Scientific Papers. Series B, Horticulture. Vol. LXII, 2018
Print ISSN 2285-5653, CD-ROM ISSN 2285-5661, Online ISSN 2286-1580, ISSN-L 2285-5653

THE EFFICACY OF DIFFERENT TREATMENTS FOR PATHOGENS CONTROL ON THE EGGPLANT CROPS IN THE FIELD

Mihaela Alina BUZATU[1], Marcel COSTACHE[2], Dorel HOZA[3], Gabriela ȘOVĂREL[2], Stelica CRISTEA[3]

[1]Engineering and Management of Vegetal and Animal Resources Doctoral School, UASMV Bucharest, 59 Mărăşti Blvd, District 1, Bucharest, Romania
[2]Research and Development Institute for Vegetable and Flower Growing Vidra, No. 22, Calea Bucureşti Street, Vidra, Ilfov, Romania
[3]University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăşti Blvd, District 1, Bucharest, Romania

Corresponding author email: buzatumihaelaalina@yahoo.com

In the field, eggplants are frequently attacked by Alternaria porri f. sp. solani, Botrytis cinerea and Phytophthora parasitica pathogens, which diminishes yield in quantitative terms and depreciates qualitatively. For the control of these pathogens three variants of fungicide treatments with different active ingredients were tested: chlorotalonil 500 g/l, pyraclostrobin 5% + metiram 55%, metiram 80%, iprovalicarb 8.4% + Cu oxychloride 40.6%, azoxystrobin 200 g/l + diphenoconazole 125 g/l. The best efficacy was obtained at variant 2 with the following schedule of treatments: treatment 1 - pyraclostrobin 5% + metiram 55% - 0.2%; treatment 2 - iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%; treatment 3 - pyraclostrobin 5% + metiram 55% - 0.2%; treatment 4 - iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%; treatment 5 - azoxystrobin 200 g/l + diphenoconazole 125 g/l - 0.1%; treatment 6 - pyraclostrobin 5% + metiram 55% - 0.2%. In this variant, the average efficacy was 85.5% and the yield 39.7 t/ha (123.17%) compared to 31.8 t/ha in the untreated control variant.

Key words: *Alternaria porri f. sp. solani, Botrytis cinerea, pathogens control, Phytophthora parasitica, Solanum melongena.*

INTRODUCTION

Although eggplants (*Solanum melongena* L.) are characterized by their adaptation to varied pedoclimatic conditions, crop yield is restricted by the large number of pests whose attack affects the productive biological potential, causing the decrease of quantity and quality of fruits (Tomescu et al., 1992; Costache and Roman, 2007). In the field eggplants are frequently attacked by the pathogens *Alternaria porri* f. sp. *solani*, *Botrytis cinerea* (Buzatu et. al., 2017), *Phytophthora parasitica* and soil borne fungal pathogen including *Verticillium dahliae* and *Fusarium oxysporum* f. sp. *melongenae* (Buzatu et. al., 2017). *Alternaria porri* f. sp. *solani* occur frequently in eggplant cultures, especially in years with high average temperatures and heavy rainfall, producing dark brown spots on leaves, stems and flowers that coalesce and form large necrotic areas (Leite, 1997; Oliveira et al., 2004; Cristea, 2005). *Alternaria* spp. has also been identified on seeds of various plant species (Cristea et al., 2008; Radu et al., 2011; Pochon et al., 2012; Mardare et al., 2014; Pană et al., 2014; Cristea et al., 2015; Manole and Cristea, 2015; Gruia et al., 2016; Dudoiu et al., 2016). The distribution of *Alternaria* spp. on various plant species (Berca et al., 2015) was also studied in the literature.

Under laboratory conditions comparative measurements were made on enzymantic content of the leaves of *Momordica charantia* (both healthy and infected with pathogenic fungi *Aspergillus niger* and *Alternaria* sp.).

Amylases, proteases and lipases content of the biological material were determined.(Cozea and Cristea, 2011). In our country, this disease was first reported in 1958 by Tr. Săvulescu (Docea, 2012). *Botrytis cinerea* occurs frequently in crops of eggplants in protected areas, but also in the fields in years of abundant precipitation or if the culture is irrigated by sprinkler irigation.

Under favorable environmental conditions to the onset and evolution of the attack, the losses can reach up to 15-20%.

