DOCTORAL THESIS
SUMMARY

THE PROTECTION OF *Pyrus communis* L. ROOTSTOCK AGAINST SPECIFIC PATHOGENS BY USING CONVENTIONAL AND NON CONVENTIONAL METHODS

SCIENTIFIC COORDINATOR
Prof. PhD. Ioan OROIAN

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INTRODUCTION

In the current economic climate, fruit growing presents an important economic potential both nationally and internationally. The Romanian climatic conditions are very favorable for fruit growing in general, particularly for pear (POPEȘCU et al., 1993).

Pear (*Pyrus communis*) is a widespread fruit tree specie, with a significant role in the fruit trees horticultural sector from all temperate regions of the world, both as cultivated and also as fruit production areas. (AGRIOS, 2005a; CHIRA et al., 2004). The importance of pear culture is given by its food value and taste, therapeutic and prophylactic proprieties of fruits, their specific technological features and the trees potential for exploiting different conditions of climate, soil and crop technologies, overall, its economic and social value (BELL, 1991; MITRE, 2007). Due to the agricultural and biological characteristics of trees, taste and therapeutic qualities, pear represents an important and valuable fruit tree species, one of the major fruit crops from the temperate climate. In our country, pear is one of the most preferred fruit tree species by population, enjoying a rich tradition and being on the second position as fruit production from seed species (after apple), and fourth after plum, apple, cherry and cherry, from all fruit species (BRANIȘTE et al., 1990; BRANIȘTE et al., 1999).

Pears are greatly valued in the current consumption, as fresh fruits, often they represent a separate category of fruit, in some cases being labeled as "luxury" or even. This status is conferred not only for the earliness of varieties, attractive commercial appearance and great gustatory quality, but is also recognized by the great sensitivity and perishable state of their fruits (BROWN, 1960; DEJEU et al., 1997; GHEORGHIES, 1999).
CHAPTER I

GENERAL CONSIDERATION UPON PEAR CULTURE

*Pyrus communis*, generally known as common pear, is a fruit tree species which belongs to the Pyrus genus, Maloideae Subfamily, Rosaceae Family, Rosales Order, Magnoliopsida Class, Plantae Kingdom.

Pear represents a fruit tree species with a great importance due to its wide spreading areal and fruit demands on domestic and foreign markets but also for its current demand for fruits consumption and manufacturing industry (ROMAN şi colab., 2008).

Pear fruits have a special nutritional value for a healthy, sick or convalescent human body due to their very complex chemical composition. The water contained in fresh fruits is a pure biological one and contributes to the hydration of the entire body. Carbohydrates are in the form of monosaccharides (fructose, glucose), disaccharide and in a lesser extent in the form of polysaccharides. These are rapidly absorbed into the body, replenish glycogen in liver, giving fruits a refreshing role. Due to the fact that fruits carbohydrates are burned in the breathing process they don’t lead to the obesity phenomena. Organic acids ensure a better storage of vitamin C, increase the appetite, and play a refreshing role. Fleshy fruits (apples, pears, plums, apricots, peaches, cherries) are included in the extremely low intake food category and serve as healthy sources of fat and protein. Reduced amounts are offset by a larger diversity in proteins. Modern methods of analysis have identified at apple a number of 26 amino acids, including essential ones (which the human body can not synthesize). Large amounts of lipids and proteins are found in nuts, almonds. Minerals from fruits have particularly mineralizing role. They participate in metabolism directly or in the form of coenzyme. Vitamins penetrate the human body and adjust the general metabolic processes. Some vitamins can not be synthesized by the human body, therefore a such person is obliged to procure the daily requirement mainly through the consumption of fruits and vegetables. Tannins play a bactericidal and hemostatic role giving astringency to fruits while pectins play an emollient and laxative role and among with cellulose improves the release of gut (FAIZE şi colab., 2007; SHABI şi colab., 1979).
CHAPTER II
THE DISEASES OF PEAR

Pear diseases can be caused by different pathogens, and depending on their nature there are a number of fighting measures that can be used according to their specificity and their pedological and climatic conditions. By the nature of the causing agents and their etiology, diseases can be divided into infectious (parasitic) diseases and non infectious (physiological) ones. An important role is played by the infectious diseases, which occur mainly due to infections caused by bacteria and fungi (PÂRVU, 2000).

