EXPERIMENTAL RESULTS REGARDING DAMAGING ORGANISMS CONTROL IN SOYBEAN CROPS OF NORTHERN DOBRUDJA

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Abstract

Research was conducted in the years 2010-2014 on molic aluviosoil of Macin-Smardan polder, located in Northern Dobrudja. We studied components of soybean growing technology, in particular the means for controlling weeds, diseases and pests. Weeds growth is favored in this area with irigation and available groundwater and fertile soils. Weeds spectrum is broad, and the most damaging species are *Sorghum halepense*, *Xanthium strumarium*, *Abutilon teophrasti*, *Solanum nigrum*, *Amaranthus retroflexus*, *Chenopodium album*, *Cirsium arvense*. The tests showed to be more effective application of pre-emergence herbicides Glifos, 3 l/ha or Glyfogan, 3.5 l/ha (glyphosat acide izopropyl amine) and of post-emergence herbicides Pulsar, 1 l/ha (imazamox) + Silwet, 0,1 l/ha (superspreader adjuvant); subsequently it was considered necessary a manual hoeing for eliminating weeds emerged after the treatments. The diseases attack has not brought particular problems; in some years, and especially in conditions of abundant irrigation, they were identified, isolated, white mold attack (*Sclerotinia sclerotiorum*). Related to pests, frequently occurs red spider mite attack (*Tetranycus urticae*); for controlling that the best results were obtained with Apollo acaricide, 0.4 l/ha (clofentezin). In some years (2011), found a beet webworm moth attack (*Loxostege sticticalis*), fighting it was the most effective Cyperguard, 0,1 l/ha (cypermethrin); in 2013 there was an attack of soybean pod borer (*Etiella zinkenella*), which was controlled by spreading Karate Zeon, 0,15 l/ha (lambda-cipermetrin).

Key words: Tulcea County, Macin-Smardan polder, soybean crop, weeds, pests and diseases control.

After years 1980-1989 when Romania cultivate with soybean over 500 thou ha, and was the biggest soybean grower in Europe, in the new socio-economic and political context after 1990, areas with soybeans fell below 100 thou ha, with a brief period between 2000 and 2006, when GM soybean growing was permitted and the area reached 200 thou ha.

Currently, the new Common Agricultural Policy prioritises promoting protein crops, including soybean non-GM, to reduce the EU's dependence on imported protein agricultural products, which represents about 70% of consumption and of soya beans and meals, exceeding 95% of consumption.

In this context, research on soybean crop present a particular interest in efforts to extend this crop, whose technology, very demanding, is less known by the current Romanian farmers.

Among the technological measures, damaging organisms control and especially weeds is a prerequisite for achieving successful and economically profitable crop yields.

MATERIAL AND METHODS

The research consisted of field experiments in Macin-Smârdan polder, an area with continental climate, and molic aluviosoil, under irrigation, in 2010-2014. Experimental years were different in terms of weather, noting that rainwater was supplemented by irrigation. In the first phase studies were conducted on the degree of land weeding on which were placed the experiments with species identification and the specification of most common species. In the same way it proceeded with the identification of insects and conditions causing them and diseases attack. Following these studies, the experimental variants were established which consisted of treatments for controlling identified damaging organisms.

The growing technology applied on the experimental field was that recommended in the area, namely: *the previous plant* - winter wheat; *tillage* - plowing after wheat harvesting, disking in the autumn, working with disc harrow or combinator in spring, before sowing; fertilization – with phosphorous, 85 kg/ha of P_2O_5, under plowing, and 30-80 kg/ha of N, after emergence of soybean, depending on the success of seed inoculation; seeding - the last decade of April, 56 seeds/m^2, 45 cm/70 cm between rows, seeds of PR93R65 variety the inoculated with

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four bottles of Nitragin-soybean; care works – damaging organisms control, depending on the experimental variants; irrigation; harvesting - manually by cutting of plants, and threshing of the grains in the farm.

