

RESEARCH REGARDING THE IMPROVEMENT OF SUNFLOWER CROP TECHNOLOGY IN SOUTH-EASTERN DOBROGEA IN THE CONTEXT OF CURRENT CLIMATE CHANGES

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Abstract: At Sport Agra in Amzacea, in the last few years there have been experimented new sunflower crop technologies designed to face the current climate changes. This technology includes the following elements: application of herbicides in order to control both weeds and *Orobanche Cumana Wallr.* parasite – it was applied imazamox 40 g/l in dose of 1.2 l/ha, in fractions, in two phases (in first stage for weed control 0.7 l/ha and in second stage 0.5 l/ha, for the parasite control) in plots cultivated with various hybrids from Syngenta and Limagrain companies; application of last generation fungicides during the vegetation period, which will reduce the attack of the main crop pathogens. There were applied three fungicides during the two sensitive phenological phases, with the ALPHA 4100 equipment; Screening of hybrids with good behavior towards the main pest agent of area – *Orobanche cumana* parasite, which cause important yield losses in the south east part of Romania. There were tested 8 hybrids from Syngenta Company, 6 hybrids from Limagrain and 4 hybrids from National Agricultural Research and Development Institute Fundulea.

Key words: *sunflower, behavior major pest, control*

INTRODUCTION

In Romania, sunflower crop is the 3rd agricultural crop after maize and wheat. In 2016, 1.000.000 ha were cultivated with sunflower and average production of 2.200 kg / ha (NIS, 2016). The behavior of some sunflower cultivars against major pests were studied (500mp/plot) under natural contamination conditions at SC Sport Agra SRL, Amzacea - Dobrogea area. The pathogens which cause diseases in vegetation periods were: *Sclerotinia sclerotiorum*, *Phomopsis helianthi* (*Diaporthe*), *Phoma macdonaldi* and *Alternaria helianthi* (Jinga et al., 2005). One of the most dangerous plant parasites in Dobrogea area was Broomrape, *Orobanche Cumana Wallr* (Păcureanu et al., 1998). In Dobrogea region, sunflower crop is cultivated on approximately 200.000 ha in Tulcea and Constanta Counties, having a significant percent within the total agricultural land in Romania.

Sunflower crop has shown a significant dissemination, especially in the south and south-eastern area of Romania (Parker, 1994; Vrânceanu et al.1995). On sunflower crops, the losses can reach 30- 70% of the harvest (Iliescu et al.1995; Jinga et al., 2010).

The paper presents studies regarding the phytosanitary state of some experimental plots with hybrids from Syngenta and Limagrain companies, and also from National Agricultural Research and Development Institute Fundulea (NARDI), within the climate conditions of year 2016.

MATERIALS AND METHODS

Experimental plots were placed at S.C. SPORT AGRA S.R.L. Amzacea, Constanța. There were studied the main sunflower crop pests. The experience was situated on a land belonging to the South Dobrogea plateau, represented by cambic chernoziom, with a profile deeper than other chernozioms from other parts of Romania, a blackish-brown soil of 40-50 cm thickness, medium texture (Demeter, 2009). The content of nutrients was: mobile P index - 72, N index – 4, Humus - 3.11, K index - 200, Neutral pH - 7.2. The climate is deeply temperate continental, with an average annual temperature of 10.7-11.7°C, with a high temperature interval between June and August. Meteorological data are presented in Table 1. Sowing (400 m²/plot) was carried out on 6 April 2016 and observations were performed in August. Due to heavy rains in the entire vegetation period, the attack of pathogens that cause diseases was very aggressive.

Table 1: Meteorological data 2016

2016	Temperature (°C)			Relative Humidity (%)	Precipitations (mm)
	high	average	low	average	sum
Jan	2.51	-1.41	-5	92	78
Feb	11.34	7.13	3.24	92	43
Mar	11.77	7.06	2.64	85	40
Apr	19.16	12.86	7.26	78	14
May	20.64	15.51	10.61	82	91
Jun	27.93	22.06	16.47	73	42
Jul	30.48	23.93	17.9	60.06	0
Aug	30.41	24.35	18.61	57.77	9

For weeds control on sunflower experimental plots, it was used a specific herbicide Imazamox 40g/l at rate of 1.2 l/ha in Syngenta and Limagrain plots.