Powdery mildew (*Podosphaera leucotrycha*) occurs throughout all the growing season, with a high intensity during May and early June. The pathogen attacks leaves, flowers, fruits, and sometimes young shoots (ZHAO și colab., 2012; 2014; SVIRCEV și colab., 2010). The attack on young leaves appears as a whitish, then yellowish powdery which covers both sides of the leaf. This felt consists in the fungus mycelium on which develop conidiophores with conidia. Young leaves are deformed, thickened, have brittle edges and twist up into the shape of a spoon, then dry early. The fungus attacks quickly young sleeves and covers them with a mycelium. Strongly attacked sprouts bend into a hook-shaped form and dry.

Brown staining of leaves, mostly known as apple scab is caused by the fungus *Venturia pyrina* (Adersh.). (sin Endostigme pirina (Adersh.)). The parasite overwinters as: stromatic spawn in the attacked shoots; the summer conidii remain on tree branches or leaves (as asexual propagation of fungus). *Venturia pyrina* has two phases: the parasitic and saprofitic phase. It is widespread in all pear culture areas, where weather conditions are favorable. In our country is common in all pear plantations; it was studied for the first time in 1879 by Prillieux (BAICU et al., 1978). In our country the ascoospors maturation begins from January and strongly grows in the first decade of March. The emptying of periteciils starts in the first decade of April (GHEORGHEȘ, 1999).
CHAPTER III  
AIM AND OBJECTIVES

The purpose of the thesis is identifying the best technological conditions in order to ensure an optimum development of common pear rootstocks, while efficiently fighting against their pathogens, in the climatic conditions of Vâlcele, Cluj county, a representative area for the Transylvania Plain, respectively Podosphaera leucotrycha and Venturia pyrina.

The thesis objectives have aimed the following issues:

- The identification of diseases caused by Podosphaera leucotrycha and Venturia pyrina pathogens at common pear rootstock in the monitored area.
- The estimation and quantification of attack degrees for the studied pathogens depending on the performed treatments.
- The identification of the abiotic factors that influence the attack of common’s pear rootstock pathogens represented by funguses Podosphaera leucotrycha and Venturia Pyrina, their action pattern, as well as the impact of their development on the manifestation of the studied pathogens.
- The identification of best fertilizer solutions in combination with specific pesticide treatments in order to reduce the pathogens attack that causes powdery mildew (Podosphaera leucotrycha) and brown leaf blotch (Venturia pyrina) to common pear.
- The quantification of studied pathogens attack upon pear rootstock in the specific manifestation of abiotic factors within each scheme fertilization and treatment, estimation of multiple correlations between them and attack degrees in order to identify the abiotic factors with the heights influence in the occurrence and manifestation of Powderly mildew and Brown staining of leaves.
- The identification of treatment solutions combined with plant fertilizer which provide the best developmental performance, expressed as the coefficient of slenderness, at common pear rootstock.
CHAPTER IV
MATERIAL AND METHOD

The experiments were conducted in Vâlcele village, Cluj county, with coordinates 47° 04’14" N 24° 00' 0E (Fig. 5).

Fig. 5. Location of experimental field

(Source:http://www.celendo.ro/HartiJudete/Harta_Judet_Cluj_Celendo.jpg)

The experiment was organized after a bifactorial scheme, with three repetitions (Sestraș et al., 2002), over three successive years, 2013, 2014 and 2015, after an experimental design implemented after the method of randomized blocks. (Fig. 7).
CHAPTER V
RESULTS AND DISCUSSIONS

5.1. THE STUDY OF THE CLIMATIC FACTORS WITHIN EXPERIMENTAL FIELD
VÂLCELE, COUNTY OF CLUJ

According to the values highlighted by the components matrix, (Table 13), it can be seen that temperature represents the first principal component of both Factor 1 - Pathogens attack (+0,74), and also as Factor 2 - Stock development (+0,55), while, rainfall regime consists the principal component only for Factor 2 - regimul pluviometric se constituie componentă principală doar pentru Factorul 2 - Stock development (-0,62).
Components matrix

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<th>Component</th>
<th>Factors</th>
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<tr>
<td></td>
<td>Factor 1 –– Pathogens’ attack</td>
</tr>
<tr>
<td>1</td>
<td>+0.74</td>
</tr>
<tr>
<td>2</td>
<td>-0.62</td>
</tr>
<tr>
<td>3</td>
<td>-0.01</td>
</tr>
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</table>

Humidity represents an sizable component just for Factor 2 - Stock development componentă sesizabilă doar a Factorului 2 - Dezvoltarea portaltoiului (-0.59), în the component of Factor 1 - Pathogens attack, being negligible (-0.01).

