

RESEARCH ON THE ATTACK OF MONILIOSIS ON PLUM, LOCATION SOIMARI, PRAHOVA COUNTY, IN THE PERIOD 2017-2019

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Abstract

The aim of our research was to establish the efficacy of the treatment scheme used in the research area for the control of specific plum pathogens and for the attack of moniliosis. The analyzed genotypes were the plum varieties Stanley, Anna Spath and Gras românesc. The research was carried out in the period 2017-2019. The treatment scheme included cupric product (2%), with the application period in the vegetative rest stage and treatments in vegetation with the fungicide Topsin WGD70 (0.2%), Luna experience 400SC (0.05%) and Signum FG (0.5%). The attack of moniliosis on the shoots was less than on the fruits in all investigated varieties. The effectiveness of the treatments on the attack of moniliosis on shoots was 73.5% for the Stanley variety and 75% on fruits for the Gras românesc variety in 2019.

Key words: plum, moniliosis, efficacy.

INTRODUCTION

Plum moniliosis, also known as brown rot and mummification of fruits, is one of the most important diseases of plum trees in orchards, being common to these species (De Miccolis et al., 2018). Plum moniliosis can be caused by species of the genus *Monilinia*, but it is primarily attributed to the species *Monilinia laxa* (Aderh. et Ruhl) Honey (gd.eppo.int/taxon/MONILA). The presence of *Monilinia* species is different in the world (Byrde and Willetts, 1977). In Europe, *Monilinia laxa* and *M. fructigena* are the most common species (Batra, 1991). Plum and other stone fruit species are annually attacked by moniliosis, which causes significant losses (Hrustic et al., 2015, Byrde and Willetts, 1977, Zhu et al., 2011). *M. laxa* (Aderh and Ruhl) Honey, manifests itself on floral bouquets, leaves, branches and ripening fruits. Gheorghieș and Geamăn (2003) showing that the disease is dangerous in the spring, when the plants bloom and when the fruits are ripening, evolving and after harvesting. The attack on flowers and newly formed fruits causes their

browning. The attack on the leaves also causes wilting, browning and, finally, their drying (Jones and Sutton, 1996). Moreover, *M. laxa* is considered a species that produces the disease of flowers and twigs (Jonas et al., 2017; Schlagbauer and Holz, 1990). The attack on fruits is manifested by the forms of brown rot, black rot and their mummification. In the case of the attack of brown rot and mummification on the fruit, the sporodochia of the fungus appear in the form of point-like agglomerations of mycelium. The mummified fruits remain in the trees during the cold period and become the source of inoculum for the following year. The moniliosis attack on stone tree species was attributed to the micromycete *M. laxa* (Fourie et al., 2002; Fourie and Holz, 1985; Schlagbauer and Holz, 1989).

MATERIALS AND METHODS

The purpose of our research was to determine the effectiveness of the treatment scheme in controlling the disease and for this. based on the biometric measurements, the pathogen isolated from the fruit was identified and the

degree of attack was calculated. The observations were carried out in the period 2017-2019 in the Șoimari location, Prohova county. The genetic material was represented by the Stanley, Anna Spath and Gras româneșc plum genotypes. The experience was built on 3 repetitions in variants treated according to the established treatment scheme and control. Identification based on morphological characters was done on plant material (infected fruits) with the Zeiss Primo Star microscope connected to the Zen program. The frequency and intensity of the attack were calculated according to the formulas: Frequency (F%) = $n \times 100 / N$, where N = number of plants observed (%), n = number of plants specific symptoms (%). The intensity was noted in percentages and calculated according to the formula: Intensity (I%) = $\Sigma (ixf) / n$ (%) where, i = percentage given, f = number of plants/organs with the respective percentage, n = total number of attacked plants / organs. Based on the data obtained in calculating the frequency and intensity, the degree of attack was calculated: GA = $F \times I / 100$ (%): GA - attack degree (%), F = frequency (%), I = intensity (%). The efficacy of the treatments was determined according to the formula $E = [G_{Am} - G_{Av}] / G_{Am} \times 100$ (%) (Abbott formulas) in which: G_{Am} - degree of attack on the control variant; G_{Av} - degree of attack on the treated variant.

