

EFFICACY OF SOME TREATMENTS ON *MONILINIA FRUCTIGENA* (ADERH. & RUHL.) HONEY FUNGUS ATTACK ON APPLE

LUCIAN CHIȚULESCU, STELICA CRISTEA

University of Agronomic Sciences and Veterinary Medicine of Bucharest, Bucharest

e-mail: lucian_chitulescu@yahoo.com

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ABSTRACT

The researches were carried out in the experiments on the attack of *Monilinia fructigena* on apple in the Hartiesti location, Arges county. The evolution of the pathogen attack in the years 2015 and 2016 was monitored, in control variants and in variants treated with specific fungicides, included in a treatment scheme. The microscopic examination of the morphology of the pathogen corresponded to the fungus *Monilinia fructigena*. The biological material was Florina, Generos, Goldrush, Idared and Topaz varieties. In the conditions of year 2015, *Monilinia fructigena*'s attack recorded values between 18.5% for Florina, 21% for Generos, 34% for Idared and 29.5% for Topaz. In the year 2016 the control variants of the fungus attack was 22% for the Florina variety and 36.5% for the Idared variety. The application of a treatment scheme that included specific products for the control like Dithane Neotec 0.2%, Topsin 0.07% and Switch 62.5WG 0.066% which had an efficacy of more than 66% in 2015 and 68% in the year 2016. In the varieties Florina and Topaz it have been calculated the highest efficacy values of over 70% during the experimentation period. Generos and Idared varieties recorded relatively close values of the efficacy of moniliosis treatments, ranging from 66.6% to 67.6% in 2015 and 69.4% respectively and 68.5% in the year 2016. The Florina variety was noted throughout the research period with the highest efficacy value $E = 70.2\%$ in 2015 and 77.25 in 2016.

INTRODUCTION

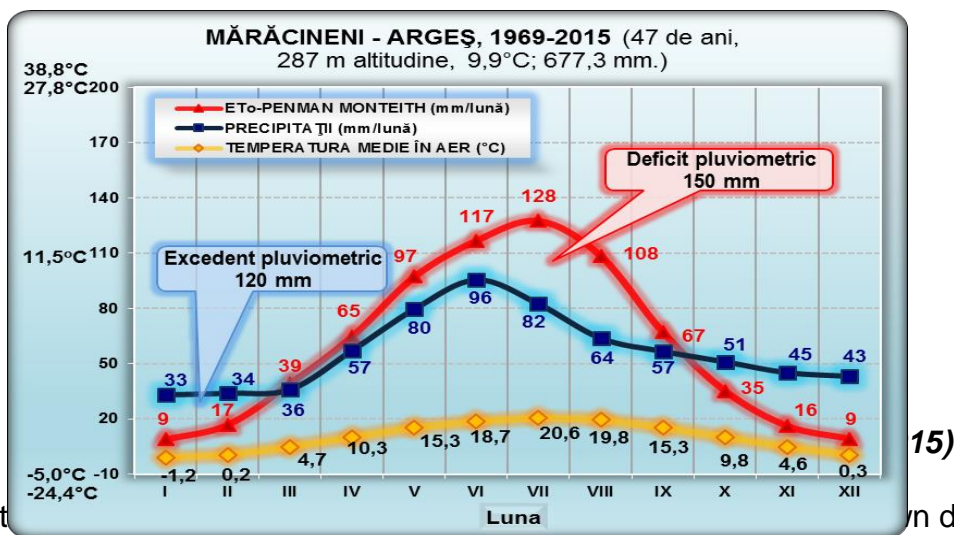
Monilinia fructigena fungus (Aderh. & Ruhl.) Honey is the agent responsible for brown rot and mummification of apple fruits, also known as apple moniliosis (Agrios, 2005, Gheorghieș et Cristea, 2001). The fungus of the genus *Monilinia*, attack the crustacea with all its components, causing them to spill and dry, and on the fruit causes brown rot, black rot and mummification of fruits, depending on the environmental conditions (Popa T., et al., 2012; 2013). The fungus attacks cause considerable losses (Van Leeuwen G.C.M., et al., 2000) and may continue on fruit (Berrie A.M., 1989; Falconi, G.J., et al., 1994). The attack from *Monilinia fructigena* (Aderh. & Ruhl.) is present every year in apple orchards wherever this species is grown. The attack of the pathogen *Monilinia fructigena* (Aderh. & Ruhl.) Honey was also frequently encountered in the research area, Hartiesti location, Arges County, Romania (Chitulescu et Cristea, 2017). Abiotic and biotic factors contribute to the dissemination of fungal inoculum that contributes to subsequent infections (Byrde R. J. W. et al., 1977, Holb I., 2003, Holb I. et al., Lack H., 1989). The frequency of diseases and production losses of species of the genus *Monilinia*, including *Monilinia fructigena*, require specific control measures (Van Leeuwen et al., 2002) and the fruits of early summer are a source of infection in fruit trees (Holb et Scherm, 2007). Holb and Scherm (2008) demonstrated that *Cydia pomonella* attacked fruits should be removed so that they are not prone to monliose attack. Fungicide treatments control both rot and brown rot (Batra, 1991).

