Table 5. The efficacy of herbicides in peach after 2 months of treatment

Treatment name	Dose L or Kg/ha	Crop stage majority: second fruit fall. (BBCH 73)											
		Weeds stage majority (BBCH)											
		79	61	81	63	71	55	60	61	89	30	35	45
		CABBP	STEME	FUMOF	POLCO	MATSS	CHEAL	XANSS	POLAV	VERSS	AMARE	SONSS	ECHCG
Untreated (plants/m ²)		11.9a	7.72a	5.39a	20.54a	9.10a	8.64a	4.74a	8.10a	7.50a	5.47a	1.01a	7.55a
Untreated (ground %)		13.15a	10.76a	5.79a	22.67a	11.20a	9.02a	6.83a	8.93a	7.83a	5.71a	3.0a	10.77a
Untreated		0.0d	0.0b	0.0b	0.0d	0.0c	0.0b	0.0b	0.0c	0.0b	0.0b	0.0b	0.0b
Flazasulfuron	0.04	61.8c	89.0a	66.2a	60.4c	78.3ab	82.5a	87.9a	73.7ab	87.5a	87.5a	75.0a	90.3a
	0.06	80.4abc	96.1a	71.2a	81.3bc	97.1ab	91.2a	91.8a	91.2ab	93.7a	91.2a	87.5a	98.3a
	0.08	88.4abc	97.9a	93.5a	88.4b	98.6ab	93.7a	97.5a	96.2ab	96.2a	96.2a	87.5a	99.0a
Glyphosate	4.0	98.6a	99.3a	100a	97.4ab	100a	100a	100a	100a	100a	100a	100a	100a
LSD P=Various		12.3-24.5	10.7-12.4	21.82	6.9-18.1	9.9-22.5	14.92	9.7-11.9	18.47	15.12	18.87	24.82	5.0-8.8
Standard Deviation		11.31t	11.38t	14.95	7.83t	12.57t	10.20	12.48t	12.65	10.36	12.93	17.01	8.66t

Table 6. The efficacy of herbicides in apricot after 2 months of treatment

Treatment name	Dose L or Kg/ha	Crop stage majority: fruit about half final size. (BBCH 75)											
		Weeds stage majority (BBCH)											
		70	89	81	63	71	55	60	79	89	81	47	16
		CABBP	LAMPU	FUMOF	POLCO	MATSS	CHEAL	XANSS	MALSI	VERSS	PAPRH	SETSS	POROL
Untreated (plants/m ²)		6.17a	6.65a	4.0a	20.35a	8.10a	9.69a	4.26a	4.51a	5.56a	2.46a	3.77a	3.50a
Untreated (ground %)		8.75a	8.74a	5.50a	23.31a	8.48 a	12.33a	6.73a	7.02a	7.69a	3.43a	5.50a	3.43a
Untreated		0.0c	0.0b	0.0b	0.0e	0.0b	0.0b	0.0c	0.0b	0.0c	0.0b	0.0b	0.0b
Flazasulfuron	0.04	52.5b	65.0a	87.5a	50.7d	75.0a	83.5a	62.9b	76.2a	60.0b	70.0a	78.7a	87.5a
	0.06	62.5ab	81.2a	93.7a	83.7a	83.7a	91.9a	69.1b	81.2a	83.7a	87.5a	86.2a	93.7a
	0.08	86.2ab	93.7a	100a	87.5a	87.5a	94.0a	89.6ab	90.0a	88.7a	93.7a	100a	100a
Glyphosate	4.0	100a	100a	100a	92.5 a	92.5a	100a	98.3a	100a	100a	93.7a	100a	100a
LSD P=Various		27.74	25.71	16.08	8.57	16.16	7.0-14.2	12.2-28.4	20.35	18.52	25.91	17.02	16.08
Standard Deviation		19.01	17.61	11.0	5.87	11.07	11.05t	14.03t	13.95	12.69	16.38	11.66	11.02

