

## RESEARCH ON THE ATTACK OF FOLIAR DISEASES IN ALFALFA, MURIGHIOL LOCATION, TULCEA COUNTY

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### Abstract

The aim of the research was to monitor the attack of some pathogens specific to alfalfa crops, in the period 2020-2022, in the Murighiol area, Tulcea county. An attack was detected by *Pseudopeziza medicaginis* ([Lib.] Sacc), responsible for the production of common leaf spot of lucerne or leaf spot of lucerne and *Peronospora trifoliorum* (de Bary) f. sp. *medicaginis-sativae* (Thuem.), a pseudofungus that produces downy mildew of alfalfa. The leaf spotting attack was higher during the observation period, reaching 10.3% in the control variant in 2021. The downy mildew attack was lower in 2022. The application of the treatments reduced the impact of the monitored pathogens, ensuring more than 60% effectiveness in the case of the attack of downy mildew and over 70% in the case of the attack of common leaf spot.

**Key words:** alfalfa, pathogens, diseases, degree of attack.

### INTRODUCTION

Considered the oldest fodder plant, alfalfa is an important plant for the agriculture of some countries, being widely spread in all countries where this plant is cultivated (Rădulescu et al., 1971). In some countries it is the most important forage legume (Barbetii et al., 2006; Al- Askar et al., 2012). Lucerne, bright high quality fodder, known as the royal fodder (Sun et al., 2012) is also considered an important nitrogen-fixing plant in the soil (Yang et al., 2008). The areas cultivated with alfalfa are also important in our country, alfalfa occupying 45.01% of the area cultivated with fodder plants (Schitea et al., 2020). Alfalfa diseases cause large losses of leaf mass and reduce the nutritional value of forage (Nutter & Guan, 2002) and seed production (Hwang et al., 2006). The diversity of alfalfa pathogens and the co-infection with several pathogens have resulted in a high cost of disease management and control difficulties (Fang et al., 2021; Tollenaere et al., 2016). Also, alfalfa seed can be affected by an important number of pathogens with implications in the quality of the harvest (Cîrstea et al., 2022). *Pseudopeziza medicaginis* ([Lib.] Sacc. [*Pseudopeziza*

*medicaginis* f. sp. *medicaginis-sativae* (Schmiedeknecht)] (gd.eppo.int/taxon/PSPZTS) attacks alfalfa plants with different frequencies, but especially on leaves that are strongly illuminated by the sun (Rădulescu et al., 1971). The characteristic attack is on the leaves, on which small spots appear, at first yellow then brown with apothecia-type fruiting in the center of the spot (Meyer & Lutrell, 1986). As the disease progresses, the leaves turn yellow and fall (Cristea, 2005). The attack causes the reduction of dry matter production, and the infection of 15% of the leaf surface reduced the digestibility by 14% and the crude protein content by 16%. Infection caused estrogenic activity in green alfalfa (Morgan & Parbery, 1980). The infection with micromyceta delays and possibly reduces flowering of affected plants (Morgan & Parbery, 1970). *Peronospora trifoliorum* (de Bary) f. sp. *medicaginis-sativae* (Thuem.) (*Peronosporae stivalis* Sydow) causes downy mildew producing serious losses of green mass and seeds (Nan, 2001). Alfalfa downy mildew affects all aerial organs of the plant, the specific attack being observed on the leaves. On the upper side of the leaves appear yellow spots that evolve

into brown and on their lower side, next to the spots, the asexual fruits of the pseudofungus (sporangia and sporangiophore) develop, the internodes are shorter (Yu et al., 2022). In favorable conditions of temperature and humidity, severe infections occur, affecting the quantity and quality of alfalfa production (Xue, 2008).

