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INFLUENCE OF EXTRACTS FROM ESSENTIAL OIL PLANTS ON THE GROWTH OF *RHIZOCTONIA SOLANI* KUHN, AGENT OF THE SUGAR BEET ROOT ROT

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Abstract

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It has been studied for the first time the effect of ethanol extract from essential oil plants *Hyssopus officinalis* L. (hissopus), *Hypericum perforatum* L. (tutsan), and *Lavandula vera* V. (lavender) in concentrations 1-20 ml/l on the growth and the cultural special features on the agent of sugar beet root rot *Rhizoctonia solani* Kuhn.

Seven-day crops from the pathogen had been cultivated on Chapek's nutrient medium into which the extracts in the corresponding concentrations had been added. In the control variant, the pathogen has been cultivated into environment free of extracts. The cultures had been incubated in the dark, on 24-26°C. In order to calculate the average rate of the mycelium growth, the colonies diameters had been measured daily, until the surface of the Petri dishes is fully covered.

The cultural special features of the pathogen had been described on the 21st day after incubation on potato dextrose agar and addition of extracts from the three crops in concentration: 1.5 and 10 ml/l.

The results had been processed statistically (Zaprianov and Marinkov, 1978).

From the researches carried out, generalizations can be made as follows:

- There is well expressed negative correlation between the growth of *Rhizoctonia solani* Kuhn and the concentration of ethanol extracts from flowers of hyssopus (*Hyssopus officinalis* L.), tutsan (*Hypericum perforatum* L.) and lavender (*Lavandula vera* V.), added into nutrient medium.

Key words: sugar beet, extract, hyssopus, tutsan, lavender, pathogen, *Rhizoctonia solani* Kuhn

Introduction

The contemporary requirements towards ecology are stimulus to search for alternative technologies in the agricultural production aimed at preservation of environment as well as mankind.

Essential part in the contemporary systems for ecology conformable and harmless to man plant protec-

tion takes the use of products from the plants, including essential oils, allowing preservation of the crops and maintenance of the natural linkages in the agrobiocoenosis (Balashova et al., 2004).

The biological test on different vegetable extracts and their products shows that some of them have powerful bactericidal fungicidal and insecticidal effect whereas others show complex influence. Chermen-

skaya (2000) has notified of biological activity of extracts from 147 plant species, including ethereal oil crops and conifers, regarding the main pathogenic agents and pests on the agricultural crops.

The literary review, regarding the alternative ecology conformable means for restricting the soil-building pests and phytopathogens, has determined as important the use of vegetable extracts and products. According to (Eksten et al., 2001), extracts from *Eucomis autumnalis* and *Schrebia alata* actively suppress seven of the main causative agents of root rot on the agricultural crops. One of them is *Rhizoctonia solani* Kuhn, which causes rot of seeds, germs and root system. This pathogen can also be suppressed by root extracts from rheum and gold tipped (Lorenz et al., 1995), by seed extracts from cruciferous species (Chung et al., 2002) as well as by flower extract from marjoram (Petrova and Tanova, 2006).

Ujvary (2002) has summarized, after a retrospective survey on the problem of the alternative approaches in the plant protection, that the use of natural products is not only perspective but its introduction as a new approach in the production of agents for plant protection is extremely indispensable.

The necessity for investigation on the biological activity of the natural products, including vegetable extracts, instead of dangerous pathogens like *Rhizoctonia solani* is now urgent, as the chemical method is effective on a smaller scale and does not guarantee preservation of the environment.

The aim of the current research is testing the biological activity of extracts from the flowers of essential oil plants: hyssopus, tutsan and lavender, under conditions in vitro, on the pathogenic agent of root rot of the sugar beet, *Rhizoctonia solani* Kuhn.

Material and Methods

During 2006, in AI – Shumen, a series of in vitro researches had been carried out for establishing the influence of 70% ethanol flowers extracts from hyssopus (*Hyssopus officinalis* L.), tutsan (*Hypericum perforatum* L.) and lavender (*Lavandula vera* V.) on the growth of *Rhizoctonia solani* Kuhn, which

causes root rot on the sugar beet.

It had been tested the influence of seven concentrations of extract from hyssopus (0.5; 1; 2; 5; 10; 15 and 20 ml/l), five concentrations of extract from tutsan (1; 2; 5; 10 and 15 ml/l) and four concentrations of extract from lavender (1; 2; 10 and 15 ml/l).

Seven-day crops from the pathogen had been cultivated on Chapek's nutrient medium into which the extracts in the corresponding concentrations had been added. In the control variant, the pathogen had been cultivated into environment free of extracts. The cultures had been incubated in the dark, on 24-26°C. In order to calculate the average rate of the mycelium growth, the colonies diameters had been measured daily, until the surface of the Petri dishes is fully covered.

The cultural special features of the pathogen had been described on the 21st day after incubation on potato dextrose agar and addition of extracts from the three crops in concentration: 1.5 and 10 ml/l.