5.2. THE STUDY OF THE ATTACK DEGREES OF *Podosphaera leucotrycha* AND *Venturia pyrina* IN PEAR (*Pyrus communis* L.) STOCKS FROM EXPERIMENTAL FIELD VÂLCELE, COUNTY OF CLUJ, 2013-2015

The average degrees of attack of powdery mildew, at common pear rootstock recorded in the experimental field fertilized with ash, located in Vâlcele, Cluj County, averaged throughout the experimental period 2013-2015, have different values depending on the version adopted treatment plant (Table 25). The best results were obtained when was administered treatment III, which consists of using an unconventional blend of plant protection products Oleorgan Funres. In these conditions it was registered an average of mildew attack for the period 2013-2015, equal to 1.44%.

The highest average attack degrade of powdery mildew registered at pear rootstocks fertilized with mineral fertilizer, calculated for the period 2013-2015 equal with 2.88% is reported for treatment variant I, which comprises administering the product mixture Topsin 70 WDG, Dithane M 45 and Calypso 480 SC (Table 25). Using the mixture of plant protection products Bravo 500 SC, Score 250 EC and Carbetoxy 50 EC coresponding with treatment option II, led to an average attack degree of powdery mildew of intermediate value equal to 2.21% (Table 25).
The averages and parameters of dispersion powdery mildew (Podosphaera leucotrycha), attack degree (AD, %) in pear (Pyrus communis L.) stocks, fertilized with magnetic fertilizer, in different treatment conditions, within experimental field located in Vâlcele, county of Cluj, 2013-2015

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<th>Issue/Treatment</th>
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<tbody>
<tr>
<td>n</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Mean</td>
<td>2,88</td>
<td>2,21</td>
<td>1,44</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>1,43</td>
<td>1,01</td>
<td>0,77</td>
</tr>
<tr>
<td>Standard error of mean</td>
<td>0,16</td>
<td>0,12</td>
<td>0,09</td>
</tr>
<tr>
<td>Minimum</td>
<td>0,93</td>
<td>0,62</td>
<td>0,24</td>
</tr>
<tr>
<td>Maximum</td>
<td>6,23</td>
<td>4,56</td>
<td>2,62</td>
</tr>
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</table>

I – Control – treatment with Topsin 70 WDG, Dithane M 45, Calypso 480 SC; II – Treatment with: Bravo 500 SC, Score 250 EC, Carbetox 50 CE; III Treatment with: Funres, Oleorgan.

The distribution of individual values of powdery mildew attack degree on common pear rootstock, for the entire experimental period, 2013-2015, presents specific features, regardless the applied treatment. (Fig. 15).

Fig. 15. The distribution of powdery mildew (Podosphaera leucotrycha) average attack degrees (AD, %) in pear (Pyrus communis L.) stocks, fertilized with magnetic
fertilizer, in different treatment conditions, within experimental field located in Vâlcele, county of Cluj, for the period 2013-2015

It can be noted that the highest dispersion of values for the powderly mildew attack degrees were obtained when applying the experimental phytosanitary treatment variant I, and the lowest values were obtained when applying the experimental phytosanitary treatment variant III (Table 24).

The highest average attack degree of brown staining registered at pear rootstock fertilized with mineral fertilizer, calculated for the period 2013-2015 and equal to 1.18% was reported for treatment variant III, which consisted in administering the mixture of unconventional phytosanitary treatment with Funres and Oleorgan products. (Table 41). Using the mixture of plant protection products Bravo 500 SC, Score 250 EC Carbetox and 50 EC, corresponding with treatment option II, led to an average attack degree of powderly mildew with intermediate value than previously mentioned equal to 0.92% (Table 41).

