Studii şi Cercetări	Martie 2021	Biologie	30/1	69-74	Universitatea"Vasile Alecsandri" din Bacău

PLANT PESTS AND DISEASES IN SOME VEGETABLES CULTURES FROM VEGETABELE RESEARCH AND DEVELOPMENT STATION FROM BACAU

Tina Oana Cristea, Gabriel-Alin Iosob, Alexandru Bute, Dan-Ioan Avasiloaiei, Daniela Bouruc

Key words: *key pests, pest and disease, pest management, vegetables*

INTRODUCTION

In order to establish the most appropriate measures to prevent infections and combat diseases and pests from vegetable cultures a screening of plant pests and diseases in vegetable crops from VRDS Bacau was accomplished. The special importance is given by determining the causes that lead to diseases and the appearance of pests to cultivated plants (Abang et al. 2014; Hasyim, Setiawati, and Sutarya 2014; Damte and Tabor 2015). Exogenous causes are grouped in abiotic causes (Kadioglu et al. 2012), producing physiological diseases (physiopaths, non-influenza diseases, non-harrasing diseases) and biotic causes, which cause infectious diseases (pathofitos, parasitic diseases). Pests and diseases attack can diminish and contaminate production at a higher rate. A natural balance is achieved, for the benefit of growers, due to pest's natural enemies and microbial competitors of plant pathogens (Alegbeleye, Singleton, and Sant'Ana 2018).

The aim of this study is to reveal the major pathogens and pests found in culture of onions, carrot, parsley, and celery from Vegetable Research and Development Station Bacau (VRDS Bacau), and to analyse the ecological systems that contribute to the plant's health and phytosanitary balance.

MATERIALS AND METHODS

Plant pests and diseases, from onions (*Allium cepa* L.), carrot (*Daucus carota* L.), parsley (*Petroselinum crispum* Mill.), and celery (*Apium graveolens* L.) crops of Bacău region, were evaluated during the vegetation season in 2020 at VRDS Bacau. Vegetable plants from *Alliaceae* and *Apiaceae* family were analyzed in situ and laboratory.

Periodically visual surveys, were used to quantify pest's populations. Plants were also visually evaluated in situ for disease symptoms and pathogen attack. For laboratory analysis, biological samples were collected. These samples consisted of leaves colonized by aphids, and vegetal material with phyto-pathogenic infection, The laboratory examination was performed according to each sample type. The insects and pathogenic fungi and bacteria were examined under binocular stereoscope.

RESULTS AND DISCUSSIONS

Diseases and pest's species of observed plants are commonly found in Bacău region as well as in our country. In the conditions of a year with moderate temperatures in the summer months (the decaldal averages of June, July and August did not exceed 22.7°C), with precipitation above the multiannual average of May, June, July and August and drought in the second decade of September, the attack of pathogens and pests in the crops of onions, carrot, parsley, and celery have varied depending on the species.

The plant pathogens described in studied crops from VRDS Bacau are *Peronospora destructor* in onions culture *Alternaria porri* in carrot culture, *Erysiphe umbelliferarum* and *Septoria petroselini* in parsley culture, and *Septoria apiicola* in celery culture. The commonly pest's species found include *Thrips tabaci* and *Aphis fabae* (Table 1.). These species are polyphagous, known to have a large distribution in our country.

Pests

The studies conducted in this research stage revealed the presence of two pests. In the onion culture the pest was identified *Thrips tabaci* Lindeman (fig. 1). Larvae and adults are found mainly in the narrow space between the tubular onion leaves from where they suck the sap of the plant. These cells lose their normal color, and the tissue appears with whitish spots or silver stripes (fig. 2). Substantial damage can be caused to young plants especially to those belonging to varieties grown directly from seeds. Reproduction of this species is mostly a process (called parthenogenesis) in which females are able to reproduce without mating. Females make an incision in the tissue of the plant for egg-laying. Egg hatching varies from 16.1 days at an average temperature of 30^0 C to 28.6 days at 20^0 C (Iosob 2021; Boateng et al. 2014; Dutta et al. 2014).

