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EFFICIANCY AND SELECTIVITY OF SOME HERBICIDES AT SWEETCORN

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Abstract

During the period 2011 - 2014 years in the experimental field of Agricultural University – Plovdiv a study for researching the effect of various herbicides on the productivity of six hybrids sweet corn - Challenger (F1), Erica (F1), Vega (F1), Honey Bentam (F1), GSS (F1) and Denitza (F1) was conducted. The effect of various herbicides and their combinations on the yield of cobs was treced. From all the used herbicides and their combinations most favorable effect on the development and productivity was found when combination of herbicides Merlin Flex 480 SC + Laudis OD doses of 42g / da after sowing and before emergence for Merlin Flex and 200ml / da foliar application for Laudis was used, and this is statistically proven. When combination of Merlin Flex 480 SC + Laudis OD was used, suitable to realize the highest total yield of cobs is GSS hybrid, and highest percentage of the total standard cob yield was found at Chellenger and Denitza.

Key words: Sweet corn (Zea mays ssp. sacharata Sturt.), herbicides, hybrids, yield.

Introduction

(Zea mays var. Saccharata) is a subspecies of ordinary corn, and in recent years in Bulgaria couses considerable interest. A major problem in the cultivation of this culture is weeding. It leads to strong reduction in yield, especially in the high density of the weeds in the early stages - between 2nd and 4th leaf. Then the plants rely yield, and weeding in this period can even completely compromise the yield. When control the weeds by chemicals, a large number of hybrids exibit phytotoxicity, and the sweetcorn plants die (Sevov et al, 2014).

According Waligóra et al. (2012) herbicide combination foramsulfuron + iodosulfuron methylosodium, shows very good control of annual dicotyledonous weeds, disregarding phytotoxic effect on any of the tested hybrids. Pataky et al. (2008) have studied the sensitivity of the 149 hybrid sweet corn to the herbicide nicosulfuron, foramsulfuron and mesotrione. In comparative research with 95 hybrids, phytotoxicity which leads to a complete death of the culture was recorded. Odero et al. (2013), has found that the efficacy of herbicides pyroxasulfone, S-metolachlor and mesotrione on soils with a high organic content (over 85%) is excellent - from 91% to 99%, without adverse effect on the culture.

Kopsell et al. (2011); report for changes in of sunscreens carotenoids, β-carotene, chlorophyll A and B content as a result of foliar treatment with mesotrione + atrazine at Rugosa hybrid. Changsaluk et all, (2009) and Rajablarijani et al. (2014) have similar results for physiological changes due to different herbicides applying.

There are many data not only on the efficacy of different herbicides in the ordinary corn, but for their economic feasibility also (Koprivlenski, 1997; 2011), Modern research has shown that the new sweet corn hybrids are highly sensitive to some herbicides, but here the problem is poorly understood. Contemporary researches show that new sweet corn hybrids are highly sensitive to certain herbicides, but in our country this problem is poorly studied.

Material and methods

The research was conducted during the 2011 – 2013 period, in the experimental field of the Agricultural University – Plovdiv on alluvial soils. Randomized complete block design was

displayed with five variants in three replications and size of the experimental plot 20 m^2, (table 1). The efficacy and selectivity of 4 herbicides and herbicide combinations to 6 maize hybrids: Challanger F1, Erica F1, Vega F1, Honey Bentam F1, GSS F1 and Denitza F1 has been researched. Soil and foliar herbicides are imported with a knapsack sprayer and working solution 300-400 l / ha. During the vegetation drop irrigation of the crop has been done.