The averages and parameters of pear scab (*Venturia pyrina*), attack degree (AD,%) in pear (*Pyrus communis* L.) stocks, fertilized with magnetic fertilizer, in different treatment conditions, within experimental field located in Vâlcele, county of Cluj, 2013-2015

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<tr>
<th>Issue/Treatment</th>
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<th>III</th>
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<tbody>
<tr>
<td>n</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>Mean</td>
<td>0.58</td>
<td>0.95</td>
<td>1.18</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.61</td>
<td>0.66</td>
<td>0.77</td>
</tr>
<tr>
<td>Standard error of mean</td>
<td>0.07</td>
<td>0.07</td>
<td>0.09</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>2.14</td>
<td>2.11</td>
<td>2.98</td>
</tr>
</tbody>
</table>

I – Control – treatment with: Topsin 70 WDG, Dithane M 45, Calypso 480 SC; II – Treatment with: Bravo 500 SC, Score 250 EC, Carbetox 50 CE; III Treatment with: Funres, Oleorg
The distribution of individual values of pear scab attack degree upon common pear rootstock, for the entire experimental period, 2013-2015, presents specific features, whichever treatment applied (Fig. 25).

Fig. 25. The distribution of pear scab (*Venturia pyrina*) average attack degrees (AD, %) in pear (*Pyrus communis* L.) stocks, fertilized with magnetic fertilizer, in different treatment conditions, within experimental field located in Vâlcel, county of Cluj, 2013-2015

It can be noted that the highest spread in the attack degrees values of powder mildew appears when applying the experimental plant treatment variant III, while for the experimental variants Treatment I and II, the distribution of attack degrees was similar but limited, compared to the situation reported for phytosanitary treatment variant III (Table 41).

5.3. THE STUDY OF THE INFLUENCE OF THE CLIMATIC CONDITIONS FROM EXPERIMENTAL FIELD VÂLCELE, COUNTY OF CLUJ, DURING 2013-2015

UPON THE *Podosphaera leucotrycha* AND *Venturia pyrina* ATTACK IN PEAR (*Pyrus communis* L.) STOCKS

Given the conditions for this present study conducted in Vâlcele, County of Cluj during the month of April to September, over three successive years, namely 2013, 2014...
and 2015, climate issues have presented specific features. According to the factor analysis applied to climatic factors with an potential impact in the manifestation of powdery mildew (*Podosphaera leucotrycha*) and pear scab (*Venturia pyrina*) at pear rootstock (*Pyrus communis* L.), namely temperature, humidity and rainfall, temperature and rainfall have a significant influence. The manifestation of these climatic factors can play a decisive role not only in forecasting the emergence, but also in regulating the intensity and frequency of attack degrees of powdery mildew (*Podosphaera leucotrycha*) and pear scab (*Venturia pyrina*) at common pear rootstock (*Pyrus communis* L.).

For this reason, it is important that in the whole experimental area, in our case, the one located in Vâlcele, Cluj county, not only to establish, but to also predict the amplitude of the interactions between the specific pathogens, temperature and rainfall. In our research we established both the quantification of interactions but also the prediction for the pathogens attack, namely powdery mildew (*Podosphaera leucotrycha*) and black staining of leaves (*Venturia pyrina*) on pear rootstock (*Pyrus communis* L.) depending on temperature and rainfall.


The distribution of individual values of pear rootstock coefficients of slenderness fertilized with magnetic fertilizer expressed as multiannual average for all experimental treatment variants presents, similar to annual developments, a normal distribution (Fig. 53). Through all experimental variants corresponding to different phytosanitary treatments normal dispersions are recorded, similar in amplitude (Fig. 53).

The highest average coefficient of slenderness from the experimental period 2013-2015, in terms of ash fertilization is reported for treatment option (Var 226) consisting of a mixture of conventional products Topsin 70 WDG, Dithane M 45, Calypso 480 SC equal to 5.05 ± 0.18. This is followed by the registered experimental variant (Var 227) which consists of mixture of conventional products Bravo 500 SC score 250 EC, 50 EC
Carbetox equal to 4.27 ± 0.47 (Fig.). The lowest average coefficient of slenderness was records for the experimental variant (Var 228) treated with the mixture of unconventional plant protection products Oleorgan Funres, being equal to 3.23 ± 0.12. (Fig. 53).

Fig. 53. The distribution of average coefficients of slenderness in pear (*Pyrus communis* L.) stocks, fertilized with magnetic fertilizer, in different treatment conditions, within experimental field located in Vâlcele, county of Cluj, 2013-2015

The Cluster analysis applied to the slenderness coefficients in the period 2013-2015 indicates that there are two main clusters (Fig. 54).

