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RESEARCH ON EFFECTIVENESS OF SOME FUNGICIDES TREATMENTS ON THE ATTACK OF *Phomopsis/Diaporthe helianthi* ON SUNFLOWER IN BRAILA, BRAILA COUNTY

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Abstract

The paper aims to present the results obtained concerning the effectiveness of fungicides in controlling the attack of Phomopsis/Diaporthe helianthi. Was followed the behavior of some sunflower hybrids against the attack, were applied solid fertilizers (urea 46% N) and liquids fertilizers in two doses (Last N 250 g/l N) on a constant agricultural fund N:P:K. and the pathogen was controlled by applying two fungicides, Sfera 535 SC (0.4 l/ha) and Tanos 50 WG (0.4 kg/ha). Regarding the hybrid ES JANIS, the fungicide Tanos (0.4 kg/ha) recorded the best value for the effectiveness, with a percentage of 95.56% in the fertilized plot with Last N (1 dose). In the case of the hybrid SY BACARDI CLP, in 2018, the fungicide Tanos (0.4 kg/ha) recorded the best value concerning the effectiveness, with a percentage of 92.27% in the fertilized plot with urea 46% N (90 kg/ha N a.s.). In 2019, both Sfera (0.4 l/ha) and Tanos (0.4 kg/ha) recorded the best values concerning the effectiveness, with a percentage of 94.10% in the fertilized plots with Last N (2 doses).

Key words*: sunflower, degree of attack, effectiveness, fungicides.*

INTRODUCTION

Sunflower is the main oil plant in Romania, with productions to ensure the need for oil in human food (Chiriac et al., 2018 a; Chiriac et al., 2018 b). In the coming years, Romania will continue to become a more and more important oilseeds producer and exporter in the European Community (Arghiroiu et al., 2015; Chiriac et al., 2019).

The first appearance of the fungus *Diaporthe helianthi* was reported in 1980 in Voevodina - Yugoslavia, from where it expanded and appeared in Hungary, Romania, Bulgaria, Italy and France (Vranceanu et al., 1983). *Diaporthe helianthi* was assumed to be the single causal agent of *Phomopsis* stem canker, although several researchers suspected that the disease might be caused by more than one species of *Diaporthe* (Mathew et al., 2018).

The *Phomopsis* attack has serious repercussions on seeds and oil production when it appears early. Later infections, before flowering, destroy the vessels leading plants, but when the attack occurs at the end of flowering, the losses are substantially reduced. Production losses are estimated at over 50% in the case of infections before flowering, at 20-30% for those during flowering and at 10-20% for the attack at the end of flowering. At physiological maturity, the losses are negligible (Davet et al., 1991).

The symptoms following *Phomopsis* attack are characterized by the appearance of spots on the leaves, petioles, stems and under certain conditions, also on the capitulum.

On the stem, around the insertion point of the petioles, spots appear ellipsoidal, brown, extending to surround the stem. The tissues of the spots rot and the stem it breaks. Pycnidia appear in the attacked tissues as small, brown spots. It manifests itself on the leaves by brown lesions, bordered by yellow areas, which from the extremities and the tip of the leaves, advances to the triangle-shaped petiole. The spots may cover the entire leaf. In case of a strong attack, the plants browns and dries, having a charred appearance (Cristea, 2005).

Dabaeke et al. (2009), quoting Jouffret et al. (2005), recommends the application of fungicides by conventional sprayers, in crops 55 - 60 cm high, at the end of the month May and until mid-June.

The measures to prevent this pathogen consist of cultivating tolerant hybrids, respecting a rotation

in which the sunflower does not return sooner than 5-6 years, respecting the optimum sowing period, using a suitable density as well as balanced fertilization that will include all macro-elements in approximately equal proportions (Popescu, 1999). The fertilization of the sunflower necessarily needs to take into account the economic component of this technological step (Franzen, 2016). With all the existing concerns in obtaining products with activity in controlling the pathogens (Ichim et al., 2017; Cristea et al., 2017), the application of fungicides treatments is an important measure against diseases in the cultivated plants (Balasu et al., 2014; Buzatu et al., 2018; Jaloba et al., 2019; Alexandru et al., 2019).

The agricultural sector will continue to keep up with the changes, to adapt, to remain competitive because having ability to produce goods and to provide services means economic growth (Chiriac et al., 2018b).

