



ISSN: 0975-833X

RESEARCH ARTICLE

INFLUENCE OF THE SOIL HERBICIDES ON THE MICROBIAL STATUS IN THE RHIZOSPHERE IN THE SUGAR BEET

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ARTICLE INFO

Article History:

Received 07th September, 2015
Received in revised form
09th October, 2015
Accepted 15th November, 2015
Published online 30th December, 2015

Key words:

Sugar beet,
Selective herbicides,
Rhizosphere microflora,
Microbial status,
S metalochlor,
Propisochlor.

ABSTRACT

The examination is performed in the proving grounds of the Agricultural Institute – Shumen, for the period from 2013 to 2014. The influence of some selective soil herbicides of sugar beet on the rhizosphere microflora was established in the proving grounds. Suppression of the soil bacteria by the herbicide S metalochlor in dose (2000 ml/ha) was observed. A total suppression of the microflora in dose 3000 ml/ha was observed as well. The herbicide propisochlor (2000 ml/ha) influences the quantity of the rhizosphere microflora.

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Citation: Svilen Raikov and Krasimira Tanova, 2015. "Influence of the soil Herbicides on the microbial status in the Rhizosphere in the Sugar Beet", *International Journal of Current Research*, 7, (12), 24067-24069.

INTRODUCTION

As a result, from the increased role of the anthropogenic factor, the microbial processes in the soil are more and more directed by the micro factors of the surrounding environment (Beker *et al.*, 1960). Especially important effects on the soil micro flora have the herbicides, which, in their essence, are plant poisons (Rudakov *et al.*, 1979). In this connection, has been studied the effect of the culture specific soil herbicides on the microbial complexes in their rhizosphere. Certain qualitative and quantitative changes have been found in the structure of the rhizosphere micro flora and the pathogen complexes in it, in the corn, under the influence of the dinitroaneline herbicides (Ruppel *et al.*, 1982). Hammet (1980) has been examined the influence of the herbicide "Атразин" on certain fungi from the rhizosphere of sick and healthy plants of broad beans. He has not found increase of the aggressiveness of the pathogen micro flora although he had observed certain changes in the microorganisms' populations. The soil herbicide "Piradur" has caused decrease of the aggressiveness of the agent, causing root decay in the sugar beet - *Rhizoctonia solani*.

The weakness of the disease development is connected with the active suppression of the infectious potential by the herbicide. (El-Abiad , 1996). The researches of many authors (Liberchtain, 1984., German *et al.*, 1988) show that the effect of the herbicides on the soil micro flora is expressed in increase or decrease of the total number of some microorganisms, or certain groups or kinds. The increasingly wider application of the herbicides in the technology for cultivation of different cultures imposes the necessity of studying their effect on the soil and the soil micro flora. In the sugar beet has been found negative effect of the herbicide "Betanal" (desmedipham), imported through the vegetation period of healthy young plants, expressed in increased aggressiveness of the agents, causing "cutting" Tanova and Raikov, 1995). These results give reasons for probable unfavorable effect of the herbicides on the soil micro flora. In connection with this we set the goal to examine the effect of the widely used in the sugar beet production selective soil herbicides "Dual 930S" /metachlorine/ and "Proponit 720 EK" in two doses on the soil micro flora of the sugar beet.

MATERIALS AND METHODS

The examinations are based on two year proving grounds trials, conducted in the proving grounds of the Agricultural Institute – Shumen, for the period of 2013 to 2014. The trials

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have been conducted with sugar beet as soil types carbonate black earth with humus content 3, 5 and pH-6, 5. The trials are conducted by the block method with size of the experimental area 27 m² in 4 successions. The effect of the following herbicides has been examined - "Dual 930S" /metachlorine/ and "Proponit 720 EK" (propisochlor). The following variants have been examined: 1. untreated control variant; 2. Dual 930S -2000 ml/ha, Dual 930S - 3000 ml/ha, Proponit720 EK - 1800 ml/ha and Proponit 720 EK - 2200 ml/ha.

From the experimental areas of the proving ground trial with sugar beet has been taken soil samples by the method of Bonchot,(1983). The analysis of the total quantity of soil bacteria, actinomycetes, and soil fungi is made for the different periods (from the 4th to the 12th day) from the import of the herbicides. Extracts from soil suspensions of the samples are sowed on hard nutrient mediums by the method of the successive dilution. The total amount of colonies of the different groups dynamic microorganisms is determined. Determined is also the herbicide effectiveness of the preparations on the weed association in the sugar beet. The amount and species composition of the weeds in the different variants is determined through throwing and area sampling – 2 per each examination area.

RESULTS AND DISCUSSION

In table 1 are shown the results from the examination from the first year of research. Decrease of the bacteria quantity has been observed – in the variants treated with „Dual 930S” in two doses. When using Dual 930S in dose of 2000 ml/ha the recorded bacteria quantity is 72 % from the control variant, and with doses of 3000 ml/ha- 73 %. When using the herbicide "Proponit 720 EK" the number of the same group microorganism is increased, which can be observed in doses of 2200 ml/ha.