For carrot the main pest is *Aphis fabae* Scop. (fig.3 and 4), a small black insect in the genus Aphis, with a broad, soft body, a member of the order Hemiptera.

Table 1. Diseases and pests identified in onions, carrot, parsley, and celery crops from VRDS Bacau

Botanic family	Plant spp.	Phatogens	Pests
Alliaceae	*Allium cepa* L.	*Peronospora destructor* (Berk.) Casp.	*Thrips tabaci* Lindeman
Apiaceae	*Daucus carota* L	*Alternaria porri* (Eli.) Saw. f. sp. *dauci* (Kiihn.) Neerg	*Aphis fabae* Scop.
	Petroselinum crispum Mill.	*Erysiphe umbelliferarum* de By.	_
		Septoria petroselini Desm.	
	Apium graveolens L	*Septoria apiicola* Speg.	_

To feed themselves, insects suck sap from stems and leaves and cause distortion of shoots, reduce crop yield, they also can be vectors for viruses that cause diseases to carrot plants, and the honeydew they secrete can encourage the growth of molds. It reproduces abundantly by living birth, but its number is kept under control, especially in the second part of the summer, by various predatory and parasitic insects (Łuczak et al. 2012; Fericean 2014).

Phatogens

For *Allium cepa* L. the downy mildew or *Peronospora destructor* (Berk.) Casp. is a plant pathogen one of the most damaging diseases of this culture causing, especially in rainy years, damage that reaches 20-30% of production. Symptoms are manifested on the leaves in the form of elongated faded peaks, which are gradually growing and soon comprising the entire foliar surface (fig. 5). Initially, oval-elongated spots of light green color appear on the leaves, after which the color becomes yellowish. In wet weather, the spots are covered by the conditioners and coniiges of the fungus that give a grayish-purple fluff appearance (fig. 6). The attacked leaves soften, bend, dry and leave to the ground. The mycelium of the fungus develops in the intracellular spaces of the attacked tissues and shows branched haustors penetrating into the cells. From the mycelium, the dicotomic branched conidiophores come out through the stomata of the leaves, branches that end in two short, uneven sterigms to which the ellipsoidal conidia are attached. They are taken by the wind and transported to other plants, where they germinate and generate a new infection (Van der Heyden et al. 2020; Fujiwara et al. 2019; Alves et al. 2018).

In carrot culture, the carrot alternariosis - *Alternaria porri* (Eli.) Saw. f. sp. *dauci* (Kiihn.) Neerg., is one of the most dangerous diseases of carrot culture. On the edge of folios and on the petiols of the old leaves, irregular shape lesions, dark brown in black which are often beaded by a yellow area. When stains grow as magnitude and number, all folios and finally, the leaves entirely necrosis and die (fig. 7). On the surface of the attacked tissues, the fungus forms conidiophores and conidiophores. The lesions that appear on the roots have an irregular shape, dark brown to black color and are slightly deepened. Once affected, the tissues die, the leaves begin to dry out, leaving the impression that they are burned. Usually old leaves are attacked first, being more susceptible to the attack of alternariosis. The appearance of the disease is favored by the presence of water on the leaves and temperatures between 20 and 28 ° C, as well as carrot cercosporiosis. At the latter, the first signs of the attack appear on young leaves. On their edges appear small and irregular spots, which increase over time and unite with each other, affecting a large part of the leaf (fig. 8) (Florea and Puia 2020; Survilienė et al. 2011; Shahnaz et al. 2013).

In the parsley culture the *Erysiphe umbelliferarum* By. was the main pathogen that causes powdery mildew. The first symptoms are represented by the appearance of a white coat (mycelium) on the surface of the leaves. The attacked leaves turn yellow and begin to wither (fig. 9). The disease evolves, and the white layer on the surface of the leaves becomes gray and dusty. In case of severe attack, the tissues under the dusty layer, dry out (fig. 10). The plant becomes susceptible to other diseases and pests. On both sides of the leaves appear spots of irregular shape, white, which subsequently acquires a dusty appearance. Then the stains are enlarged, united and cause the leaves to dry (Zalewska et al. 2013; TÜLek and Dolar 2012; Czerwińska et al. 2016).

