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RESEARCH ON DISEASES AND PESTS DETECTED IN THE FRUIT TREE SPECIES IN BUCHAREST

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Abstract

The work is inspired by the concerns of biologist and botanist Traian Săvulescu (1889-1963), founder of the Romanian School of Phytopathology, who in 1928 founded the annual publication Phytosanitary condition in Romania, which presented the manifestation of various diseases in many host plant species, the first publication of this type in the world, followed by similar publications in the United States, Germany, and the Netherlands. Later, the entomologist Constantin Manolache (1906-1977), together with various collaborators, began to publish the situation of animal pests of plants grown in Romania. Both Traian Săvulescu and Constantin Manolache were teachers at the "Nicolae Bălcescu" Agronomic Institute in Bucharest. Fruit tree biodiversity is crucial for nutrition and ecosystem resilience around the world. Phytopathogenic and entomological biodiversity is of particular importance because diseases and pests of fruit trees cause significant loss of quality and quantity. Phytosanitary control plays an important role in reducing these losses. This paper presents the diseases and pests detected in fruit tree species in the experimental field of the Faculty of Horticulture-UASVM Bucharest, during the vegetation period of 2020 and 2021.

Key words*: fruit trees; biodiversity; diseases; pests.*

INTRODUCTION

The domestication of fruit trees took place several millennia after that of cereals and pulses (Janick, 2005; Zohary and Hopf, 2000).

Although domestication of fruit trees has received far less attention than that of annual crop plants, their significance as food sources in ancient times should not be underestimated. (Goldschmidt, 2003).

The domestication in the context of horticulture represent a "major positive change in the edibility of a wild, non-palatable fruit brought about by a rare genetic event that would disappear without human intervention" (Kislev et al., 2006).

Fruit trees can withstand the variability of rainfall better than annual crops due to the deep root systems and the perennial growth habit. Diversification into fruit tree-based systems generates high returns to the farmer and creates opportunities for value addition and avenues for employment creation at the village level (Dhyani et al., 2013).

In Romania, the cultivation of fruit trees has been practiced since immemorial time. The first information about the cultivation of fruit trees can be found in the language of our Daco-Roman ancestors. Historical sources specify that during the Roman rule, the economic base of Dacia was "cereal production, cattle breeding and fruit growing" (Baciu A.A., 2005).

Fruits are essential products for a rational diet, regardless of the age of the population. They are most often consumed as the plant produces them (without a culinary or industrial preparation). Following the processing of fruits (cooked foods, compotes, jams, jellies, etc.) the initial value decreases, the content of vitamins is reduced, etc. (Ropan, 2000).

The nutritional value of fruits is given by their chemical composition, in forms easily accessible to the human body, to which are added various olfactory, visual and gustatory stimulants (Sumedrea et al., 2011).

Diseases and pests of fruit trees cause significant loss of quality and quantity. Phytosanitary control plays an important role in reducing these losses. Identification of pathogens and pests in different areas of Romania is a permanent goal for phytopathological and entomological scientific activity in our country (Istrate et al., 2006;

Istrate et al., 2019; Paraschivu et al., 2010; 2021; Popa et al., 2013; Zală, 2021). Some pathogens can develop high epidemics in Romania depending on its virulence and the susceptibility of the host plant (Paraschivu Mirela et al., 2015). Correct diagnosis of pathogens and pest is the primary requirement in any integrated management practice.

Traian Săvulescu in 1928 founded the academic journal Phytosanitary Status in Romania, which presented the symptoms of various diseases in many host plant species, the first publication of this type in the world, followed by similar publications in the United States, Germany, and the Netherlands. Later, the entomologist Constantin Manolache (1949), together with various collaborators, began to publish the situation of animal pests of plants grown in Romania. Taking the example of the forerunners, we also want to present what are currently the diseases and pests, in this case, in the fruit tree species in Bucharest.

Biodiversity refers to the diversity in living organisms in an area (Altieri, 1999).

Biodiversity represents an important factor of ecosystem stability and productivity (Tilman et al., 2014).

