

Testing the Anti-Fungal Effect of Aqueous Extract of *Allium cepa* L. in Potato

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Abstract

According to FAO-STAT data updated until 2020, worldwide, Europe ranks first in terms of the proportion of potato production at global level (41.90%), followed by Asia (39.60%), America (12.70%), Africa (5.30%) and Oceania, which only has a contribution of 0.50% in the world potato production. The present study aims to emphasize the effect of aqueous extract of *Allium cepa* L. in fight against *Alternaria solani* Sorauer in potato. Over the entire experimental period, the best results were obtained with the non-conventional treatment performed with an aqueous solution of 3.3% *Allium cepa* L. (GA6 = 8.11%) and 4% *Allium cepa* L. (GA2 = 13.42%), and the weakest (even weaker than in the case of the untreated control) under the conditions of treatment with Alcupral 50 PU (GA4 = 16.07%).

Keywords: attack degree, phytosanitary treatment, best results.

1. Introduction

Allium cepa L. is a well-known vegetable with antibacterial, and antifungal actions [1, 2, 3], which has demonstrated effects on plants pathogens attacks [4].

According to FAO-STAT data [5] updated until 2020, worldwide, Europe ranks first in terms of the proportion of potato production at global level (41.90%), followed by Asia (39.60%), America (12.70%), Africa (5.30%) and Oceania, which has only a contribution of 0.50% in the world potato production (Fig. 1, Table 1).

The highest yields of potato production, between 1989 and 2020, were recorded in Oceania, followed by America, while the lowest values of potato production are characteristic of the African continent. The purpose of the present study is to test the antibacterial effect of extracts of *Allium cepa* L. on potato culture. *Allium cepa* L. extracts were used in four different

concentrations, namely: 1.1%, 2.2%, 3.3% and 4%, respectively. Antimycotic effect of *Allium cepa* L. extracts on potato culture are tested against *Alternaria solani* Sorauer.

2. Material and Method.

The experiment took place in 2021, and a bifactorial scheme was followed, with three repetitions (Fig. 1), following an experimental scheme implemented according to the randomized block method. The layout of the plots is done differently for the three repetitions, for the potato variety under study, respectively Redsec – Re, depending on the control and the experimental variants corresponding to the treatments tested against the fungi *Alternaria solani* Sorauer. The experiment was installed in a private vegetable farm intended for potato cultivation in Cluj County, in an experimental device organized within it.

