

UNIVERSITY OF CRAIOVA
THE DOCTORAL SCHOOL OF ENGINEERING OF ANIMAL
AND VEGETABLE RESOURCES

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Thesis resume

STRATEGIES FOR CONTROLLING THE MAIN PESTS AND
PATHOGENS SPECIFIC TO APPLE CULTURE IN
MĂRĂCINENI AREA

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RESUME

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The choosing of the research theme is justified, considering that the introduction in the treatment programs, for keeping under control the apple pathogens and pests, of some fungicide and insecticide products, based on some new active substances, which offer a longer protection, a performant way of action and a larger spectrum, respecting the environmental and food requirements, is essential in developing the control strategies and in increasing the efficiency of treatment programs.

The doctoral thesis is made after the norms in force and it is structured in two parts:

- Part I, which contains the introduction and the first chapter
- Part II, which contains the chapters 2, 3 and 4

In the chapter 1 named „The main pests and pathogens in apple culture and their control”, are presented the main pests and pathogens that cause serious damage to apple culture.

For each damage agent there are presented data regarding the taxonomy, patography respectively way of damage, eco-biology, epidemiology, prophylaxis and theraphy, with the indication of the consulted source.

In the chapter 2 named „The natural frame where the research took place” are noticed data regardind the I.C.D.P. Pitești - Mărăcineni location and the climatic conditions in the research area, being known their direct influence on the specific apple damage agents bio-ecology.

Chapter 3 named „The aim and the research objectives, material and method of research” is the one in which are presented the basic directions for the doctoral thesis elaboration, the biologic material used and the applied working method.

The purpose of the present paper is to emphasize the importance of increasing the accuracy in establishment the treatment moments in rationalization the phytoprotection actions regarding the apple culture and strengthening the control action of the main damage agents throw including in the treatment scheme of some new products with different way of action.

In this context, the proposed objectives have targeted:

- following the meteo parameters between 2014 - 2016, with Watchdog station;

- following the relation plant – damage agent – environment evolution during the research years, with Watchdog station;

- following the correlation between data offered by station and the situation from the field regarding the dynamics of the evolution attack for the damage agents specific to apple culture, depending on the phenophase and year;

- the evaluation of the attack made by the damage agents, in the studied conditions;

- the establishment of treatment program (BBCH, data, products/active substance, number of application) correlated with the risk for producing the primary and secondary infections of monitorized phytoparasites and the development stages of the present pests;

- the establishment of treatment program efficiency, applied in vegetation on the monitorized damage agents.

The used biologic material was represented by Idared apple variety, cultivated on a large area in our country, suitable for the majority soil types, but recognized as sensitive to the attack of some pathogens and pests.

The research method for fulfillment the proposed objectives consisted in:

- the establishment of the apple maxim vulnerability to the studied damage agents, based on the correlation of data offered by Watchdog station with those collected from the field, from untreated variant;

- the evaluation of the damage organisms attack level based on degree attack (GA%), calculated after noting the frequency (F%) and intensity (I%), data being statistically interpreted, according to the determination moment and observation year;

- setting up the experiences which targeted the keeping under control the damage agents, in two treatment programs, the products complexing and data application being adapted to the climatic conditions specific to each research year.

Chapter 4 „Results and discussions” includes own data and interpretations regarding the dynamics of the evolution attack of each damage agents during the three research years, the influence of some treatment schemes on *Erwinia amylovora*, *Venturia inaequalis*, *Podosphaera leucotricha*, *Monilinia fructigena* *Quadraspidiotus perniciosus*, *Phyllonorycter blancardella* and *Cydia pomonella* attack, the efficiency of treatment programs applied between 2014-2016 and data referring to the quantity of active substance per hectare.

The obtained results led to conclusions and recommendations, with importance for research and fruit practice.

The research theme was chosen considering the necessity of a permanent adaptation of control strategies for the damage agents specific to apple culture, both through increasing the precision moment for treatments applying and including of some new products.

In the research period 2014-2016 the main damage agents which attacked during the vegetation were the pathogens named *Venturia inaequalis* and *Podosphaera leucotricha*, respectively the pests named *Quadraspidiotus perniciosus*, *Phyllonorycter blancardella* and *Cydia pomonella*.

The most favourable year for *Venturia inaequalis* attack was 2014 (GA% = 22.2% on leaves and 7% on fruits), while 2015 was the most favourable for *Podosphaera leucotricha* attack, being present also on fruits.

The most favourable year for *Quadraspidiotus perniciosus* first generation larvae (G₁) was 2014 while 2016 was the most favourable for G₂ larvae attack.

For *Phyllonorycter blancardella*, the most favourable year for G₁ larvae attack was 2014 (GA = 35%), for G₂ generation, were 2014 and 2016 (GA = 37%), and for G₃ generation was 2016 (39%).

