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FLOWER-ORNAMENTAL PLANTS – THE HOST OF BOTRYTIS CINEREA PERS.

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Botrytis cinerea Pers. is a widespread pathogen that causes Gray mold in many plant species. Specifically, this disease can affect many flower-ornamental plants. During the last several decades, there are no available observations about this pathogen under the Kyiv's climate conditions. Since the recent increase in cultivation of many flower-ornamental plant species in this region, it is important to better manage Gray mold and identify the host plants in specific climatic and ecological conditions. We found that *B. cinerea* pathogen infected 26 plant species from 22 botanical families at the Kyiv Regional Center of the National University of Life and Environmental Sciences of Ukraine. Specifically, the infected species were annual aster, dahlia, chrysanthemum, marigold, zinnia, alstroemeria, ivy, lupine, begonia, verbena, azalea, carnation, pelargonium, hydrangea, orly, tulip, bergenia, lilac, hibiscus, nasturtium, petunia, primrose, rose, sedum, violet, and coleus. Gray mold is characterized by symptoms that gradually change in infected plants. These include the appearance of water soaked areas, formation of gray sporulation or plaque on the leaves or fruits, loss of the form and rotting of plant organs, presence of spots that resemble burns, and plant wilting if the stem is infected.

Keywords: *gray mold, Botrytis cinerea, flowers and ornamental plants, symptoms, frequency of presence*

Introduction. *Botrytis cinerea* Pers. (*Botryotinia fuckeliana* (de Bary) Whetzel) is a widespread pathogen that causes Gray mold in 235 cultivated and wild plant species. The disease causes significant economic losses during the growing season and at the harvest [7]. Gray mold is especially dangerous for flower-ornamental plant species. No one studied recently the infestation by *B. cinerea* under the Kyiv's climate conditions. Because of rapid cultivation of flower-ornamental plants in this region, it is important to better

manage Gray mold and identify the host plants in under these specific climatic and ecological conditions.

Analysis of recent research findings and publications. Research for studying different aspects of Gray mold development in flower plants is conducted in different countries. For example, in Belarus L. A. Golovchenko and V. A. Timofeyeva [3] studied varieties of Gray mold for ornamental plants. Egorova L. N. and N. A. Pavlyuk [2] found that this pathogen infects 20 orders



from 15 plant families, including common flowering plants such as astra, dahlia, chrysanthemum, roses, marigold, alstroemeria, violet, tulips, lilies, iris, gypsophila, antirrhinum, hydrangea, lupin, crassula, lysimachia, patrinia as well as less known plant orders such as Gazania, Chamaedorea, Tetrastigma, Silybum, Alocasia. Also, many studies were conducted to identify the best methods and practices to manage the negative impact of *Botrytis cinerea* Pers. on petunias [8], pelargonium [5] and varieties of Roses [6].

The aim of research. We conducted a phytopathological survey of flower-ornamental and woody plants that grow at the Kyiv Regional Center of the National University of Life and Environmental Sciences of Ukraine to identify the presence of *B. cinerea* and diagnosing the symptoms of this disease.

Research methods. The study of the infected plants by *B. cinerea* was done from 2014 to 2017, during the growing season, every 10 days from May to October. The infected plant organs were sampled and the disease was diagnosed using the commonly accepted methods [4]. The fungus was identified using its different morphological and cultural characteristics. The frequency of micromicet was estimated using a ratio of the total number of isolated fungus species to the number of the collected samples [1].

Results and discussion. The study revealed the presence of *B. cinerea* on 26 plants that belong to 22 plant families. The infected species included annual aster, dahlia, chrysanthemum, marigold, zinnia, alstroemeria, ivy, lupine, begonia, verbena, azalea, carnation, pelargonium, hydrangea, orly, tulip, bergenia, lilac, hibiscus, nasturtium, petunia, primrose, rose, sedum, violet, and coleus (Table 1). Every year, gray mold infects dahlias, chrysanthemum, pelargonium. Roses were affected by the pathogen during 2014, 2016 and 2017 growing seasons.