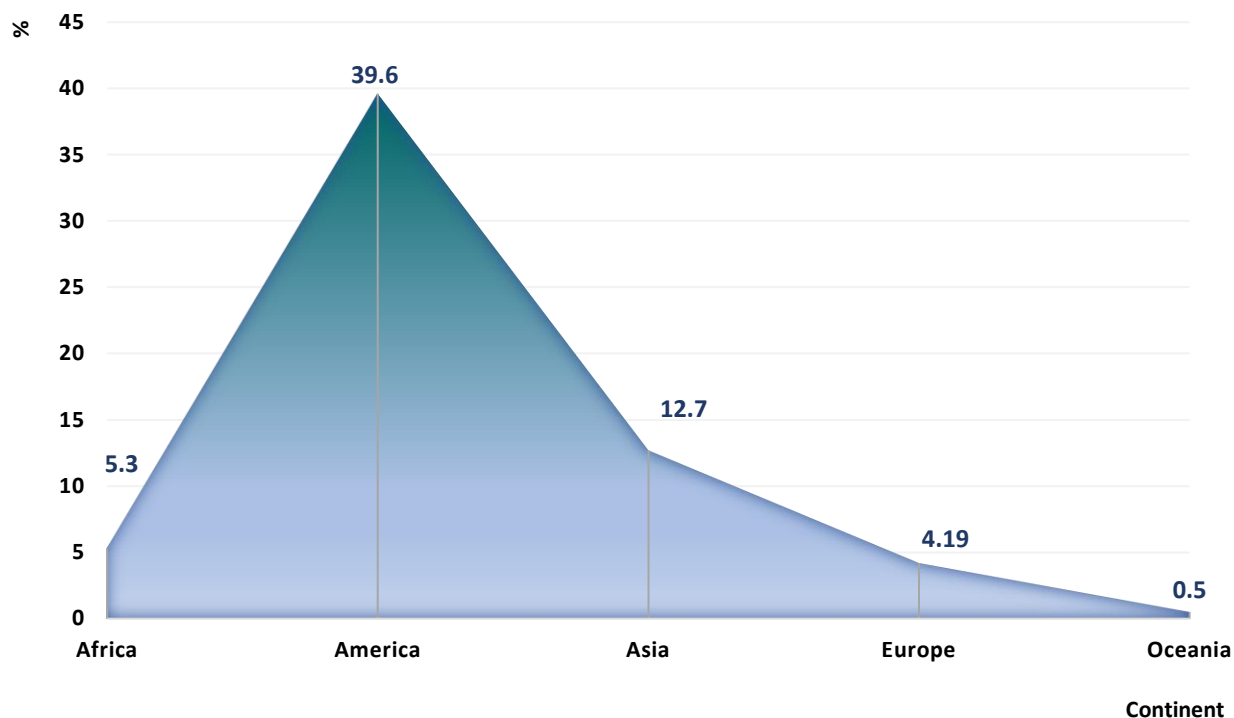


Figure 1. Proportion of worldwide potato production, by continent, 1993 – 2020 [5]

Re-R1	V7	V5	V1	V3	V2	V6	V4
Re-R2	V2	V1	V7	V4	V3	V5	V6
Re-R3	V4	V6	V2	V5	V1	V7	V3

Note 1: Re – Redsec. Noe 2: R – repetition; V1 – control; V2 – treatment with aqueous extract 1,1% *Allium cepa* L.; V3 – treatment with aqueous extract 2,2% *Allium cepa* L.; V4 – treatment with Alcupral 50 PU; V5 – conventional treatment with Infinito 687.5 SC; V6 – treatment with aqueous extract 3,3% *Allium cepa* L.; V7 – treatment with aqueous extract 4% *Allium cepa* L.

Figure 1. The experimental pattern

The monitoring of the alternariosis attack is carried out according to a diagonally crossed scheme, on an area of one hectare, on which the potato culture is installed and exploited.

The monitoring points are placed on an area of 1 m². The temperature and rainfall regime evolutions throughout the experimental period were obtained with the help of an automated, mobile weather station, placed in the experimental device.

The biological material is represented by the indigenous Redsec potato. This is a semi-late variety, created at the Târgu Secuiesc Potato

Culture Research Station. Foliar treatments were carried out with conventional products, namely Infinito 687.5 SC and Alcupral 50 PU.

The non-conventional foliar treatments consisted of 1.1%, 2.2%, 3.3% and 4% *Allium cepa* L aqueous solutions.

The results obtained were statistically analyzed through descriptive statistical analysis, respectively: the averages of the degree of attack, the averages of the productions recorded in the *Solanaceae* crops taken in study, standard errors of the mean, standard deviations and coefficients of variability.

3.Results and Discussions

In the Redsec potato variety, in the experimental conditions characterized by the pedo-climatic regime in the area of Cluj County, specific to the Transylvanian Plain, with aqueous solutions of *Allium cepa* L. and *Allium cepa* L. enriched in organic selenium, in different concentrations, during the experimental period between April and August 2021, led to the achievement, following the performance of the majority of treatments, of lower levels of attack than the control variant (Table 1, Fig. 2).