The various phytopathogenic microorganisms along with harmful insects are the most important component of the biodiversity of an orchard, on which depends, to some extent, ensuring food security. Abiotic factors, especially temperature and rainfall, have a decisive effect on orchard biodiversity.

In the context of sustainable agriculture, the recommended doses have been observed in the preventive and curative application of fungicides and insecticides, in an integrated management system, thus respecting the criteria imposed by the European Union, by the 2009/189 Directive: establishing a framework for Community action to achieve the sustainable use of pesticides, so that plant protection products must not have harmful effects on human or animal health and must not have unacceptable effects on the environment.

MATERIALS AND METHODS

The research was carried out in the fruit tree species in the experimental field of the Faculty of Horticulture - USAMV of Bucharest.

The observations were made on three species of seed trees of the Rosaceae family: apple, pear, quince and on six species of stone trees: cherry, sour cherry, apricot, plum, nectarine, peach.

They were noted 10 varieties of apple, 7 varieties of pear, 3 varieties of quince, 11 varieties of plum, 6 varieties of cherry, 5 varieties of sour cherry, 2 varieties of apricot, 7 varieties of nectarine and peach.

Visual observation is the fastest method to identify diseases and pests based on symptoms shown by infected fruit tree species.

For the flying insects were used the glue traps (Figure 1).

Scouting for diseases and pests attack has a particular importance in fruit tree species to establishing the attack value during the vegetation season.

Figure 1. Glue traps

The attack value is represented by frequency (F%), intensity (I%) and attack degree (AD%).

Frequency is the percentage of leaves or fruits attacked out of 100 examined leaves or fruits.

The intensity, visually estimated, indicates the degree to which the leaf or fruit is attacked. The intensity was noted directly in percentage. The attack degree present severity of disease or pest in the crop and was calculated using the frequency (disease incidence) and intensity (severity). Attack degree was calculated using the formula: A.D. (%) = F (%) x I (%)/100.

The period analysed in this study was 2020-2021. For scouting optimization and for the observation of the climatic conditions necessary for the appearance and development of the disease, precipitation, wind speed and temperatures were taken into account (Paraschivu et al., 2020).

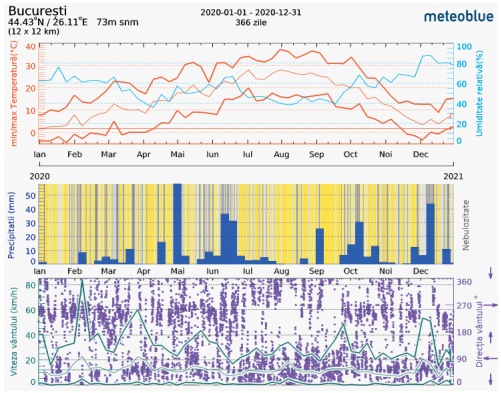

Figure 2. Climate parameters registered in 2020 in Bucharest (source:https://www.meteoblue.com/ro/vreme/historyclimate/weatherarchive/bucurești_românia_ year=2020)

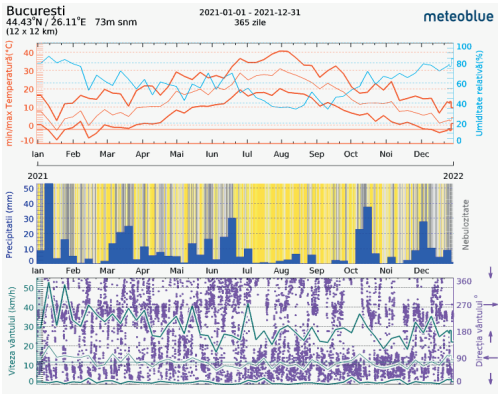

Figure 3. Climate parameters registered in 2021 in Bucharest (source:https://www.meteoblue.com/ro/vreme/historyclimate/weatherarchive/bucurești_românia_ year=2021)

The phytosanitary treatments applied in 2020 can be found in Table 1.

