CHEMICAL WEED CONTROL OF SUNFLOWER STANDS

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Abstract. *Chemical weed control of sunflower crops is currently the main method of controlling weeds in the crop. The goal was to focus on the problems of this method of treatment stands. In the first part focuses on the general characteristics of herbicides description of the mode of action, their distribution, extent and characteristics of sunflower. Farms weeds cause the greatest share of the losses to crops 32%, animal pests and pathogens are less important because they represent 18 and 15% losses to crops. Companies engaged in the manufacture and sale of chemicals used to control weeds constantly looking for new technologies that improve the current herbicides. Second part contains the results of experiments on a given team in sunflower crop. The results presented in the thesis shows that the PD Mojmírovce to control the weeds growing sunflower („Clearfield") used at the time of our observations herbicides Wing® P, Afalon 45 CS®, Proponit® 720 EC and Pulsar 40®. Weed infestation was moderate to severe (12 to 25 weeds per m2). Between 2012 and 2013 years, was the most effective use of herbicides in weed control for observed variations early post-emergence herbicide Pulsar 40®. From the pre-emergence herbicides was found to be the most effective formulation Wing P®. How financially most demand application of the product was found Pulsar 40®. According to the data collected, however, this price is the effect of the herbicide. The most important weed species occurring in crops of sunflower on PD Mojmírovce include: Agropyron repens, Iva xanthiifolia, Echinochloa crus-galli, Chenopodium album, Chenopodium hybridum, Amaranthus spp., Abutilon theofrasti, Datura stramonium, Convolvulus arvensis, Panicum miliaceum, Cirsium arvense, Fallopia convolvulus, Persicaria spp. and Polygonum spp.. While it seems that these methods is a possible solution to this need not be. The weeds are gradually creating resistance to herbicides used in such systems, and it is possible that once because such interference with the natural ecosystem inadvertently create "super-weed", you cannot destroy the available herbicides. Despite such a trend control weeds in sunflower, classical chemical weed control has and will have in the current agriculture an important place.*

Key words: *herbicides, weed control, sunflower, weeds.*

INTRODUCTION

The main reason why today we grow crops is their return, economy. For simplification is a difference of income and expenses. In a positive balance we look forward to when we think about the negative reasons and looking for reserves, new opportunities. It is true that at today's prices of commodities are positive economics at standard conditions can be achieved. A closer look at factors affecting the economy growing sunflowers can sometimes be surprising. Not once we find they underestimate some important facts - such as the selection of the appropriate product for weed control. Firms engaged in the production and sale of chemicals used to control the weeds are constantly looking for new technologies that improve an existing herbicides, or invent new methods to combat this enemy such as total herbicide Roundup from Monsanto, used in genetically modified crops (GMOs). It uses the gene is transferred to certain crops ("Roundup Ready" crops), which makes these crops resistant to Roundup-in and its application destroys all undesirable plants on the property. In recent years,

BASF has developed a method used mainly in sunflower for weed control - the "Clearfield®", which works on a similar principle but without the use of GMOs. Although it seems that these methods represent a possible solution may not be so, because in the weeds gradually creates resistance to herbicides used in these systems and it is possible that once because such interference with the natural ecosystem inadvertently create "super weed", which will be almost impossible dispose of available herbicides. Growing sunflower is globally important because one of the major oilseeds. Also, the PD Mojmirovce has a permanent place in the crop rotation, but weed control in sunflower represents often a big problem. PD Mojmirovce seeks weeds in sunflower regulate a manner of the light to them the least cost, that is, herbicides.

Before using chemical herbicides, weeds were controlled by natural processes (pH change soil salinization or increasing the fertility of crops). Mechanical weed control (including soil treatment) was also (still is) used in the past (LÉGER, STEVENSON, 2005).

Leaf herbicides - applied to seedling plants. The active substance penetrating to the aerial parts of plants in particular, and the plant is distributed in the body (KENKEL et al., 2002).