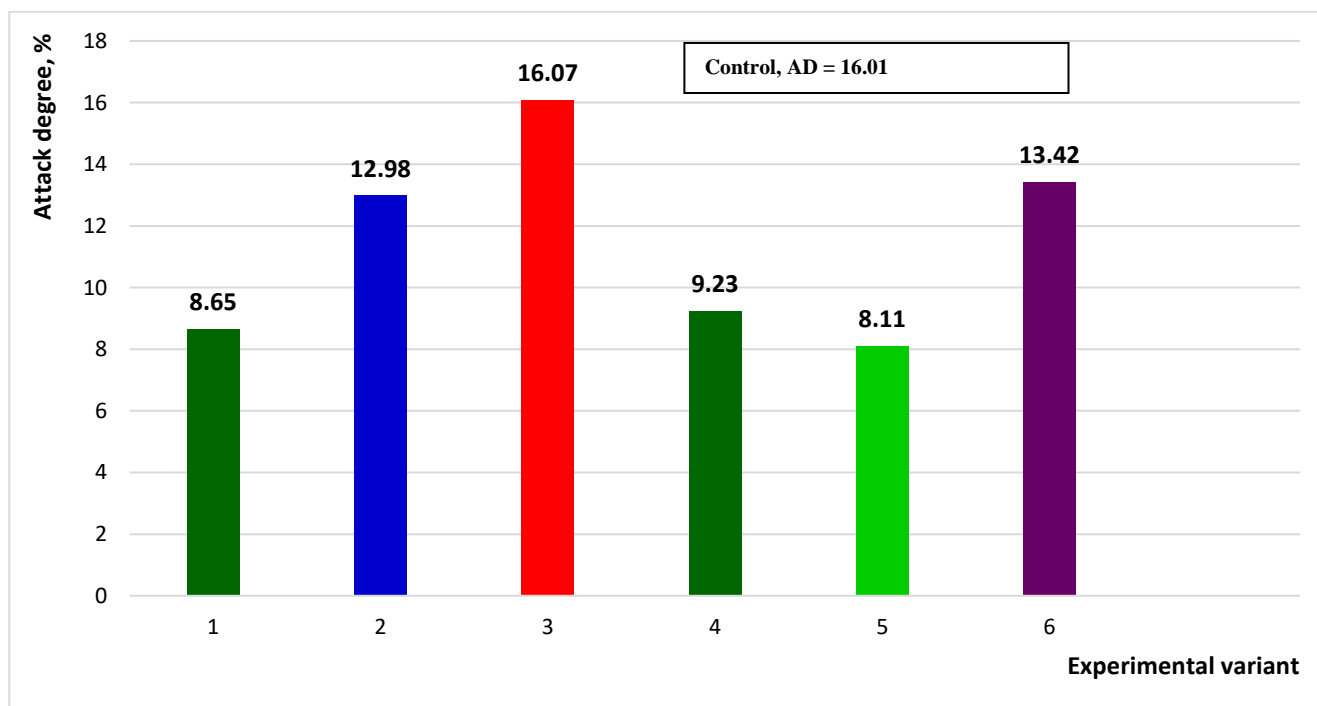
The analysis of the average degrees of attack obtained for each experimental variant (Table 1, Fig. 3), highlights the effectiveness of the treatments carried out with *Allium cepa* L. solutions in the minimum concentrations administered (11%), the best results being represented by the lowest attack degrees, AD = 8.65% (solution 1.1% *Allium cepa* L.) and AD = 8.11% (3.3% *Allium cepa* L. solution).

Both the increase in the concentration of the garlic solution and that of *Allium cepa* L. led to lower results (AD 2 = 12.98% and respectively AD 6 = 13.42%).

Table 1. Means and dispersion parameters of the degree of attack (GA) of *Alternaria solani* Sorauer in the Redsec potato variety according to the applied treatment, 2021

Experimental variant	n	X	±	s _x	s	Min.	Max.	CV (%)
1, Control	28	16.01	±	0.32	1.61	13.72	21.43	10.06
2	28	8.65	±	0.29	1.53	6.65	10.84	17.69
3	28	12.98	±	0.28	1.02	10.86	14.75	7.86
4	28	16.07	±	0.21	1.35	13.86	18.77	8.40
5	28	9.23	±	0.31	1.61	7.36	13.92	17.44
6	28	8.11	±	0.35	1.64	7.07	10.98	20.22
7	28	13.42	±	0.54	3.01	10.31	17.21	22.43

V1 – control; V2 – treatment with aqueous extract 1,1% *Allium cepa* L.; V3 – treatment with aqueous extract 2,2% *Allium cepa* L.; V4 – treatment with Alcupral 50 PU; V5 – conventional treatment with Infinito 687.5 SC; V6 – treatment with aqueous extract 3,3% *Allium cepa* L.; V7 – treatment with aqueous extract 4% *Allium cepa* L.



V1 – control; V2 – treatment with aqueous extract 1,1% *Allium cepa* L.; V3 – treatment with aqueous extract 2,2% *Allium cepa* L.; V4 – treatment with Alcupral 50 PU; V5 – conventional treatment with Infinito 687.5 SC; V6 – treatment with aqueous extract 3,3% *Allium cepa* L.; V7 – treatment with aqueous extract 4% *Allium cepa* L.

Figure 2. Evolution of the average degree of attack of *Alternaria solani* Sorauer on the Redsec potato variety depending on the treatment applied, 2021

4. Conclusions

For the Redsec potato variety, the calculation of the basic statistical parameters highlights over the entire experimental period, the treatment with 3.3% *Allium cepa* L. aqueous solutions leads to the lowest average attack degree of *Alternaria solani* Sorauer (AD 5 = 8.11%) and the treatment with Alcupral 50 PU with the lowest performances, leading to the recording of an average degree of attack (AD 4 = 16.07%) close in value to that of the untreated control (AD 4 = 16.01%).

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