MATERIAL AND METHOD

The researches were carried out in the apple orchard in Hartiești, Arges County, under the conditions of year 2015 and year 2016, and they watched the effectiveness of some treatments on the attack of the fungus *Monilinia fructigena*, integrated into a disease and pest control scheme. The biological material was Florina, Generos, Goldrush, Idared and Topaz varieties. Observations were made on the fungus attack on the fruit, in autumn before harvesting. The frequency and severity of attack was noted using the following formulas: $F (\%) = nx100/ N$, in which: n = percentage attacked organs, N = total analyzed organs and $I (\%) = \sum (ixf) / n$, where i = percentage granted, f = number of plants (organs) with the respective percentage, n = total number of attacked plants (organs) analyzed. In the autumn observations, prior to harvesting, the intensity of the attack was considered the highest, both in the control variants and in the variants treated, considering the attacked fruits unfit for marketing and storage. The attack rate was calculated by: $DA = F \times I / 100 (\%)$, where: F = attack frequency (%), I = attack intensity (%), DA = degree of attack. Intensity was noted as a percent. The efficacy of the treatments was calculated by the formula $E = [(Gam-Gav) / Gam] \times 100$, where Gam = control level, Gav = variant attack level. Data on environmental conditions was provided by the Maracineni – Pitesti RIFG meteorological station.

Obtained results

Observations of the *Monilinia fructigena* attack on fruits were made prior to harvest in the conditions of year 2015 and year 2016. The values of the meteorological parameters of the research period allowed favoring the attack of the fungus *Monilinia fructigena*.



The values of the meteorological parameters were obtained from the database of the Research Institute for Fruit Growing Pitesti-Mărăcineni, consisting of average values, maximum and minimum daily values between 1969 and 2015 (47 years) (fig. 1).

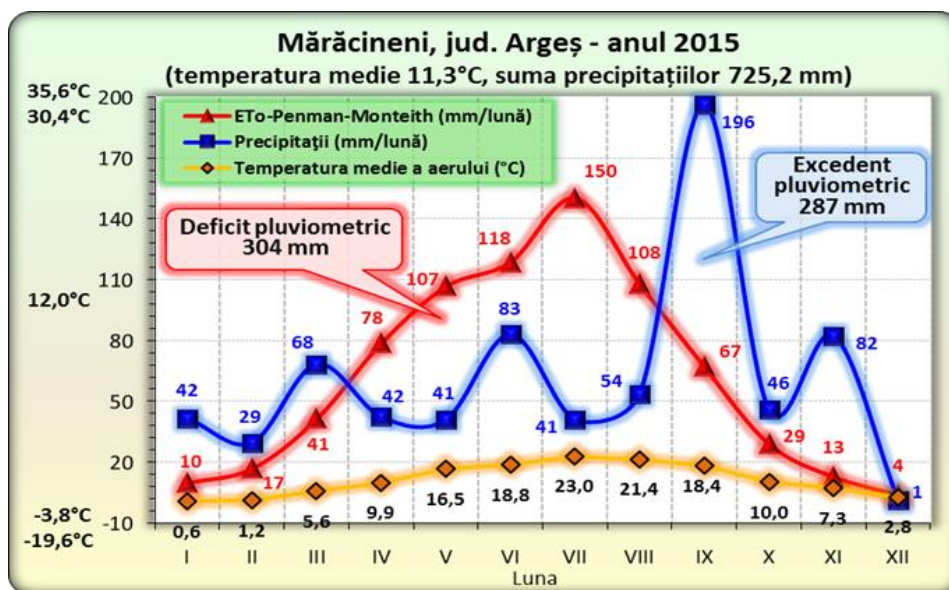


Figure 2 . Meteogram of year 2015 at Mărăcineni, Argeș county

In 2015, the average annual air temperature recorded a very high value of 11.3°C, exceeding the multiannual values by 1.4°C. Also, the amount of precipitation (725.2 mm) exceeded by 47.9 mm multiannual average (677.3 mm). If we compare the water regime of 2015 with the multiannual values, we find that there were very large deviations in both the surplus and the rainfall deficit. Thus, the excess rainfall of 287 mm exceeded by 167 mm the multiannual value and was noted especially in September, and the 304 mm deficit exceeded the normal value by 154 mm, especially in May and July (fig. 2).