Root herbicides - are mostly applied before sowing or pre-emergence. Act on germinating, seedlings monocotyledonous and dicotyledonous plants respectively underground vegetative organs of reproduction (URL 2). The death of plants occurs before emergence. Root herbicides are low in translocation (movement) in the plant and the active ingredient remains in the soil, in the top layer (CHAUVEL et al., 2011). The active ingredient is a chemical compound which possesses the properties of the herbicide, or of another product. Name of the active substances and active substance in the package is usually the subtitle trade name herbicide or a plant (CHAUVEL et al., 2011).

They can be divided according to their effect: • growth hormones auxins, • inhibitors of the biosynthesis of amino acids (aromatic), • amino acid inhibitors (ALS inhibition), • inhibitors of pigments (chlorophyll and carotenoids). The first findings of resistant weeds to herbicides were responsive the introduction of persistent herbicides from the group of triazines. These herbicides were used repeatedly, especially in monocultures of corn and apple. Resistance was established in the late 60's in the US (DELYE et al., 2013).

Herbicide resistance has so far been reported at 228 weed species, with a higher prevalence of dicotyledonous monocotyledonous. Of the 25 groups of the established effects of herbicides of interest is the resistance observed in 21 groups, in the 150 active substances (DELYE et al., 2013). Clearfield is a technology allowing excellent soil and the effect of contact herbicides for regulating not only common, but also problematic weeds in specific crops. This global project involves a number of crops and countries around the world (URL 19). The basis for breeding new hybrids used in the system Clearfield® the crossing, inspection and evaluation of thousands of different species of plants. The results of this search are plants tolerant to herbicides from the group of imidazolines (URL 20).

In Slovakia, Clearfield production system used in sunflower and allows postemergence preparation Pulsar 40® (URL 18).

METOD AND MATERIAL

The aim of work was to study and can produce information regarding the chemical weed control stands of sunflower (*Helianthus annuus* L.) at home and abroad. Another objective of this work was to investigate the efficacy of herbicides and financial demands of chemical control in crops of sunflower the PD Mojmirovce.

In the second part of the work was necessary set themselves on plots with different technologies regulating weed tracking box where it was during the marketing year in 2012, 2013 followed weed infestation of crop establishment to harvest sunflower. Then before harvest harvester surveillance was carried out actual weed count methods. It was subsequently found mass HTN, harvested moisture and other yield-forming elements sunflower.

Table 1

Variant of experiment in 2012 and 2013 years

Variant/herbicides	The dose of the preparation of l ha^{-1}	The amount of water in H_2O.ha l^{-1}	Application deadline	Type of application
1. Wing® P	4,0	400	15.4.2012 16.4.2013	Preemergence application
2. Afalon 45 CS®	1,0	400	15.4.2012 16.4.2013	Preemergence application
3. Pulsar 40®	1,2	400	4.5.2012 5.5.2013	Early postemergence application
4. no treatment control	-	-	-	-

Wing ® P a dust herbicidal emulsifiable concentrate formulations for preemergence treatment of maize and sunflower against dicotyledonous weeds and annual grasses. Active substance: dimethenamid-P 212.5 gl-1, pendimethalin 250g.l-1. Application: Wing® P is applied within 3 days after sowing and before emergence of weeds in well-prepared soil without lumps. In the spring or in the dry arid regions is more appropriate to incorporation into the soil 20-30 mm deep. Method of operation: dimethenamid-P belonging to the group chlóracentamidov and is received by plants through koleoptyl seedlings. Reliably effective against annual grasses and a range of dicotyledonous weeds. Residual activity does not limit the possibilities for crop rotation, plant is tolerant enough for individual crops. Pendimethalin inhibits the initial growth and development of germinating sensitive plant species. Affected plants die shortly after germination or after emergence. Germination itself is not affected. Destroying a broad spectrum of annual weeds, but does not act on perennial weeds.