RESULTS AND DISCUSSIONS

The pathogen involved in the occurrence of moniliosis was identified by the morphological characteristics of its asexual fruiting. Biological samples were taken with *Monilia* fructifications from the sporodochia present on the mummified and preserved fruits. Measurements were made on the length and width of the spores, taking into account the spores arranged in the characteristic chains. The measurements were made on images with microscopic preparations - 10X objective (Figures 1-3).

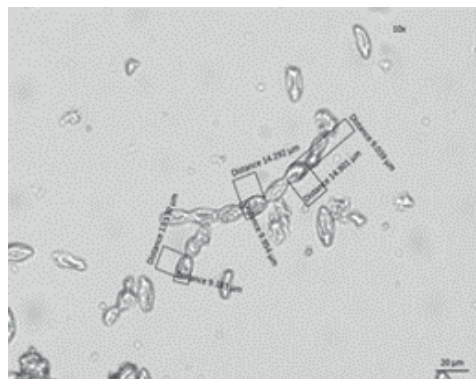


Figure 1. *M. laxa* - conidia (Stanley variety) (original)

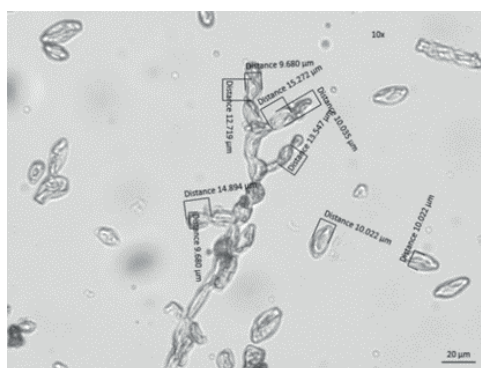


Figure 2. *M. laxa* - conidia (Anna Spath variety) (original)

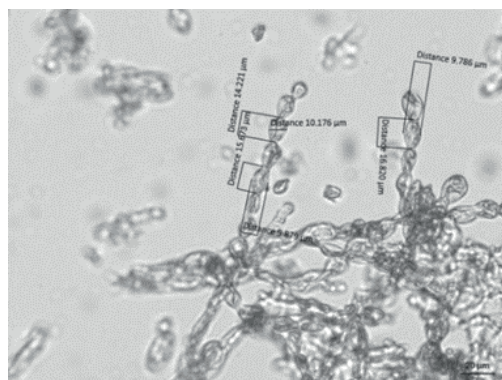


Figure 3. *M. laxa* - conidia (Gras româneșc variety) (original)

Table 1. Biometric measurements - *M. laxa* (f.c. *Monilia laxa*)

Variety	Biometric measurements		Biometric measurements	
	Conidia (L μ m) Min.-max. N = 10	$\bar{X} \pm s_x$	Conidia (l μ m) Min.-max. N = 10	$\bar{X} \pm s_x$
Stanley	13.5-14.9	14.094 \pm 0.633477	9.03-9.95	9.55 \pm 0.408847
Anna Spath	12.71-15.27	14.229 \pm 0.840641	9.03-10.03	9.615 \pm 0.369872
Gras româneș	13.54-16.82	14.611 \pm 0.970572	9.72-10.22	9.916 \pm 0.194205

Biometric measurements (Table 1 can classify the pathogen as *M. laxa* so that the measurements of the spores of the micromycete from the infected fruits of the Stanley variety fell within the dimensions of the length of 13.5-14.9 μ m, with an average value of 14.094 μ m and the width of had values of 9.03-9.95 μ m, average 9.55 μ m. The Anna Spath variety recorded the lowest length value of 12.71 μ m

and a maximum value of 15.27 μ m, with an average value of 14.229 μ m. Spore width was 9.03-10.03 μ m, resulting in an average value of 9,615 μ m. In the case of the Gras Romanian variety, the highest value of the length of the spores in the chain was measured, of 16.82 μ m but with an average value of 14.611 μ m, which is found in the measurements in the literature (Docea and Severin, 1991; Docea et al., 1976).

