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ВЛИЯНИЕ НА ОКСИФЛУОРФЕН ВЪРХУ ЗАПЛЕВЕЛЯВАНЕТО И РАСТЕЖНИТЕ ПРОЯВИ В ПЛОДОДАВАЩО ЯБЪЛКОВО НАСАЖДЕНИЕ
INFLUENCE OF OXYFLUORFEN ON WEED CONTROL AND GROWTH OF FRUIT-BEARING OF APPLE TREES

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Abstract

The aim of the present study was to test the influence of two rates of a. i. oxyfluorfen (Goal 2 E) on the weed control and growth of fruit-bearing apples trees. The following variants were set: a_1 – control (untreated); a_2 – oxyfluorfen (Goal 2 E in rate 250 ml/ da); a_3 - oxyfluorfen (Goal 2 E in rate 500 ml/ da). The number and the weight of weeds were reported on 30^{th}, 60^{th} and 90^{th} day after treatment. The indexes for annual shoot length increment and stem cross section area were studied after the end of vegetation. The obtained results showed that oxyfluorfen had a three-mounth weed control efficacy. Only weed species unsusceptible to oxyfluorfen were present. A depressing effect on the tree growth expressed by the annual shoot length and stem cross section was not detected.

Key words: oxyfluorfen, apple, weeds, annual shoot length increment, stem cross section area.

INTRODUCTION

Weeds are competitors of crops to soil moisture, nutrients and sunlight. There are different methods of weed control, which includes machining, cutting, mulching and chemical control (DuPlissis, 1998). It is known that herbicides affect the growth of fruit types of events and can cause phytotoxicity, expressed in chlorosis, necrosis, growth inhibition, etc. (Mitchell, 1987; Porterfield *et al.,* 1993; Wazbinska, 1997; Abdul *et al.,* 1998; Kaufman and Libek, 2000). According to different authors oxyfluorfen preemergence herbicides (Goal 2 E in dose 400 ml ha^{-1}, Galigan 240 EC in a dose 500 ml ha^{-1}) implemented effective controls against annual monocotyledonous and dicotyledonous weeds and has duration of 4-5 months herbicide action. Because of its broad spectrum that herbicide is suitable for use in permanent plantations (Rankova and Bozhkova, 2008; Rankova and Kolev, 2008; Rankova *et al.,* 2009).

The aim of the present experiment was to study the influence of weed control efficacy of a.i. oxyfluorfen - trade name Goal 2 E of vegetative habits of apple plantation - average annual shoot length increment and stem cross section area.

MATERIALS AND METHODS

The experiments were carried out over 2009-2011 in the experimental field of the Institute of Land Reclamation and Agricultural Mechanization – Sofia. Soil type is leached maroon forest soils, medium to heavy mechanical composition with good air mode, medium to high water-passing, with an average filtration capacity.

It was used the method of the field experience with options on the following scheme: a_1 - no herbicides, weeds (K_0); a_2 - herbicide oxyfluorfen (trademark Goal 2 E) at the rate 250 ml/da; a_3 - herbicide oxyfluorfen (trademark Goal 2 E) at the rate 500 ml/da. The experiment was set up by the long-plot method and it included three replications with the size of the harvest area 20 m².

Apples are variety of Florina, planted in 1996. They were reported are the number and fresh weight of weeds on the 30^{th}, 60^{th} and 90^{th} day after the treatment with herbicides, annual shoot length increment *(cm),* stem cross section area (S-cm^2) and the influence of applied herbicides on the increase stem cross section area compared to 2008 year.

Treatment with preemergence herbicide was carried out in the second half of April after pretreatment of the soil.

The results obtained were processed by the dispersion analysis method.