One cluster is composed of one branch and corresponds to the experimental treatment and fertilization variant (Var 220) which led to the best results, namely the highest average annual slenderness coefficient equal to 5.27. It consists in ash fertilization and the administration of phytosanitary treatment option with the mixture of Topsin 70 WDG, Dithane M 45 and Calypso 480 SC (Fig. 54). The second cluster is divided into several subclusters, corresponding to the variants with inferior results obtained in the specific experimental conditions which include the three types of phytosanitary treatments and the three types of fertilization (Fig. 54).

Fig. 54. The cluster analysis applied to pear stocks slenderness coefficients, 2013-2015

In this framework are highlighted the technological combinations with the lowest efficiency for common pear rootstock expressed as the slenderness coefficient (Fig. 54). They are represented in the subclusters containing the experimental variants:

- Var 228, fertilization with magnetic fertilizer and unconventional phytosanitary treatment with product mix of Oleorgan and Funres, for which was reported an multiannual average slenderness coefficient equal to 3.23;

- Var 225, fertilization with mineral fertilizers N\(_{15}\)P\(_{15}\)K\(_{15}\) and phytosanitary treatment with unconventional mixture of ecologic products Funres and Oleorgan, for which was reported an multiannual average slenderness coefficient equal to 3.68;
• Var 222, fertilization with ash and phytosanitary treatment with unconventional mixture of ecologic products Funres and Oleorgan, for which was reported an multiannual average slenderness coefficient equal to 3.71.

If we analyze the entire experimental period, it appears that best developmental traits for pear rootstock were obtained when using ash fertilization as technological solution in all treatments variants This is proven by the multiannual average values recorded by the slenderness coefficients. (Fig. 58).

The highest average coefficient of slenderness was recorded under ash fertilization and phytosanitary treatment with the mixture of conventional products Topsin 70 WDG, Dithane M 45, Calypso 480 SC, being equal to 5.27 (Fig. 58).

The lowest results were recorded when using fertilization with magnetic fertilizer, in which resulted the lowest average multiannual slenderness coefficients from the experiment, for all phytosanitary treatment variants with conventional plant protection products Topsin 70 WDG, Dithane M 45, Calypso 480 SC, respectively Bravo 500 SC, Score 250 EC, and Carbetox 50 EC, as well as the lowest value for the entire experimental plot equal to 3.23 for the treatment variant performed with combinations of unconventional plant protection products Funres and Oleorgan (Fig. 58).
Fig. 58. The evolution of the average coefficients of slenderness of pear (*Pyrus communis* L.) stocks, fertilized with ash, in different treatment conditions, within experimental field located in Vâlcele, county of Cluj, by entire experimental period 2013-2015

Intermediate values for the slenderness coefficient of pear rootstock were recorded for mineral fertilization with N<sub>15</sub>P<sub>15</sub>K<sub>15</sub> for which the condition of applying the phytosanitary treatment with the mixture of conventional products Bravo 500 SC Score 250 EC, Carbetox 50 CE a value equal to 4.24 was recorded, very close to the maximum of this experimental variant, respectively 4.26 reported for ash fertilization.(Fig. 58).
CHAPTER VI
CONCLUSIONS

Following the investigations related to the influence of phytosanitary treatments upon the attack of powderly mildew and pear scab, under the experimental conditions of the Vâlcele area, Cluj County, a series of conclusions were drawn:

1. The climatic factors with the greatest influence in the attack manifestation of Podosphaera leucotrycha and Venturia pyrina at pear rootstock are temperature and rainfall, in the climatic conditions of the Vâlcele area, Cluj county, according to the factor analysis performed by applying algorithms specific to the Analysis of Principal Components (APC).

2. In the fight against powderly mildew the weakest results were recorded in terms of ash fertilization and phytosanitary treatment with the mixture of conventional products Topsin 70 WDG, Dithane M 45 and Calypso 480 SC. In this case was recorded the highest average degree of attack of powderly mildew equal to 3.58. The most effective technological solutions in order to fight against powderly mildew at pear rootstock consisted in administering magnetic fertilization combined with the phytosanitary treatment of unconventional products Funres and Oleorgan, followed by mineral fertilization combined with unconventional phytosanitary treatment with Topsin 70 WDG, Dithane M 45 and Calypso 480 SC and followed by Bravo 500 SC, Score 250 EC and Carbetsol 50 EC combined with fertilization magnetic. In these conditions the lowest levels of attack degree by the pathogen Podosphaera leucotrycha were recorded, respectively 1.44%, 1.74%, 1.96% and 2.21%.