Within the experimental plots (Figure 1), were used the following fungicides: IBE 4085 (0.8 l/ha), Dimoxistrobin 200 g/l + Boscalid (200 g/l - 0.5 l/ha) and Famoxadon 25% + Cimoxanil (25% - 0.4 l/ha), applied through vegetation period on 11 June 2016 as first treatment, and on 14 July 2016 as second treatment, using ALPHA 4100 equipment (Figure 2).

RESULTS AND DISCUSSIONS

For the sunflower hybrids belonging to Syngenta Company, there were noted the following data:

For the pathogen *Phomopsis helianthi*, within sunflower plot, when treated with fungicide IBE 4085 it was record an attack on leaves between 20 and 65% with an intensity of 18-25%; with fungicide mixture Dimoxistrobin + Boscalid, the frequency was between 5-68% and the intensity 25-40%, and when treated with fungicide combination of Famoxadon + Cimoxanil, the frequency was 45-66% and the intensity 20-45%, in comparison with the untreated control variants with 100% frequency and intensity of 35-45% (table 2).

For the pathogen *Sclerotinia sclerotiorum*, within sunflower experimental plot, when treated with fungicide IBE 4085 it was record an attack rate between 5 and 25% with an intensity of 100%; with fungicide mixture of Dimoxistrobin + Boscalid the frequency was between 10-30% and the intensity was 100%, and when treated with Famoxadon + Cimoxanil fungicide combination, the frequency was 12-26% and 100% intensity, compared to the untreated variant which presented a 15-25% frequency and 100% intensity (table 3).

For the pathogen *Phoma macdonaldi*, within sunflower plot, when applying the IBE 4085 it was observed an attack rate between 20 and 35% and an intensity of 20-30%; with Dimoxistrobin + Boscalid the frequency was between 35-65% and the intensity was 25-50%, and with Famoxadon + Cimoxanil fungicide mixture, the frequency was between 40-65% with an intensity of 20-35%, compared to untreated variant where it was observed 80-95% frequency of attack and 35-45% intensity (table 4).

For the pathogen *Alternaria helianthi*, within sunflower plot, when applying the IBE 4085 fungicide, it was record an attack rate between 20 and 35% with an intensity of 15-35%; with fungicide mixture of Dimoxistrobin + Boscalid, the frequency was between 29 and 60% and the intensity 20-35%; with Famoxadon + Cimoxanil combination, the frequency was between 45-70% with intensity of 20-35%, compared to the untreated variant which had between 80-100% frequency and 30-60% intensity (table 5).



Figure 1. Aspect of experimental field



Figure 2. Aspect from field treatment

Table 2. Syngenta hybrids behavior towards *Phomopsis helianthi*

Hybrid	IBE 4085		Dimoxistrobin + Boscalid		Famoxadon + Cimoxanil		Untreated control	
	F%	I%	F%	I%	F%	I%	F%	I%
NEOMA	30	25	55	26	45	30	100	45
DIAMANT	25	20	68	30	46	20	100	38
ACADEMI	26	21	65	30	66	33	100	48
NEOSTAR	20	18	50	25	65	45	100	50
BACARDI	25	20	50	40	60	25	100	35
GARCIA	24	20	45	25	65	35	100	48
TALENTO	28	22	65	40	60	38	100	45
EXPERTO	35	20	40	25	55	22	100	40

Table 3. Syngenta hybrids behavior towards *Sclerotinia sclerotiorum*

Hybrid	IBE 4085		Dimoxistrobin + Boscalid		Famoxadon + Cimoxanil		Untreated control	
	F%	I%	F%	I%	F%	I%	F%	I%
NEOMA	5	100	12	100	15	100	20	
DIAMANT	20	100	20	100	22	100	25	100
ACADEMI	15	100	25	100	15	100	15	100
NEOSTAR	10	100	20	100	12	100	20	100
BACARDI	18	100	25	100	26	100	25	100
GARCIA	5	100	16	100	18	100	15	100
TALENTO	17	100	10	100	12	100	20	100
EXPERTO	25	100	30	100	23	100	25	100