Septoriosis of parsley - *Septoria petroselini* Desm. it is a disease of the foliar apparatus that can reduce much of the capacity of chloriphyl assimilation in parsley crops, diseases that can cause a lower production of roots and a faulty storage (in the cold season). The attack occurs annually. On the leaves appear 1-4 mm in diameter corner spots, yellowish-gray in color, bordered by a narrow brown area, which extend and unite. The tissues next to the spots are necrotic (fig. 11) and dry, and on their surface are formed the picnidies of the fungus, punctate, of brown color. On the leaves appear irregularly shaped spots, grayish-yellow in color, surrounded by a brown border. The spots evolve, and they become whitish. Inside the spots appear some small black dots, which represent the fructifications of the fungus (fig. 12). The appearance of the disease is favored by high temperatures and high atmospheric humidity. The disease is transmitted through the spores of the

fungus and resists in winter on the plant debris and on the infested seed (Tok and Kurt 2019; Marthe et al. 2013).

Culture of celery has been affected by black blight - *Septoria apiicola* Speg. It is a common disease, very dangerous, which can completely destroy the foliar apparatus of the plant. Initially, small yellow spots are distinguished, later brown, appearing predominantly at the edge of the outer leaves. Later, punctate fructification forms are recognized. The leaves wither and turn yellow from the outside inwards. The attack is favored by temperatures between 18 and 20 ° C and high atmospheric humidity. Yellow-brown spots appear on the leaves (fig. 13), bordered by a reddish border. In optimal conditions, the disease evolves, the spots increase, and in their center appear the fructifications of the fungus (fig. 14). The fungus quickly spreads to the other organs, so the symptoms of the disease can appear on the stems, inflorescences or even on the seeds. Transmission is achieved through infected seeds and spores of the fungus. They withstand in winter on the plant debris from the surface of the soil (Hilal and Ghebrial 2015; Tesfaendrias et al. 2014).

Fig. 1. *Thrips tabaci* Lindeman

Fig. 2. The point of attack of thrips on onion leaves and tissue with whitish spots or silvery stripes in the leaf following the attack

Fig. 3. *Aphis fabae* Scop.

Fig. 4. Colony of aphids on a carrot plant

Fig. 5. Downy mildew or *Peronospora destructor* (Berk.) Casp. to onions

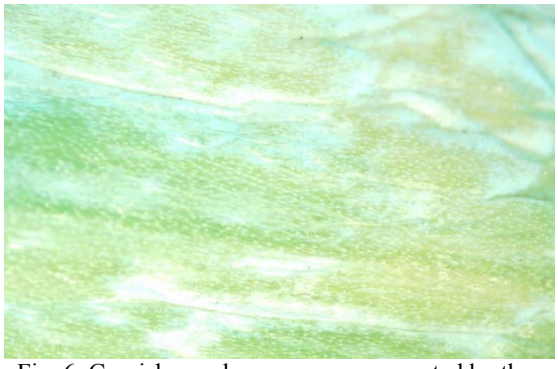

Fig. 6. Grayish-purple appearance generated by the presence on the leaves of conidia and conidiophores

Fig. 7. Carrot alternariosis - *Alternaria porri* (Eli.) Saw. f. sp. *dauci* (Kiihn.) Neerg.

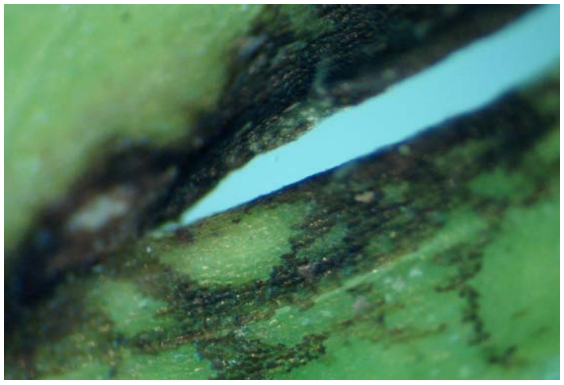

Fig 8. Small and irregular spots, which increase over time and unite with each other

