# RISK EVALUATION OF THE FRUITS GRAY MOLD (*BOTRYTIS CINEREA*) BY FUNGUS PRESENCE ON WILDE STRAWBERRY (*FRAGARIA VESCA*)

**Cerasela CIUI (MOT) [1], A BORCEAN [1]**

*Banat`s University of Agricultural Sciences and Veterinary Medicine "King Michael I of Romania", Faculty of Agriculture, Timişoara, Romania*
*Calea Aradului 119, 300645 Timişoara, Romania,*
*E-mail: adrian_borcean@yahoo.com*

***Abstract.*** *Like other areas in high hill areas, where traditional agricultural crops do not work, there is a possibility of focusing on plants that are highly adapted to the area and can bring satisfactory economic results. On examples of such species are strawberry's which has varieties that can easily adapt to the conditions from areas like those found in the valleys of the main rivers in Caraş Severin County. One of the most important conditions for the success of such a culture is to have previously the knowledge of the potential technological problems which could impede the development of plants and the yield quantity and quality. One of these problems, which are very difficult to avoid, is the pathogens presence on strawberry plants from the spontaneous flora of these areas because in favorable conditions these pathogens could produce significant yield loses. Present paper contain data about evaluation of a well-known disease such as the gray rot of fruits produced by the Botrytis cinerea on strawberry plants from spontaneous flora. These pathogen produce random attacks on a few Rosaceae species such as Rubus sp., Fragaria vesca and Rosa canina. This fact leads to a high probability of pathogen disamination from the spontaneous flora natural reserve to any other strawberry culture, blackberry culture or even roses culture from the reference area. The area where observations were made is located in the middle basin of the Nera River, a well-known area for the high diversity of flora species, including species from Rosaceae genus. All data were collected during years 2016 and 2017 from strawberry populations (Rubus idaeus), large enough to be representative for this area and for statistical computation. Regarding to methodology, the main steps were: first step to identify pathogens, the second step was to record primary data of the pathogen attack frequency and intensity and the last step was the statistical evaluation of field data. The results confirmed a relatively constant presence of Botrytis cinerea fungus in strawberry in the middle basin of the Nera River.*

***Key words*** *: wild strawberry, Fragaria vesca, Botrytis cinerea*

## INTRODUCTION

*Fragaria vesca* known as wild strawberry is a very well know plant on the area where the survey for the present paper was performed (1, 2, 3, 5). This species is from the same genus as common strawberries and for this reason it has the same diseases and pests. There are a lot of ways to use strawberries, from fresh fruit consumption to sophisticated culinary delights and never the less so called green pharmaceutical products. Wild strawberries are also known for their sweet and very fragrant fruits and could be used as ornamental plants on some modern arrangement of landscape architecture (6). Mainly this are the reasons why we consider that knowing the infectious pressure of the pathogens from *F. vesca* is very important for evaluation the strategy of diseases protection on the areas where are cultivated both common and wild strawberries (4). One last reason for such evaluation of a disease like *Botrytis cinerea* is the idea of organic crops of strawberries very intense circulated. For organic agriculture it is very important to have information's about the infectious pressure of regional pathogens, especially about those which bring serious damages to plants and by this way they reduce the

yield. In the present case, taking in consideration the close the relationship of kinship between the two strawberry species, it is highly probable that if a disease as is present on wild strawberries from spontaneous flora same will happened with strawberries from crops and peoples gardens.

## MATERIAL AND METHOD

To have a precise idea about the infectious pressure we conduct a survey on some *Fragaria vesca* populations from two national parks where the environment is proper for wild strawberry plants, under reserve that depending on annual variation of temperatures and rain conditions some years are better than others. These populations have to be in accord with two requirements: first requirement was to have such a distribution over the surveillance area that all this area is covered by the surveillance and the second requirement is that each population have a proper number of plants to be representative and to eliminate any possible error from statistic calculation. Taking in consideration those requirements we identified three populations which meet our requirementents and also they are well distributed over the research area. First population situated near Marghitas Lake situated on National Park Semenic - Caras River and populations of Potoc and Carbunari both situated on National Park Nera Canyon –Beusnita.