Afalon 45 SC® the herbicide as a liquid dispersible concentrate designed to destroy dicotyledonous weeds in many crops. Active ingredient: linuron 450 $g.l^{-1}$. Mode of action: The active substance is received leaves and roots of plants. Preparation destroying one-year dicotyledonous weeds. Symptoms of exposure are manifested quite quickly, sensitive weeds turn yellow and die. The length of residual action depends the dose used, the type and moisture content of soil (about 6-8 weeks). The composition during the growing season soil degraded and does not affect the cultivation of succeeding crops. Application: Afalon 45 SC® is applied within 3 days after sowing settled on the surface. When applied to light soils used lower limit of the registered margin. If, after application of the plant followed by heavy rainfall may occur sailed preparation in roots and damage to vegetation. This damage, in most cases subside without affecting the crop.

Pulsar 40® a dust selective herbicide in the form of liquid water soluble concentrate designed to destroy dicotyledonous weeds and annual grasses in soybeans and sunflower (only varieties technology Clearfield®). List of plant varieties in technology Clearfield®. Does the www.uksup.sk section varietal testing. Active substance: imazamox 40 $g.l^{-1}$, tween 20 400 $g.l^{-1}$.

Application: Pulsar 40® is applied with sunflower in the growth stage 2-6 leaves. The best effect on the dicotyledonous weeds is when in the phase of 2-4 pairs of true leaves and grass have 1 to 1.5 leaf. Under optimum moisture conditions the dose of Pulsar 40® 1.2 $l.ha^{-1}$. In drier conditions and phased emergence of weeds may be used divided by the application of 0.6 + 0.6 l ha^{-1}. Pulsar 40 ® can also be used as the subsequent application of the pre-emergent herbicidal formulation (e.g. WING® P at a rate 4.0 $l.ha^{-1}$). Mode of action: Pulsar 40® is a broad-spectrum herbicide. Its active substance are taken by the leaves and roots, in which nutrients and assimilates flow, so the distribution for the whole plant. Imazamox interferes with enzymatic processes (AHAS), accumulates the growth cone. Seedlings sensitive weeds stop growing after suffering cease to compete with the crop and die. Built-wetting ensures rapid penetration of the active substance in plant tissues. The first sign of herbicidal action in addition to stopping the growth of weeds is dark red discoloration or chlorosis of the youngest leaves gradually extending to necrosis and death of the plant. The speeds of action of the dependent the type of weed seeds and the growth phase, the temperature and humidity conditions, and the dose. The stress conditions for the growth and development of weeds may herbicidal effect only detected later after application.

RESULTS AND DISCUSSIONS

During the implementation of the PD Mojmirovce experiments were carried specific practical measurements on the basis of which the results were produced in the final form publishing the final work.

In the variant V1 is a next result in the years 2012 and 2013 next figure1.