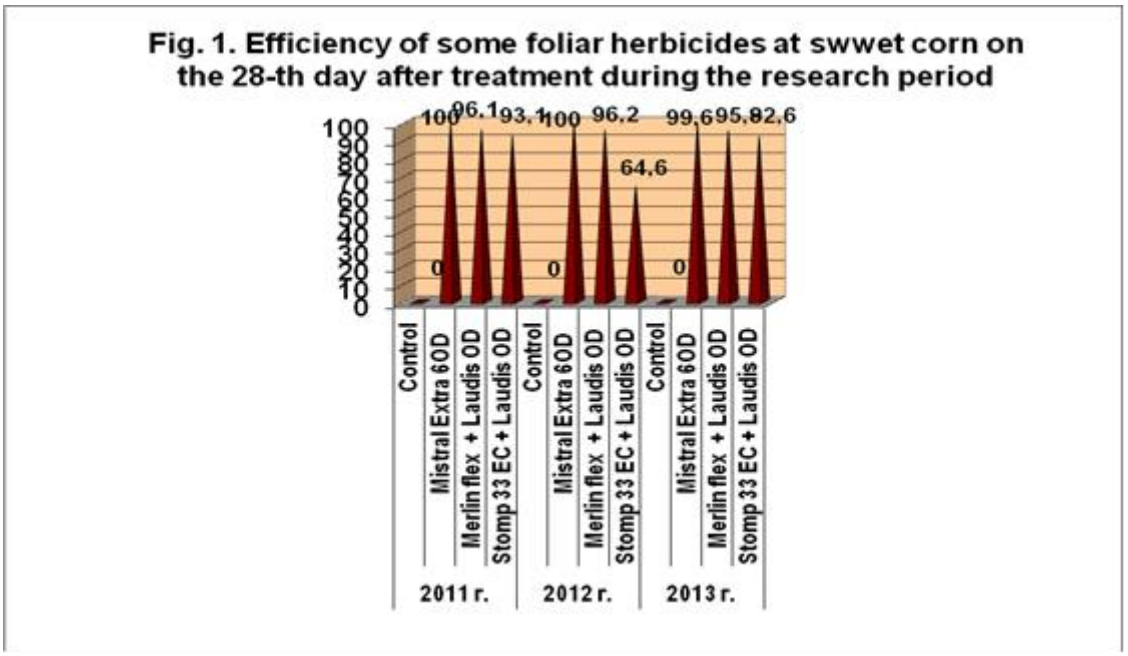
Table 1. Variants of experiment

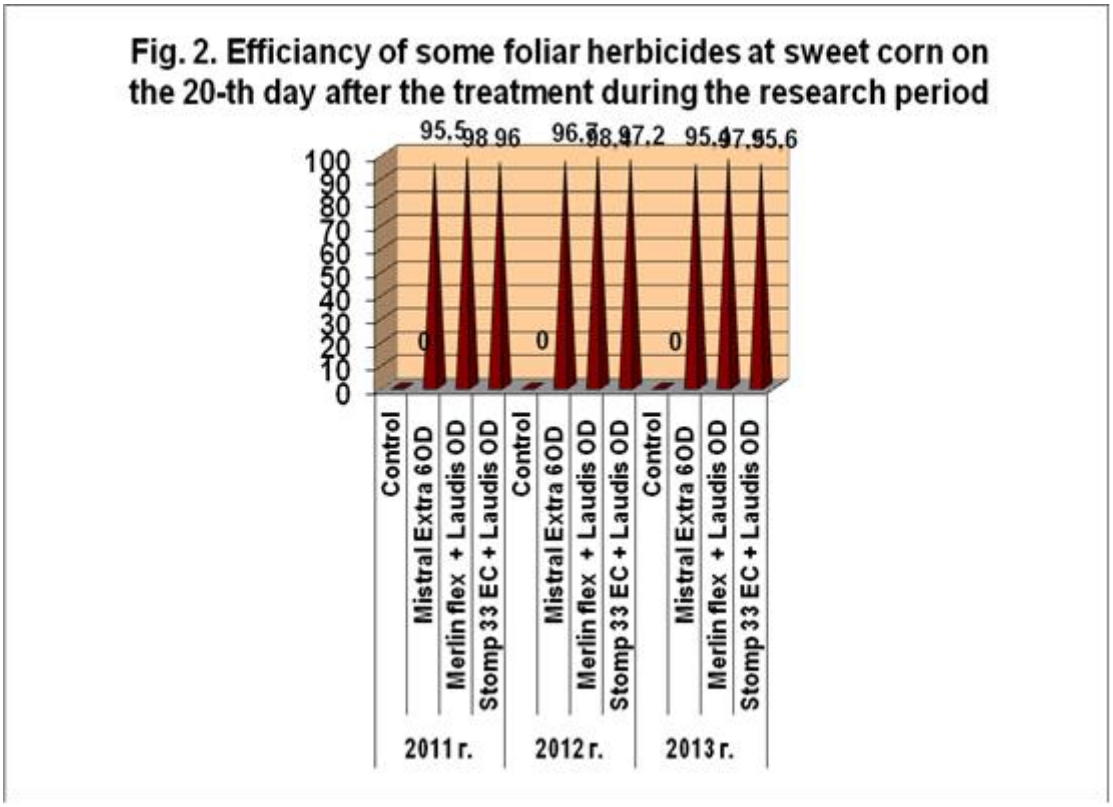
Variants	Herbicide	Active substance	Dose /ha
1	**Zero control (untreated)**	-	-
2	**Gardoprim Plus Gold 500 SC**	**312.5 g / l S-metolachlor + 187.5 g / l terbutilzin**	**4 l /ha** - *soil application*
3	**Mistral Extra 6OD**	**60g / l nicosulfuron**	**650 ml /ha** - *foliar application*
4	**Merlin flex + Laudis OD**	**240 g / l isoxaflutol + 44 g / l tembotrione**	**420 g /ha**- *soil application+* **2 l /ha**- *foliar application*
5	**Stomp 33 EC + Laudis OD**	**330 g / l pendimethalin + 44 g / l tembotrione**	**3,50 l /ha** - *soil application+* **2 l /ha**- *foliar application*

Years of the conducting experience are characterized with varying temperature and precipitation. The highest amount of precipitation in the period of sowing up to the 45^{th} day after treatment with soil herbicides (April and May) have fallen in 2013 - 183,0 mm, and at least in 2011 - 59,6 mm. In relation to temperature, warmest was 2013 - with temperature sum for April-May 34.0 C^0, and coolest is 2011 - 28,9S0.