During the period of the study (2014-2017) *B. cinerea* affected zinnia, alstroemeria,

lupin, azalea, hydrangea, badana, nasturtium, hibiscus, crassula, coleus only during one growing season. In other plant species, the pathogen was found during the two growing seasons. Analysis of frequency of *B. cinerea* suggests that the largest number of infected plants (above 50 %) was in some years for verbena, pelargonium, petunia and roses. The medium frequency values (less than 50 % infected plants) were found for dahlia (2017), ivy, lupine, begonia (2014), verbena (2016), lilac та primrose (2014, 2016). For other plant species the frequency of Gray mold was relatively low (less than 10 % plants infected). In some year, we did not find plants infected by the fungus (table 1).

Analysis of symptoms of *B. cinerea* on different plant species suggests that the pathogen colonizes first flower petals (table 2 and fig. 1). The pathogen causes small brown spots like lesions. This is typical for roses, petunia, alstroemeria, begonia, azalea and others. In addition, the fungus can cause large brown spots on flower petals. In both situations, the leaves get gray ash color plaque. Next *B. cinerea* spreads on plant leaves and stems from the infected flowers (fig. 1). This is common for dahlia, pelargonium, petunia, alstroemeria, begonia, verbena, azalea, lilac, primrose and other. Gray mold is characterized by symptoms that gradually change in infected plants. These include the appearance of water soaked areas, formation of gray sporulation on the leaves or fruits, loss of the form and rotting of plant organs, presence of spots that resemble burns, and plant wilting if the stem was affected.

Conclusions. We found that *B. cinerea* pathogen infected 26 plant species from 22 botanical families at the Kyiv Regional Center of the National University of Life and Environmental Sciences of Ukraine. Specifically, the infected species were annual aster, dahlia, chrysanthemum, marigold, zinnia, alstroemeria, ivy, lupine, begonia, verbena, azalea, carnation, pelargonium,



1. Presence of *B. cinerea* on flower-ornamental plants

Family	Plant	Observed frequency per year*			
		2014	2015	2016	2017
Asteraceae Berch & Presl	Aster (<i>Callistephus chinensis</i>)	+	-	+	+
	Dahlia (<i>Dahlia Cav.</i>)	+	+	+	++
	Chrysanthemum (<i>Chrysanthemum L.</i>)	+	+	+	+
	Marigold (<i>Tagetes L.</i>)	+	-	-	+
	Zinnia (<i>Zinnia L.</i>)	+	-	-	-
Alstroemeriaceae Dum.	Alstroemeria (<i>Alstroemeria L.</i>)	+	-	-	-
Araliaceae Juss.	Ivy (<i>Hedera L.</i>)	++	-	+	-
Fabaceae Lindl.	Lupine (<i>Lupinus L.</i>)	++	-	-	-
Begoniaceae C. Agardh	Begonia (<i>Begonia L.</i>)	++	-	-	+
Verbenaceae J.St.-Hil.	Verbena (<i>Verbena L.</i>)	+++	-	++	-
Ericaceae Juss.	Azalea (<i>Azalea L.</i>)	+	-	-	-
Caryophyllaceae Juss.	Carnation (<i>Dianthus L.</i>)	+	-	-	+
Geraniaceae Juss.	Pelargonium (<i>Pelargonium L'Her. Ex Ait.</i>)	+++	+	+	+++
Hydrangeaceae Dumort.	Hydrangea (<i>Hydrangea L.</i>)	+	-	-	-
Ranunculaceae Juss.	Orly (<i>Aquilegia L.</i>)	+	-	+	-
Liliaceae Juss.	Tulip (<i>Tulipa L.</i>)	+	-	+	-
Saxifragaceae Juss.	Bergenia (<i>Bergenia Moench</i>)	+	-	-	-
Oleaceae Hoffmanns & Link	Lilac (<i>Syringa L.</i>)	++	-	++	-
Malvaceae Juss.	Hibiscus (<i>Hibiscus L.</i>)	+	-	-	-
Tropaeolaceae Juss. ex DC	Nasturtium (<i>Tropaeolum L.</i>)	+	-	-	-
Solanaceae Juss.	Petunia (<i>Petunia Juss.</i>)	+++	+	-	-
Primulaceae Vent.	Primrose (<i>Primula L.</i>)	++	-	++	-
Rosaceae L.	Rose (<i>Rosa L.</i>)	+++	-	+	+++
Crassulaceae DC	Sedum (<i>Sedum L.</i>)	-	-	-	+
Violaceae Batsch	Violet (<i>Viola L.</i>)	+	-	+	-
Lamiaceae Martinov	Coleus (<i>Coleus Lour.</i>)	+	-	-	-

