SUMMARY

of the doctorat thesis entitled:

RESEARCH ON THE BEHAVIOR OF SOME SUGAR BEET HYBRIDS TO THE ATTACK OF SPECIFIC DISEASES IN THE PEDOCLIMATIC CONDITIONS OF THE COVASNA COUNTY

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The economic importance of sugar beet in ensuring the sugar requirement in our country and in the favorable areas of the culture is the motivation for the research on the frequent pathogens of this agricultural plant in the area and the period of experiments with impact on the phytosanitary measures undertaken in the experimental location on the attack and production.

Research on diseases specific to sugar beet and with an annual incidence such as heart rot and especially cercosporiosis, requires control of the culture and knowledge of the impact on indices such as root production, sugar content, sugar production. Agricultural research is concerned with the reaction of cultivated genotypes to the attack of pathogens, the effectiveness of phytosanitary interventions that require a major attention on the applied molecules, the establishment of integrated crop technology schemes. Starting from the knowledge of the impact of diseases on production and the special attention given to culture in the experimental area, in the framework of the thesis, research was carried out on the attack of the most common diseases, such as cercosporiosis in the pedoclimatic conditions of the Covasna area, the monitoring of the attack and the effectiveness of some treatment schemes in which the alternation in the application of the chemical products recommended during the research period, the impact of the pathogen attack on root production, and the sugar reaction of the cultivated genotypes were followed.

The aim of the doctoral thesis was to carry out some research on the behavior of some sugar beet hybrids when attacked by diseases, to establish the effectiveness of the treatments used in the research location during the experimental period and the *in vitro* study of the pathogen Cercospora beticola which showed the highest incidence during the period of research.

The objectives pursued in achieving the proposed goal:

- observation of incident diseases;
- identification of pathogenic agents;
- determining the attack of diseases in the analyzed genotypes;
- establishing the effectiveness of some treatment schemes applied in combating monitored diseases;
- the influence of the treatments on the obtained productions;

- performing biometric measurements on specific spores of the micromycete *Cercospora beticola;*
- establishing the biological parameters of the pathogen *Cercospora beticola.;*
- statistical analysis of the obtained results.

The research carried out in the doctoral thesis has a scientific and applied nature, it completes the knowledge regarding the attack of sugar beet diseases in an area recognized for the culture of this plant and makes important contributions regarding the reaction of the monitored genotypes to their attack, in the conditions of the area and the period experimental. The knowledge of the effectiveness of the products used in the control of detected pathogens and in the case of the phytoparasite *Cercospora beticola* which is frequent in the area constitutes a benchmark for growers in their choice with an impact on obtaining productions expected by farmers. The thesis makes important contributions regarding the role of the effectiveness indicator in the choice of impact pathogen control products, with a view to integrating the treatments and the response of the genotype in the conditions of the area, which ensures the character of originality and novelty. The interest for the research undertaken in the doctoral thesis consists of the chosen subject, which concerns a culture that could be reconsidered for the agriculture of the area and of Romania, and the data obtained regarding the analyzed products, their effectiveness in combating diseases specific to the beet culture, the statistical analysis of the influence of genotype and treatment factors on production have an applied research character, which is directly addressed to beet growers. In vitro research on biometric measurements and the biology of the Cercospora beticola pathogen has a deep fundamental and applied research character with an impact on the interventions of phytosanitary measures to combat it.

The researches were carried out in the experimental field within S.C. Agromiki S.R.L., Sînzieni, Covasna county, in the period 2018-2020, located in an area favorable to the culture and the evaluation of the effectiveness of the intervention measures applied, which represents a study and interest for the growers in the area. The in vivo research on the attack of cercosporiosis, the most common disease in the area, was completed with the in vitro research on the biological parameters of the *C.beticola* fungus, considered useful in the application and establishment of intervention possibilities. Research on the impact of the cercosporiosis attack on production, sugar content and sugar production per hectare brings important practical knowledge on cultivated genotypes, and the effectiveness of some products applied at different times in the vegetation can contribute to the establishment of important measures for agricultural practice. The research undertaken has a scientific and applied nature and completes the information regarding the attack of some pathogens present in the beet crops from the ready zone and makes important contributions regarding the reaction of the analyzed hybrids under the conditions of the area and the experimental period. The thesis makes important contributions regarding the prioritization of the effectiveness indicator, the treatment scheme and the moment of application, in the selection of products to combat some diseases with a major impact, realizing an integrated interpretation of combating them, which we consider can ensure an originality and novelty.