Each number on the repeats table represent an average of 10 readings in order to have eliminate any possibility of errors and to have representative readings for each area and for all the research period of time (5). The same technique to represent the field readings was used also for attack frequency and attack intensity. Because we didn't have an experimental reliable control to refer when we compare the statistic calculations, we decide to use the average of the field reading to be the control for statistic analyze and so it will be obvious the behavior of plants from different populations

## RESULTS AND DISCUSSIONS

In table 1 are the figures which represent the plant density inside each population where were carried out the diseases surveillance. If we take in consideration to compare the three populations, it is obvious that the differences of plant density were almost inexistent, the averages present differences under 1 plant / $m^2$. That is the reason why from statistic calculations the differences between populations were under the significance limit.

When it was to compare the evolution of all three populations on the two years on which the surveillance was carried out (table 2), the differences between the averages of years 2015 and 2016 was under 1 lplant / $m^2$. This is the reason why statistics indicate that the differences to control was under the significance limit.

*Table 1*

Plant density of Fragaria vesca major population's evolution on the area of interest between 2015 and 2016.

| Factor A Population | Factor B Year | Repetition 1 | Repetition 2 | Repetition 3 | Averages of factor A | Difference | Significance |
|---|---|---|---|---|---|---|---|
| Marghitas | 2015 | 3 | 5 | 5 | 3.5 | 0.3 | - |
| | 2016 | 4 | 2 | 2 | | | |
| Potoc | 2015 | 2 | 5 | 3 | 3.0 | -0.2 | - |
| | 2016 | 3 | 2 | 3 | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Carbunari | 2015 | 3 | 5 | 3 | 3.0 | -0.2 | - |
| | 2016 | 1 | 3 | 3 | | | |
| Population Averages | 2015 | 2.7 | 5.0 | 3.7 | 3.2 | Control | - |
| | 2016 | 2.7 | 2.3 | 2.7 | | | |

DL 5% = 1.19 DL 1% = 1.97 DL 0,1% = 3.7

*Table 2*

*Plant density of Fragaria vesca evolution between 2015 and 2016.*

| Factor B - Year | 2015 | 2016 | Average of the years |
|---|---|---|---|
| Averages of factor B | 3.8 | 2.6 | 3.2 |
| Difference | 0.6 | -0.6 | Control |
| Significance | | | |

DL 5% = 1.0 DL 1% = 1.54 DL 0,1% = 2.48

The attack frequency of fungus *Botrytis cinerea* (table 3) on the experimental time frame varied between 10-35 %. The highest averages values was registered on Carbunari population on both experimental years (table 3) with an value of 22.5 % and the lowest values of attack frequency were registered on the Marghitas population with an average value of 18.3 %.

*Table 3*

The attack frequency (%) of fungus *Botrytis cinerea* registered on *Fragaria vesca* major populations from area of interest between 2015 and 2016

| Factor A Population | Factor B Year | Repetition 1 | Repetition 2 | Repetition 3 | Averages of factor A | Difference | Significance |
|---|---|---|---|---|---|---|---|
| Marghitas | 2015 | 15 | 20 | 25 | 18.3 | -2.5 | - |
| | 2016 | 10 | 15 | 25 | | | |
| Potoc | 2015 | 20 | 20 | 25 | 21.7 | 0.8 | - |
| | 2016 | 10 | 25 | 30 | | | |
| Carbunari | 2015 | 15 | 20 | 35 | 22.5 | 1.7 | - |
| | 2016 | 30 | 10 | 25 | | | |
| Population Averages | 2015 | 16.7 | 20.0 | 28.3 | 20.8 | Control | - |
| | 2016 | 16.7 | 16.7 | 26.7 | | | |

DL 5% = 7.23 DL 1% = 12.52 DL 0,1% = 18.45

*Table 4.*

The evolution of fungus *Botrytis cinerea* attack frequency (%) on 2015 and 2016.