The results had been processed statistically by the method of Student (Oivin, 1960) and correlation analysis (Zaprianov and Marinkov, 1978).

Results and Discussion

The results of the influence of extracts from hyssopus on the growth of the *Rhizoctonia solani* Kuhn pathogen are given in Table 1.

The mycelium colonies, with extract added in the highest tested concentration of 20 ml/l, have the smallest diameter, whereas the biggest can be found in the variant with no extract added. In these variants can be observed, respectively, weakest and highest growth of the mycelium. The average growth rate in the variant with extract of 20 ml/l is 1.28 cm/24h and in the control sample is 2.82 cm/24h. It can be observed growth restriction of the mycelium for all of the tested concentrations of the extract added into the nutrient medium. With raising the concentration of the extracts, the growth hold-up of the mycelium colonies is from 13.3 up to 52.1 % and the growth rate decreases from 3.7 up to 54.6 %. It has been established well expressed correlation between the concentration of

Table 1
Influence of extracts from *Hyssopus officinalis* on the growth of *Rhizoctonia solani*

Variants	Diameter of the mycelium colonies		Speed of mycelium growth	
	cm	relative, %	cm per 24 h	relative, %
0.5 ml /l	5.5.	86.7	2.71.	96.3
1.0 ml /l	4.72.	79.6	2.49.	88.3
2.0 ml /l	4.62.	78.3	2.45.	86.9
5.0 ml /l	4.22.	71.0	2.24.	79.4
10.0 ml /l	3.42.	57.5	1.57.	55.6
15.0 ml /l	3.38.	56.9	1.48.	52.5
20.0 ml /l	2.85.	47.9	1.28.	45.4
Control	5.94	100	2.82.	100
GD 5%	0.09	1.6.	0.05	1.6.
GD 1%	0.13	2.2.	0.06	2.2.
GD 0.1%	0.18	3.1.	0.09	3.2.
P %	0.59		0.55	

Table 2
Influence of *Hypericum perforatum* extracts on the growth of *Rhizoctonia solani*

Variants	Diameter of the mycelium colonies		Speed of mycelium growth	
	cm	relative, %	cm per 24 h	relative, %
1.0 ml /l	4.47.	88.50	2.14.	93.40
2.0 ml /l	4.20.	83.20	1.86.	81.22
10.0 ml /l	3.67.	72.70	1.45.	63.3
15.0 ml /l	3.22.	63.56	1.10.	48.0
Control	5.05.	100	2.29.	100
GD 5%	0.08	2.4.	0.04	2.9.
GD 1%	0.10	3.6.	0.05	4.0.
GD 0.1%	0.14	4.8.	0.07	5.3.
P %	0.65		0.71	

Table 3
Influence of extracts from *Lavandula vera* V. on the growth of *Rhizoctonia solani* Kuhn

Variant	Diameter of the mycelium colony		Speed of mycelium growth	
	cm	relative, %	cm per 24 h	relative, %
1.0 ml /l	6.55	91.4	3.07	90.3
2.0 ml /l	6.5	85.5	2.85	83.8
10.0 ml /l	4.63	60.9	1.91	56.2
15.0 ml /l	4.25	55.9	1.72	50.6
Control	7.6	100	3.4	100
GD 5%	0.1	1.4	0.06	1.9
GD 1%	0.14	1.9	0.08	2.5
GD 0.1%	0.19	2.5	0.1	3.4
P %	0.67		0.66	

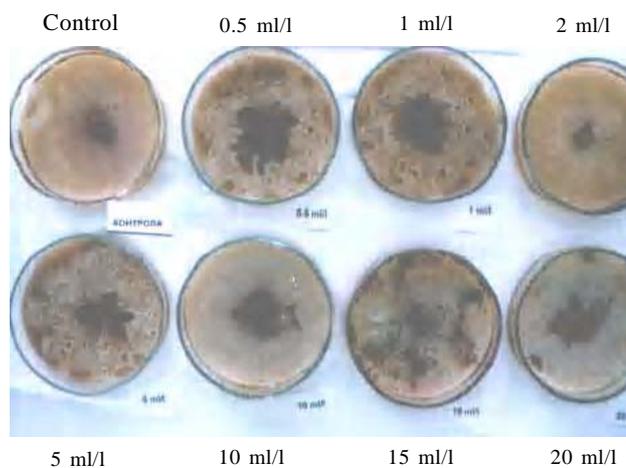


Fig. 1. Colonies of *Rh. solani* Kuhn with addition of *Hyssopus officinalis* L. extract to the cultural medium

the extracts into nutrient medium and the mycelium growth ($r = -0.91 \pm 0.06$) (Figures 1 and 2).

The results from the tests with extracts from tutsan (*Hypericum perforatum* L.) are given in Table 2, whereas Table 3 indicates the results from tests with extracts from lavender (*Lavandula vera* V.).