Table 1. Phytosanitary treatments applied in 2020

Date	Species	Product
31.01.	All species	Ovipron Top-1.5%
06.03.	Apple	Boedeaux mixture-0,5%+Confidor Energy-0.06%
18.03.	Nectarine, Peach	Syllit-0,2%+Dithane-0.2%+ Calypso-0,02%
	Apple, Pear, Quince	Calypso-0,02%+Luna experience-0.05%
	Cherry, Sour Cherry, Apricot, Plum, Walnut	Novadim progress-0.1%+ Dithane-0.2%
05.04.	Cherry, Sour Cherry, Apricot, Plum, Walnut, Nectarine, Peach	Calypso-0,02%+Luna experience-0.05%+ Syllit-0,2%+Dithane-0.2%
	Apple, Pear, Quince	Aliette-0,2%+ Microthiol-0,5%+Envidor-0.04%
03.05.	Cherry, Sour Cherry, Apricot, Plum, Walnut, Nectarine, Peach	Calypso-0,02%+ Syllit-0,2%+ Nissorun-0.03%+Topsin-0.07%
	Apple, Pear, Quince	Topsin-0.07%+ Nissorun-0.03%+Prev-Am-0.6%+Nurelle-0.08%
18.05.	Cherry, Sour Cherry, Apricot, Plum, Walnut, Nectarine, Peach	Luna experience-0.05%+ Syllit-0,2%+Envidor-0.04%+ Cropmax-0.3%
	Apple, Pear, Quince	Microthiol-0,5%+Flipper-0.2%
10.06.	Cherry, Sour Cherry, Apricot, Plum, Walnut, Nectarine, Peach	Calypso-0,02%+ Syllit-0,2%+ Luna experience-0.05%+ Zeamă Bordeleză-0,5%
	Apple, Pear, Quince	Nurelle-0.08%+ Nissorun-0.03%+ Microthiol-0,5%+Flint plus-0.15%
03.07.	Apple, Pear, Quince	Flipper-0.2%+ Luna care-0.3%+Furry-0.02%
	Cherry, Sour Cherry, Apricot, Plum, Walnut, Nectarine, Peach	Alcupral-0.5%+ Furry-0.02%
10.08. 21.08.	Apple, Pear, Quince	Alcupral-0.5%+Copfort-0.25%+Microfort-0.25%
13.11.	All species	Zeamă Bordeleză-2%

The phytosanitary treatments applied in 2021 can be found in Table 2.

Table 2. Phytosanitary treatments applied in 2021

Date	Species	Product
03.03.	Cherry, Apple, Sour Cherry	Ovipron Top-1,5%
26.03.		Zeamă Bordeleză-0,5%+ Microthiol-0,5%
	Nectarine, Peach	Zeamă Bordeleză-0,5%+Syllit-0,2%+Calypso-0,02%
	Apricot, Plum, Pear, Quince, Walnut	Zeamă Bordeleză-0,5%+ Calypso-0,02%+Teldor-0,08%
16.04.	Apple	Calypso-0,02%+Luna experience-0.05%
	Apricot	Calypso-0,02%+Luna experience-0.05%+Dithane-0,2%
23.04.	Nectarine, Peach, Apricot	Dithane-0,2%+Funguran-0.04%+Kerafol-0.3%
07.05.	Pear, Apple, Walnut	Luna experience-0.05%+Aliette-0,2%+Movento-0,75%+Cropmax-0.3%
	Nectarine, Peach, Apricot, Plum, Cherry, Sour Cherry	Movento-0,75%+Cropmax-0.3%+Alcupral-0.5%+Envidor-0.04%
12.05.	Pear, Quince, Apple, Walnut	Aliette-0,2%
15.06.	Cherry, Apple, Apricot, Plum, Sour Cherry, Nectarine, Peach	Super Fifty-0.5%+Prev-Am-0.6%+Microthiol-0.5%+Zeamă Bordeleză-0,5%+ Nissorun-0.03%
24.06.	Nectarine, Peach Apricot, Plum	Super Fifty-0.5%+ Zeamă Bordeleză-0,5%+Kerafol-0.3%+ Microthiol-0,5%+Garex-0.2%+Mimox-0.3%
	Pear, Apple, Quince, Walnut	Super Fifty-0.5%+Luna care-0.3%+ Envidor-0.04%+OmyraPro Calcium-0.5%