Table 4. Syngenta hybrids behavior towards *Phoma macdonaldi*

Hybrid	IBE 4085		Dimoxistrobin + Boscalid		Famoxadon + Cimoxanil		Untreated control	
	F%	I%	F%	I%	F%	I%	F%	I%
NEOMA	25	25	35	30	40	35	90	35
DIAMANT	30	28	45	50	55	30	85	40
ACADEMI	25	20	65	30	50	20	95	40
NEOSTAR	20	20	60	30	60	30	80	45
BACARDI	25	20	65	40	65	25	90	45
GARCIA	35	30	60	25	60	25	95	40
TALENTO	30	20	65	25	55	30	85	45
EXPERTO	30	30	60	30	65	30	80	35

Table 5. Syngenta hybrids behavior towards *Alternaria helianthi*

Hybrid	IBE 4085		Dimoxistrobin + Boscalid		Famoxadon + Cimoxanil		Untreated control	
	F%	I%	F%	I%	F%	I%	F%	I%
NEOMA	20	30	29	30	45	30	90	35
DIAMANT	30	35	45	35	60	20	100	60
ACADEMI	20	15	30	25	55	20	90	48
NEOSTAR	25	30	60	26	70	25	95	30
BACARDI	35	32	40	35	55	35	95	35
GARCIA	28	20	35	25	60	25	90	35
TALENTO	35	20	50	20	50	20	85	30
EXPERTO	25	20	45	25	55	25	80	35

The sunflower hybrids tested from Limagrain Company presented the following results (table 6): the *Phomopsis helianthi* attack had a frequency between 60-85%; the *Phoma macdonaldi* attack had a frequency between 70-95%; the *Alternaria helianthi* attack had a frequency between 45-75%; *Orobanche cumana* parasite attack was between 0-18%.

Table 6. Phytosanitary condition of sunflower experimental plots from Limagrain (F %) - 30 June 2016

Hybrid	<i>Phomopsis helianthi</i>	<i>Phoma macdonaldi</i>	<i>Alternaria helianthi</i>	<i>Orobanche cumana</i>
LG 5463 CL	80	95	60	18
LG 5542 CL	85	90	65	0
LG 5555 CLP	75	85	55	4
LG 5661 CL	85	90	75	2
LG 364 P69	83	95	70	5
LG 5671CLP	70	75	55	3
TANOSTAR	60	70	45	8

The sunflower hybrids belonging to NARDI Fundulea, have shown the following results regarding the crop phytosanitary condition (table 7): the *Phomopsis helianthi* attack had a frequency between 7-38%; the *Phoma macdonaldi* attack had a frequency between 12-30%; the *Sclerotinia sclerotiorum* attack had a frequency between 10-25%; *Orobanche cumana* parasite attack was between 0-7 %.

Table 7. Phytosanitary condition of NARDI Fundulea hybrids (F %)

Hybrid	<i>Sclerotinia sclerotiorum</i>	<i>Phomopsis helianthi</i>	<i>Phoma macdonaldi</i>	<i>Orobanche cumana</i>
FAVORIT	10	8	30	7
FD 117	22	35	25	3
FUNDULEA 225	25	38	30	0
FUNDULEA 708	10	7	12	0

Under production conditions the sowing date was changed with one month earlier, it was performed on 14 March, fact which led to early stage maturation of crop and decrease of sunflower crop main pest attack. The yield obtained in these conditions was 4600 kg/ha.

CONCLUSIONS

There were used last generation fungicides through the vegetation period, which have reduced the attack of the main pests during the two sensitive phenological phases;

From Syngenta Company, the best results regarding the screening of hybrid with a good behavior towards the main pests from the area were obtained with Neostar, Garcia and Neoma; From Limagrain Company, the best results were obtained with Tanostar and LG 5671CLP hybrids;

Towards the Broomrape parasite, *Orobanche cumana*, the best results were obtained with hybrids LG 5542 CL and LG 5661 CL from Limagrain, also with Fundulea 225 and Fundulea 708 from NARDI Fundulea;

Changing the sowing date determined an increased sunflower yield of 4600 kg/ha.

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