

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

Tudor-Radu Mădălina (Vulpe)

Biologist

Summary of the Thesis

CONTRIBUTIONS TO THE DEVELOPMENT OF
TECHNIQUES OF COMBATING PEST AGENTS IN
TOMATO-PROTECTED CROPS AND SEED LOTS

SCIENTIFIC COORDINATOR
Professor Rodi Mitrea, Ph.D.

CRAIOVA

2018

Keywords: tomatoes, ecological agriculture, diseases, cures

The choosing of the research theme is justified, considering that the introduction in the crops of some types of tomatoes, with quality organic and biological traits and resistance to the attack of the specific pathogens will make possible the creation of curing programs, with minimal use of polluting solutions, based on the principles of the ecological agriculture.

We also considered that the study would help identify scientific criteria that would ensure the penetration of indigenous creatures on the market to cope with the fierce competition with foreign varieties often insufficiently tested and adapted to specific crop conditions in some vegetable areas in our country.

The thesis is elaborated taking into account the norms in force and it is structured in two different parts:

- Part 1- which contains the introduction and two chapters,
- Part 2- which contains three chapters.

In the first chapter, called "Diseases with economical importance for the tomato cultures", we presented the main phytoparasites from the phytopatogen bacteria and fungus category, whose attack can be signalled in the parcel tomato crops and in controlled spaces. For each pathogen, data are presented on pantograph, ecobiology, prophylaxis epidemiology and therapy with indication of the source consulted.

Because the diseases of tomatoes are very important for the cultures, grown in a greenhouse or on a parcel, the second chapter, called "Research overlooking the evolution of the pest agents of the ecological tomato cultures combating techniques" presents the literature results on the ecological eliminating of the tomato pest agents on a national and international scale. The literature information mentioned above emphasizes the fact that in order to rentabilize the vegetable cultures, in the period of transition to ecological agriculture, it is useful to search for the identification of the spontaneous local flora species, which contain an important amount of phytoalexine. The discovery of the exploiting measures and methods as well as their application can be used in order to prevent the attack or to destroy harmful organisms.

Chapter 3, named "The natural frame where the research took place", contains information about the location of the National Institute of Research for Biotechnologies in Horticulture (I.N.C.D.B.H.) Ștefănești - Argeș, where tomato crops were planted, in

protected systems and in the seed lot. It is also a characterization of the pedo-climatic area of vegetation and flora.

Chapter 4, as its title suggests, "The purpose of the research, materials and methods of research" presents the base of the thesis. Its purpose is the deepening of knowledge concerning the behaviour of different new types of tomatoes, developed at I.N.C.D.B.H. Stefanesti- Arges, and the attack of the pathogen agents, in order to identify the biotypes with strong biological resistance and quality traits. Thus the goal was:

- the identification of new biotypes of Romanian tomatoes with an important amount of phytonutrients and some of their organoleptic traits;
- presenting methods of integrality, with the purpose of maintaining the health of the tomatoes planted in a controlled environment, while respecting the norms of ecological agriculture;
- the study of the monitored reaction of the tomatoes to the attack of the identified pathogens in the tomato culture;
- the comparative study of the biological efficiency of the treatment scheme in combating the pathogen agents identified in the seed tomato lot;
- the discovery of the efficiency of the conventional and unconventional treatment applied on the vegetation contaminated with the pathogen agents identified in the seed tomato culture.

The biological material. There were used 6 types of tomatoes created at I.N.C.D.B.H. Stefanesti-Arges, made in the experimenting time: Arges11, Arges16, Arges123, Arges20, Stefanesti 22 and Costate21.

Methods of research. In order to reach the goals enumerated above, the studies were made in the deposit of tomato germoplasma collection taken from the ecological greenhouse and seed parcels during 2013-2014. It was crucial that the new studies were made about some of the phenotype and nutritional traits and about the reaction to the attack of the specific phytoparasites, in order to insert them in the ecological agriculture system. The determinations of the compositional parameters of all studied variety of tomatoes were made in the general chemistry lab placed in the University of Pitesti and in the chemistry and physiology laboratory at I.N.C.D.B.H. Stefanesti-Arges.

The pathogen agents were ecologically controlled in these 2 years of research by creating experiences that overlooked the biological efficacy of the next: alcoholic extract from plants, juice 0.6% and plant pulp. The plants used were *Rhus typhina*, *Dryopteris*

flis-mas, *Basilicum officinalis*, *Equisetum arvense*, *Urtica dioica*. For the seed lot a trifactorial experiment was initialized, repeated for 3 times, during which the next factors were analysed:

Factor A: - the variety with 6 graduations:

a₁ - Argeș 16 variety

a₂ - Argeș 11 variety

a₃ - Argeș 20 variety

a₄ - Argeș 123 variety

a₅ - Costate 21 variety

a₆ - Ștefănești 22 variety

Factor B – the treatment scheme with 3 graduations:

B₁ - treatment with conventional elements

B₂ - treatment with unconventional elements

B₃ - untreated

Factor C - the year with 2 graduations:

- year 2013

- year 2014

For the identified attack of the pathogens there was noted the frequency (F%) and the intensity of the attack (I%), the overlooking the grade of the attack (GA%) and the effectiveness of treatments.

