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Original Article

The study of the Climatic Condition Influence on *Alternaria solani* Sorauer Attack on Potato

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Abstract

Alternari solani Sorauer produces harmful disorders in potato cultures. It is a mushroom with high sensitivity against climatic conditions, rainfall regimen, especially. The aim of this study is to emphasize the influence of the climatic factors upon develpment of earlyblight in potato, and also interactions between the evolution of the earlyblight and climatic conditions. The interaction between the climatic factors of importance in the manifestation and management of the earlyblight in potato attack produced by the attack of the *Alternaria solani* Sorauer mushroom on the potato variety Redsec (depending on the applied treatment), represented mainly by humidity and temperature, expressed as averages throughout the experimental period 2018 -2019, presents a series of particularities, which, however, are also conditioned by the applied phytosanitary treatments.

Keywords: *cluster analysis, earlyblight, regression line temperature.*

1. Introduction

The earlyblight in potato is a disease produced by the mushrom *Alternari solani* Sorauer. Occasionally, the disease can be just as dangerous as late blight [5, 6].

Circular spots, oval or corner, brown, with concentric areas of 1-2 cm appear on the basal leaves; in humid weather, the stains have a velvety appearance. From the basal leaves, the attack passes to the middle and upper floor [3].

The brown spots can come together and thus the burning or drying of the leaves takes place[1]. The attacked tubercles have dark brown, slightly shallow circular spots, and the pulp has a black, hard and dry rot [2, 4].

Climatic conditions play a crucial role in both disease attack and also in disease evolution, in potato. For this reason the strategies of disease fight and also the disease treatment must take into consideration the environmental factors involved in disease development, mainli rainfall regimen, and in a smaller extent, the temperature.

The aim of this study is to emphasize the influence of the climatic factors upon develpment of earlyblight in potato, and also interactions between the evolution of the earlyblight and climatic conditions.

2. Material and Method

The trial was developed during 2018 – 2019 in Valcele village, Cluj County, on Redsec potato variety. Redsec potato variety is a semi-late potato variety created at Targu Secuiesc Research Station for Potato Culture,and has a vegetation period of 110 – 120 days. The earlyblight attack degrees were recorded weekly. The following products were used

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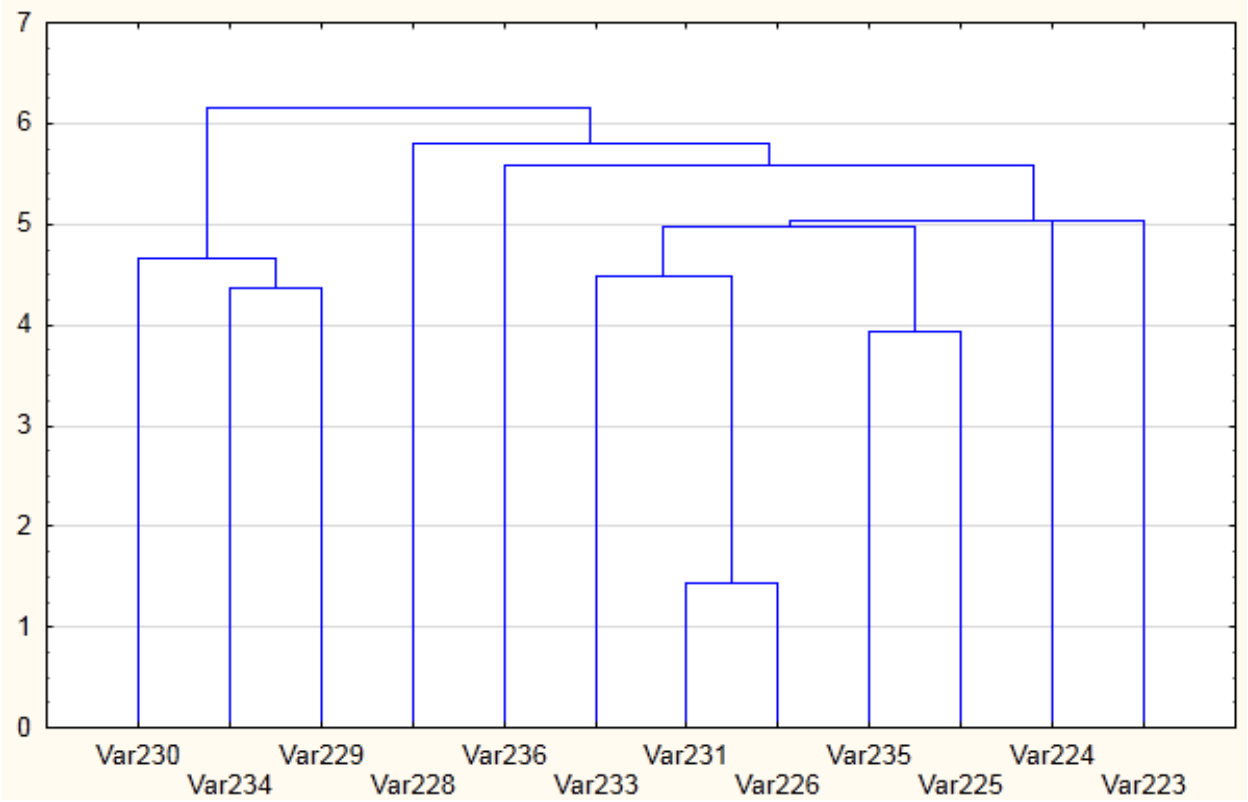
for tratments: Infinito 687.5 SC, and Alcupral 50 PU (conventional products), and Mimoten+Zytron (unconventional treatment). The results are expressed as means by the entire experimental period of 2018, and 2019. Data processing was performed using the program STATITICA v.8.0 for windows.

