VERBASCUM PHLOMOIDES LEAF SPOTS PRODUCED BY *PHYLLOSTICTA VERBASICOLA* A COMMON DISEASE ON THE SOUTH-WEST PART OF ROMANIA

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Abstract. *In Romania, Verbascum phlomoides known as wooly mullein or orange mullein is considered to be a plant used in traditional medicine as tea or decoct from flowers and leaves. As tea it is used to ameliorate on short time some pulmonary affections as cough acute and chronic bronchitis, cold, flu, bronchial catarrh, pneumonia, pleurisy, pulmonary congestion, angina, laryngitis, tracheitis, hoarseness and even tuberculosis. As decoct it is mentioned to help as emollient to ameliorate and specially in the history it was mentioned by antiques Greek physicians to cure some affections as there are expectoration, asthma, neurological disorders and some injuries. During the researches carried out on medicinal plants pathogens from the wild flora of the south-western part of Romania it was found on Verbascum phlomoides plants on different populations some leaf spots that was suspected to be produced by a leaf pathogen . Later on laboratory work it was determined that the leaf pathogen that cause the spots on the leafs was Phyllosticta verbasicola. In the present paper there are facts about the disease incidence on the previous mentiond area. First we determine in three parts of the area of interest some significant populations of Verbascum phlomoides concentrated on small areas. All this areas has as common point that they are situated near the Nera stream but on higher ground and on meadow sandy soil. There are a lot of Verbascum phlomoides plants on the Nera Canyon but there are small groups of 1-6 plants there was hard to find places where the river medow was large enough to find more than five of this mullein groups. During the last years we learned that this pathogen was always present on mullein plants with different but since now it doesn't produce lethal attacks. In the present paper there are data about fungus Phyllosticta verbasicola attack parameters on the reference area.*

Key words: *Phyllosticta verbasicola, Verbascum phlomoides*

INTRODUCTION

Wooly mullein (*Verbascum phlomoides*) is a very well-known plant in the area where we carry out our research. It is considered to be very well adapted to local conditions and we found plants of *Verbascum phlomoides* as mostly as individual and rarely as small groups under 12 plants on approximately 10 m^2. The importance of this plant as medicinal plant came out from the content in different substances which make it useful in very different human affections: decocts from seeds is repelling tape worms (but it should be used carefully because the high content in saponins) (GRIEVE M., 1984), infusions of green or dried leaves in oil can be a remedy to earaches, sores, wounds, and tea from leaves and flowers could help in healing different respiratory troubles as coughs, bronchitis, asthma and throat irritations(BOWN. D.,1995)

Because it's large spectrum of use as medicinal plant it could be considered a very important plant and this is the reason why for the last three years we try to assess the infectious potential of the diseases affecting this species. If we discus about medicinal plant crops than it is necessary to say that for this kind of crops in plant protection it has to be considered a strategy with the lowest amount of pesticides against diseases, pests and weeds. This is done just for the reason to minimize the risk to bring some active substances molecules from the pesticides on the plants harvested for different medicinal preparations. For minimize the pesticide use it has to be known the natural enemies from wild flora and to quantify their pressure on the cultivated plants (BORCEAN A. ET AL., 2016).

Wooly mullein pathogens populations were under observations for a three years period of time, together with other medicinal plants from the same region of the . All this time interval we collect data National Park Cheile Nerei – Beusnita. This particular region was choose because it is well known as an area with a very high plant species diversity.

The data regarding wooly mullein (*Verbascum phlomoides*) pathogens were collected during a period of three years, from 2014 till 2016 as a part of a larger study concerning pathogens of medicinal plants from wild flora of the region of National Park Cheile Nerei – Beusnita which is well known as a region with a wide diversity of vegetal species (DĂNEȚ CARMEN ELENA, 2008). During the monitoring period we found two leaf pathogens at wooly mullein plants: powdery mildew produced by *Erysiphe cichoraceaum* and a leaf spot produced by *Phyllosticta verbasicola* as it clear that it was happened on the past on other places over the world with *Verbascum sp.* plants. In this paper we present data we collect regarding to leaf spot disease produced by *Phyllosticta verbasicola*.

MATERIAL AND METHOD

Quantification of the pathogens attack was done by indicators as attack frequency and attack intensity. The values for these parameters were collected on the reference areas which we prefer to define previously because we chose some regions with representative populations for the wooly mullein plants which are the subject of the observations. These populations were named after the closest locality. The data necessary for statistic calculation come from the defined populations. These populations were also previously divided in three parts, each part representing a statistical experimental repeat. Values of the attack frequency and attack intensity from each repeat are in fact an average of ten determinations. All statistics calculations were made after the specifically method for two factors experiences, each factor have for statistic relevance three repeats. The control for statistic analyze was the experimental averages because we didn't have one more reliable point of reference.

The choice to work with 10 determinations for each variant because it is generally considered sufficient in specialized literature to avoid calculation errors (ELZINGA C. L, ET AL, 1998). Locations from where the samples were taken are small in size, lesser than 2 hectares. This is the reason why we consider that 10 evaluation marks made on each point are sufficient to obtain relevant data and to avoid errors. Control for statistical data comparing, was the average of each factor.

RESULTS AND DISCUSSIONS

Leaf spot disease caused by fungus *Phyllosticta verbasicola* on wooly mulain plants was present in all the investigated areas during the last three years, with different values of frequency and intensity, as it is presented on the tables from the present paper.