Table 1. Influence of soil herbicides on soil micro flora in sugar beet 2013-2014

Variants	I period of counting				II period of counting			
	Bacteria mil/gr	Relative %	Fungi mil /soil	Relative %	Bacteria mil/gr	Relative %	Fungi mil /soil	Relative %
"Dual 930S" 2000 ml/dka	102.10 ⁵	72.0	41.3.10 ³	58	79.10 ⁵	57,0	42,6.10 ³	64,0
"Dual 930S" 3000 ml/dka	103.10 ⁵	73.0	45.6.10 ³	64	92.10 ⁵	67,0	34,6.10 ³	52,0
"Proponit 720 EK" 3000 ml/dka	160.10 ⁵	113.0	88.3.10 ³	123	91.3.10 ⁵	66,0	35.0.10 ³	53,0
"720 EK" t 220 ml/dka	232.10 ⁵	165.0	21.6.10 ³	30	126.10 ⁵	91,0	34.3.10 ³	52,0
Control variant	141.10 ⁵	-	71.8.10 ³	-	138.5.10 ⁵	-	66.5.10 ³	-

The quantity of the recorded bacteria in this variant exceeds the control variant with 65 %. The recorded quantity of fungi is lower than the control variant for all variants except for the variant where the "Proponit 720 EK" is used in dose 1230 ml/ha. The increase of the dose for the „Proponit 720 EK" - 2200 ml/ha has caused lowering the number of fungi and actinomycetes, and decrease has been recorded – 70% from the control variant. The results from the second recording show the tendency of decrease the quantity of the bacteria in the variants when „Dual 930S" has been used. Sharp bacteria decrease has been observe for the two "Proponit 720 EK" doses. The recorded quantity of fungi and actinomycetes keeps the tendency of decreasing when the "Dual 930S" is applied, but when the "Proponit 720 EK" is used in both doses – the number of fungi and actinomycetes population is sharply

decreased. During the third recording has been observed clearly expressed tendency for recovering the populations of bacteria when using the "Proponit 720 EK" in both doses respectively 109 % and 112 % against the control variant, as well as when using "Dual 930S" 2000 ml/ha - 97 % from the control variant. When applying "Dual 930S" 3000 ml/ha one can observe stimulating effect on the bacteria populations. Regarding the quantity of the fungi and actinomycetes for all variants has been observed the even more suppressive effect of the herbicides. This is expressed mostly when applying "Proponit 720 EK" 2200 ml/ ha (30 % from the control variant).

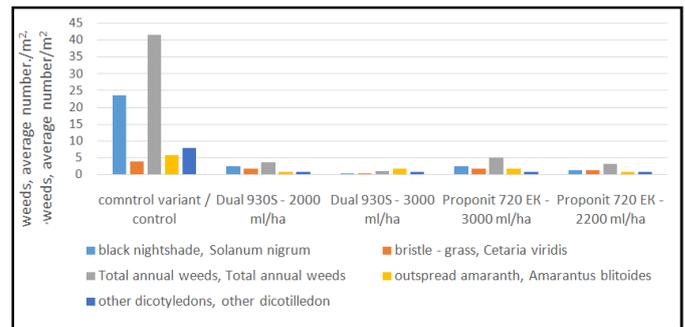


Figure 1. Effectiveness of soil herbicides against weeds in sugar beet

Figure 1 shows the data for the effectiveness of the soil herbicides "Dual 930S" and "Proponit 720 EK", used in two doses, against the main kinds of weed in the sugar beet. In the non – treated control variant are found 41, 8 pieces per square meter total annual weeds. With higher density are the kinds black nightshade 23,8 pieces per square meter, outspread amaranth 6,0 pieces per square meter, bristle grass 4,0 per square meter and other dicotyledons /thornapple, mountain – spinach, common amaranth, annual woundwort / 8 pieces per square meter.

The treatment with selective soil herbicide „Dual 930S" is highly effective against the said weed kinds. With the dose of 3000 ml/ha only 1, 3 pieces per square meter remain not destroyed, and with dose of 2000 ml/ha - 3, 7 pieces per square meter from all annual weeds. Such effect is observed in the herbicide "Proponit 720 EK" respectively the not destroyed weeds are 3,2 per square meter and 5,3 per square meter – against the control variant /41,8 pieces per square meter.

Conclusions

- The application of the selective soil herbicides, „Dual 930S" and "Пропонит 720 EK" affects the soil micro flora.

- The application of higher doses of "Proponit 720 EK" is not advisable, because the herbicide effect will be insignificantly higher and it will be connected with the changes in the microbial status of the rhizosphere of the sugar beet.

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