MATERIALS AND METHODS

The research has followed the behavior of some sunflower hybrids against *Phomopsis/Diaporthe helianthi* in terms of application of solid and liquid fertilizers on a constant agriculture fund N:P:K and the effectiveness of the treatments applied against the monitored pathogen. A three-factor experience, the location of the plots was done randomly, by the method of incomplete blocks, each variant having 3 repetitions. The results were obtained in 2018 and 2019.

Factor 1 (genotype): ES JANIS CLP, MAS 92.CP, SY NEOSTAR CLP, SY BACARDI CLP, ES GENESIS.

Factor 2 (fertilization): unfertilized plot; urea fertilizer 46% N (90 kg/ha active substance); liquid fertilizer Last N (250 g/l N – one dose: 15 l/ha in 200 l water); liquid fertilizer Last N (250 g/l N – two doses: first application 15 l/ha in 200 l water and the second application, with the same dose, 14 days after).

Factor 3 (fungicides): Sfera 535 SC (0,4 l/ha); Tanos 50 WG (0,4 kg/ha).

The pathogen was controlled with two fungicides, with Sfera 535 SC (160 g/litre Cyproconazole+375 g/litre Trifloxystrobin) in dose of 0.4 l/ha and Tanos 50 WG (250 g/kg Cymoxanil+250 g/kg Famoxadone) in dose of 0.4 kg/ha.

Assessments were made on the frequency (F%) and the intensity (I%) of pathogen attack, the degree of attack (DA%) and effectiveness (E%). The degree of attack was calculated using the formula: $DA\% = \frac{F\% \cdot I\%}{100}$.

The effectiveness was calculated using the Abbott formula:

$E\% = 1 - \frac{DA\%Tp}{DA\%Up} \cdot 100$, where DA%Tp = degree of attack in treated plot; DA%Up = degree of attack in the untreated plot.

RESULTS AND DISCUSSIONS

The applied treatments considerably reduced the attack of *Phomopsis/Diaporthe helianthi* in the treated plots (Table 1.). Regarding the hybrid ES JANIS, it registered an attack of *Phomopsis/Diaporthe helianthi* only in 2018, with a degree of the attack of 0.45% for the untreated plot. For the other variants, the degree of attack varied from 0.02% for the fertilized plot with Last N (1 dose) to 0.11% for the fertilized plot with urea 46% N (90 kg/ha N a.s.). Concerning those two fungicides used in the control of this pathogen, the fungicide Tanos (0.4 kg/ha) recorded the best value for the effectiveness, with a percentage of 95.56% in the fertilized plot with Last N (1 dose).

In the case of the hybrid MAS 92.CP, for the untreated plot, in 2018 the degree of the attack was 0.56% and in 2019 0.83%. The most effective fungicide in controlling the pathogen *Phomopsis/Diaporthe helianthi,* proved to be the fungicide Tanos (0.4 kg/ha), with an effectiveness of 92.86% for the fertilized plot with Last N (1 dose) in 2018 and an effectiveness of 95.18% for the fertilized plot with urea 46% N (90 kg/ha N a.s.) in 2019.

The hybrid SY NEOSTAR, registered a degree of the attack of 7.03% in 2018 and 5.18% in 2019, for the untreated plot. The fungicide Tanos (0.4 kg/ha) recorded the best value concerning the efficacy, with a percentage of 96.87% in the fertilized plot with Last N (1 dose) in 2018 and an effectiveness of 94.59% for the fertilized plot with Last N (2 doses) in 2019.

In the case of the hybrid SY BACARDI CLP, for the untreated plots, in 2018 the degree of the attack was 6.73% and in 2019, 5.2%. In 2018, the fungicide Tanos (0.4 kg/ha) recorded the best value concerning the efficacy, with a

percentage of 92.27% in the the fertilized plot with urea 46% N (90 kg/ha N a.s.). In 2019, both Sfera (0.4 l/ha) and Tanos (0.4 kg/ha) recorded the best values concerning the effectiveness, with a percentage of 94.10% in the fertilized plot with Last N (2 doses). Toth and Cristea (2020) shows also that the fungicide Sfera 535 SC had a high effectivenes in controlling cercosporiosis.