RESULTS

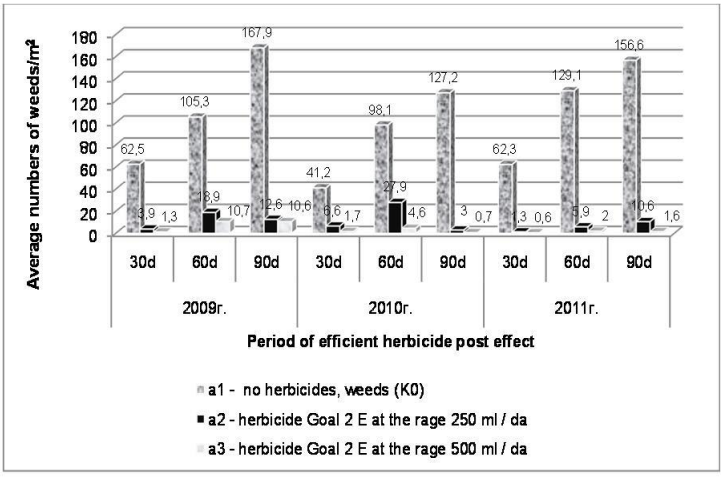
During growing period was evidenced the spread of 22 annual weed species forming the weed association inter-row – yellow bristle-grass (*Setaria glauca* L. Beauv.), green bristlegrass (*S. viridis* L. Beauv.), cockspur (*Echinochloa crus-galli* L. Beauv.), black grass (*Alopecurus myosuroides* Huds.), field brome (*Bromus arvensis* L.), mouse barley (*Hordeum murinum* L.), ivy leaf speedwell (*Veronica hederifolia* L.), henbit deadnettle (*Lamium amplexicaule* L.), common chickweed (*Stellaria media* L.), common groundsel (*Senecio vulgaris* L.), black bindweed (*Polygonum convolvulus* L.), garden vetch (*Vicia angustifolia* L.), hairy tare (*Vicia hirsuta* L. S. F. Gray), white goosefoot *(Chenopodium album* L.), redroot pigweed (*Amaranthus retroflexus* L.), prostrate knotweed (*Polygonum aviculare* L.), gallant soldier (*Galinsoga parviflora* Cav.), rough cockle-bur (*Xanthium strumarium* L.), common stork`s-bill (*Erodium cicutarium* L.), shepherd`s-purse (*Capsella bursa-pastoris* L. Medic.), scented mayweed (*Chamomilla recutita* L. Beauv.), canadian fleabane (*Erigeron canadensis* L.).

Weed in treated variants represented by 15 species total for the tree years of conducting experience, not present at all readings.

In the three years of conducted experience the weakest annual shoot length increment was accounted of variant a_1 (no herbicides, weeds), the most powerful - variant a_2 (Goal 2 at the rate 250 ml/da). Smaller cross-sectional area of the stem was found in the a_3 variant (Goal 2 E at the rate 500 ml/da).

DISCUSSION

Data about the weed species, mean number of plants per square metre in dinamics for the three trial years are presented in figure 1. Oxyfluorfen in the two concentration applied fully killed the following weed species on the 30th day after treatment: Echinochloa crus-galli, Hordeum murinum, Lamium amplexicaule, Veronica hederifolia, Stellaria media, Senecio vulgaris, Polygonum convolvulus, Polygonum aviculare, Vicia hirsuta, Chenopodium album, Amaranthus retroflexus, Chamomilla recutita, Galinsoga parviflora, Erodium cicutarium, Capsella bursa-pastoris, Erigeron Canadensis.



30-th day LSD 5% - 17,99; 1% - 29,84 0,1% - 55,81
60-th day LSD 5% - 32,13; 1% - 53,29 0,1% - 99,66
90-th day LSD 5% - 21,99; 1% - 36,47 0,1% - 68,21

Фиг. 1. *Среден брой плевели в 1 m² в динамика през трите експериментални години*
Fig. 1. *Average numbers of weed per square meter in dinamics for the three trial years*

Analogous results of its herbicide effect were obtained for the mentioned weeds on the 60th day after applying of oxyfluorfen.

90 days after the introduction of herbicides in 2009 in variant treated with Goal 2 E at the rate 250 ml/da was accounted increase the number of S. viridis to average 6,3 with average weight 25,77 g and Xanthium strumarium (average 3,3 numbers per m² with average weight 48,97 g). By the use of high rate of herbicide with average 4 numbers per m² and average weight 27,78 g was determined the type Setaria glauca, with average 3 numbers per m² and average weight 11,86 g - S. viridis and with average 2,7 numbers per m² and average weight 42,52 g - Xanthium strumarium. In 2010 in variant treated with Goal 2 E at the rate 250 ml/da was established largest weed species control in the species Alopecurus myosuroides and Xanthium strumarium. In Xanthium strumarium was accounted significantly increase of its average weight of 1 m² - 43,2 g, without changing his