07.07.	Sour Cherry, Cherry Peach, Nectarine, Apricot, Plum	Super Fifty-0.5%+ Kerafol-0.3%+ Zeamă Bordeleză-0,5%+ Garex-0.2%+ Prev-Am-0.6%
	Pear, Apple, Quince, Walnut	Super Fifty-0.5%+ Kerafol-0.3%+ OmyraPro Calcium-0.5%+ Microthiol-0,5%+Decis-0.25%
27.10.	All species	Zeamă Bordeleză-2%

Samples of crop units (leaves and fruits) were taken randomly from every fruit tree variety from 4 points of the crown. In each point, 100 leaves were noted.

The apple (*Malus pumila* Mill.) varieties studied were: Enterprise, Braeburn, Florina, Red Elstar, Florina, Jonafree, Redcats, Goldcats, Suncats and Starcats.

The pear (*Pyrus comunis* L.) varieties studied were: Conference, Abatele Fetel, General Leclerc, Williams, Red Favoritka, Red Williams and Untoasă Bosc.

The quince (*Cydonia oblonga* Mill.) varieties studied were: Ekmek, Tinella and Bereczki.

The cherry (*Prunus avium* L.) varieties studied were: George, Ludovic, Bucium, Van, Regina and Vega.

The sour cherry (*Prunus cerasus* L.) varieties studied were: Pandy, Northstar, De Botoșani, Nana and Productiv de Debretin.

The plum (*Prunus domestica* L.) varieties studied were: Anna Späth, Stanley, Silvia, Centenar, Amers, President, Bluefree, Empress, Pescăruș, Grossa di Felisio and Ruth Gestetter.

The peach (*Prunus persica* L.) varieties studied were: Lucius, Gladys, Red Top, Sweet Dream, Royal Glory, Cardinal, and Springbelle.

The nectarine (*Prunus persica* var. *nucipersica* L.) varieties studied were: Honey Late, Nectaross, Stark Red Gold, Honey Royale, Big Top, Big Fire and Nectabelle.

The apricot (*Prunus armeniaca* L.) varieties studied were: Farbali and Farely.

RESULTS AND DISCUSSIONS

Taphrina deformans have been present in peach and nectarine since the end of March; in early April, *Podosphaera leucotricha* appeared on young apple shoots, *Monilinia laxa* made its presence felt on apricot stem; in May, *Monilinia laxa* appeared on the stem and fruits of the cherry, *Hyalopterus pruni* and *Grapholita funebrana* appeared on the plum, *Myzus cerasi* on the cherry, *Plum-pox* virus appeared on the leaves of some plum and apricot varieties, and on the apple *Dysaphis plantaginea*; In June, the few adults of the *Rhagoletis cerasi* were caught on the glue traps, *Erwinia amylovora* caused the burning of the pear leaves, *Xanthomonas arboricola* pv. *juglandis* on walnut stem and fruits, and on cherries *Monilinia laxa* on leaves and fruits; in July *Monilinia laxa* appeared on peach and apricot fruit, *Epitimerus pyri* on leafs and fruits of pear, *Eriophyes erinea* on leafs of walnut, *Wilsonomyces carpophilus* on peach and nectarine leaves, and *Quadraspidiotus perniciosus* on apple fruit; in August, *Monilinia fructigena* on apple fruits and *Monilinia linharthiana* on quince fruit.

The attack degree of powdery mildew on apple was highest in the Redcats variety - 2.2% in 2020 (Table 3). Varieties Enterprise, Braeburn, Florina, Red Elstar, Florina and Jonafree showed no symptoms of powdery mildew.

Some apple fruits of varieties Redcats and Goldcats showed characteristic symptoms of purplish red colour of *Quadraspidiotus perniciosus* attack. Also on varieties Redcats and Goldcats we found some leaves curled downwards and brown-reddish as a result of the attack by *Dysaphis plantaginea*.