The observations and data contained in the thesis regarding the treatment framework with alternative products, the integration of boron fertilization, their effectiveness in the therapy of detected diseases, in the case of cercosporiosis, the statistical analysis of the results have a deeply applied research character that is directly addressed to farmers area. Research in field conditions has a scientific and applied character and is complemented by relevant laboratory studies carried out in the laboratory.

The first part of the thesis includes a bibliographic study on the researched topic and the second part, which presents the own research.

Part I of the thesis includes a chapter "The stage of knowledge of the main diseases of sugar beet" in which information from the scientific literature on the important diseases of sugar beet is presented synthetically. The data presented refer to the symptoms of the disease, the causative pathogen, the propagation and transmission of the disease, conditions and control possibilities.

The second part of the thesis, with the title "Own research" presents the purpose and objectives of the work, the natural environment in which the research took place, the material and working method, the calculation formulas used, the statistical processing of the obtained results, their interpretation, the observations and the calculations obtained under in vivo and in vitro conditions, conclusions and recommendations, the consulted bibliography and the thesis attachments.

Chapter II is entitled The natural framework in which the researches were carried out, and includes the natural conditions of the experimental location during the research period, and the cultural conditions of the location and the experimental field.

Chapter III, named Material and working methods, presents the research methods used in macroscopic and microscopic diagnosis, the calculation formulas necessary to obtain the frequency, intensity and degree of attack, to calculate the effectiveness of treatments applied in vegetation, the experimental scheme, the presentation monitored genotypes, statistical calculation.

Chapter IV, Results and discussions, includes personal results obtained during field and laboratory research. Research on the manifestation of the observed diseases, cercosporiosis and heart rot, was carried out based on concrete observations in the field and completes the clinical picture of beet pathology, being accompanied by original figures from the experimental field that support the described clinical picture. The microscopic identification researches were carried out using a modern apparatus, the fruitings specific to the researched pathogen being sampled.

The research carried out in 2018, regarding the effect of the treatment on the attack of the pathogen *C. beticola* highlighted the highest values of the attack in the control, without treatments, but a high value of the frequency of the attack (F=70%) was calculated for the Matti hybrid in the second experience and the lowest incidence value was noted for the Tatry hybrid in the third treatment scheme (F=46%). The intensity of the attack had relatively low values, 1.84% for the Tatry hybrid in the third experiment and 3.4% for the Matti, in the same experiment. The values of the intensity of the cercosporiosis attack in the control

(untreated) in all analyzed genotypes was around 6%. We consider that the differences between the hybrids were mainly due to the variation in the frequency of the attack in the analyzed treatment options. in the conditions of 2018, sub-unit attack values were obtained at Tatry, in the third treatment experience and the Damian hybrid in the first treatment experience

The results obtained under the conditions of 2019 showed that the Matti hybrid had the lowest frequency value, 37% in the third treatment experience, followed by Damian, in the same experience. The frequency values were 51% (experience II), 54% (experience II) and 53% (experience II) in the hybrid Vangelis, in 2019. The values of the intensity of the attack were varied, being higher in the hybrids Damian, Vangelis and Tatry in the scheme first treatment, with the same hybrids in the second and with Vangelis and Tatry, in the third experience. The lowest values of the attack level were in the third treatment scheme for Damian and Matti with GA = 0.46% and 0.59%. The Matti hybrid recorded the lowest attack values in the Isi II schemes as well. In the case of the witness, the value of the degree of attack was higher, in the conditions of 2019, reaching 12.3% for the Vangelis variety. In the case of the Damian hybrid in the control, the attack level was 10.1%, and in the Matti and Tatry hybrids, the attack level reached 7.49% and 9.5%, respectively