| Factor B - Year | 2015 | 2016 | Average of the years |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Averages of factor B | 21.7 | 20.0 | 20.8 |
| Difference | 0.8 | -0.8 | Control |
| Significance | - | - | - |

DL 5% = 3.17 DL 1% = 7.34 DL 0,1% = 11.46

When it came to discuss about the differences between populations it came out some slight differences and if this differences are statistically analyzed the difference to control was under the limit of significance for all three populations. If it is to consider the arrack frequency values, fungus *Botrytis cinerea* has the higher average on Carbunari population. The lowets value of wild strawberry fruits grey mold average of attack frequency was registered at Marghitas population.

The differences between the averages of attack frequency overall the populations on the two experimental years (table 4) have averages was also lower the statistical significance threshold.

Regarding to the aggressiveness of fungus *Botrytis cinerea* there are very small differences between the wild strawberry populations (table 5), but this differences are much lower than the significance threshold. If it is to compare the figures than it is obvious that the highest average of pathogen attack intensity was registered on Carbunari population while the lowest value was on Potoc population.

The differences of fungus *Botrytis cinerea* attack intensity between the two years of observations were very low reported to control, the averages of both years were situated under significance threshold.

*Table 5*.

The attack intensity (%) of fungus *Botrytis cinerea* registered on *Fragaria vesca* major populations from area of interest between 2015 and 2016.

| Factor A Population | Factor B Year | Repetition 1 | Repetition 2 | Repetition 3 | Averages of factor A | Difference | Significance |
|---|---|---|---|---|---|---|---|
| Marghitas | 2015 | 5 | 1 | 5 | 5.2 | -2.4 | o |
| | 2016 | 10 | 5 | 5 | | | |
| Potoc | 2015 | 5 | 15 | 10 | 8.3 | 0.8 | - |
| | 2016 | 5 | 5 | 10 | | | |
| Carbunari | 2015 | 10 | 5 | 5 | 9.2 | 1.6 | - |
| | 2016 | 15 | 15 | 5 | | | |
| Population Averages | 2015 | 6.7 | 7.0 | 6.7 | 7.6 | Control | - |
| | 2016 | 10.0 | 8.3 | 6.7 | | | |

DL 5% = 2.2 DL 1% = 3.6 DL 0,1% = 5.3

*Table 6.*

*The evolution of fungus Botrytis cinerea attack intensity (%) on 2015 and 2016*

| Factor B - Year | 2015 | 2016 | Average of the years |
|---|---|---|---|
| Averages of factor B | 6.8 | 8.3 | 7.6 |
| Difference | -0.8 | 0.8 | Control |
| Significance | - | - | - |

DL 5% = 3.82 DL 1% = 6.31 DL 0,1% = 9.11

## CONCLUSIONS

1. Wild strawberries (*Fragaria vesca*) is a very well adapted species on the research area because the plant density on all three populations was almost the same from the very beginning, averages were between 3 and 4 plants / $m^2$. This differences remain at the same level on both years and this is proved also by the statistics where the differences between plant density was situated under the significance threshold of experimental period.
2. The virulence of fungus *Botrytis cinerea* prove to be higher on the population of Marghitas and we believe that it is due to prolonged time period of dew was maintained on the leaves because the area is situated near the lake Marghitas and at an altitude of approximately 500 m and exposed directly to sun only approximately 10 hours/ day long while Potoc population is situated near Nera river but only at 150 m altitude and exposed directly to sun all day long. Carbunari population is situated at approximately 800m from Nera river and at 700 m altitude, exposed directly to sun all day long.
3. There were no differences between the two experimental years regarding attack frequency even if in 2016 the rain water quantity was slight higher.
4. Regarding the fungus *Botrytis cinerea* aggressiveness, the differences to control of the attack intensity registered on the wild strawberries populations and the experimental years averages was under the significance threshold and this show a very good tolerance of Fragaria vesca plants to the pathogen.

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