## MATERIALS AND METHODS

The aim of the research was to identify and establish the attack of foliar diseases in alfalfa with incidence in the Murighiol area, Tulcea county, in the period 2020-2022. During the experimental period, a leaf spotting attack was detected, caused by the micromycete *Pseudopeziza medicaginis* and pseudofungus *Peronospora trifoliorum* f. sp. *medicaginis-sativae* that produces downy mildew of lucerne. The frequency and intensity of the attack was monitored and, based on the data obtained, the degree of the attack was calculated. The formulas were used: Frequency (F%) =  $n \times 100/N$ , where: N - number of plants observed (%), n - number of plants characteristic symptoms (%). The intensity was noted in percentages and calculated according to the formula: Intensity (I %) =  $\Sigma (i \times f)/n$  (%), where: i - percentage given; f - number of plants/organs with the respective percentage; n - total number of attacked plants/organs.  $GA = F \times I/100$  (%), where: GA - attack degree (%); F - frequency

(%); I - intensity (%). The biological material was represented by the Romanian variety Dobrogea. When the culture was established, the seed was treated with the biopreparation Nitragin with Rhizobium in a dose of 0.04 l/kg. The vegetation was treated with Faster 0.1 l/ha, the fungicide Probalance 1 l/ha and a biostimulator, Bioactivate in a dose of 0.6 l/ha. The control variant was not treated.

## RESULTS AND DISCUSSIONS

In period 2020-2022 (Figures 1 and 2) in the alfalfa crop experimentation area, the common leaf spot or leaf spot attack produced by the pathogen *Pseudopeziza medicaginis* was observed and monitored and downy mildew caused by the pseudofungus *Peronospora trifoliorum* f. sp. *medicaginis-sativae* (*P. aestivalis* Syd). Observations were made on the clinical picture of the diseases induced by the detected pathogens and the attack on the leaves was noted. In the case of the common leaf spot attack, small brown spots were observed on the leaves with a darker central point, representing the fruiting of the fungus - apothecia (Figure 3 a). The leaves dried up and the plants showed defoliation. The attack of downy mildew was manifested by discoloration spots on the upper side of the leaves (Figures 3 b and 4 a), and the sporangiophores and sporangia specific to the genus *Peronospora* were observed on the lower side (Figure 4 b).

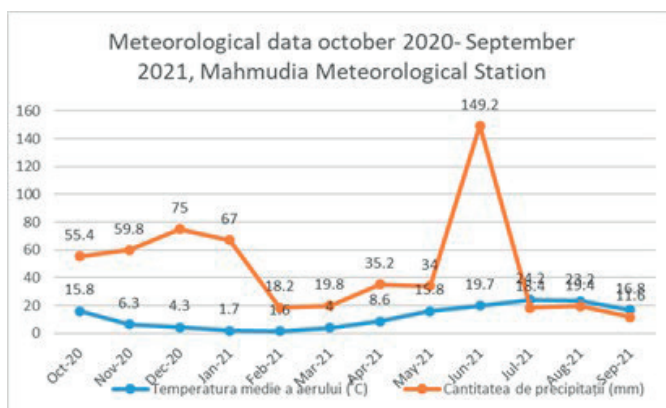


Figure 1. Meteorological data October 2020 - September 2021, Mahmudia Meteorological Station, Tulcea County

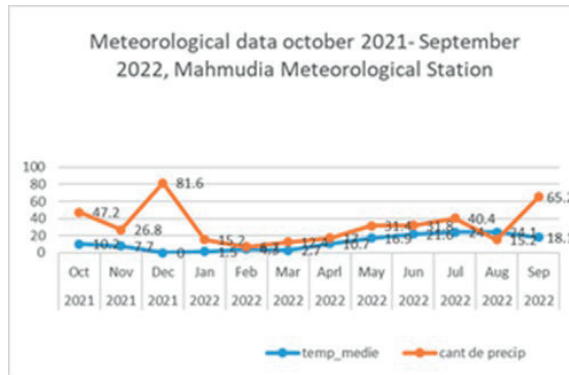
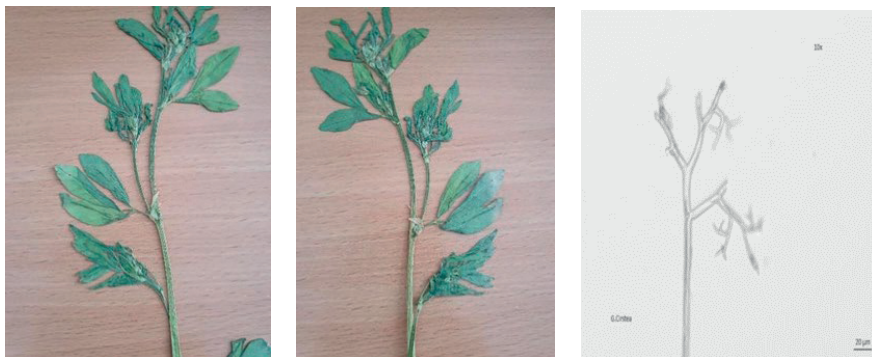