The predominant weeds were of *Polygonaceae* family, thus in peach, at 3 months after treatments *P. convolvulus* and *P. aviculare* had a density/m² together higher than 36% and a soil coverage higher than 45% (Tables 7 and 8). At rate of 0.08 kg/ha Flazasulfuron, the results obtained are comparable with standard reference: therefore, in peach: 98.3% for *Capsella bursa-pastoris* and 100% glyphosate;

96.2% for *S. media* and 100% at glyphosate; 92.4% for *P. convolvulus* and 96.8% at glyphosate; 93.7% for *Matricaria* spp. and 95.0% at glyphosate; 93.7% for *C. album* and 100% at glyphosate; 97.5% for *C. album* and 100% at glyphosate; 91.2% for *P. aviculare* and 96.2% at glyphosate; 100% for *Veronica* spp. and 100% at glyphosate; 96.2% for *A. retroflexus* and 100% at glyphosate; 87.5% for *Sonchus* spp. and 100% at glyphosate and 99.0% for *E. crus-galli* and 100% at glyphosate. The comparison with the standard reference is also valid for apricot except for the species *P. convolvulus* whose efficacy was 68.7% at flazasulfuron and 92.5% at glyphosate.

Table 7. The efficacy of herbicides in peach after 3 months of treatment

Treatment name	Dose L or Kg/ha	Efficacy (% control in comparison with the untreated plots)											
		Crop stage majority: second fruit fall. (BBCH 73)											
		Weeds stage majority (BBCH)											
		89	81	89	67	97	69	69	79	97	14	19	18
		CABBP	STEME	FUMOF	POLCO	MATSS	CHEAL	XANSS	POLAV	VERSS	AMARE	SONSS	ECHCG
Untreated (plants/m ²)		7.04a	5.14a	4.0a	24.97a	7.99a	9.20a	4.74a	11.88a	4.13a	5.3a	1.01a	9.94a
Untreated (ground %)		9.69a	7.47a	4.88a	30.57a	9.90a	10.64a	6.83a	15.0a	6.50a	6.86a	3.00a	11.32a
Untreated		0.0b	0.0b	0.0b	0.0c	0.0b	0.0b	0.0b	0.0b	0.0b	0.0b	0.0b	0.0b
Flazasulfuron	0.04	87.0a	88.7a	78.7a	69.7b	82.5a	82.5a	87.9a	77.5a	90.0a	90.0a	75.0a	88.7a
	0.06	91.9a	93.7a	91.2a	88.7a	90.0a	91.2a	91.8a	86.2a	95.0a	92.5a	87.5a	98.3a
	0.08	98.3a	96.2a	100a	92.4a	93.7a	93.7a	97.5a	91.2a	100a	96.2a	87.5a	99.0a
Glyphosate	4.0	100a	100a	100a	96.8a	95.0a	100a	100a	96.2a	100a	100a	100a	100a
LSD P=Various		8.0-12.2	11.97	18.50	6.5-15.7	16.76	14.92	9.7-11.9	13.26	12.63	13.9	24.8	7.4-10.8
Standard Deviation		11.32t	8.20	12.68	7.53t	11.48	10.22	12.48t	9.09	8.66	9.5	17.01	10.86