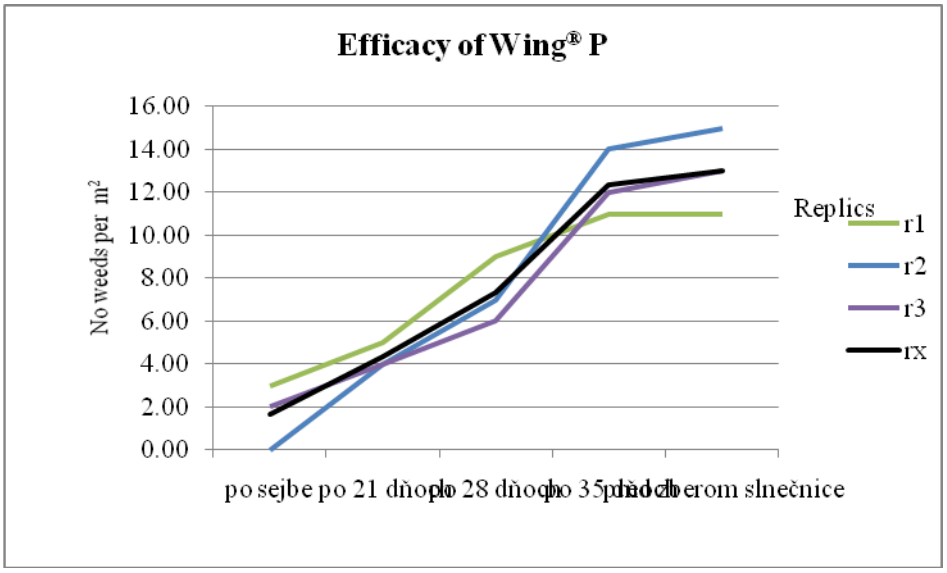

Figure 1: Graphical representation of action of Wing® P in 2012, 2013

For variation was observed immediately after application represented the minimum number of weeds - *Cirsium arvense, Agropyron repens*. In the following weeks, the effect of the herbicide affected by high rainfall, which was reflected in the measurements after 21 and 28 days, which have also been observed on weeds that a plant Wing® P effect claimed - Chenopodium spp. ,Iva xanthiifolia, Abutilon theofrasti. After 35 days and before the collection of variants was already quite heavily weeded.

In the variant V2, is next valid. After herbicide application were observed only for variant resistant weeds - Cirsium arvense, Cirsium arvense. Also, as previously was also influenced by the effect of the variation of the herbicide, high rainfall and this is reflected in a relatively strong weeds variant after 28 to 35 days after application. During this period, the emerged weeds were followed - Agropyron repens, Echinochloa crus-galli, Chenopodium spp., Amaranthus spp., Iva xanthiifolia, theofrasti Abutilon, Datura stramonium. To harvest sunflowers their number grew, figure 2.

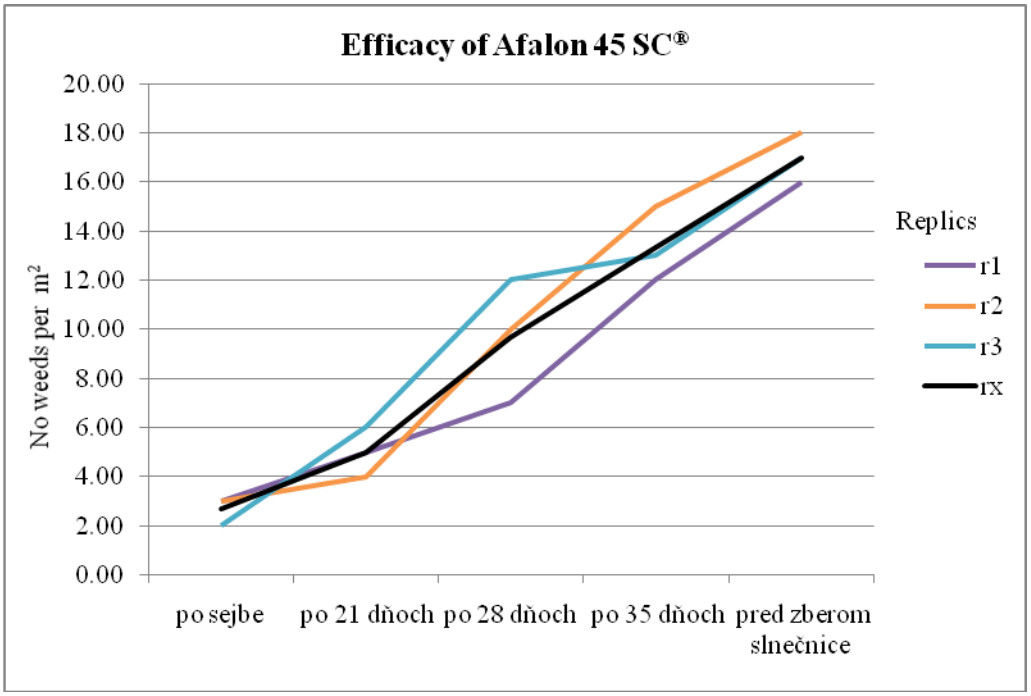

Figure 2: Graphical representation of action of Afalon 45 SC® 2013

After sowing was undetected variation greater number of emerged weeds. They were species - Agropyron repens, Iva xanthiifolia, Echinochloa crus-galli, Chenopodium spp., Amaranthus spp., Abutilon theofrasti, Datura stramonium, Convolvulus arvensis, Panicum miliaceum, Cirsium arvense and Fallopia convolvulus. Observation after 21 days was performed after herbicide application. Effect of herbicide occurred immediately after

application and observations on the variation after 21 days remaining if only the most resistant species Cirsium arvense and Agropyron repens, but also those appeared signs of damage. The measurements at 28 and 35 days longer for variation were observed no weeds. Up before the collection we found in 2 replicates in the variant Convolvulus arvensis (Figure 3).