Fig. 9. Appearance of parsley plants affected by powdery mildew

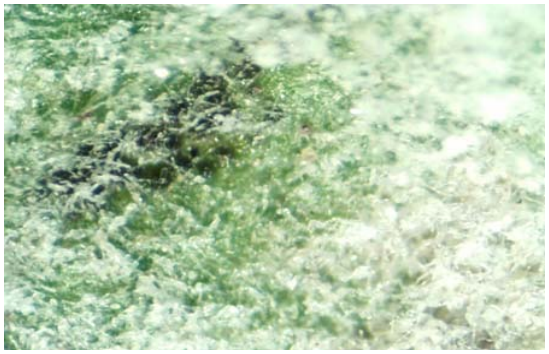

Fig. 10. Powdery mildew *Erysiphe umbelliferarum* By.on parsley

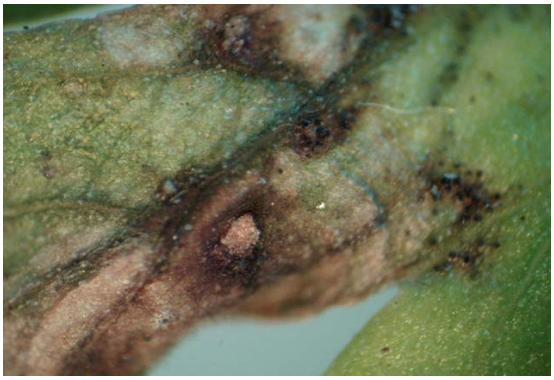

Fig 11. Necrosis of tissues in parsley leaves due to the pathogen *Septoria petroselini* Desm.

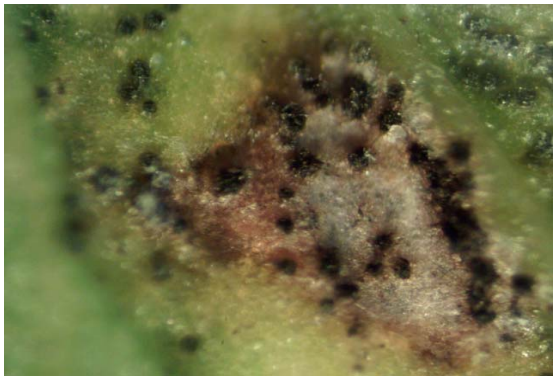

Fig. 12. Mushroom picnides, punctiforms, brown in color on parsley leaves

Fig. 13. Black blight - *Septoria apiicola* Speg.

Fig 14. The fruitings of the fungus

CONCLUSIONS

There are plenty of new technologies that offers the posibility to modernize the methods and practices applied in the monitoring and control of the attack of the various pathogens. Among them are hardware-software systems, intelligent equipments of analysis, prediction and biodynamic action for integrated control of diseases and pests. In order to achieve this, it is necessary to know in advance a number of key elements, namely establishing the inventory of the main diseases and pests, the record of pests as well as the determination of the fauna of parasites and predators.

The present study revealed the major pathogens and pests found in culture of onions, carrot, parsley, and celery from Vegetable Research and Development Station Bacau (VRDS Bacau), analyzing also the ecological systems that contribute to the plant's health and phytosanitary balance.

ABSTRACT

It is well known that in every agrobiocenosis, there are a number of pest species, called key pests due to their considerable ability to multiply, making frequent chemical treatments necessary. In addition to these key pests, vegetable crops also have secondary pests (which can cause damage in certain years and in some areas), potential pests (which do not cause significant damage but can become significant due to improper application of control methods) and migratory species from other crops but which may cause damage to vegetables.

In order to establish the most appropriate measures to prevent infections and combat diseases and pests from vegetable cultures a screening of plant pests and diseases in vegetable crops from VRDS Bacau was accomplished. A special importance was given to determine the causes that lead to diseases and the appearance of pests to cultivated plants.

Pest identification and the establishment of the complex of harmful species in a given culture serve to make reconnaissance maps in any software, as well as to determine pest species, parasites and predators, with important implications for an innovative technical system.