Among the pear varieties researched only at the Conference, the fire blight was manifested.

Some leaves reddish to yellowish green blisters and deformed fruits caused by *Epitimerus pyri* were detected in the variety Abatele Fetel.

The attack degree of brown rot of quince fruit was highest in the Tinella variety-1.9% in 2021.

Regarding the peach leaf curl attack, the highest values - 12.0%, in 2021, were recorded for the Gladys variety, and the lowest - 4.0%, in 2020, for the Springbelle variety. In the Cardinal variety, we did not find any symptoms of leaf curl. Also in peach, in two of the researched varieties we reported the presence of brown fruit rot, with the highest attack, of 5.4% in 2021, in the Springbelle variety and symptoms typical of shot hole disease, in two other varieties, with the highest attack-4.6%, in 2021, for the Cardinal variety.

In nectarine of the seven varieties analysed, in three (Honey Late, Nectaross and Nectabelle) we found symptoms of leaf curl, with the highest degree of attack-10.8% in 2020 in the Nectabelle variety and two other varieties (Big Top and Big Fire) presented brown rot on some fruits. Stark

Red Gold and Honey Royale varieties showed no symptoms of disease.

Brown rot of apricot fruit showed the highest degree of attack - 4.5% in 2021 for the Farbali variety, and the lowest - 3.8% in 2020 for the Farely variety. Mild light green discoloration bordering the leaf veins (vein yellowing) or yellow to light green rings, typical of *Plum-pox potyvirus* infection, could be observed on some leaves of both varieties.

Table 3. Note the attack of diseases on the varieties that showed symptoms

Orchard	Varieties	Disease/scouting/year					
		F (%)		I (%)		A.D. (%)	
		2020	2021	2020	2021	2020	2021
		Powdery mildew					
Apple	Redcats	22.5	18.0	9.7	9.3	2.2	1.7
	Goldcats	17.75	14.5	8.6	7.9	1.5	1.1
	Suncats	14.25	11.5	9.3	8.5	1.3	1.0
	Starcats	9.5	7.25	7.6	7.3	0.7	0.5
	Brown rot of fruit						
	Florina	3.75	4.25	19.4	21.8	0.7	0.9
Pear	Fire blight						
	Conference	5.75	7.0	68.2	87.3	3.9	6.1
Quince	Brown rot of fruit						
	Ekmek	2.75	3.5	39.9	40.1	1.1	1.4
	Tinella	3.25	4.0	45.8	46.6	1.5	1.9
	Bereczki	2.25	3.25	34.3	36.2	0.8	1.2
Peach	Leaf curl						
	Lucius	11.25	12.0	82.3	82.5	9.3	9.9
	Gladys	12.75	14.0	85.1	85.6	10.9	12.0
	Red Top	12.5	13.5	84.4	85.0	10.6	11.5
	Sweet Dream	9.5	10.5	77.8	78.7	7.4	8.3
	Royal Glory	8.75	10.0	77.6	78.2	6.8	7.8
	Springbelle	5.25	6.0	77.2	77.9	4.0	4.7
	Brown rot of fruit						
	Sweet Dream	4.25	4.75	95.5	98.1	4.1	4.7
	Springbelle	4.75	5.5	95.8	98.9	4.6	5.4
	Shot hole disease						
	Cardinal	52.5	55.1	7.43	8.4	3.9	4.6
	Gladys	27.25	30.5	6.8	7.2	1.9	2.2
Nectarine	Leaf curl						
	Honey Late	8.75	9.0	78.8	79.2	6.9	7.1
	Nectaross	11.5	12.0	80.2	80.4	9.2	9.6
	Nectabelle	13.25	13.0	81.4	81.7	10.8	10.6
	Shot hole disease						
	Big Top	31.25	32.5	8.5	8.8	2.7	2.9
	Big Fire	28.75	29.5	7.6	8.1	2.2	2.4
Apricot	Brown rot of fruit						
	Farbali	4.75	5.0	90.2	90.5	4.3	4.5
	Farely	4.25	4.5	88.8	89.1	3.8	4.0
Plum	Brown rot of fruit						
	Stanley	6.25	6.75	89.9	90.2	5.6	6.1
	Centenar	4.25	4.75	87.3	87.5	3.7	4.2
	President	6.75	7.0	90.2	91.1	6.1	6.4
Cherry	Moniliosis of blossoms, buds, leaves and twigs						
	George	10.5	11.5	16.2	17.1	1.7	2.0
	Ludovic	11.25	12.5	17.5	18.0	2.0	2.3
	Bucium	10.25	11.0	15.1	15.9	1.5	1.7
	Van	9.75	10.5	12.6	13.8	1.2	1.4
	Regina	8.5	10.0	9.4	11.2	0.8	1.1
	Vega	11.5	12.5	18.7	19.9	2.2	2.5
	Brown rot of fruit						
	All varieties	-	90	-	100	-	90
Sour Cherry	Moniliosis of blossoms, buds, leaves and twigs						
	Pandy	2.25	3.5	6.7	7.3	0.2	0.25
	Noerthstar	2.0	2.5	6.6	7.1	0.13	0.17
	De Botoşani	0.5	1.0	5.0	5.4	0.03	0.05
	Nana	6.5	7.0	9.3	9.5	0.6	0.66
	Productiv de Debretin	1.25	2.0	6.1	6.6	0.08	0.13