From the observation of untreated variant can watch the exponential growth of weed growth. In 2013 was observed almost twice as many weeds as they were in 2012. This has given the high rainfall at the beginning of the growing season. In this variation occurring weeds - Agropyron repens, Iva xanthiifolia, Echinochloa crus-galli, Chenopodium album, Chenopodium, Amaranthus spp., Abutilon Theofrasti, Datura stramonium, Convolvulus arvensis, Panicum miliaceum, Cirsium arvense, Fallopia convolvulus, Persicaria spp. , Polygonum spp., Atriplex spp. (Figure4).

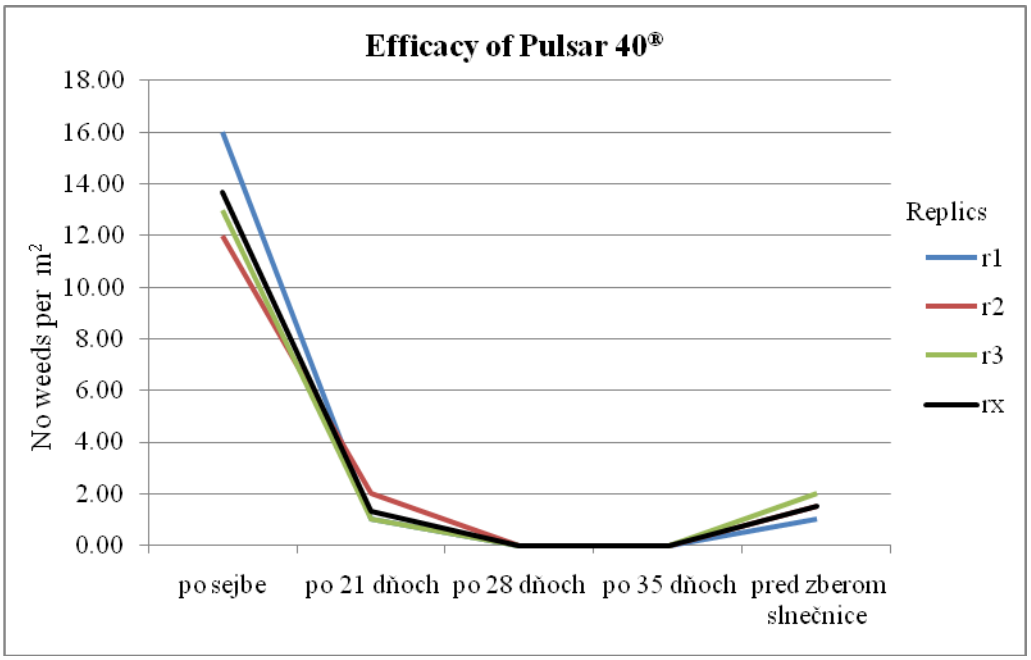

Figure 3: Graphical representation of action of Pulsar 40® in 2013

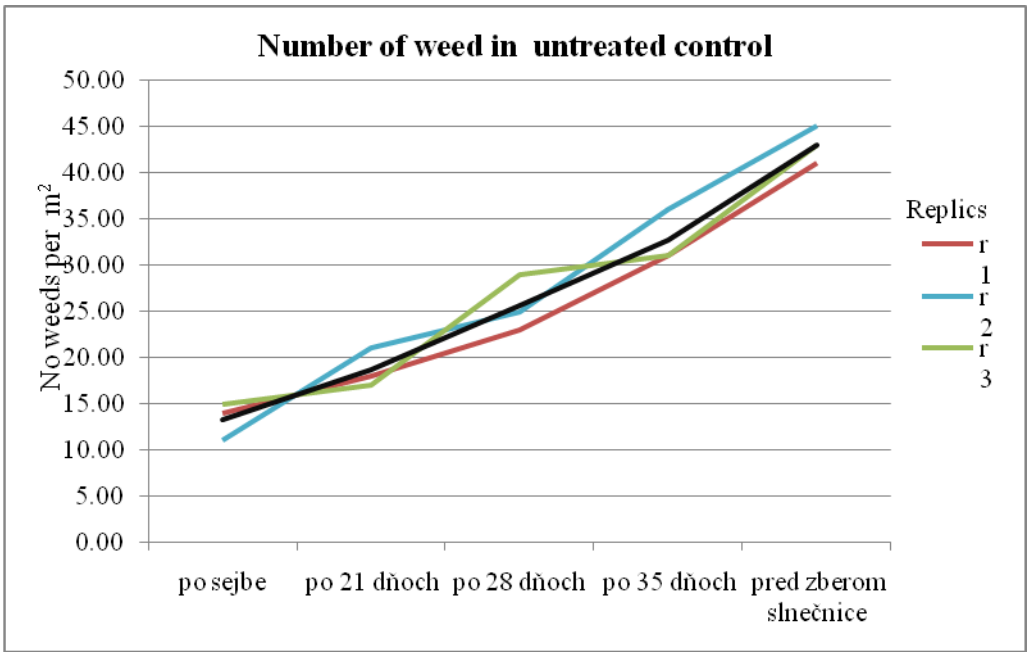

Figure 4: Graphical representation of weeds in the untreated control in 2013

In the years 2012, 2013, using three kinds of herbicides and one control sample we have numerous methods for monitoring variations found the following values of weeds growing sunflower.