The analysis of the results indicates similar effect,

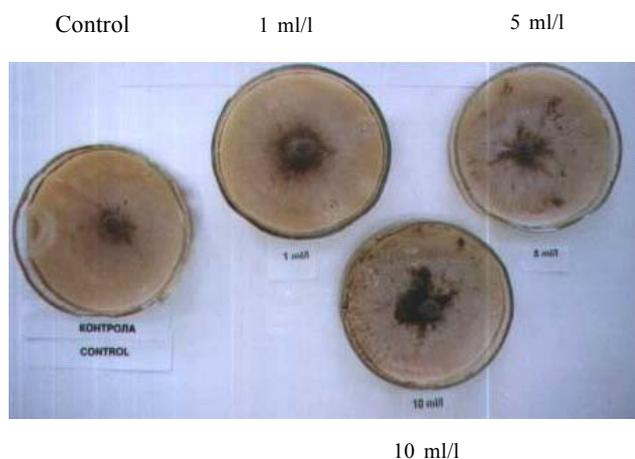


Fig. 2. Colonies of *Rh. solani* Kuhn with addition of *Hypericum perforatum* L. extract to the cultural medium

regarding the growth of the colonies and the average growth rate of the mycelium. It has been established growth suppression with increasing the concentration of the extracts. After addition of extracts from tutsan into nutrient medium, the growth suppression of the colonies is bounded within 11.5 and 36.44 % with increasing the concentration. The average growth rate of the mycelium, for one day, holds up from 6.6 up to 52.6 %. There is a well expressed negative correlation ($r = -0.92 \pm 0.05$) between the mycelium growth and the increase of the extracts concentration, into nutrient medium.

The research of extracts from lavender shows similar effect. The mycelium colonies growth can be powerfully suppressed with increasing the concentration ($r = -0.97 \pm 0.04$).

The different extracts change the cultural specific features of the pathogen. The hyssopus is to the greatest extent under their influence. Among all of the tested extracts concentrations, tightest firmness of the mycelium and the mycelium forms, the sclerotiums, can be observed on the hyssopus.

The obtained results show that the extracts from ethereal oil crops hyssopus, lavender and tutsan act fungistatically on the pathogen *Rhizoctonia solani*, causing root rot in beets. This gives reason to continue the researches in this direction, because the use

of natural products in plant protection ensures the harvest of clean production and nature preservation.

Conclusions

From the researches carried out, generalizations can be made as follows.

- There is well expressed negative correlation between the growth of *Rhizoctonia solani* Kuhn and the concentration of ethanol extracts from flowers of hyssopus (*Hyssopus officinalis* L.), tutsan (*Hypericum perforatum* L.) and lavender (*Lavandula vera* V.), added into nutrient medium.

References

- Balashova, N. N., A. A. Zhuchenko, V. F. Pivovarov, E. G. Kozar, A. V. Bepalko, O. N. Pishnaia, I. G. A. Kintia, N. E. Mashtenko, S. A. Shvec and V. A. Bobeyks, 2004. Regulation of stability of phytopathology-systems in secondary compounds of plants, *Agr. Biology*. Ser. "Biology of plants". (№ 1): 3-16 (Ukr).
- Chermenskaya, T. D., 2000. Secondary compound outlooks of their using while technical cultures are pests and pathogens. Author's summary of Cherm dissertation. Sankt Peterburg, 165 pp. (Ru).
- Chung W.E., Huang Y.W., Huang H.C. and Y.F. Yen, 2002. Effect of ground Brassica seed meal on control of *Rhizoctonia damping-off* of cabbage. *Can. J. Plant. Pathol.*, **24** (№2): 211-218.
- Eksten, D., Y. C. Pretorius, Nien Won and P. C. Zietsman, 2001. Mycelial growth inhibition of plant pathogenesis fungi by extracts of South African plant species. *Ann. Appl. Biol.* **139** (№2): 243-249.
- Lorenz, G., M. Scherer, F. Klingans, A. Schmidtt and J. Latten, 1995. Verhanzen zur Bekämpfung von Pilzen mit *Rheum zhabarbarum* und *Solidago canadensis*. *BASF AG* №441,3.
- Oivin, I., 1960. Statistical analysis of results experimental researches. *Pathological Physiology and Experimental Therapy*, (No4): 76-85 (Ru).
- Petrova P. and K. Tanova, 2006. Influence of extract *Origanum majoram* on agent of *Rhizoctonia* root rot of sugar beet (*Rhizoctonia solani* Kuhn). *Field Crops Studies*. **III-3**: 475-478 (Bg).
- Ujvary, I., 2002. Transforming natural products into natural pesticides. Experience and expectations. *Phytoparasitica*, **30** (5): 439-442.
- Zaprianov V. and A. Marinkov, 1978. Experimental Biometry. *Publ. house "H. G. Danov"*. Plovdiv, pp. 164-173 (Bg).

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