Of the 11 plum varieties, only 3 (Stanley, Centenary and President) had fruit with brown rot. Of these, the highest degree of attack was manifested by the President variety: 6.1% in 2020 and 6.4% in 2021. Several leaves with symptoms typical of *Plum-pox potyvirus* infection have been reported in the Centenary variety. Also at the Centenary variety we discovered *Hyalopterus pruni* colonies underside of the leaves. Some fruits of the Pescăruș variety showed entrance holes and exude gum caused by the attack of *Grapholita funebrana* larvae. The plum varieties Anna Späth, Silvia, Amers, Bluefree, Empress, Grossa di Felisio and Ruth Gestetter did not show any disease or pest attack.

The attack of the *Monilinia laxa* fungus caused the wilting of flowers, buds, leaves and a portion of the twigs in spring, both on cherries and sour cherries; higher attack values are marked on the cherry. A few colonies of *Myzus cerasi* could be seen at the top of the shoots of the George variety.

CONCLUSIONS

The sporadic presence of bacterial burn and walnut erinosis was also noted.

Diseases and pests were detected under conditions of natural infection under the influence of climatic conditions during the vegetation period of the two years of studies.

Despite the application of phytosanitary treatments, the appearance of the typical symptoms of the attack of pathogens and harmful insects is attributed to the sensitivity of the varieties in which they were encountered. In view of the results obtained, it may be advisable to use other plant protection products for the species of fruit tree species in which we have encountered diseases and pests, which could

have a better action against the complex of diseases and pests.

In 2020 the degree of attack was higher for apple powdery mildew, rosy apple aphid and San José scale, pear and walnut leaf blister mite, the plum fruit moth, cherry fruit fly and cherry aphid.

In 2021 the degree of attack was higher for leaf curl of peach and nectarine, shot hole disease of apricot, plum, peach and nectarine, walnut blight, fire blight of pear, moniliosis or brown rot of stone fruits: cherry, sour cherry, plum, apricot, peach; brown rot of apple and quince. Practically, the almost continuous presence of rainfall during the ripening of cherries has led to a total compromise of production in all varieties. The attack of the detected insects was sporadic.

The highest frequency was recorded in the attack of *Taphrina deformans* fungus, and the highest intensity of a disease was caused by brown rot of stone fruit.

Among the microorganisms that made up the phytopathogenic biodiversity were a virus, two bacteria and six fungus and entomological biodiversity was represented by eight species of insects.

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REFERENCES

Altieri, M.A. (1999). The ecological role of biodiversity in agroecosystems. *Agriculture, ecosystems & environment*, 74(1): 19-31.

Baciu, A.A. (2005). *Pomicultura generală.* Ed. Universitaria, Craiova.