3. Results and Discussions

If we consider the manifestation of the attack of the Asari mushrooms Alternari, which produces alternariosis, at the redsec potato variety, within the trifactorial experience with four graduations carried out under the climatic conditions of the experimental field placed in Vâlcele, Cluj county, it can be noticed that, in lack of fertilization, the best results were obtained under the conditions of the foliar treatment with Alcupral 50 PU (GA = 13.89%) and the weaker ones (GA = 16.12%) in the case of the unconventional treatment with Mimoten + Zytron (Fig. 1). Cluster analysis highlights the existence of two main clusters (Fig. 1). One of them is subdivided into two subclusters and corresponds to the best experimental results (Fig. 1).

Thus, one of the subclusters corresponding to the lowest degrees of attack consists of a single branch, respectively the experimental variant in which the mineral fertilization with N15P15K15 was practiced and the conventional treatment with Infinito 687.5 SC (Var 230, GA = 13.44 %) and the other two branches corresponding to the experimental variants mineral fertilized with N15P15K15 and treated conventionally with Alcupral 50 PU (Var 229, GA = 12.15%) and respectively organic fertilized with compost and treated conventionally with the product Alcupral 50 PU (Var 234, GA = 11.82%).

The other cluster is divided into a series of subclusters (Fig. 1). The first consists of a single sub-branch, corresponding to the mineral variant fertilized with N15P15K15 and untreated (Var 228, GA = 15.44%), while the second corresponds to the other experimental variants, showing a high degree of subdivision (Fig. 1).



Var 223 – AD, %, variant not fertilized, not treated; Var 224 – AD, %, variant not fertilized, treated with Alcupral 50 PU; Var 225 – AD, %, variant not fertilized, treated with Infinito 687.5 SC; Var 226 – AD, %, variant not fertilized, treated with Mimoten + Zytron); Var 228 – AD, %, variant $N_{15}P_{15}K_{15}$ fertilized, not treated; Var 229 – AD, %, variant $N_{15}P_{15}K_{15}$ fertilized, treated with Alcupral 50 PU; Var 230 – AD, %, variant $N_{15}P_{15}K_{15}$ fertilized, treated with Infinito 687.5 SC; Var 231 – AD, %, variant $N_{15}P_{15}K_{15}$ fertilized, treated with Mimoten + Zytron; Var 233 – AD, %, variant fertilized with compost, not treated); Var 234 – AD, %, variant fertilized with compost, treated with Alcupral; Var 235 – AD, %, variant fertilized with compost, treated with with Infinito 687.5 SC; Var 236 –AD, %, variant fertilized with compost, treated with Mimoten + Zytron.