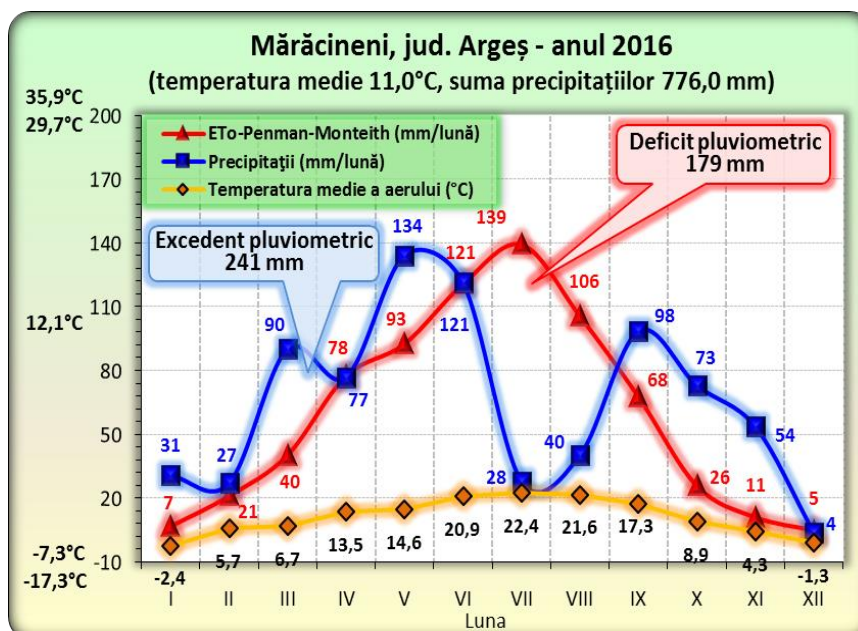


Figure 3. Meteogram of year 2016 at Mărăcineni, Argeș county

In 2016, the average annual air temperature recorded, as in the previous year, a high value of 11.0°C, exceeding the multiannual values by 1.1°C. Also, the amount of precipitation (776.0 mm) exceeded the multi-annual average (677.3 mm) by 98.7 mm. If we compare the water regime of 2016 with the multiannual values, we find that very large deviations have also been recorded, especially with regard to the pluviometric surplus. Thus,

the very large pluviometric surplus of 241 mm exceeded the multi-annual value by 121 mm and was reported mainly in March, May, October and November, and the deficit of 179 mm exceeded only by 29 mm the normal value, being registered mainly in July and August (fig. 3).

Table 1

The attack of *Monilinia fructigena* on fruits 2015 - 2016 (Hartiesti)

No.	Variety	2015			2016		
		Frequency (F)(%)	Intensity (I)(%)	Degree of attack (DA)(%)	Frequency (F)(%)	Intensity (I)(%)	Degree of attack (DA)(%)
1	Florina	18.5	100	18.5	22	100	22
2	Generos	21	100	21	24.5	100	24.5
3	Goldrush	26	100	26	28.5	100	28.5
4	Topaz	29.5	100	29.5	31	100	31
5	Idared	34	100	34	36.5	100	36.5

The data in Table 1 show that during the research period, the attack of *Monilinia fructigena* on control variants had the highest level of attack of the Idared variety, 34% in 2015 and 36.5% in 2016. In the Topaz variety, the values of the attack were close in the two years of experimentation with DA = 29.5% in 2015 and DA = 31% in 2016. A lower attack was recorded in the Florina variety at which the attack level was 18.5% in 2015 and 22% in the 2016. Also, the Generos and Goldrush varieties recorded higher attack values in 2016. The value of the attack was due to the incidence of the attack, as the intensity value was considered the maximum at the harvest date, the affected fruit being considered unfit for storage or commercialization.

Between 2015 and 2016 years, treatments against moniliosis were introduced into the treatment scheme for diseases and pests of apple. The data from Table 2 show that in the phenophase of the buttock - the opening of the first flower, treatments against moniliosis were applied, the size of the fruit was half the normal size, and 15 days after the previous treatment, fungicides were applied to fight the moniliosis of the apple in the recommended concentrations.