Under the conditions of 2020, the research demonstrated that the value of the attack frequency of 38% was the highest in the Vangelis hybrid in the third experience and the lowest value of the incident was noted in the third treatment experience, F=25% in Matti. In the Vangelis and Tatry genotypes, the frequency was 37% in the conditions of the first experience. High values of the frequency F=37% were also recorded by Vangelis in the case of the second experience. The Matti hybrid registered reduced attack frequency values in the other variants of the treatment scheme as well, with cercosporiosis attack frequency values of 28% in experiment II and 29% respectively in the case of the first experiment. In the case of the hybrid Damian, the lowest value of the attack frequency on the leaves was noted in the case of the third experiment, where the value was F=28%. In experiences II and II with the Damian hybrid, the attack incidence had values close to 31% and 33%. The frequency of attack in the Tatry hybrid showed a high level between 35% in the second experience, 36% in the third experience and 37% in the first experience. The frequency values in the control variant amounted to 92% in the case of the Vangelis variety and 89% in the Tatry variety. The lowest intensity values were calculated at Damian and Tatry in experiment three, with I=2.1%. The degree of attack saw sub-unit values at Matti following the application of the treatments from the first and second experiences in the scheme (GA= 0.69% and GA = 58%), at Tatry in the second experiences (GA= 0.94%) and the third (GA= 0.75%). Damian registered a low value of the degree of attack in the third experience with GA= 0.58%.

The results regarding the effectiveness of the treatments applied in 2018 had the value, 86% in the third treatment experience with the Tatry variety, followed by the treatments applied in the first treatment experience to Damian. In the conditions of 2019 and with the applied treatment scheme, the effectiveness in controlling the disease was higher, reaching 95.44% for the Damian variety in the third treatment experience and 92.12% for the Matti

variety. In 2020, the data show that the value of the effectiveness of the treatment scheme was recorded for Damian under the conditions of treatment experience III, with E = 91.27%. High values of effectiveness were obtained at Matti in the case of treatment experience II (E=87.63%) and Tatry in treatment scheme III with E=87.41%. In the case of the hybrid Matti, the lowest value of effectiveness was recorded in the case of treatment experience III with E= 75.05%, followed by Vangelis in scheme I, with E= 78.85%.

Observations regarding the presence of heart rot reported in 2018 and 2019, in Damian, Vangelis and Matti hybrids, found values of reduced frequency and intensity with a level of subunit attack degree. The effectiveness of the treatments was maximum, E=100%. The observations regarding the attack of this micromycete, which was weak during the analyzed period, can be attributed to the application of boron, a product that limits the attack of Phoma on beets.

Research on root production, sugar content and sugar production per hectare showed that in 2018 the reaction of the hybrids was different, the highest values being obtained at Damian in experiments I and III. Sugar production per hectare was also higher in the variants with treatments compared to the untreated control, which had values 6.83t/ha - Damian and 6.42t/ha -Vangelis and Tatry. In the conditions of 2019, in the monitored experiments, the amounts of roots were reduced, but the sugar content of the Vangelis hybrid remained at the highest values. In terms of sugar production, it had higher values in Tatry (experiments I and III) and Damian (experiments II and III). In 2020, the application of the treatment scheme led to obtaining high values for all analyzed parameters compared to the control for the monitored genotypes

The monofactorial and trifactorial analysis of the factors year, genotype, treatments applied in the monitored experiments and the correlations made on the attack of the micromycete *Cercospora beticola* and root production confirmed the results obtained.

The biometric measurements of the spores of the micromycete *C. beticola* collected from the preserved diseased leaves of the analyzed genotypes showed a variability of the spore sizes in the analyzed genotypes.

The research on the testing of the pathogen *C beticola*, in laboratory conditions, showed that the micromycete develops well at a temperature of 20 , it has no major preferences regarding the analyzed culture media, it developed more abundantly than the PMA and PDA media, forming on the Czapeck media a dense vegetative mass and a stronger growth in the first days after which it grew constantly but slowly. Regarding the vegetative development depending on the light/dark alternation parameter, the fungus had a more accelerated dynamic at the 24h/24h alternation (light/dark), followed by the 12/12 hour alternation (light/dark), the pathogen preferring the equal alternation of the two parameters.

Chapter V includes the general conclusions and recommendations resulting from the research undertaken.

The thesis includes a total of 140 pages with 28 tables from which 24 originals and 49 figures from which originals 43. The bibliography cites 135 references from specialized literature to which 23 web sources are added.