Table 2. The treatment scheme and the moments of application in the control of pathogens during 2017-2019

The chemical product / active substance / year	Concentration (%) / Dose (l, kg/ha)	Phenophase	Date of treatment of administration during the period 2017-2018/2019
Bordeaux mixture WDG (20% metallic copper and 80% neutralized copper sulfate)	2%	Vegetativ retention	15.03/02.03
Confidor oil (imidacloprid+ulei)	1.5%	Vegetativ retention	05.03/10.03
Topsin WDG 70 (tiofanat metil 70% + Calypso (480SC/tiacloprid 480 g/l)	0.2% (+0.02%)	Green button	05.04/1.04
Luna experience 400 SC (fluopiram 200 g/l tebuconazol 200 g/l) + (Mospilan 20SG)	0.05% (0.045%)	White button	20.04/14.04
Signum FG (boscalid and piraclostrobin) + (Calypso 480SC)	0.5% (+0.02%)	Flowering corolla 10-15%	04.05/29.04
Luna experience 400 SC (boscalid and piraclostrobin) + Novadim Progress EC/dimetoat 400 g/litru	0.05% (+0.075%)	Shake of the petals10-15%	17.05/15.05
Signum FG (boscalid and piraclostrobin) + (Mospilan 20SG/acetamiprid	0.5% (+0.045%)	Fruit development	01.06/07.06

The treatment scheme (Alexandru et al., 2019; Alexandru, 2020) included cupric product, with the application period in the vegetative rest stage and the Confidor oil insecticide. Along with the green button phase, treatments were applied in the vegetation with the fungicide Topsin WGD70, targeting moniliosis, and in the white button phenophase, the fungicide Luna experience 400SC was applied. In the 10-15% flowering phase of the corolla, Signum FG was administered, a fungicide applied for protection against moniliosis attack on inflorescences (moniliosis of flowers) and fruits. For protection against the pathogen, the

treatments with the fungicide products Luna experience 400SC and Signum FG were alternated. The insect attack was controlled by applying in complex with the Calypso 480SC, Mospilan 20SG and Novadim Progress EC insecticides. It was withdrawn on 31.12.2019 following the application of the provisions of the Rectification to Reg. (EU) no. 1090/2019 regarding the non-renewal of the approval of the active substance dimethoate, with a grace period until 30.06.2020) (<https://www.botanistii.ro/cheminova-novadim-progress.html>) (Table 2).

Table 3. The influence of treatments on the attack of moniliosis in plum, during 2017-2019

Year	Variety	Variant	Pathogen/Disease/ Frequency (%)/ Efficacy (%)			
			<i>Monilinia</i> spp./ moniliosis on shoots		<i>Monilinia</i> spp./ moniliosis on fruits	
			F (%)	E (%)	F (%)	E (%)
2017	Stanley	control	15	-	32	-
		trated	5.5	63.33	9	71.8
	Anna Spath	control	18	-	33	-
		trated	7	61.11	9.5	71.2
	Gras românesc	Control	11	-	29.5	-
		trated	3.5	68.18	7.5	74.5
2018	Stanley	control	14	-	36	-
		trated	4	71.42	11	69.4
	Anna Spath	control	16	-	38	-
		trated	6	62.5	13	65.7
	Gras românesc	Control	9.5	-	33	-
		trated	3	68.42	8	65.7
2019	Stanley	control	17	-	32.5	-
		trated	4.5	73.52	10	69.2
	Anna Spath	control	16.5	-	33	-
		trated	5.5	66.66	11	66.6
	Gras românesc	Control	10	-	30	-
		trated	4.0	72.72	7.5	75