During vegetation they were made phenological observations and biometric measurements. Also, observations and determinations were performed on experimental variants effectiveness in controlling damaging organisms. At harvest, it was determined seeds yields, which was expressed in kg/ha at humidity of 12%.

RESULTS AND DISCUSSIONS

The weeds and their control

Determinations on weed populations showed the presence of the following common species: dicotyledonous weeds - *Chenopodium album* (12 plants/m^2), *Xanthium strumarium* (10 plants/m^2), *Abutilon theophrasti* (7 plants/m^2), *Amaranthus retroflexus* (12 plants/m^2), *Sonchus arvensis* (4 plants/m^2), *Solanum nigrum* (6 plants/m^2), *Convolvulus arvensis* (12 plants/m^2), *Polygonum lapatifolium* (28 plants/m^2), *Cirsium arvense* (5 plants/m^2); monocotyledonous weeds - *Sorghum halepense* (56 plants/m^2), *Setaria viridis* (102 plants/m^2). Among the less common species are mentioned: *Echinochloa crus-galli*, *Hibiscus trionum* and *Digitaria sanguinalis*.

The results on the effectiveness of herbicides in controlling weeds in 2013 and 2014 years are presented in Tables 1 and 2. From tables resulted that the presence of weeds drastically reduced the soybeans seeds yields, by comparison with the weeding control variant; in the absence of weed control measures, the yields were reduced from 3356-4273 kg/ha to 763-1104 kg/ha, so with 74.2 to 77.3%.

Figure 1 ***Solanum nigrum* L., a very damaging weed for soybean harvest quality (Macin Experimental Field, 2014)**

In all cases, tested herbicides or herbicides associations proved effective in weeds controlling. The best results were obtained in both years, by application of a pre-emergence herbicide of glyphosate (Glifos, 3 l/ha or Glyfogan, 3.5 l/ha) and post-emergence of Pulsar, 1 l/ha (imazamox); for these variants, the weed control was conducted at a rate of 82-87% and seeds yields accounted 90.0-94,2% of the control variant.

Figure 2 ***Sorghum halepense* (L.) Pers., a perennial weed very commun in soybean fields (Macin Experimental Field, 2014)**

Good results were also obtained by applying pre-emergent herbicide Dual Gold, 1 l/ha (quizalofop-p-ethyl), and post-emergent herbicide Basagran Forte, 2 l/ha (bentazon). In this case, it was achieved a good control of weeds (73-82%), and were harvested 2740-3742 kg/ha of seeds, accounting for 81.6 to 87.6% of weeding control variant.

In experimental plots, but also in production plots, it proved necessary the weeding work to remove of occurred weeds emerged after post-emergence herbicide application.

Table 1

Efficiency of herbicides in weed control (Macin Experimental Field, 2013)

No. crt.	Experimental variants		Rate (l/ha)	Weed control (%)	Seeds yields (kg/ha)
1.	Control		-	-	1.104
2.	Control 3 time weeding		-	100	4.273
3.	Glifos (glyphosat)	preem.	3 l/ha	87	4.025
	Pulsar (imazamox)	postem.	1 l/ha		
4.	Guardian (acetoclor)	preem.	2 l/ha	75	2.877
	Pulsar (imazamox)	postem.	1 l/ha		
5.	Dual Gold 960 EC (S-metolaclor)	preem.	1 l/ha	42	1.843
6.	Dual Gold 960 EC (S-metolaclor)	preem.	1 l/ha	82	3.742
	Basagran Forte (bentazon)	postem.	2 l/ha		

Table 2

Efficiency of herbicides in weed control (Macin Experimental Field, 2014)