ACKNOWLEDGMENT

This work was cofinanced from the European Social Fund through the project: ADER 25.2.2: „Cercetare cu privire la proiectarea unui echipament inteligent horticol de analiză, predicție și acțiune biodinamică", ADER 735 projects developed by VRDS Bacău, grant of the Romanian Ministery of Research and Innovation, CCCDI - UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0850/ contract 14 PCCDI /2018, within PNCDI III, The BRESOV project GA no 7742 44, European Union's HORIZON 2020 research and innovation programm.

REFERENCES

1. ABANG, A. F., C. M. KOUAMÉ, M. ABANG, R. HANNA, AND A. K. FOTSO. 2014. 'Assessing vegetable farmer knowledge of diseases and insect pests of vegetable and management practices under tropical conditions', *International journal of vegetable science*, 20: 240-53.
2. ALEGBELEYE, OLUWADARA OLUWASEUN, IAN SINGLETON, AND ANDERSON S. SANT'ANA. 2018. 'Sources and contamination routes of microbial pathogens to fresh produce during field cultivation: A review', *Food microbiology*, 73: 177-208.
3. ALVES, DANIEL PEDROSA, EDIVÂNIO RODRIGUES DE ARAÚJO, GERSON HENRIQUE WAMSER, PAULO ANTÔNIO DE SOUZA GONÇALVES, CAILLET D. MARINHO, AND RAFAEL SIMÕES TOMAZ. 2018. 'Field performance and screening for resistance to Peronospora destructor of 46 onion cultivars in Brazil', *Australasian plant disease notes*, 13: 1-6.
4. BOATENG, C. O., H. F. SCHWARTZ, M. J. HAVEY, AND K. OTTO. 2014. 'Evaluation of onion germplasm for resistance to Iris yellow spot (Iris yellow spot virus) and onion thrips, Thrips tabaci', *Southwestern Entomologist*, 39: 237-60.
5. CZERWIŃSKA, EWA, AGNIESZKA SZPARAGA, TOMASZ PISKIER, AND EWA DESZCZ. 2016. 'Effect of the application methods of natural plant extracts on emergence of beets', *Journal of Research and Applications in Agricultural Engineering*, 61: 67-71.
6. DAMTE, TEBKEW, AND GETACHEW TABOR. 2015. 'Small-scale vegetable producers' perception of pests and pesticide uses in East Shewa zone, Ethiopia', *International Journal of Pest Management*, 61: 212-19.
7. DUTTA, B., A. K. BARMAN, R. SRINIVASAN, UTKU AVCI, D. E. ULLMAN, D. B. LANGSTON, AND R. D. GITAITIS. 2014. 'Transmission of Pantoea ananatis and P. agglomerans, causal agents of center rot of onion (Allium cepa), by onion thrips (Thrips tabaci) through feces', *Phytopathology*, 104: 812-19.
8. FERICEAN, LIANA MIHAELA. 2014. 'Research regarding external anatomy of species Aphis fabae', *Research Journal of Agricultural Science*, 46: 218-21.
9. FLOREA, ANTONIA, AND CARMEN PUIA. 2020. 'Alternaria Genus and the Diseases Caused to Agricultural and Horticultural Plants', *Bulletin of the University of Agricultural Sciences &*