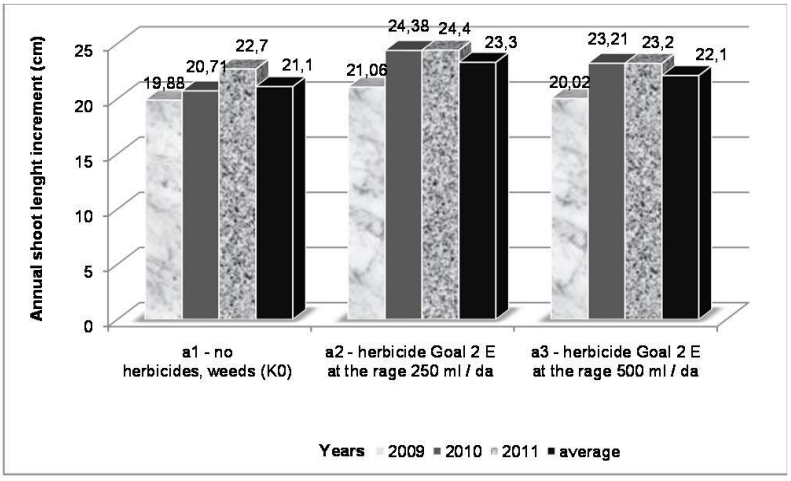
number. In the variant treated by Goal 2 E at the rate 500 ml/da was accounted the existence of Xanthium strumarium as established weed species compared to control were 25.93%. In 2011 variant treated with Goal 2 E at the rate 250 ml/da dominant weed species was Alopecurus myosuroides (average 9 numbers per m^2 and average weight 12,79 g). It were determinate weed species Erigeron canadensis (average 1 numbers per m^2 and average weight 3.71 g), Alopecurus myosuroides (average 0.3 numbers per m^2 and average weight 0,03 g) and Xanthium strumarium (average 0,3 numbers per m^2 and average weight 20,05 g) in the variant treated with the highest rate of oxyfluorfen.

By treatment with oxyfluorfen (Goal 2 E at the rates 250 and 500 ml/da) was carried out successful control of annual dicotyledonous weeds for three months, which was a good length of toxic action against them. Similar results were described previously by Rankova and Kolev (2008), Rankova et.al. (2009). The only exception was the species Xanthium strumarium, which was more resistant to the active substance used. Towards annual monocotyledonous weeds this herbicide was not suitable for use if weeds were represented mainly by such species. Low level of weed species by use of herbicide Goal 2 E warrants this product to be recommended for treatment of apple orchards predominantly by annual dicotyledonous weeds. Lower rate of herbicide oxyfluorfen had not enough good toxic action only against type Alopecurus myosuroides, but in gardens, in which the species isn't distributed it can be successfully used. It was established a significant effect of oxyfluorfen on weed control in the three years of conducted experience (fig. 1). The differences relative to the respective control were statistically significant.

Data of the biometric analysis were unidirectional throughout the study years and they were presented as average values.

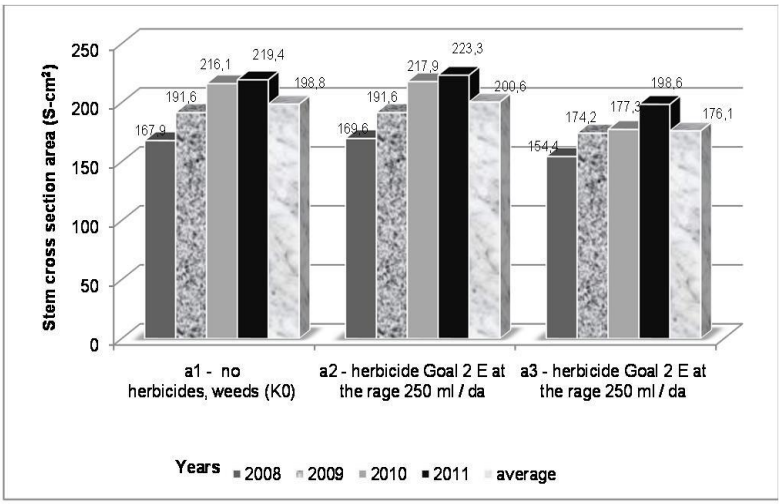
Figure 2 showed the average annual shoot length increment taken in the two years of the experiment. The results showed higher values in the apple trees of the variants with applied oxyfluorfen in both of rates, which were established by the other authors (Rankova and Kolev, 2008; Rankova et. al.,2009). After a mathematical processing of results was found that between the tested variants had no statistical differences in the average annual shoot length increment (*cm*), from which it can be concluded that in the survey herbicides used in appropriate doses have not depressing effect on the growth of annual shoots and have a negative impact on that ground.