+ – low frequency of pathogen presence (infected less than 10 % plants);

++ – medium frequency of pathogen presence (infected less than 50 % plants);

+++ – high frequency of pathogen presence (infected more than 50 % plants);

-- absence of pathogen.



2. Gray mold symptoms on flower-ornamental plants

Plant	Symptoms
Aster	Rotting of flowers and stems, brown leaf spots
Dahlia	Rotting of flower buds, flowers, stems, brown spots on the leaves, dying out of the infected leaf tissues
Chrysanthemum	Rotting and drying out of flower branches
Marigold	Rotting and drying out of flower branches
Zinnia	Mold on flowers and stems
Alstroemeria	Brown spots on flower petals, spots on leaves and stems, mold of leaves and stems
Ivy	Brown leaf spots and rotted leaves
Lupine	Rotting flowers, gray plaque on beans and stems
Begonia	Rotting flowers, stems, brown vague spots on leaves
Verbena	Rotting flowers, flower blossoms, brown leaf spots, drying out of the infected plants
Azalea	Spots on flower petals and rotting petals
Carnation	Rotting and drying of flower blossoms
Pelargonium	Rotting of flowers, flower stems, brown vague spots on leaves, dying out the infected leaf tissues
Hydrangea	Rotting flowers and brown vague spots on leaves
Orly	Rotting of flower petals and brown leaf spots
Tulip	Brown leaf spots with gray plaque
Bergenia	Brown leaf spots
Lilac	Mold on flower blossoms and brown spots on leaves
Hibiscus	Spots and mold on flower petals
Nasturtium	Necrosis of flower petals, rotting, chlorosis of leaves
Petunia	Formation of water-soaked areas and spots with gray color on flower petals, deformation and rotting of flowers, dying out of infected parts
Primrose	Rotting of flower blossoms, water-soaked spots on leaves, rotting of leaves
Rose	Color change of flower petals; necrosis on flower petals without spores; dying out of the infected flowers, formation of gray plaque on flower blossoms
Sedum	Water-soaked leaf spots and rotting leaves
Violet	Mold on flowers, leaves and stems
Coleus	Mold on leaves and wilting leaves

hydrangea, orly, tulip, bergenia, lilac, hibiscus, nasturtium, petunia, primrose, rose, sedum, violet, and coleus. Gray mold is char-

acterized by symptoms that gradually change in infected plants. These include the appearance of water soaked areas, formation of