Veterinary Medicine Cluj-Napoca. Animal Science & Biotechnologies, 77.
10. FUJIWARA, KAZUKI, TAKASHI FUJIKAWA, AKIRA KAWAKAMI, RYOICHI SONODA, AND ATSUSHI MIYASAKA. 2019. 'RNA sequence analysis data of Peronospora destructor maintained on onions', *Data in brief*, 22: 693-96.
11. HASYIM, AHSOL, WIWIN SETIAWATI, AND RAHMAT SUTARYA. 2014. 'Screening for resistance to anthracnose caused by Colletotrichum acutatum in chili pepper (Capsicum annuum L.) in Kediri, East Java', *Advances in Agriculture & Botanics*, 6: 104-18.
12. HILAL, ARAFA, AND EMAN GHEBRIAL. 2015. 'Occurrence of late blight (Septoria apiicola Speg.) on celery (Apium graveolens L.) in Egypt', *Egyptian Journal of Phytopathology*, 43: 187-88.
13. IOSOB, GABRIEL-ALIN. 2021. *Combaterea biologică a dăunătorilor legumelor cultivate în spații protejate* (Editura "Alma Mater" Bacău: Bacău).
14. KADIOGLU, ASIM, RABIYE TERZI, NESLIHAN SARUHAN, AND AYKUT SAGLAM. 2012. 'Current advances in the investigation of leaf rolling caused by biotic and abiotic stress factors', *Plant Science*, 182: 42-48.
15. ŁUCZAK, IRENA, ADAM ŚWIDERSKI, MAŁGORZATA GABORSKA, AND ALEKSANDRA MECH-NOWAK. 2012. 'Occurrence and harmfulness of black bean aphid (Aphis fabae Scop.) in carrot cropsWystępowanie i szkodliwość mszycy burakowej (Aphis fabae Scop.) w uprawie marchwi', *Progress in Plant Protection*, 52: 235-39.
16. MARTHE, F., T. BRUCHMÜLLER, A. BÖRNER, AND U. LOHWASSER. 2013. 'Variability in parsley (Petroselinum crispum [Mill.] Nyman) for reaction to Septoria petroselini Desm., Plasmopara petroselini Săvul. et O. Săvul. and Erysiphe heraclei DC. ex Saint-Aman causing Septoria blight, downy mildew and powdery mildew', *Genetic resources and crop evolution*, 60: 1007-20.
17. SHAHNAZ, EFATH, V. K. RAZDAN, M. ANDRABI, AND T. R. RATHER. 2013. 'Variability among Alternaria porri isolates', *Indian Phytopathology*, 66: 164-67.
18. SURVILIENĖ, ELENA, ALMA VALIUŠKAITĖ, SONATA KAZLAUSKAITĖ, AND LAISVŪNĖ DUCHOVSKIENĖ. 2011. 'Carrot Alternaria leaf blight management using forecasting model', *RURAL DEVELOPMENT 2011*: 227.
19. TESFAENDRIAS, MICHAEL T., CHERYL L. TRUEMAN, BRUCE D. GOSSEN, ALAN W. MCKEOWN, AND MARY RUTH MCDONALD. 2014. 'The influence of nitrogen and calcium fertilizers on septoria late blight and yield of celery', *Canadian Journal of Plant Science*, 94: 1391-99.
20. TOK, FATIH MEHMET, AND ŞENER KURT. 2019. 'THE EFFECT OF HOT WATER TREATMENT ON SEED TRANSMISSION OF SEPTORIA PETROSELINI, THE CAUSAL AGENT of septoria blight on parsley', *Mustafa Kemal Universitesi Tarim Bilimleri Dergisi*, 24: 210-16.
21. TÜLEK, SENEM, AND F. DOLAR. 2012. 'Ankara ili havuç alanlarında görülen fungal yaprak hastalıklarının belirlenmesi ve yaygınlık oranlarının saptanması', *Bitki Koruma Bülteni*, 52: 247-59.
22. VAN DER HEYDEN, HERVÉ, PIERRE DUTILLEUL, JEAN-BENOÎT CHARRON, GUILLAUME J. BILODEAU, AND ODILE CARISSE. 2020. 'Factors influencing the occurrence of onion downy mildew (Peronospora destructor) epidemics: Trends from 31 years of observational data', *Agronomy*, 10: 738.
23. ZALEWSKA, EWA DOROTA, ZOFIA MACHOWICZ-STEFANIAK, EWA DOROTA KRÓL, AND BEATA ZIMOWSKA. 2013. 'DIseases of heRbs fRoM apIaCeae faMILy', *Modern Phytomorphology*, 4: 105-07.

AUTHORS' ADDRESS

CRISTEA TINA OANA, IOSOB GABRIEL-ALIN, BUTE ALEXANDRU, AVASILOAIEI DAN-IOAN, BOURUC DANIELA - Vegetable Research and Development Station Bacau, Calea Bârladului street, no. 220, Bacău, Romania
Corresponding author email: tinaoana@yahoo.com; iosob.gabriel@gmail.com