Figure 1. The cluster analysis applied for alternariosis attack degree, in Redsec potato variety, within different conditions of fertilization and treatment, within experimental field located in Vâlcele, County of Cuj, during experimental period 2018–2019

The interaction between temperature, humidity and degree of attack of the mushroom Alternaria solani Sorauer on the potato variety Redsec (result depending on the treatment applied), expressed as averages over the entire experimental period, is graphically represented (Figs. 2-5).

In this way, it is possible to predict the attack of the alternariosis, depending on the climatic factors, characteristics of the reference area, important in the manifestation of the disease, as it resulted from the analysis applied to the conditions of the studied area (Fig. 2).

Thus, taking into account the climatic conditions of the experimental field located in Vâlcele, Cluj county, under the experimental conditions characterized by the lack of application of the phytosanitary treatments, it is predicted that the degree of attack of the alternariosis exceeds the value of 19% at an average humidity higher than 85% and average temperature above 13ºC (Fig. 3).

Under the same experimental field located in Vâlcele, Cluj county, when applying the conventional treatment with Alcupral 50 PU, it is predicted that the degree of attack of the alternariosis exceeds the value of 17% at an average humidity greater than 85% and an average temperature higher than 13 ° C (Fig. 4).

For the conventional treatment with Infinito 687.5 SC, an attack degree of Alternaria solani Sorauer mushroom is predicted, higher than 17% at an average humidity greater than 75% and average temperature higher than 12ºC (Fig. 5).

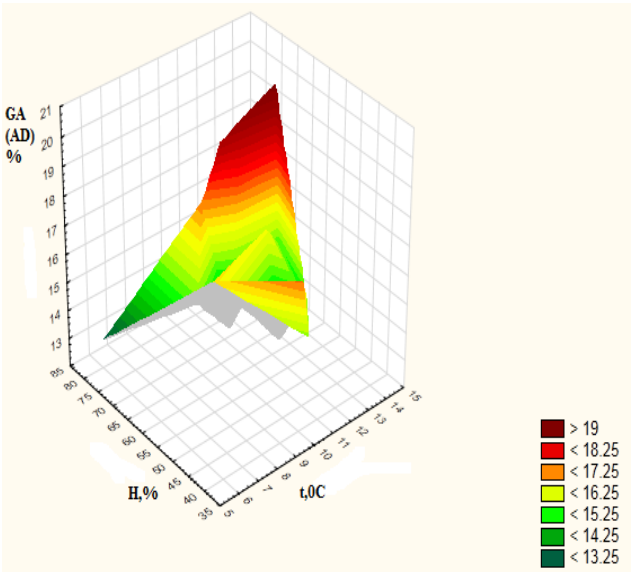


Figure 2. The evolution of earlyblight attack degrees in Redsec potato variety untreated, in different fertilization conditions, function of temperature and humidity, Vâlcele, 2018–2019

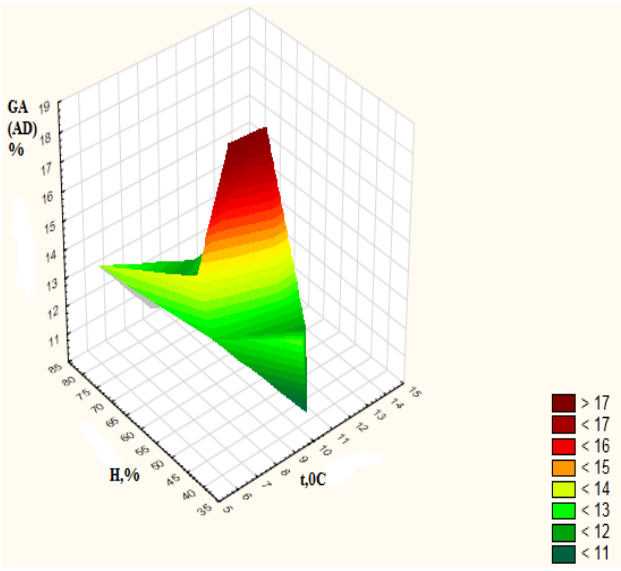


Figure 3. The evolution of earlyblight attack degrees in Redsec potato variety treated with Alcupral 50 PU, in different fertilization conditions, function of temperature and humidity, Vâlcele, 2018–2019