In table 1 are notes for *Phyllosticta verbasicola* frequency of attack. As it comes out from a first analyze the variation of values of fungus attack frequency is just a matter of local conditions and eventually a matter of local populations plant tolerance to fungus infectious pressure. The general idea of these values is that over the analyzed time period frequency values of *Phyllosticta verbasicola* ranged between 10% and 60%. This point out clearly that the pathogen is well adapted both to the climate conditions and host species.

Statistical analysis indicates that there are not so obvious differences between the three populations. The only one population, in which the average frequency of attack was greater overall three experimental years, hovering at a significant difference from the control was population Potoc (table 1). Attack frequency averages of Bogodinti and Sasca has differences situated under the control average but their values was under the significance limit.

Comparing the three years in which we have made observations (table 2), the most favorable to pathogen from attack frequency point of view was 2016 when the average of attack frequency has situated over the control average with a distinctly significant value. Average value of attack frequency in 2015 was situated at a significant difference to control. The most unfavorable year from attack frequency analyze prove to be 2014 because the average on this year is placed statistically at a very significant negative difference from control (average of three experimental years). This situation point out once again that the climatic differences between years have a very important influence over the relations between pathogen and host plants.

Table 1

Values of *Phyllosticta verbasicola* attack frequency at various local populations

Factor A - population	Factor B - year	First repeat	Second repeat	Third repeat	Averages of factor A	Differences	Significance
Population of Potoc	2014	15	10	30	35.00	3.70	*
	2015	30	60	60			
	2016	30	40	40			
Population of Bogodinţi	2014	30	20	10	30.00	-1.30	-
	2015	40	10	30			
	2016	40	30	60			
Population of Sasca	2014	10	10	30	28.89	-2.41	-
	2015	30	60	20			
	2016	20	50	40			
Averages	2014	18.33	13.33	23.33	31.30	control	-
	2015	33.33	43.33	36.67			
	2016	30.00	40.00	46.67			

DL 5% = 3.3 DL 1% = 6.8 DL 0,1% = 10.6

Table 2

Phyllosticta verbasicola attack frequency over the research period

Factor B -year	2014	2015	2016	Average
Averages	18.33	37.78	38.89	31.30
Difference	-12.96	6.48	7.22	control
Significance	000	*	**	-

DL 5% = 3.8 DL 1% = 6.3 DL 0,1% = 8.4

Fungus *Phyllosticta verbasicola* intensity of attack occurrence over the surveilled populations point out a very low variation. The lowest average of attack intensity over the last three years period of time (table 3) was recorded at Population of Bogodinti with 22.78 % since the highest value of attack intensity was recorded at Population of Potoc with 28.89 %. So the difference between the extreme values of attack intensity averages over the three years observation period was at 6.11 %, value which could be considered as very low.

At this differences the result of statistic analyze point out that the only difference between populations between 2014 and 2016 was recorded at Population of Bogodinti with a

significant negative difference to control. This situation is due to fact that the control is the average of fungus attack intensity registered over the three years observation period.

Regarding to the differences between years of the time period since we carried out this observations, it is obvious that the differences are not high. The real difference between 2016 as the year with the highest attack intensity and 2014 as the year with the lowest attack intensity is at 5.56 %, as it became from calculations(table 4). Statistical calculation indicates that there is a distinctly significant difference between average of attack intensity of the populations in the year 2016 and control. Also the lowest average value of the attack intensity over all three populations was registered on the year 2014 with a value of 23.33 % which situate this value with 2.96 % under the control value and give a significant negative statistic difference.

Table 3

Values of *Phyllosticta verbasicola* attack intensity at various local populations

Factor A - population	Factor B - year	First repeat	Second repeat	Third repeat	Averages of factor A	Differences	Significance
Population of Potoc	2014	15	20	40	28.89	2.59	-
	2015	30	25	40			
	2016	20	30	40			
Population of Bogodinți	2014	15	20	15	22.78	-3.52	0
	2015	20	20	20			
	2016	30	25	40			
Population of Sasca	2014	30	30	25	27.22	0.93	-
	2015	35	30	20			
	2016	25	30	20			
Averages	2014	20.00	23.33	26.67	26.30	control	-
	2015	28.33	25.00	26.67			
	2016	25.00	28.33	33.33			

DL 5% = 3.3 DL 1% = 5.8 DL 0,1% = 9.3

Table 4

Phyllosticta verbasicola attack intensity over the research period

Factor B -year	2014	2015	2016	Average
Averages	23.33	26.67	28.89	26.30
Difference	-2.96	0.37	2.59	control
Significance	0	-	*	-

DL 5% = 2.4 DL 1% = 5.1 DL 0,1% = 9.6

CONCLUSIONS

1. Leaf spots of wooly mullein is an important pathogen for the southwest part of Romania prove by the fact that the fungus *Phyllosticta verbasicola* which produce this disease was present on the surveillance are all over the three years.
2. *Phyllosticta verbasicola* can lead to severe loss of leaf surface and by this economic loss due to quantity and quality of leafs which could be harvested from wooly mullein (*Verbascum phlomoides*) plants affected by pathogen attack.
3. The fact that the fungus *Phyllosticta verbasicola* was present all over *Verbascum*

phlomoides plants over the entire three years of our research time period sugest that this pathogen could have an endemic behavior.

4. Three years averages values of fungus *Phyllosticta verbasicola* attack intensity over the populations of *Verbascum phlomoides* suggest that almost 25 % of leaf crop could be loss only due to this pathogen attack and this could be considered an economic indicator of this disease importance.
5. The behavior of fungus *Phyllosticta verbasicola* attack frequency, with variations from 18.33 % and 38.89 % as populations averages between experimental years suggest that the fungus is highly influenced by the climatic conditions.

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