No	Experimental variants		Rate (l/ha)	Weed control (%)	Seeds yields (kg/ha)
1.	Control		-	-	763
2.	Control 3 time weeding		-	100	3.356
3.	Glyfogan 480 SL (glyphosat)	preem.	3.5 l/ha	82	3.020
	Pulsar (imazamox)	postem.	1 l/ha		
4.	Glyfogan (glyphosat)	preem.	3,5 l/ha	69	2.432
	Leopard (quizalofop-p-ethyl)	postem.	2 l/ha		
5.	Dual Gold 960 EC (S-metolaclor)	preem.	1 l/ha	83	2.740
	Basagran Forte (bentazon)	postem.	2 l/ha		

The pests and their control

Among the pests were identified: red spider mite (*Tetranycus urticae*), steppe caterpillars (*Loxostege sticticalis*), soybean pods moth (*Etiella zinkenella*).

It was found that red spider infestation is present every year in soybean, in the area and is favored by hot and dry weather. The appearance of this polyphagous pest occurs starting from the edge of the plots so that it can interfere with efficient treatments applied to limited areas, at early infestation.

In this soybean experiment was established a strategy for monitoring the occurrence of red spider mite and control him. Many products were tested and the best results gave application of Apollo acaricide, 0.4 l/ha (clofentezine), especially against the young stages of the insect. Note that applying Nissorun, 0.5 l/ha proved less efficient and give up the treatment.

In specific years, in soybean crops has been found other pests. Thus in 2011, there has been a beet webworm moth attack (*Loxostege sticticalis*), to combat which the best results were obtained with Cyperguard, 0.1 l/ha (cypermethrin). In 2013, there has been a specific soybean pests, but less frequently in the area, soybean pod borer (*Etiella zinkenella*), which, with very good results was one treatment with Karate Zeon, 0.15 l/ha (lambda-cypermethrin).

The diseases and their control

In specific conditions of dammed meadow Macin-Smardan, not reported symptoms of diseases that attack to impose chemical interventions. In isolated cases, when irrigated in abundance were found the white mold (*Sclerotinia sclerotiorum*) symptoms, but which did not require chemical intervention. This good situation can be attributed to strict observance of crop rotation; in addition, the farm does not grow sunflowers and rapeseed is grown on small areas.

CONCLUSIONS

In the experimental area, the farmers show a particular interest to soybean crop, which is an important component of asolaments dominated by cereals, contribute to increased soil fertility, and in recent years is sustained by agricultural policies.

Weed control is the most important work care of soybean technology. Weed growth is favored by soil fertility, groundwater intake and irrigation conditions. Problem weeds in soybeans are: *Chenopodium album*, *Xanthium strumarium*, *Abutilon theophrasti*, *Amaranthus retroflexus*, *Sonchus arvensis*, *Solanum nigrum*, *Convolvulus arvensis*, *Polygonum lapatifolium*, *Cirsium arvense, Sorghum halepense*, *Setaria viridis.*

The most effective weed control was managing by pre-emergence herbicides based on glyphosate (Glifos, 3.0 l/ha sau Glyfogan, 3.5 l/ha) and apply of postemergence imazamox (Pulsar 1 ha) associated with Silwet 0.15 l/ha. It was subsequently required manual weeding to remove weeds emerged after herbicide aplication.

In all the years it was reported attack by insects, most commonly was red spider mite (*Tetranycus urticae*), for whom the most effective control was the treatment with acaricide Apollo, 0.4 l/ha (clofentezin).

Figure 3 **Soybean crop in Macin-Smardan polder**

In one of the 4 experimental years was reported beet webworm moth attack (*Loxostege sticticalis*), which was controlled by treatment with Cyperguard, 0.1 l/ha (cypermethrin), and in another year a soybean pod borer attack (*Etiella zinkenella*), which was countered with Karate Zeon, 0.15 l/ha (lambda-cypermethrin).

In the experimental plots were not observed attack symptoms of disease requiring intervention with fungicides. In certain years, given an abundant irrigation were reported isolated symptoms of the white mold attack (*Sclerotinia sclerotiorum*).

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