Figure 2. Meteorological data October 2021 - September 2022, Mahmudia Meteorological Station, Tulcea County



a) b)

Figure 3. Common Leaf spot (a) and downy mildew (b) attack in alfalfa



a) b)

Figure 4. Downy mildew attack of alfalfa (a) and sporangiophore (b)

The data in Table 1 show that in 2020-2021 the attack of common leaf spot in alfalfa had a frequency of 68% in the control variant and an intensity of 15%, resulting in a value of the degree of attack of 10.2%. The application of the treatment reduced the attack to 3.5%, with an effect in terms of both the incidence and the

intensity of the attack. The attack of downy mildew on the leaves recorded incident values of 23.5% with an intensity of 6.5% in the control variant and compared to F = 12.5% and I = 5% in the treated variant. The value of the degree of attack was sub-unit in the treated variant and GA = 1.5% for the control variant.

Table 1. Attack of common leaf spot and downy mildew on alfalfa, 2020-2022 period, Sarinasuf-Murighiol location, Tulcea County

Variety	Year	Variant	Pathogen / Disease					
			<i>Pseudopeziza medicaginis</i> / leaf spot of lucerne			<i>Peronospora trifoliorum</i> f. sp. <i>medicaginis-sativae</i> / downy mildew		
	2020-2022	Trait/Control	F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)
Dobrogea	2020/2021	Trait	34	8.5	3.0	12.5	5	0.6
		Control	68	15	10.2	23.5	6.5	1.5
	2021/2022	Trait	28	6.5	1.8	10.5	3.5	0.4
		Control	62	11	6.8	21.5	5.5	1.2

In the conditions of 2021-2022, a frequency of 62% was recorded in the case of the attack of common leaf spot in alfalfa, the intensity of the attack was 11%, resulting in GA = 6.8%. With regard to the attack of downy mildew, it had

significantly lower values than in the previous year, due to the lower intensity at the time of the assessment of the attack. The frequency of the disease was 21.5% in the control variant and 10.5% in the treated variant.

Table 2. Efficacy of the treatment on the leaf spot and downy mildew attack of alfalfa (2020-2022) location Sarinasuf - Murighiol, Tulcea county

Variety	Year	Variant	Pathogen / Disease			
			<i>Pseudopeziza medicaginis</i> / leaf spot of lucerne		<i>Peronospora trifoliorum</i> f. sp. <i>medicaginis-sativae</i> /downy mildew	
	2020-2022	Trait/Control	GA (%)	E (%)	GA (%)	E (%)
Dobrogea	2020/2021	Trait	3.0	70.5	0.6	60
		Control	10.2	-	1.5	-
	2021/2022	Trait	1.8	73.5	0.4	66.6
		Control	6.8	-	1.2	-

The effectiveness of the application of the treatment was also calculated and its values of 70.5% were obtained in the year 2020-2021 on the attack of *Pseudopeziza medicaginis* and 60% in combating the pathogen *Peronospora trifoliorum* f. sp. *medicaginis-sativae*. In 2021-2022, the effectiveness had values higher than 73.5% against the attack of common spot leaf in alfalfa and 66.6% in combating the attack of downy mildew in alfalfa (Table 2). The application of treatments is an effective means of combating diseases of cultivated plants, being integrated in the schemes for combating plant diseases (Alexandru et al., 2019; Buzatu et al., 2018; Totk & Cristea, 2020; Chiriac & Cristea, 2021). The application of the treatments ensures a good control, based on the assessment of the percentage of defoliation, on alfalfa diseases (Nutter et al., 2022). Treatment application reduced diseases incidence in alfalfa (Wilcoxson & Bielenberg, 1972) and the management control at foliar diseases can benefit alfalfa seed production (Hwang et al., 2006)

## CONCLUSIONS

In the period 2020-2022, an attack of common spot leaf in alfalfa and downy mildew was detected. Higher values of the attack were calculated in the case of the micromycete responsible for the appearance of brown spotting of alfalfa leaves. The application of the treatment was effective in the condition of the monitored diseases on alfalfa.

## ACKNOWLEDGEMENTS

We wish to thank “Dima Ancuta” P.F.A, Tulcea County, for technical support.

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