From the measurements taken in 2013, we found that the crop sunflower weed infestation was greater than it was in 2012, thanks to better hydrological conditions. Thanks to this fact proves to be the best used herbicide Pulsar 40, which was applied early postemergence. The following herbicide application practically completely "clean up" the crop of weeds and the effect persisted until harvest crops. In scenarios where they were applied preemergence herbicides Wing® P and Afalon 45 SC®. We measured nearly identical results of weeds. In the untreated control weeds can follow catastrophic crop if not used any herbicide.

Effect of herbicides on the yield-forming factors in 2012 and 2013

The variations observed in the experiment, we collected measurements harvest and found the number of plants and yield-forming factors (HTN, humidity and economic yields per ha) in each variant.

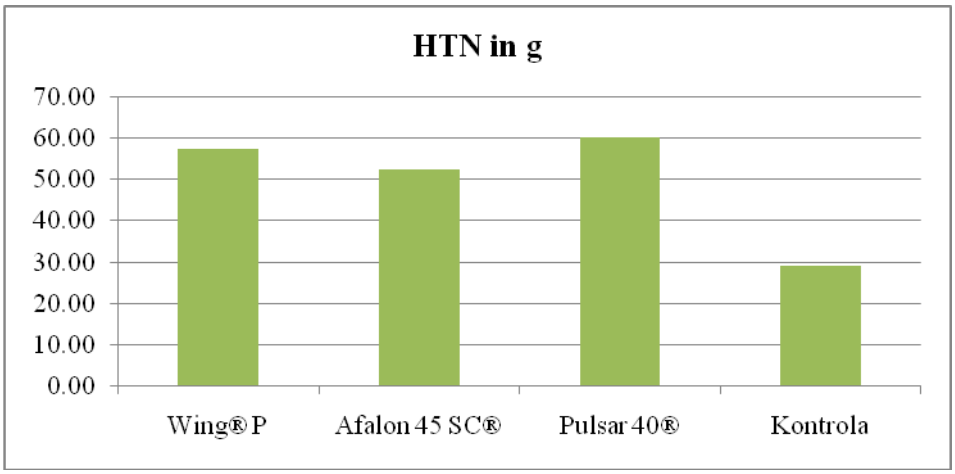

Figure 5: Graphical representation of HTN in the observed variations in 2013

According to measurements taken in 2013, we came out as the most effective option 3 followed by option 1 and 2. In the variant 1 was measured maximum economic yield and HTN (Figure 5).