Chapter 5. - “Results and discussions”- contains the data about the pathography of the detected diseases, their attack on the 6 biotypes of tomatoes, identified along the period of the experiment. The frequency and the intensity of the attack of the pathogen agents (*Botrytis cinerea*, *Phytophthora infestans* and *Mycovellosiell fulva*) were determined and the grade of the attack was calculated for the tomatoes studied and pathogen agents identified, for the pathogen found during each year of study.

The results led to the next conclusions:

1. The 6 new types of tomatoes found at I.N.C.D.B.H. Ștefanesti-Argeș present ununiformity at the number of the plant, the resistance at depositing, etc., regarding the biochemical composition.
2. In the Ștefanesti-Argeș zone, under microclimate conditions in the ecological greenhouse and in the research period the attack of the pathogens *Botrytis cinerea* and *Mycovellosiell fulva* was signalled.

3. From all 6 types of tomatoes, the best response to the phytoparasite *Mycovellosiella fulva* was present at Arges 11 and Costate 21, which has shown the smallest grade of attack, at the opposite end being Arges 123 and Stefanesti 22.
4. The application on the vegetation of the juice, pulp and *Rhus typhina*, *Dryopteris flis-max* and *Urtica dioica* alcoholic extract treatment, along with additive and integrality measures stopped the pathogen attack and produced ecological certified tomatoes.
5. In the same conditions of microclimate in the ecological greenhouse, in the research years, *Trialeurodes vaporariorum* parasite was found, whose attack may kill the tomato culture if an immediate treatment is not used.
6. The application of successive and different treatments on trap plants (*Fragaria vesca*) reduced the number of mobile forms (larvae and adults) compared with the untreated plant and, in this way, their migration to the tomato culture was stopped.
7. The best results of reducing the number of parasites (larvae and adults) of *Trialeurodes vaporariorum*, came from the mint oil and *Rhus typhina* extract treated plants, where the number of larvae and adults were small. The other treatments are good alternatives as well, the number of mobile forms of the parasites being reduced to a minimum.
8. Relying on the obtained results we can tell that the 6 new tomato types created at I.N.C.D.B.H. Stefanesti-Arges are valuable and they will be spread in controlled conditions, ecological systems, in microclimate zones, similar to the research zone.
9. The same variety of tomatoes (Arges 11, Arges 16, Arges 20, Stefanesti 22 and Costate 21), planted on seed parcels signalled the presence of the phytopathogen *Phytophthora infestans* and *Botrytis cinerea* attack.
10. The studies made in these 2 years of research showed the influence of the climate factors on the apparition and evolution of the diseases, the behaviour of the tomatoes, the efficiency of the conventional and unconventional treatments compared to the untreated plant.
11. In both years of study, the best response to the attack came from Costate 21, next in line being Arges 20, while the increased sensitivity was signalled by Arges 123 and Stefanesti 22.

12. At the new variety of tomatoes, the type of growth did not influence the behaviour of the plant, as Costate 21 was the most resistant while Stefanesti 22 was the weakest.
13. By applying the conventional treatments, at the optime period, the pathogen attack was considerably reduced compared to the untreated plant, under the direct influence of soil and culture.
14. The application of unconventional treatments on the vegetation prevented and maintained the control over the pathogen agents in the tomatoes cultures, but the values of the three parameters (frequency of attack, intensity of attack and grade of attack) were bigger, excepting the variety and the culture of the year.
15. Our results emphasized the fact that Costate 21 and Arges 20 cultivares, planted on a parcel, best adapted to the ecological protection and can be recommended to other farmers and cultivators of tomatoes for both of the systems (conventional and unconventional), while Stefanesti 22 and Arges 123 cultivares are recommended only for the conventional system.

The doctoral thesis has 174 pages. It contains 28 tables of which 27 are original, 125 figures of which 897 are original and a bibliography carefully selected from the Romanian and international specialized literature.

Our results were capitalized in the papers published in journals indexed in international data (BDI) and ISI-quoted.

The novelty of this work consists in the study on the report between the complex interrelations biotype (tomato varieties) and harmful organisms specified, the report geared towards promoting those biotypes, which guarantees the relation to consumer food safety, aimed at shifting.