Symptoms present in flowers range from browing to fall off. On the fruit, the symptoms begin at the base of the calyx through a small round lesion that develops into a soft rot.
The fruit is covered by a mass of gray spores, characteristic of the disease (Compendium of Strawberry Diseases, 1998).
Phytophthora parasitica appears more frequently on well - developed fruits at the base of plants that come in contact or are near the surface of the soil. The tissues of the attacked fruit is rotting.
Under high temperature and humidity conditions, the rot is expanding and progressing affecting the whole pulp (Docea, 2012).
Based on the results obtained in the world and presented in the literature (Dillard et al., 1996; Anthony et al., 1998), the work aims to highlight the possibilities to monitor the complex of pathogens in the eggplant crops by using different treatment schedule.

MATERIALS AND METHODS

The experiments were carried out in 2017, under field conditions, using the Luiza eggplant variety. The culture was planting on May 12, 2017, with a density of 28,000 plants/ha. Four variants of treatments (Table 1) were used for the control of pathogens *Alternaria porri* f. sp. *solani*, *Botrytis cinerea* and *Phytophthora parasitica*. Technological control variants have been establisheed according to the sequence of pathogens in culture. During the growing season were applied 6 foliar treatments, at intervals of 12-16 days, in correlation with the climatic factors. Observations were made on the frequency (AF%) and the intensity (I%) of pathogen attack and the degree of attack (DA%) and efficacy (E%) were calculated. The degree of attack was calculated using the formula (F% × I%)/100 and the efficacy with the formula (untreated DA% – treated DA%) × 100/untreated DA.

Table 1. Variants to pathogens control on the eggplant crops in the field (Vidra, 2017)

Variant	22.06.2017	06.07.2017	18.07.2017	04.08.2017	22.08.2017	06.09.2017
	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
I.	chlorotalonil 500 g/l - 0.2%	iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%	chlorotalonil 500 g/l - 0.2%	iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%	azoxystrobin 200 g/l + diphenoconazole 125 g/l - 0.1%	chlorotalonil 500 g/l - 0.2%
II.	pyraclostrobin 5% + metiram 55% - 0.2%	iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%	pyraclostrobin 5% + metiram 55% - 0.2%	iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%	azoxystrobin 200 g/l + diphenoconazole 125 g/l - 0.1%	pyraclostrobin 5% + metiram 55% - 0.2%
III.	metiram 80 % - 0.2%	iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%	metiram 80 % - 0.2%	iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%	azoxystrobin 200 g/l + diphenoconazole 125 g/l - 0.1%	metiram 80% - 0.2%
IV.	Untreated control	-	-	-	-	-

RESULTS AND DISCUSSIONS

The first pathogen in culture was *Botrytis cinerea*, followed by *Alternaria porri* f. sp. *solani* and *Phytophthora parasitica*. The attack of the pathogens *Botrytis cinerea* and *Alternaria porri* f. sp. *solani* began in the third decade of July (21.07. and 24.07., respectively) and the *Phytophthora parasitica* in the first decade of August (7.08.). Abiotic factors (temperature, atmospheric humidity and light) are important factors in the evolution of pathogen attack.
The influence of these abiotic factors on the growth and development of *Alternaria* spp. has been studied in the literature (Mardare et al., 2015).
The attack of the 3 pathogens had a slow evolution due to the low relative atmospheric humidity in the period July - August (52.4 - 74.7%, mean = 61.2%; Table 2).
Under these conditions, the average efficacy of treatment variants was between 79.7% (V **III**) and 85.5% (V **II**, Table 3).
The yields of field eggplants were 38.7 t/ha (V **III**), 39.7 t/ha (V **II**) and the untreated control variant was 31.8 t/ha (Table 4).
The highest yields were obtained in variants II (39.7 t/ha - 124.8%) and I (39.2 t / ha - 123.1%.

Table 2. The occurrence and evolution of the pathogens attack on the eggplants from the field in correlation with climatic factors (Vidra, 2017)