On figure 3 is reflected stem cross section area ($S\text{-}cm^2$). The circumference of the trunk was measured at 20 cm from the soil surface in November 2008, 2009, 2010 and 2011. It was estimated the stem cross section. Smaller cross-sectional area of the stem which was found in the a_3 variant (Goal 2 E at the rate 500 ml/da) is due to the difference back in 2008 before the start of experimental work.



LSD 5% - 2,62; 1% - 6,06 0,1% - 19,27

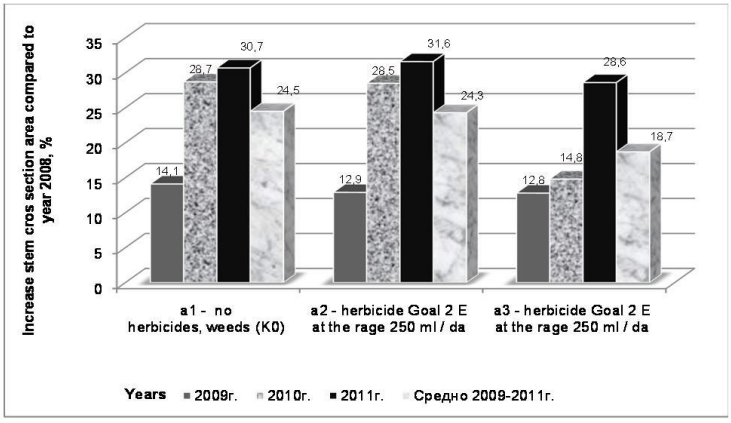
Фиг. 2. *Влияние на използваните хербициди върху показателя прираст на едногодишните летораслu (cm)*
Fig. 2. *Effect of the applied herbicides on the average annual shoot length increment (cm)*



Фиг. 3. *Влияние на използваните хербициди върху показателя "напречно сечение на стъблото" (S-cm^2)*
Fig. 3. *Influence of applied herbicides on stem cross section area (S-cm^2)*

Figure 4 showed the increase stem cross section area compared to year 2008 in percent. In 2010 the biggest percentage increase of stem cross section area was established in the variants a_1 and a_2. In 2011 in a variant a_3 the

percentage increase of stem cross section area was the highest compared to 2008. Average to the period 2009-2011 the slightest percentage increase of stem cross section area was established in a variant a_3 due to of slighter increase in 2010. In the three years of account were not established statistically proven differences towards increase cross-sectional area of the stem.



LSD 5% - 9,35; 1% - 15,5 0,1% - 29,01

Фиг. 4. *Влияние на използваните хербициди върху процентното увеличение на "показателя напречно сечение на стъблото" спрямо 2008 година*
Fig. 4. *Influence of applied herbicides on the increase stem cross section area compared to year 2008*

The results obtained gave the grounds to conclude that applying the preemergence herbicide oxyfluorfen (trademark Goal 2 E) at the rates 250 ml/da and 500 ml/da in fruit-bearing apple plantation did not have depressing effect on their growth. The higher valued of the biometric indicates in the treated variants were due to the lack of a phytotoxic effect of the herbicide applied and to the eliminated competition for water and nutrient substances between the weeds and the apple trees.

CONCLUSIONS

1. Treatment with preemergence herbicide oxyfluorfen (Goal 2 E at the rates 250 and 500 ml/da) provided good herbicide control of the annual dicotyledonous weed species for three months, which is a very good length of toxic action against them.
2. A depressing effect on tree growth expressed by the annual shoot length increment and increase stem cross section area compared to year 2008 was not detected.
3. The low degree of weed species by using herbicide Goal 2 E warrants this product to be recommended for treatment of apple orchards, when predominantly weeds are annual dicotyledonous species. Lower rate has not

good enough toxic action only against type Alopecurus myosuroides, but in gardens, in which the species isn`t distributed can be successfully used.

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