Table 1. Effectiveness of the tretments applied in the control of the pathogen *Phomopsis/Diaporthe helianthi* (2018 – 2019) in Braila, Braila county

			Phomopsis/Diaporthe helianthi			
			2018		**2019**	
Hybrid	**Chemical fungicides/ fertilization**		DA(%)	**E(%)**	DA(%)	**E(%)**
ES JANIS	Untreated		**0.45**	**-**	**-**	**-**
	Sfera 535 SC (0.4 l/ha)	urea 46% N (90 kg/ha N a.s.)	0.11	**75.56**	-	**-**
		Last N (1 dose)	0.07	**84.44**	-	**-**
		Last N (2 doses)	0.07	**84.44**	-	
	Tanos (0.4 kg/ha)	urea 46% N (90 kg/ha N a.s.)	0.05	**88.89**	-	**-**
		Last N (1 dose)	0.02	**95.56**	-	**-**
		Last N (2 doses)	0.07	**84.44**	-	**-**
MAS 92. CP	Untreated		**0.56**	**-**	**0.83**	**-**
	Sfera 535 SC (0.4 l/ha)	urea 46% N (90 kg/ha N a.s.)	0.12	**78.57**	0.16	**80.72**
		Last N (1 dose)	0.12	**78.57**	0.13	**84.34**
		Last N (2 doses)	0.17	**69.64**	0.15	**81.93**
	Tanos (0.4 kg/ha)	urea 46% N (90 kg/ha N a.s.)	0.06	**89.29**	0.04	**95.18**
		Last N (1 dose)	0.04	**92.86**	0.07	**91.57**
		Last N (2 doses)	0.22	**60.71**	0.21	**74.70**
SY NEOSTAR CLP	Untreated		**7.03**	**-**	5.18	**-**
	Sfera 535 SC (0.4 l/ha)	urea 46% N (90 kg/ha N a.s.)	1.51	**78.52**	1.27	**75.48**
		Last N (1 dose)	0.96	**86.34**	1.34	**74.13**
		Last N (2 doses)	0.78	**88.90**	0.73	**85.91**
	Tanos (0.4 kg/ha)	urea 46% N (90 kg/ha N a.s.)	0.56	**92.03**	0.37	**92.86**
		Last N (1 dose)	0.22	**96.87**	0.60	**88.42**
		Last N (2 doses)	0.54	**92.32**	0.28	**94.59**
SY BACARDI CLP	Untreated		**6.73**	**-**	**5.42**	**-**
	Sfera 535 SC (0.4 l/ha)	urea 46% N (90 kg/ha N a.s.)	1.38	**79.49**	1.64	**69.74**
		Last N (1 dose)	1.68	**75.04**	1.14	**78.97**
		Last N (2 doses)	1.34	**80.09**	0.32	**94.10**
	Tanos (0.4 kg/ha)	urea 46% N (90 kg/ha N a.s.)	0.52	**92.27**	0.64	**88.19**
		Last N (1 dose)	0.33	**95.10**	0.60	**88.93**
		Last N (2 doses)	0.30	**95.54**	0.32	**94.10**
ES GENESIS	Untreated		**0.68**	**-**	-	**-**
	Sfera 535 SC (0.4 l/ha)	urea 46% N (90 kg/ha N a.s.)	0.18	**73.53**	**-**	**-**
		Last N (1 dose)	0.19	**72.06**	-	**-**
		Last N (2 doses)	0.10	**85.29**	-	**-**
	Tanos (0.4 kg/ha)	urea 46% N (90 kg/ha N a.s.)	0.08	**88.24**	-	**-**
		Last N (1 dose)	0.06	**91.18**	-	**-**
		Last N (2 doses)	0.22	**67.65**	-	**-**

Regarding the hybrid ES GENESIS, it registered an attack of *Phomopsis/Diaporthe helianthi* only in 2018, with a degree of attack of 0.68% for the untreated plot. For the other variants, the degree of attack varied from 0.06% for the fertilized plot with Last N (1 dose) to 0.22% for the fertilized plot with Last N (2 doses). Also, for this hybrid, the fungicide Tanos (0.4 kg/ha) proved to be effective, with an effectiveness of 91.18% for the fertilized plot with Last N (1 dose).

Research on the behavior of some sunflower hybrids to the attack of the pathogen *Diaporthe helianthi* were made also by Manole et al. (2018).

CONCLUSIONS

The treatments applied have considerably reduced the attack of *Phomopsis/Diaporthe helianthi* in the treated plots.

The fungicide Tanos (0.4 kg/ha) proved to be effective for all the analyzed variants.

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REFERENCES

Alexandru, I., Cristea, S., Hoza, D. (2019). Effectiveness of treatments on the attack of *Polystigma rubrum* pathogehs and *Stigmina carpophila* on plum in soimari location, Prahova County. *Scientific Papers-Series B-Horticulture*, *63*(2), 79–82.