Table 8. The efficacy of herbicides in apricot after 3 months of treatment

Treatment name	Dose L or Kg/ha	Efficacy (% control in comparison with the untreated plots)											
		Crop stage majority: Colouring advanced (BBCH 85)											
		Weeds stage majority (BBCH)											
		89	97	89	67	97	69	69	89	97	97	65	51
		CABBP	LAMPU	FUMOF	POLCO	MATSS	CHEAL	XANSS	MALSI	VERSS	PAPRH	SETSS	POROL
Untreated (plants/m ²)		2.0a	1.82a	3.0a	39.15a	3.34a	9.69a	4.27a	4.48a	3.88a	3.0a	7.82a	5.11a
Untreated (ground %)		2.0a	1.82a	2.51a	46.25a	3.34a	10.11a	6.73a	7.02a	4.74a	2.87a	10.2a	7.50a
Untreated		0.0c	0.0b	0.0b	0.0e	0.0b	0.0c	0.0c	0.0b	0.0b	0.0b	0.0c	0.0b
Flazasulfuron	0.04	91.5a	87.5a	87.5a	40.0d	72.5a	62.5b	56.2b	68.7a	71.2a	81.2a	75.0b	81.2a
	0.06	100a	93.7a	91.2a	52.5c	87.5a	80.0a	62.5ab	81.2a	91.2a	87.5a	91.9ab	86.2a
	0.08	100a	100a	100a	68.7b	100a	90.0a	81.2ab	87.5a	100a	93.7a	95.4ab	95.0a
Glyphosate	4.0	100a	100a	100a	92.5a	92.3.7a	100a	100a	100a	100a	100a	100a	100a
LSD P=Various		10.94	15.19	14.03	8.43	24.70	14.76	25.19	20.34	25.49	25.25	6.91-18.5	15.15
Standard Deviation		7.49	10.41	10.23	6.40	16.93	10.10	17.26	14.28	17.48	17.30	10.44t	10.32

The results obtained demonstrate that herbicide Flazasulfuron can protect stone fruit orchards during a 90 days period after treatments. Control of broadleaf weeds with flazasulfuron varied by rates and rating times (Singh et al., 2012) Flazasulfuron, or N-[4,6-dimethoxypyrimidin-2-yl)- 3-(3-

trifluoromethyl-2-pyridylsulphonyl)urea] (Tomlin, 2000) is rapidly absorbed into the weed leaves and is translocated through the xylem and phloem towards the meristematic zone. In this zone Flazasulfuron inhibits acetolactate synthase (ALS), a key enzyme for branched-chain amino-acids synthesis which results in cessation of cell division and plant growth. Following post-emergent application of Flazasulfuron, treated weeds stop growing within a few hours and show gradual discoloration on the newly developed leaves. This is followed by leaf necrosis, desiccation and ultimate death on the plants. The visual symptoms appear within three to few days after treatment and the whole plants are normally killed within 20 to 25 days (Hashizume, 1990; Magne et al., 2006). Flazasulfuron is assumed to be safe for use in orchards, due to a rapid detoxification (Bourdrez & Beraud, 1999), followed by degradation into inactive compounds. This inactivation is also observed in tolerant weeds and is considered as the main selectivity mechanism for flazasulfuron (Hashizume, 1990). Flazasulfuron may be used as a pre or post-emergence herbicide at very low rates (25–100 g ha) and has a wide herbicidal spectrum. Moreover, it presents a favorable profile in terms of toxicology and ecotoxicology (Bourdrez & Beraud, 1999), and it efficiently controls weeds up to harvest, thus limiting the number of treatments.

No phytotoxicity symptoms have been shown in the experimental plot. No symptoms of chlorosis, necrosis, leaf deformation, height reduction, distortion and delay at flowering in plots treated with herbicides Flazasulfuron were seen (**, 2014). Crop selectivity of Flazasulfuron exists based on the metabolic ability of some plants to breakdown Flazasulfuron into inactive metabolites.

4. CONCLUSIONS

The stone fruit orchards in Romania are yearly infested by annual, biennial and perennial mono and dicotyledonous weeds, some of them very difficult to be controlled.

The weed species composition on the research sites was dominated by annual broadleaf weeds.

Flazasulfuron was applied in post emergence at the doses of 0.04, 0.06 and 0.08 kg/ha. Standard reference (Glyphosate 360g/l) was applied at the dose of 4 l/ha.

Assessments made at 1, 2 and 3 months after treatments demonstrated a good efficacy of the herbicides Flazasulfuron in control of annual weeds in stone fruit orchards, the best results were obtained at the dose of 0.08 kg/ha. The post effect duration of the herbicide Flazasulfuron was 90 days. That eliminated the competition for water and nutrient substances and the weed density was significantly lower in all the treatments compared to untreated control. The results were similar with the standard reference.

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