Results and discussion

Sweet corn areas are weeding mainly with annual late spring weeds as: *Amaranthus retroflexus L., Solanum nigrum L., Chenopodium album L., Portulaca oleraceae L., Dathura stramonium L., Setaria viridis L., Setaria glauca L., Xanthium strumarium L., Echinochloa grus-galli L.*, rather than multi - *Sorghum halepense* L. In the untreated control the weed infestation level of is very high and ranges from 503 pcs. / m2 (2012) to 584 pcs / m2 (2013).
The efficacy of soil applied herbicides Gardoprim Plus Gold 500 SC, Merlin flex and Stomp new 330EK on the 28th day after treatment, average for the three year period is an excellent. In regard to the weeds highest efficiancy show Gardoprim Plus Gold 500 SC - 4 l / ha - 99,9%, followed by Merlin Flex - 4.2 l / ha - 96,1% and Stomp new 330EK - 3,5 l / ha (93,4%) (Figure 1).





Yearly, there was no substantial difference of the effect of the applied soil herbicides to the 45th day after treatment. Highest efficiency show again Gardoprim plus Gold 500 SC - 98.9%, followed by Merlin Flex - 4.2 l / ha - 93,7%. Less control on weeding - 89.7% was recorded in Stomp new 330EK - 3,5 l / ha.

For none of the used soil herbicides was established pytotoxity on the studied hybrids sweetcorn on the third, 7th and 21st day after the treatment (ball 1 on the scale of EWRS).

In foliar appended herbicides, both itself (var.3) and in combination with soil herbicides (var.4 and 5) efficacy on the 20th day after the treatment was very good.
In the variants where the combination Merlin Flex - 420 g / ha (soil application) + Laudis OD 2 l / ha- (foliar application) is applied the efficiency is 97.9%, and in variant 5 - Stomp new 33 EC - 3 5 l / ha (soil application) + Laudis OD - 2 l / ha (foliar application) - 96,3% (Figure 2).
Lower weed control is obtained when treated with Mistral extra OD 6 - 650 ml / ha - 95,8%, and it is mainly due to weeds sprouted as a result of precipitation in April and May, and performed irrigations in the later period of vegetation of culture.
The herbicide controls the perenial species Sorghum halepense L. up to 99% and Laudis OD - 2 l / ha to 95% - 96%. In the untreated control the level of weed infestation is very high and ranges from 571 pcs. / M2 (2012) to 613 pcs. /m2 (2013).
Despite the high density of annual weeds in the research areas, the efficiency of the appended foliar herbicides, both alone and in combination is maintained until the 40th day after spraying.
In regard to the selectivity of the leaf herbicides negative impact on the studied hybrids sweetcorn is not reported, except Erica (F1). Mistral extra OD 6 at a dose 650 ml / ha and Laudis OD - 2 l / ha caused complete death of plants of this hybrid (ball 9 on the scale of EWRS). From 7 to 14 days after treatment, Laudis OD - 2 l / ha caused lightening of maize plants, which turn white from the top of the leaves to the base (ball 6-7 by EWRS) and on the 21th day wither and die (ball 9 on the scale of EWRS). When treated with Mistral Extra 6 OD on the 7th day, plants acquire anthocyanin colouring (ball 4 EWRS), on the day 14th necrosis (Ball 6 EWRS), and on the day 21st wither and die (9 ball EWRS).

Conclusions

Soil applied herbicides on the 28th day after treatment showed excellent effect against the weeds, which lasts until the 45th day after treatment. Efficacy varies from 93.4% at Stomp new 330EK - 3,5 l / ha, to 99.9% at Gardoprim plus Gold 500 SC - 4 l / ha.
Phytotoxicity of studied soil herbicides Gardoprim Plus Gold 500 SC at a dose of 4 l / ha, Merlin flex - 4,2 l / ha and Stomp new 330EK - 3,5 l / ha on the crop has not been established.

High efficacy against the weeds of leaf herbicides Extra Mistral OD 6 - 650 ml / ha - 95,8%, and the combination of Merlin Flex - 420 g / ha (soil +) Laudis OD 2 l / ha (leaf) - 97.9% has been reported.

Mistral Extra OD 6 - 650 ml / ha controls the perennial species Sorghum halepense L. up to 99% and Laudis OD - 2 l / ha up to 95% - 96%.
Prolonged control on weed infestation average of three years of investigations was reported when using combination of soil and foliar herbicide.
When treated with foliar herbicides Mistral 6 Extra OD at a dose of 650 ml / ha and Laudis OD - 2 l / ha phytotoxic effect on the hybrid Erica (F1) was reported and the herbicides cause complete death of plants - Ball 9 EWRS.

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