Arghiroiu, A.G., Cristea, S., Alecu, I.N. (2015). Tendencies regarding trade with oleaginous seeds of Romania. *Scientific Papers–Series Management Economic Engineering in Agriculture and Rural Development*, *15*(3), 49–58.

Balasu, A.G., Zala, C., Cristea, S. (2015). Effectiveness of treatments applied in fighting *Pseudomonas savastanoi* pv. *Glycinea* pathogen, in terms of 2014, location Unirea, Braila County. *Journal of Biotechnology*, *208*. S108-S108, Supplement: S, DOI: 10.1016/j.jbiotec.2015.06.340.

Buzatu, M.A., Costache, M., Hoza, D., Sovarel, G., Cristea, S. (2018). The efficacy of different treatments for pathogens control on the eggplant crops in the field. *Scientific Papers-Series B-Horticulture*, *62*. 495–498.

Chiriac, A.R., Cristea, S., Popescu, M., Risnoveanu, L. (2018 a). The evolution of sunflower crops in Romania in the context of the pre-and post-accession to the European Union. *Agrarian Economy and Rural Development-Realities and Perspectives for Romania*. 9th Edition of the International Symposium, November 2018, Bucharest.

Chiriac, A.R., Mocuta, D., Joita-Pacureanu, M., Cristea, S. (2018 b). Trends and Correlations in Romania's Oilseeds Market in the Context of the Accession to the European Union. *Vision 2020: Sustainable Economic Development and Application of Innovation Managemen*t, 6625–6636.

Chiriac, A.R., Mocuta, D., Cristea, S. (2019). The Tendency Concerning The Evolution Of Oilseed Market In Romania, *AGROFOR International Journal*, *4*(1), 14–23.

Cristea, S. (2005). *Fitopatologie vol.2*. Editura Cris Book Universal, București.

Cristea, S., Manole, M.S., Zala, C., Jurcoane, S., Danaila-Guidea, S., Matei, F., Dumitriu, B., Temocico, G., Popa, A. L., Calinescu, M., Olariu., L. (2017). In vitro antifungal activity of some steroidal glycoalkaloids on *Monilinia* spp. Romanian *Biotechnological Letters*, *22*(5), 12972–12978.

Davet, P., Pérès, A., Regnault, Y., Tourvieille, D., Penaud, A. (1991). *Les maladies du turnesol*. Les points techniques du CETIOM, Paris, 72 p.

Dabaeke, P., Estragnat, A. (2009). Crop canopy indicators for the early prediction of *Phomopsis* stem canker *(Diaporthe helianthi)* in sunflower. Crop Protection, *28*(9), 792–801.

Franzen, D. (2016). *Fertilizing Sunflower*. North Dakota State University, Extension Publication SF713. Fargo, ND.

Ichim, E., Marutescu, L., Popa, M., Cristea, S. (2017). Antimicrobial efficacy of some plant extracts on bacterial ring rot pathogen, *Clavibacter michiganensis* ssp. *Sepedonicus*. *Eurobiotech Journa*l, *1*(1), 85–88, DOI: 10.241290/ISSN2564-615X/2017/01.14.

Jaloba, D., Jinga, V., Cristea, S. (2019). Research on effectiveness of some fungicides treatments on jonathan apple variety for apple scab control in Voinesti area. *Scientific Papers-Series A-Agronomy*, *62*(2), 135–139.

Manole, D., Jinga, D., Giumba, A.M., Dudoiu, R., Cristea, S. (2018). Researches regarding new and improved technologies for sunflower and *Sorghum* crops in the context of climate changes in Dobrogea Region. *Scientific Papers. Series A. Agronomy*, *LXII*(1), 348–354.

Mathew, F., Harveson, R., Gulya, T., Thompson, S., Block, C., Markell, S. (2018). *Phomopsis Stem Canker of Sunflower*. Plant Health Instructor. DOI: 10.1094/PHI-I-2018-1103-01.

Popescu, Gh. (1999). *Fitopatologie agricolă*, Editura 1999.

Toth, K., Cristea, S. (2020). Efficacy of treatments in controlling cercosporiosis (*Cercospora beticola* sacc.) in sugar beet. *Scientific Papers-Series A-Agronomy*, *63*(2), 236–239.

Vranceanu, A.V., Csep, N., Pârvu, N., Stoenescu, F.M. (1983). Genetic variability of sunflower reaction to the attack of *Phomopsis helianthi (Munt. Cvet. et al.)*. *Helia, 6*. 23–25.