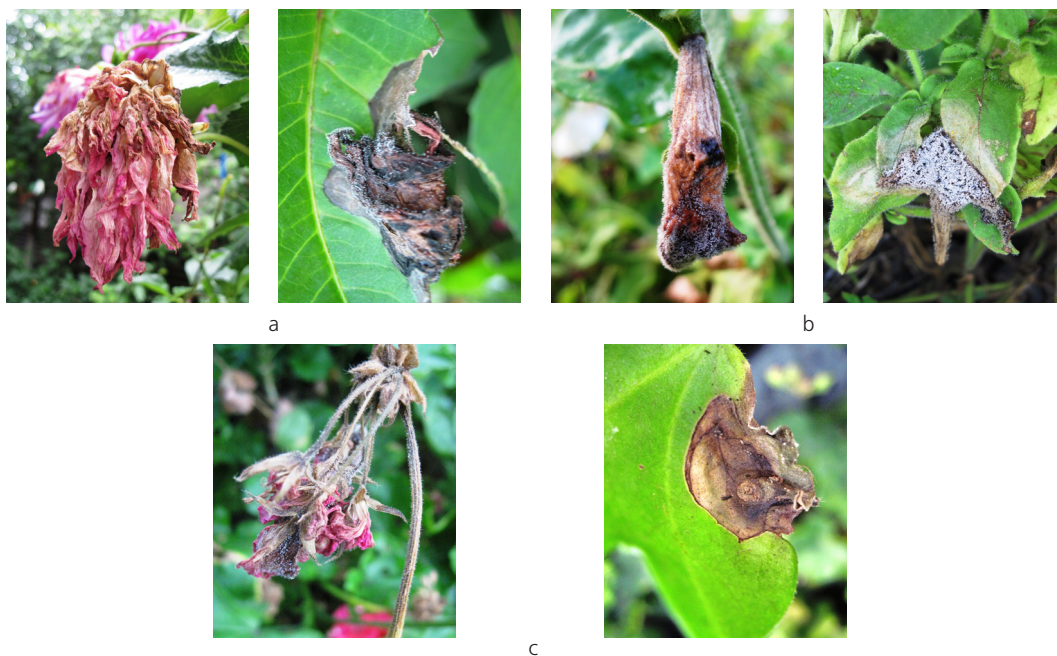


Fig. 1. Colonialization of flowers and leaf tissues by *B. cinerea* dahlia (a), petunia (b), pelargonium (c)

gray sporulation or plaque on the leaves or fruits, loss of the form and rotting of plant organs, presence of spots that resemble burns, and plant wilting of infected stems. Knowledge of the host plants for *B. cinerea* in specific climatic conditions should help

develop practical solutions to better manage Gray mold in other crops. We suggest continuing the monitoring of this disease to identify the effects of different ecological factors on development and dynamics of Gray mold.

References

1. Bilay, V. I., editor. (1982). *Metody eksperymetal'noy mikologii*. [Methods of Experimental Mycology] Kiev: Nauk. Dumka. – 550 p. (in Russian).
2. Egorova, L. N., Pavlyuk, N. A. (2006). Anamorfnyye griby na tsvetochnykh rasteniyakh v Botanicheskom sadu-institute DVO RAN. [Anamorphic fungi on flowering plants in the Botanical Garden-Institute FEB RAS] *Mycology and phytopathology*, vol. 40, issue 2. – P. 93–100. (in Russian).
3. Golovchenko, L. A., Timofeyeva, V. A. (2009). Vozbuditeli seroy gnili dekorativnykh rasteniy v respublike Belarus'. [The causative agents of gray mold of ornamental plants in the Republic of Belarus] *Sbornik nauchnykh trudov «Botanika (issledovaniya)»*, vyp. 37. – S. 316 – 326. (in Russian).
4. Koev, G. V. (1985). *Bolezni tsvetochnykh kul'tur: (Metody diagnostiki i mery bor'by)* / G. V. Koev, L. G. Kleshnina, V. V. Makhortov; Otv. red. N. N. Balashova. [Diseases of flower crops: Methods of diagnosis and control measures] Chisinau: Shtiintsa, 1985. – 59 p. (in Russian).
5. Darras, A. I., Bali, I., Argyropoulou, E. (2015). Disease resistance and growth responses in *Pelargonium* hortorum plants to brief pulses of UV-C irradiation. *Scientia Horticulturae*, 181, 95.
6. Herrera-Romero, I., Ruales, C, Caviedes, M., Leon-Reyes, A. (2017). Postharvest evaluation of natural coatings and antifungal agents to control *Botrytis cinerea* in *Rosa* sp. *Phytoparasitica*, 45, 1, 9-20.



7. Jarvis, W. R. (1980). *Epidemiology. The Biology of Botrytis*. J. R. Coley-Smith, K. Verhoeff and W. R. Jarvis. eds. Academic Press. London, 219-248.
8. Samarakoon, U.C., Schnabel, G., Faust, J. E., Bennett, K., Jent, J., Hu, M.J., Basnagala, S., Williamson, M. (2017). First Report of Resistance to Multiple Chemical Classes of Fungicides in *Botrytis cinerea*, the Causal Agent of Gray Mold From Greenhouse-Grown Petunia in Florida. *Plant diseases*, 101, 6, 1052.