The pathogens/ climatic factors	Date of the attack	Degree of attack/frequency of attack (%)/month, decade												
		May	June			July			August			September		
		III	I	II	III	I	II	III	I	II	III	I	II	III
Alternaria solani	24.07	0	0	0	0	0	0	1,1	2.3	4.2	5.8	6.7	8.8	10.9
Botrytis cinerea	21.07	0	0	0	0	0	0	1.4	1.9	2.5	3.4	3.9	5.8	8.1
Phytophthora parasitica	7.08	0	0	0	0	0	0	0	0.8	1.5	2.3	3.2	4.4	5.9
Minimum temperature (ºC)	-	12.4	15.0	14.0	16.3	15.9	15.9	17.5	21.1	18.3	15.1	13.7	15.3	10.5
Maximum temperature (ºC)	-	21.4	27.0	26.0	31.9	28.4	28.9	31.0	36.6	31.8	28.7	28.8	29.4	19.2
Average temperature (ºC)	-	16.5	20.1	19.8	23.8	22.0	22.0	24.0	30.8	25.6	21.3	20.8	21.5	14.2
Minimum relative humidity (%)	-	57.0	47.5	43.8	36.4	46.0	37.8	35.7	26.9	27.4	30.2	29.3	30.8	41.7
Maximum relative humidity (%)	-	79.6	77.8	74.4	82.5	74.7	63.6	63.3	52.4	57.0	56.4	72.3	61.7	64.6
Average relative humidity (%)	-	66.9	59.5	56.8	56.4	57.9	47.6	46.8	36.7	38.7	41.7	46.9	44.8	50.7
Precipitation (mm)	-	7.5	20.0	22.5	1.0	84.0	8.5	6.5	0	0	45.0	30.0	1.0	2.0

Table 3. Efficacy of some schedules of trearments to control pathogens on the eggplant culture (Vidra, 2017)

Variant	Degree of attack / frequency of attack (%) and efficacy (%)						
	Alternaria solani (DA%)	E (%)	*Botrytis cinerea* (AF%)	E (%)	*Phytophthora parasitica* (AF%)	E (%)	Average of efficacy (%)
I	2.2	79.8	1.3	83.9	1.0	83.0	82.2
II	1.9	82.6	1.0	87.6	0.8	86.4	85.5
III	2.4	78.0	1.5	81.5	1.2	79.7	79.7
IV (Untreated control)	10.9	-	8.1	-	5.9	-	-

Table 4. The yield of eggplant in correlation with the experimental treatments (Vidra, 2017)

Variant	Yield			
	kg/sqm	% as compared to the untreated control	Difference (kg/sqm)	Significance
I	3.920	123.1	+ 0.74	***
II	3.972	124.8	+ 0.79	***
III	3.872	121.6	+ 0.69	**
IV (untreated control)	3.182	100.0	0	

LSD 5% - 0.359 kg/ sqm, LSD 1% - 0.504 kg/sqm, LSD 0.1% - 0.712 kg/sqm

Analyzing the obtained results, compared to the untreated control variant, it was found that the best results were obtained in the variants I and II, with very significant yield differences compared to the untreated control variant.

CONCLUSIONS

Alternaria porri f.sp. *solani*, *Botrytis cinerea* and *Phytophthora parasitica* are more frequent occured pathogens that attack the foliage and fruits of the eggplants.

In the climatic conditions of 2017, in Vidra, Ilfov region, these pathogens decreased the yield with 22-25%.

The best efficacy was obtained at variant II with the following schedule of trearments: treatment 1 - pyraclostrobin 5% + metiram 55% - 0.2%; treatment 2 - iprovalicarb 8.4% + Cu oxychloride 40.6 % - 0.2%; treatment 3 - pyraclostrobin 5% + metiram 55% - 0.2%; treatment 4 - iprovalicarb 8.4% + Cu oxychloride 40.6% - 0.2%; treatment 5 - azoxystrobin 200 g/l + diphenoconazole 125 g/l - 0.1% and treatment 6 - pyraclostrobin 5% +

metiram 55% - 0.2%. In this variant the mean efficacy was 85.5%. The highest yields were obtained in variants II (39.7 t/ha - 124.8%) and I (39.2 t/ha - 123.1%).

REFERENCES

Anthony V., Greenland A., Melchers L., Stuiver M., 1998. Strategies for fungal control development of fungicides or use biotechnology. Mededelingen Faculteit Landbouw kundige en Toegepaste Biologische Wetenschappen, Univ. Gent., 63 (4b): 1619-1624.

Berca L.M., Cimponeriu G.D., Cristea S., 2015. Distribution of *Alternaria* sp. on *Brassica napus* seeds from growing fields affected by Alternaria black spot in Calarasi County, Journal of Biotechnology, vol 208, Supplement S, 115.

Buzatu M.A., Costache M., Cristea S., 2017. Behavior of some eggplant cultivars (*Solanum melongena* L.) at the pathogens attack in greenhouse and field. Lucrări Ştiinţifice, USAMV Iaşi, vol. 60 (1), seria Agronomie, 117-122.