3. Regarding the fight against pear scab, similar to the situation recorded at powderly mildew, the weakest results were recorded in terms of ash fertilization and phytosanitary treatment with conventional products Topsin 70 WDG, Dithane M 45 and Calypso 480 SC, the average multiannual degree of infection with Venturia pyrina recorded in these technological conditions had the highest value, being equal to 1.93%. Most effective combat solutions for pear scab are in the case of using magnetic fertilizer among with phytosanitary treatments with
conventional products Topsin 70 WDG, Dithane M 45 and Calypso 480 SC and Bravo 500 SC, Score 250 EC, and Carbetox 50 EC and mineral fertilizers combined with variable magnetic fertilization treatment option fitosnitar N15P15K15 treatment plant combined with Bravo 500 SC score Carbetox 250 EC and 50 EC. For the above mentioned experimental conditions, have resulted in the lowest degree of infection of the leaf brown staining, respectively, 0.58%, 0.95% and 0.94%.

4. Between the degrees of attack of powderly mildew and the most important climatic factors in its manifestation, temperature and rainfall, multiple average correlations were identified. In exchange, between the degrees of attack of pear scab and the most important climatic factors in its manifestation, meening temperature and rainfall, were identified only multiple weak correlations. This consists an important prerequisite for predictig the intensity and frequency of attacks at pear rootstock manely at Podosphaera leucotrycha and less at Ventura pyrina and to adopt the best fighting strategies.

5. Regarding the influence of fertilization and phytosanitary treatments in specific climatic conditions of Vâlcele area, Cluj county, upon the experiment period (April-September, 2013 to 2015) on the development of pear rootstock, expressed as the coefficient of slenderness, demonstrates that:

- In each experimental year, from 2013-2015, the distribution of the slenderness coefficients at pear rootstock is normal for all variants of fertilization and phytosanitary treatment against powderly mildew and pear scab.

- Between the vast majority of slenderness coefficients corresponding to the experimental variants, there are no significant differences assured statistically at the 5% threshold, neither for their annual analysis, and whether it analysis the entire experimental period, 2013-2015. By considering the entire experimental period it is found that there is only one statistically significant difference at 5% significance threshold equal to 0.45, when practicing the unconventional treatment with Oleorgan Funres, between the average slenderness coefficient of for the entire xperimental period 2013-2015.
corresponding to the mineral fertilization variant \( \text{N}_{15}\text{P}_{15}\text{K}_{15} \) and the one obtained by applying magnetic fertilization.

- The cluster analysis highlights the best technological solution for treatment and fertilization, which ensures an optimal development of pear rootstock namely the use of ash fertilization while administering the treatment option I Topsin 70 WDG, Dithane M 45 and Calypso 480 SC, for which the highest annual average slenderness coefficient was reported equal to 5.27. As well were identified the technological solutions that lead to the worst performance in terms of unconventional treatment with Oleorgan and Funres: □ fertilized with magnetic fertilizer led to a multiannual slenderness coefficient of 3.23; □ fertilized with mineral fertilizer \( \text{N}_{15}\text{P}_{15}\text{K}_{15} \), slenderness coefficient of 3.68; □ fertilized with ash, slenderness coefficient of 3.71.

* * *

- In terms of combating pear scab best desirable fertilization is using magnetic fertilizer in combination with phytosanitary treatment Funres and Oleorgan and Bravo 500 SC Score 250 EC and Carbetox 50 EC as well as mineral fertilization \( \text{N}_{15}\text{P}_{15}\text{K}_{15} \) in combination with the mixture of conventional plant protection products Bravo 500 SC Score 250 EC and Carbetox 50 EC.

- Monitoring the temperature and rainfall in the concerned area in order to forecast the pathogens attack that causes powdery mildew and pear scab on pear rootstock in order to adopt of the most appropriate methodology of prevention and combat.

- In order to obtain better performance in the developing traits of pear rootstock it is recommended to apply technological solutions which provide ash fertilization and phytosanitary treatment with the mixture of Topsin 70 WDG, Dithane M 45 and Calypso 480 SC.
REFERENCES