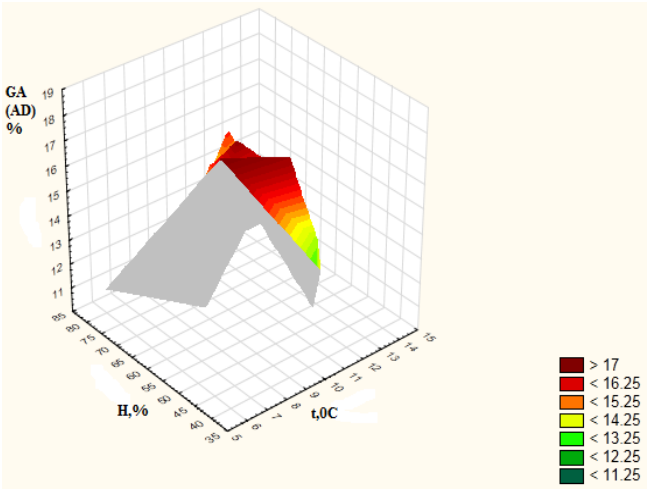


Figure 4. The evolution of earlyblight attack degrees in Redsec potato variety treated with Infinito 687,5 SC, in different fertilization conditions, function of temperature and humidity, Vâlcele, 2018–2019

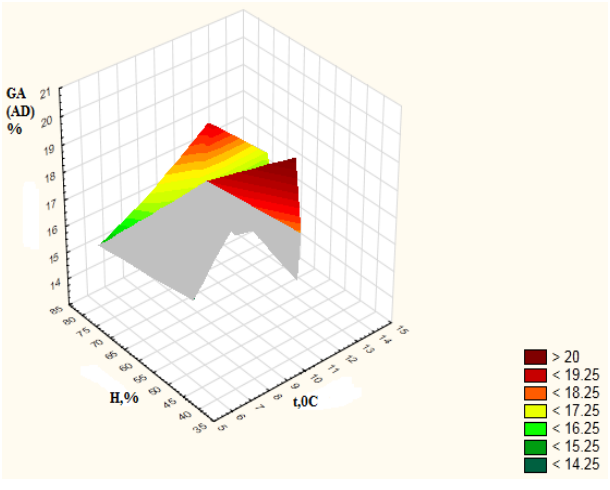


Figure 5. The evolution of early blight attack degrees in Redsec potato variety treated with Mimoten+Zytron, in different fertilization conditions, function of temperature and humidity, Vâlcele, 2018–2019

If, in the strategy of combating the alternative to the semi-late potato variety Redsec, under the climatic conditions of the commune of Valcele from Cluj county, it is opted for the application of an unconventional treatment with the mixture Mimoten + Zytron, the registration of an attack degree of more than 20% is forecast at an average humidity greater than 80% and an average temperature greater than 13ºC (Fig. 5).

4. Conclusions

The interaction between the climatic factors of importance in the manifestation and management of the earlyblight in potato attack produced by the attack of the *Alternaria solani* Sorauer mushroom on the potato variety Redsec (depending on the applied treatment), represented mainly by humidity and temperature, expressed as averages throughout the experimental period 2018 -2019, presents a series of particularities, which, however, are also conditioned by the applied phytosanitary treatments. Thus, the graphs with response surfaces suggest the following: the degree of attack of the alternariosis exceeds the value of 19% at an average humidity greater than 85% and an average temperature higher than 13ºC under the conditions of non-application of the phytosanitary treatments, when applying the conventional treatment with Alcupral 50 PU , it is predicted that the attack degree of the alternariosis exceeds the value of 17% at an average humidity higher than 85% and an average temperature higher than 13ºC, for the treatment with Infinito 687.5 SC, an attack degree of the fungus is predicted Alternaria solani, higher than 17% at an average humidity greater than 75% and average temperature higher than 12ºC, and when applying the unconventional treatment with the Mimoten + Zytron mixture, it is predicted that an attack degree of more than 20% will be recorded at one average humidity greater than 80% and average temperature greater than 13ºC.

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