Table 2

Scheme of treatment applied during the period 2015- 2016

No.	The pathogen / pest	Phenophase	2015		2016	
			Product	Concentration (%)	Product	Concentration (%)
1	<i>Quadraspidiotus perniciosus</i> ; <i>Eriosoma lanigerum</i> <i>Tetranychus urticae</i> <i>Aphis pomi</i> (hibernated eggs)	The beginning of sprout opening; mouse ears	Confidor Oil SC 004	1.5	Confidor Oil SC 004	1.5

2	<i>Venturia inaequalis</i> ; <i>Adoxophyes reticulana</i> ; Defoliation (<i>Hyphantria cunea</i> , <i>Lymantria dispar</i> <i>dispar</i> , <i>Malocosoma</i> <i>neustria</i> , <i>Euproctis</i> <i>chrysothoea</i>)	Floral sprouts (visible)	Antracol 70 WP; Decis Mega 50EW	0.2 0.015	Clarinet; Bravo; Decis Mega 50EW	0.1 0.25 0.015
3	<i>Venturia inaequalis</i> ; <i>Podosphaera leucotricha</i> ; <i>Monilinia fructigena</i>	Pink button (opening first flower)	Clarinet; Bravo; Decis Mega 50EW Topsin	0.1 0.25 0.015 0.07	Antracol 70 WP; Decis Mega 50EW; Topsin	0.2 0.015 0.07
4	<i>Erwinia amylovora</i> ; <i>Venturia inaequalis</i> ; <i>Podosphaera leucotricha</i> ; <i>Haplocampa testudinea</i> ;	The beginning of the petals fall (end of bloom)	Topas; Flint plus 64 WG; Calipso	0.03 0.125 0.02	Topas; Flint plus 64 WG; Calipso	0.03 0.125 0.02
5	<i>Podosphaera leucotricha</i> ; <i>Venturia inaequalis</i> ; <i>Cydia pomonella</i> ;	10 mm fruit (as a hazel) Apple's Worm Generation 1	Luna Experien e 400 SC; Bravo; Decis Mega 50EW	0.05 0.25 0.015	Folicur solo; Bravo; Calipso	0.05 0.25 0.02
6	<i>Venturia inaequalis</i> ; <i>Podosphaera leucotricha</i> ; <i>Eriosoma lanigerum</i> ; <i>Monilinia fructigena</i>	The fruit is ½ of normal size	Folicur solo; Calipso Dithane Neotec	0.05 0.02 0.2	Luna Experien e 400 SC; Decis Mega 50EW Dithane Neotec	0.05 0.015 0.2
7	<i>Cydia pomonella</i> ; <i>Venturia inaequalis</i> ; <i>Podosphaera leucotricha</i> ; <i>Monilinia fructigena</i> ;	Apple's Worm Generation 2 (15 days from previous treatment)	Decis Mega 50EW; Bravo Switch 62,5WG	0.015 0.25 0.066	Decis Mega 50EW; Bravo Switch 62,5WG	0.015 0.25 0.066

Table 3

Efficacy of treatments on *Monilinia fructigena* attack (2015-2016)

Variety	Variant	2015		2016	
		DA (%)	Efficacy (%)	DA (%)	Efficacy (%)
Florina	treated	5.5	70.2	5	77.2
	control	18.5	-	22	-
Generos	treated	7	66.6	7.5	69.4
	control	21	-	24,5	-
Goldrush	treated	8.	69.2	7	75.4
	control	26	-	28.5	-
Topaz	treated	8	72.8	9	71
	control	29.5	-	31	-
Idared	treated	11	67.6	11.5	68.5
	control	34	-	36.5	-

Observations on the efficacy of treatments for the *Monilinia fructigena* attack show that the applied treatment scheme (Table 2) provided an efficacy of over 66% in 2015 for all varieties. The highest value of efficacy under the conditions of 2015 was calculated for Topaz variety with E = 72.8% followed by Florina with E = 70.2%. For Generos and Idared varieties, efficacy had values close to 67%. Efficacy was 69.2% for Goldrush variety (Table 3).

Under the conditions of 2016, the treatments used to combat moniliosis had an efficacy of over 68%. The Florina variety had the highest efficacy value, 77.2%. Applying treatments for Goldrush and Topaz varieties in the year 2016 also had high values of 75.4% and 71%, respectively. In all varieties analyzed, the efficacy of treatments was higher in 2016 than in 2015.

CONCLUSIONS

Under the conditions of 2015 and 2016 years, the attack of the *Monilinia fructigena* fungus recorded values between 18.5% for Florina variety and 34% for Idared variety and 22% for Florina and 36.5% for Idared varieties. The application of the treatments determined the significant reduction of the attack in the experimental period, ensuring values of efficacy of over 66% in 2015 and more than 68% in the conditions of 2016. In Florina variety the treatments applied according to the scheme presented in this work had the greater efficacy over the analyzed period. We consider that the treatments applied against the pests have contributed to reducing the incidence of the *Monilinia fructigena* fungus attack.

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