

## THE INFLUENCE OF TREATMENTS WITH SOME FUNGAL EXTRACTS ON PLANTS OF SOYBEAN GROWN UNDER GREENHOUSE CONDITIONS

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### Abstract

*The study was carried out in the greenhouse from the Department of Vegetable and Ornamental Plants, USAMV Bucharest during 2008-2009. In this study we used the soybean as biological material, variety PR 91M 10. The experimental variants consisted in treatments with chemicals and fungal extracts applied on plants and soil. After inoculation with pathogen we found that plants in variants treated with fungal extracts showed increased resistance to Botrytis cinerea as compared with the untreated control.*

*All fungal extracts induced resistance to Botrytis cinerea in soybean plants more efficiently when administrated on leaves. They can be use for plants protection in the context of sustainable agriculture.*

### INTRODUCTION

By applying friendly products we can help to reduce environmental and plants pollution. Identifying products that induce plant resistance to reduce chemical treatments costs, in this way we contribute to a sustainable agriculture.

The aim of the study was testing the influence of fungal extracts on improving the resistance of soybean plants to pathogen *Botrytis cinerea*.

Research has been carried out to find biocontrol products of microbial origin that increase plant resistance or inhibit pathogen development (Legard et al., 2002; Namdeo, 2007). Studies on the use of fungi with origin into the soil carried out by Ushamalini et al. (2008) proved that these fungi induced defend responses in plant against various pathogens.

### MATERIAL AND METHODS

The study carried out during 2008-2009 in the greenhouse from USAMV Bucharest. The biological material was PR 91 M 10 soybean cultivar, sensible to grey mould.

The experimental variants were: V1 - control; V2 - chemical treatment; V3 - treatment with Extract 1; V4 - treatment with Extract 2; V5 - treatment with Extract 3. Biological control treatments were derived from pathogenic (E1), antagonistic (E2) and both mixed (E3) fungi. The chemical fungicides and fungal extracts were applied on plant (leaves) and on soil. All vegetative factors (light, temperature and humidity) were daily monitored. The chemical and biological treatments and doses administrated are presented in Tables 1 and 2.

**Table 1**

**The chemical treatments was applied spraying on leaves and on soil**

The days	Products - spraying on leaves	Dose ml/plant	Products applied on soil	Dose ml/pot
Day 1st	Captan +Teldor	10 ml	Topsin +Rovral	10 ml
Day 4th	Captan +Teldor	10 ml	Topsin +Rovral	10 ml
Day 6th	Captan + Batron	10 ml	Topsin	10 ml
Day 8th	Captan + Batron	10 ml	Topsin	10 ml

**Table 2**

**The fungal extract applied by spraying on leaves**

The days	Extracts - spraying on leaves	Dose ml/plant	Products Applied on soil	Dose ml/pot
Day 1st	1,2 and 3	10 ml	1,2 and 3	10 ml
Day 4th	1,2 and 3	10 ml	1,2 and 3	10 ml
Day 6th	1,2 and 3	10 ml	1,2 and 3	10 ml
Day 8th	1,2 and 3	10 ml	1,2 and 3	10 ml

After three days of treatments with chemical products and biological extracts, the plants were experimentally infected with the pathogen *Botrytis cinerea*.

The observations and determinations made: the dynamic of height plant; number of leaves; the growth rhythm; the evolution of attack after 24, 48, 72 and 168 hours after inoculation with pathogen; foliar surface; number of affected leaves; percent of affected leaves. The data were compared by means of statistical analysis of variance.

**RESULTS AND DISCUSSION**

After examining the effect of treatment, we found that the percentage of affected leaves was lower at the variants treated on plant and soil with chemical products and extracts as compared with control. The treatment made with fungal extract E2

(in V4) on plant and soil showed the best resistance of plants at *Botrytis cinerea* (Table 3).

**Table 3**

**Total leaves, total leaves affected and the percent of leaves affected from total leaves**

Experimental variants	Treatments applied on:	Total number of leaves per plant	% to control	Signif.	Leaves affected	% of leaves affected from total leaves
V1 - Control	V1 Mt	7.33	100.00	Mt	3	40.93
V2 – Treatment	V2 - Plant	10.00	136.43	*	1	10.00
	V2 - Soil	11.00	150.07	*	1	9.09
V3 - Extract 1	V3 - Plant	10.33	140.93	*	1	9.68
	V3 - Soil	8.00	109.14	N	1	12.50
V4 - Extract 2	V4 - Plant	10.33	140.93	*	0	0.00
	V4- Soil	11.00	150.07	*	0	0.00
V5 - Extract 3	V5 - Plant	10.67	145.57	*	1	9.37
	V5 - Soil	7.00	95.50	N	1	14.29

DL5% = 2.540      DL5% in % = 34.6521

DL1% = 3.700      DL1% in % = 50.4775

DL01% = 5.550      DL01% in % = 75.7162

Based on observations we noticed that all variants treated with Extracts on the leaves were not significantly affected after 48 hours respectively 72 hours after inoculation with the pathogen at variants 3, 4 and 5. In control variant, percentage of attack to total leaf area was highest after 48 hours (1.19%) respectively after 168 hours (23.51%). In V4 leaves have not been affected (Table 4).

**Table 4**

**Foliar surface and the percent of surface affected from total foliar surface**

Experimental variants Treatments applied on plant	Foliar surface	Surface affected of pathogen from the total foliar surface (%)		
		48 hours	72 hours	168 hours (7 days)
V1 - Control	923	1.19	18.09	23.51
V2 - Chemical treatment - plant	1115	0.81	6.01	10.58
V3 - Extract 1 - plant	1050	0.10	0.48	2.10
V4 - Extract 2 - plant	986	0	0	0
V5. Extract 3 - plant	988	0	0.10	2.83

We remarked that when applying the treatments on soil all variants treated with fungal extract have provided a better protection of plants, but less efficient than treatment on plant (Table 5).

The surface of affected leaves was about ten fold reduced in variants treated with extracts E1 and E3 as compared with control, but the chemical fungicides applied, reduced the surface affected by pathogen to about half from that registered in control variant.

**Table 5**

**Foliar surface and the percent of surface affected from total foliar surface**

Experimental variants Treatments applied on soil	Foliar surface	% attack regarding the total foliar surface		
		48 hours	72 hours	168 hours (7 days)
V1 - Control	923	1.19	18.09	23.51
V2 –Chemical treatment -soil	1023.11	0.49	8.60	10.95
V3 - Extract 1 – soil	956.37	0.10	0.63	3.24
V4 - Extract 2 - soil	893.67	0	0	0
V5. Extract 3 – soil	886.33	0	0.11	4.06

**CONCLUSIONS**

1. Biological control agents represented by fungal extracts had beneficial effects on soybean plants that were better protected against infection with *Botrytis cinerea* than non-treated plants or treated with chemical fungicides
2. The effect of biological agents for pathogen control was the best when applied by spraying on plant leaves than on soil
3. In the case of the treatment applied on plant and soil the best protection was observed at variant 4, where there were no signs of attack
4. The efficiency of pathogen control treatments in the experiment was: Extract 2>Extract 1>Extract 3>Chemical fungicides.

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