АНОТАЦІЯ

М. Й. Піковський, О. В. Колесніченко, В. І. Мельник, О. О. Середюк. Квітково-декоративні рослини-господарі *botrytis cinerea* pers // Біоресурси і природокористування. – 2018. – 10, № 5–6. – С. 5–10. <https://doi.org/10.31548/bio2018.05.001>

Мікроміцет *Botrytis cinerea* Pers. є широко поширеним патогеном, який викликає сіру гниль на багатьох видах рослин. Особливо небезпечним є розвиток даної хвороби на квітково-декоративних рослинах. На останніх в умовах Києва вивчення паразитування *B. cinerea* протягом багатьох десятиліть не проводилося. Водночас, у зв'язку з розширенням асортименту квітково-декоративних рослин та для вирішення практичних питань із захисту від сірої гнилі, першочергове значення мають дослідження паразитичної спеціалізації та встановлення рослин-живителів мікроміцета *B. cinerea* в конкретних екологічних умовах. Встановлено, що в умовах Київського територіального центру Національного університету біоресурсів і природокористування України паразитування *B. cinerea* виявлено на 26 видах

рослин, що відносяться до 22 ботанічних родин. Зокрема, уражувалися айстра однорічна, жоржина, хризантема, чорнобривці, цинія, альстромерія, плющ, люпин, бегонія, вербена, азалія, гвоздика, пеларгонія, гортензія, орлики, тюльпан, бадан, бузок, гібікус, настурція, петунія, примула, троянда, очиток, фіалка та колеус. Симптоми сірої гнилі характеризувалися мінливими ознаками: появою насичених вологою мокрих плям, формуванням сірого нальоту, втраченою формою та загніванням уражених органів, плямистістю у вигляді опіку, засиханням рослин при ураженні стебел.

Ключові слова: сіра гниль, *Botrytis cinerea*, квітково-декоративні рослини, симптоми, частота трапляння

АННОТАЦИЯ

М. И. Пиковский, Е. В. Колесниченко, В. И. Мельник, А. А. Середюк. Цветочно-декоративные растения-хозяева *botrytis cinerea* pers // Биоресурсы и природопользования. – 2018. – 10, № 5–6. – С. 5–10. <https://doi.org/10.31548/bio2018.05.001>

Микроміцет *Botrytis cinerea* Pers. являється широко распространённым патогеном, который вызывает серую гниль на многих видах растений. Особенно опасным является развитие данной болезни на цветочно-декоративных растениях. На последних в условиях Киева не проводилось изучение паразитирования *B. cinerea* в течение многих десятилетий. В то же время, в связи с расширением ассортимента цветочно-декоративных растений и для решения практических вопросов по защите от серой гнили первостепенное значение имеют исследования паразитической специализации и установления растений-хозяев микроміцета *B. cinerea* в конкретных экологических условиях. Установлено, что в условиях Киевского территориального центра Национального университета биоресурсов и природопользования Украины параз-

итирования *B. cinerea* выявлено на 26 видах растений, относящихся к 22 ботанических семействам. В частности, поражились астра однолетняя, георгина, хризантема, бархатцы, цинния, альстромерия, плющ, люпин, бегония, вербена, азалия, гвоздика, пеларгония, гортензия, аквилегия, тюльпан, бадан, сирень, гибискус, настурция, петунья, примула, роза, очиток, фиалка и колеус. Симптомы серой гнили характеризовались меняющимися признаками: появлением насыщенных влагой мокрих пятен, формированием серого налета, потерей формы и загниванием пораженных органов, пятнистостью в виде ожога, усыханием растений при поражении стеблей.

Ключевые слова: серая гниль, *Botrytis cinerea*, цветочно-декоративные растения, симптомы, частота встречаемости