Dhyani, S.K., Handa A.K., Uma. (2013). Area under agroforestry in India: An assessment for present status and future perspective. *Indian J. of Agroforestry*, 15(1):1-11.

Goldschmidt, E.E. (2003). The Evolution of Fruit Tree Productivity: A Review. *Econ. Bot*., 67(1): 51–62.

Istrate, R., Rădescu, M. (2005). The dynamics of *Rhagoletis cerasi* L. (cherry fly) in cherry and sour cherry orchards from the Bucharest area in 2004. The works of the 7th National Conference on Environmental Protection through Biotechnologies and the 4th National Conference on Ecosanogenesis, with international participation, Braşov.

Istrate, R., Manole, M.S.; Clinciu Radu, R.A. (2019). Ecological aspects regarding biodiversity of micoflora and fauna from cherry and sour cherry orchards from USAMV-Bucharest, *Lucrări Ştiinţifice Seria Agronomie*, vol. 62(1):45-48.

Kislev, M.E., Hartmann, A., Bar-Yosef, O. (2006). Early domesticated fig in the Jordan valley. *Science*, 312:1372–1374.

Manolache, C., Panin, S., Săvescu, A., Bucşan, I., Manolache, Fl., Hrisafi, C. (1949). Situația dăunătorilor animali ai plantelor cultivate în anul 1947-1948. *ICAR*, nr. 4.

Paraschivu, Mirela; Partal, Elena; Paraschivu, A.M. (2010). The influence of sowing time to the evolution of *Pyrenophora tritici-repentis* to a set of winter wheat varieties in Ards Șimnic area. *Annals of the University of Craiova-Agriculture, Montanology, Cadastre Series*. Vol.40(1):142-147.

Paraschivu, Mirela; Cotuna, Otilia; Paraschivu, M.; Durau, Carmen Claudia; Damianov, Snejana. (2015). Assesment of *Drechslera tritici repentis* (Died.) Shoemaker attack on winter wheat in different soil and climate conditions in Romania. European Biotechnology Congress the 20th August 2015, Bucharest, Journal of Biotechnology, Volume 208, p. S113.

Paraschivu, Mirela; Ciobanu, A.; Cotuna, Otilia; Paraschivu, M. (2020). Assessment of the bacterium *Erwinia amylovora* attack on several pear varieties (*Pyrus communis* L.) and the influence on fruits sugar content. Agricultural Sciences & Veterinary Medicine University, Bucharest. *Scientific Papers. Series B. Horticulture*, vol LXIV, no.1:163-168.

Paraschivu, Mirela; Cotuna, Otilia; Paraschivu M., Ciobanu, A., Cătălin Oltenacu, C.V., (2021). Infection of Erwinia amylovora on different apple varieties and the impact on fruits quality. *Scientific Papers. Series B, Horticulture*. Vol. LXV, No. 1: 219-227.

Ropan, G. (2000). *Pomicultură generală*, Editura AcademicPres, Cluj-Napoca.

Săvulescu, T.; Sandu-Ville, C.; Săvulescu, Alice-Aronescu; Hulea, A.; (1940). Starea fitosanitară în România în anul 1937-1938. *ICAR*, nr. 62.

Sumedrea, D., Sumedrea, Mihaela (2011). *Pomicultură generală*. Ed. Invel Multimedia, Ilfov.

Tilman, D., Isbell, F., Cowles, J. M. (2014). Biodiversity and ecosystem functioning. *Annual Review of Ecology, Evolution, and Systematics*, 45: 471-493.

Zală, C.R. (2021). First report of loose smut - *Ustilago syntherismae* (Schweinitz) Peck on *Digitaria sanguinalis* (L.) scop. in Bucharest-Romania. *Scientific Papers. Series A. Agronomy*, Vol. LXIV, No. 1: 632-637.

*Directiva 2009/128/CE a Parlamentului European și a Consiliului din 21 octombrie 2009 de stabilire a unui cadru de acțiune comunitară în vederea utilizării durabile a pesticidelor.

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