On the basis of the data collected was the financial cost of treatment of sunflower crops per hectare highest in the pre-emergence formulation Wing P. Price of treatment is directly related to the expected herbicidal activity on weed spectrum present compared to other usage composition.

The regulation of weed vegetation of sunflower we based our measurements recommended PD Mojmirovce to continue using mainly early post-emergence and post-emergence herbicides because they have been shown the most effective and are less dependent on the weather as compared to pre-emergence herbicides. A particular solution might be Clearfield® technology with which PD Mojmirovce began experimenting in 2013 and we would recommend it to all managed stands of sunflower to the firm concerned.

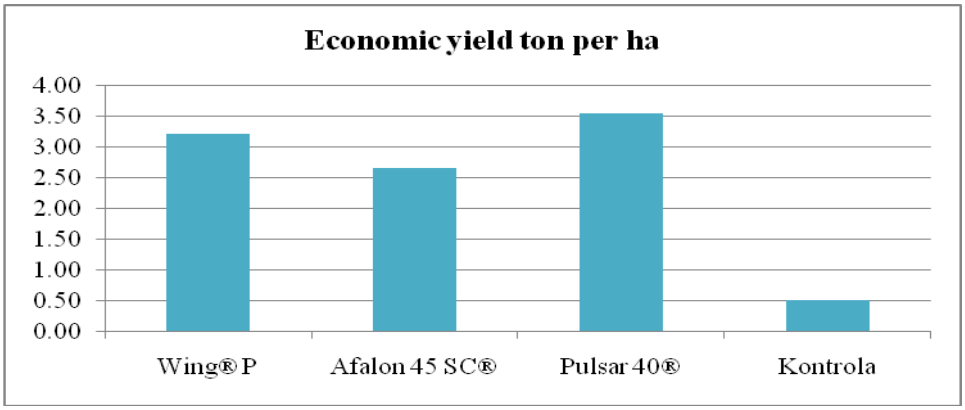

Figure 6: Graphical representation of the crop in the observed variations in 2012, 2013

Application of herbicides in agriculture is easier. It brings us Clearfield technology. European community does not accept GMOs, the technology is similar but not identical. Fcilitates the cultivation of sunflower for the production of edible oils.

CONCLUSIONS

The most important weed species occurring in crops of sunflower on PD Mojmirovce include: Agropyron repens, Iva xanthiifolia, Echinochloa crus-galli, Chenopodium album Chenopodium, Amaranthus spp., Abutilon theofrasti, Datura stramonium, Convolvulus arvensis, Panicum miliaceum, Cirsium arvense, Fallopia convolvulus, Persicaria spp. and Polygonum spp ..

The PD Mojmirovce to control the weeds growing sunflower used at the time of our observations herbicides Wing® P Afalon 45 CS® and Pulsar 40®. From our observations and measurements made in 2012 and 2013, we can conclude that the most effective use of herbicides in weed control for observed variations were almost post-emergence herbicide Pulsar 40® used exclusively in Clearfield technology, which virtually destroyed all the weeds in the crop to harvest sunflower year. From the pre-emergence herbicides was found to be the most effective Wing P® but Pulsar 40 ® shown to be effective to the extent that the pre-emergence application of herbicides is required.

How financially most demanding application of the product was found Pulsar 40® according to the data collected, however, this cost is the effect of the herbicide and although at first glance may seem like the most expensive, so it is very effective in regulating weed impact on increasing yields and thus higher yields.

The high efficacy of Pulsar 40® is also reflected in increased crop sunflower and our measurements is demonstrated that the variation was used where the herbicide was found highest profit among all studied variants.

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