Buzatu M.A., Costache M., Cristea S., 2017. Research concerning the behaviour of some eggplant (*Solanum melongena* L.) genotypes in Vidra, Ilfov region. Current Trends in Natural Sciences, 6 (12), 25-29.

Compendium of Strawberry Diseases, 1998. APS Press, St. Paul-MN.

Costache M., Roman T., 2007 . Bolile şi dăunătorii culturilor de legume, Editura Agris - Redacţia Revistelor Agricole, Bucureşti.

Cozea A., Cristea S., 2011. Aspects regarding pathogen-enzymatic system interrelation at *Momordica charantia* naturalized in Romania. Romanian Biotechnological Letters, 16 (5), 6668-6672.

Cristea S., 2005. Fitopatologie, vol. 2, Editura Cris Book Universal, Bucureşti.

Cristea S., Georgescu M., Patrascu N., Groza O., 2008. Research regarding the pathology and anathomy of the seed the extention of wheat kernel. Scientific Papers, USAMV Bucharest, Series A, Agronomy, Vol. LI, 280-287.

Cristea (Manole) M.S., Cristea S., Zală C., 2015. Research on micoflora present in the caryopses of wheat (*Triticum aestivum*) in the S-E of Romania, in terms of 2014. Romanian Biotechnological Letters, Vol. 20, No. 1, 10182-10189.

Docea E., Cristea S., Iliescu H., 2012. Bolile plantelor legumicole, Ediția a II-a revizuită și adăugită, Editura Ceres, Bucureşti, 100-102.

Dillard H.R., Johnston S.A., Cobb A.C., Hamilton G.H., 1997. An assessment of fungicide benefits for the control of fungal diseases of processing tomatoes in New York and New Jersey. Plant Dis. 81 (6): 677-681.

Dudoiu R., Cristea S., Lupu C., Popa D., Oprea M., 2016. Micoflora associated with maize grains during storage period, Agrolife Scientific Journal 5 (1), 63-68.

Gruia L., Cristea S., Zală C., 2016. Researches on the micoflora of the mustard seeds (*in vitro*), Journal of Biotechnology, vol 231, Supplement S, pages: S67-S67. Doi: 10.1016/j.jbiotec.2016.05.248.

Leite R.M.V.B.C., 1997. Doenças do girassol. Londrina, EMBRAPA-CNPSo. 68pp.

Manole (Cristea) M.S., Cristea S., 2015. Identification and quantification of fungi associated with seeds of barley, in terms of 2014. Scientific Papers, Series A Agronomy, Volume 58, 246-249.

Mardare E.Ş., Cristea S., Zala R.C., 2014**.** Researches On The Micoflora Of Sunflower's Achenes For The Hybrids Cultivated In Fetesti Area, Ialomita County. Lucrări Ştiinţifice,USAMV „Ion Ionescu de la Brad" Iasi, Vol. 57: 213-216.

Mardare E.S., Cristea S., Gâdea M., Tamba-Berehoiu R., 2015**.** The influence of some abiotic factors on the development of *Alternaria* spp. pathogen (*in vitro*).Romanian Biotehnological Letters, Vol. 20, Issue: 5:10888-10892.

Oliveira M.F.D., Neto A.T., Leite R.M., Castiglioni V.B., Arias C.A.A., 2004. Mutation Breeding In Sunflower For Resistance To *Alternaria* Leaf Spot/ *Helia*, 27 (41), 41-50.

Pană M., Cristea S., Cernat S., Negrila E., 2014. The mycoflora on barley-the varieties extension certificated at ARDS - Teleorman. Scientific Papers UASVM Iasi, Series Agronomy, Vol. 57 (2), p. 217-220.

Pochon S., Terrasson E., Guillemette T., Iacomi Vasilescu B., Georgeault S., Juchaux M., Berruyer R., Debeaujon I., Simoneau P., 2012. The *Arabidopsis thaliana* - *Alternaria brassicicola* pathosystem: a model interaction for investigating seed transmission of necrotrophic fungi. Plant Methods, 8: 16.

Radu E., Cristea S., Zală C., 2011. Reserch on the biological features of *Alternaria brassicae* pathogen isolated on rape. Scientific Papers, USAMV Bucharest, Series A, vol LIV, 350-355.

Tomescu A., Dragomir N., Costache M., Voican V., 1995. Avertizarea în complex a tratamentelor pentru combaterea agenţilor patogeni din culturile de tomate timpurii şi de vară toamnă. Simpozionul Proplant, Călimănești, 7-10 noiembrie, 61-67.