The degree attack on fruits for *Cydia pomonella* registered the highest degree, for G₁ larvae, in 2015 (25%) and for G₂ larvae in 2014 (40%).

The treatments applied in vegetation in two variants (V₁ și V₂), reduced significantly the damage agents attack, on the analyzed organs in the three research years, compared with the untreated variant.

The efficiency of treatments on the damage agents attack from the studied apple culture, was influenced by the climatic conditions in the research years and by the products complexing in the two treatment schemes.

The products for *Venturia inaequalis* control used in V₁ had an efficiency (E%) in apple scab control on leaves, for primary infections, between 81.02% in 2014 and 91.20% in 2015, and for the secondary infections, between 90.0% in 2014 and 98.94% in 2016, while for the primary infections on fruits, the efficiency was between 90.0% in 2014 and 99.92% in 2015 and 2016. The efficiency of the products used in V₂ was superior, regardless the infection type, the analyzed organ and culture year.

The products for *Podosphaera leucotricha* control used in V₁ had an efficiency in control the mildew powdery on leaves, for primary infections, between 90.88 % in 2015 and 91.64% in 2014 and for the secondary infections between 98.28% in 2016 and 98.53% in 2014, while for the primary infections on shoots, the efficiency was between 90.90% in

2016 and 92.5% in 2014. The efficiency of the products used in V₂ variant was, in case of primary infections on leaves, between 98.53% in 2015 and 99.15% in 2016 and between 98.8% in 2014 and 99.39% in 2016, on shoots, while the efficiency regarding the secondary infections was, on leaves, between 99.5% in 2014 and 99.76 in 2016, while on shoots, between 99.38% in 2014 and 99.76% in 2016.

The highest efficiency value in controlling the primary and secondary infections with mildew powdery on leaves and shoots was recorded in 2016, when were applied 4 treatments with Luna Experience 400 SC, compared with 2014 and 2015, when were applied only 3 treatments with this fungicid.

In controlling *Quadrascidiotus perniciosus* attack on leaves, the program efficiency applied in V₁ variant, in case of G₁ larvae, was between 78.12% in 2016 and 83.33% in 2015 and for G₂ larvae, between 72.97% in 2014 and 82.35% in 2016 while on fruits, the efficiency was in case of G₁ larvae, between 80.95% in 2016 and 87.5 in 2015 and for G₂ larvae, the efficiency was between 82.75% in 2016 and 88.88% in 2014. In V₂ variant the efficiency was considerable higher, for both generations, both on leaves (92.30% - 98.53%) and fruits (92.59% - 100%).

The efficiency of insecticides products applied in V₁ to control *Phyllonorycter blancardella*, was between 70.96% (in 2015) and 80% (in 2014), in case of G₁ larvae, between 77.14% (in 2015) and 81.08% (2014), in case of G₂ larvae and between 76.92% (in 2016) and 81.58% (2015) in case of G₃ larvae, while the efficiency of V₂ variant was between 90.32% (in 2015) and 98.52 (in 2016), for G₁ larvae, between 89.19% (in 2014) and 97.3% (in 2016), for G₂ larvae and between 91.66% (in 2014) and 97.43% (in 2016), for G₃ larvae.

The products applied in V₁ variant, to control *Cydia pomonella* larvae attack, led the calculation of an efficiency between 84% (in 2015) and 88.88% (in 2016), for G₁ larvae and between 83.33% (in 2016) and 87.17 (in 2015) for G₂ larvae, while in case of V₂ variant, the efficiency varied, for first generation larvae, between 80% (in 2015) and 83.33% (in 2016) and between 80.55% (in 2016) and 85% (in 2014), for G₂ larvae.

The product named Movento 100 SC, applied in V₂ variant, has proven its superior efficiency, in controlling the *Quadrascidiotus perniciosus* and *Phyllonorycter blancardella* attack regardless the generation, the attacked organ and/or culture year, with the increasing the number of applications, year by year, the treatment programs efficiency increased, too.

The application of Luna Experience fungicide, besides the superior protection against *Venturia inaequalis* and *Podosphaera leucotricha* attack, leads to reduction of active substances quantity per hectare; in the same time, its application as last treatment, is indicated thanks to its short time before harvest, only 7 days, compared with other competitive products in which case this is of 14-28 days.

The doctoral thesis has 182 pages and contains 104 figures, of which 91 are original and 67 tables of which 64 are original.

The obtained results are published in 4 specialty journals, indexed in international data (BDI), as first author.

The novelty of this work consists in the study regarding the getting of some superior results in controlling the damage agents specific to apple culture through including in the treatment programs of some products based on new active substances and less amount of substances per hectare, applied at the maximum risk moments, as complementary beneficial effects being mentioned reducing the risk of resistance, selectivity for non-invasive organisms and increasing the yield quantity and quality indices.