The application of treatments from the proposed scheme on the attack of moniliosis on shoots and fruits reduced the attack, respectively its incidence in the treated variants compared to the control variants. In 2017, in the Stanley variety, the frequency of moniliosis attack on shoots was reduced to 5.5% compared to the control, where $F = 15\%$ and on fruits to 9% compared to 3% in the control. In the case of the Anna Spath variety, the attack frequency on the shoots was 7% after the treatments and on the fruits 9.5% compared to the untreated variants, where the incidence was 18% and 33%, respectively. Regarding the attack of moniliosis in the Gras românesc variety, they showed that the attack of the pathogen on the shoots decreased to 3.5% compared to the control with $F=11\%$ and on the fruits a frequency of 7.5% was recorded after the application of the treatments, compared to the untreated variant with $F = 29.5\%$ (Table 3). Jonas et al. (2017) highlights the resistance of plum varieties to the attack of the fungus *Monilinia laxa* and classifies the investigated varieties as more affected and or more resistant. The attack of moniliosis on shoots and fruits in 2018 in the untreated version recorded a decrease in the frequency of the attack. In the Stanley variety, an attack value of 14% on the shoots and 36% on the fruits was determined, and in the Anna Spath variety, the level of the

attack on the shoots was of 16% and on fruits of 38% (control variants). In the case of the Gras românesc variety, the attack on shoots was 9.5% and on fruits 33% for the same varieties. In the treated variants, the lowest values of the moniliosis attack were determined in the Gras românesc variety, both on shoots and on fruits (Table 3). Oroian et al. (2010) show that, in the monitored area, infections were 100% in the case of *Monilinia laxa* attack. Regarding the influence of the treatment scheme on the attack of moniliosis in the conditions of 2019, the data from the same table show that in the Stanley variety the attack frequency decreased from 17% in the control variant to 4.5% in the variant to which they were applied treatments and on fruits the frequency decreased to 10% compared to the control variant, where the incidence was 32.5%. And in the Anna Spath variety, the frequency of the moniliosis attack on the shoots was reduced from 16.5% in the control variant to 5.5% in the variant with treated trees. On fruits, the attack reached 11%, compared to 33% in the control variant. In the Gras românesc variety, the lowest values of the attack on the shoots of 4%, compared to 10% in the control and 7.5% in the fruits, compared to 30% in the control variant, were also calculated in this year's conditions. The effectiveness of the treatments applied against the attack of

moniliosis on the shoots according to the established scheme was between 61.11% for the Anna Spath variety and 68.18% for the Gras românesc variety in 2017. In 2018 for the Stanley variety, the effectiveness increased to 71.42%. In 2019, the highest efficiency values were recorded for the Stanley and Gras romanesc varieties with over 72%. Regarding the effectiveness of the treatment scheme on the attack of moniliosis on fruits, it had values of over 71% for the Stanley and Anna Spath varieties in 2017 and 75% for the Gras românesc variety in 2019 (Table 3). The application of plum treatments is aimed at combating pathogens in a complex way where product recommendation is possible and the reaction of the plum variety and the influence of environmental conditions are taken into account (Alexandru, 2020; Alexandru, 2019; Oroian et al., 2010). Establishing the effectiveness of applied treatments or integrated schemes is an indicator regarding taken into account when establishing phytosanitary control of plants as well as finding alternative possibilities to chemical control (Buzatu et al., 2018; Jaloba et al., 2019; Toth and Cristea, 2020; Toth and Cristea, 2021; Cristea et al., 2017).

CONCLUSIONS

The research showed that the attack of *Monilinia laxa* was more serious on the fruits compared to the attacked plum shoots, recording higher values of the incident of the attack. In the Gras românesc variety, the lowest attack values were recorded during the monitored period. The applied treatment scheme reduced the attack of moniliosis, the highest values of effectiveness being recorded in the Gras românesc variety, in 2019 with E = 75% (on fruits) and Stanley with E = 73.52%

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