

THE PHYTOSANITARY STATUS OF SOME FLOWERING PLANTS CULTIVATED IN DIFFERENT GREEN SPACES IN THE MUNICIPALITY OF CRAIOVA

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Abstract

The research was carried out on 23 host plants and the attack of 32 fungal pathogens was identified.

The identified pathogens were classified by attack incidence value (F%) into main pathogens, secondary pathogens and potential pests.

The host plants that were attacked by key pathogens were chrysanthemum, snapdragon, marigold, yarrow, yucca and rose.

The host plants that were attacked by pathogens from the secondary group were peony, sedge, oxeye, hydrangea, hyacinth, queen of the night, sage and cloves.

Attack of potential harmful pathogens has been recorded on gladioli, tulips, snapdragons, chrysanthemums, marigolds, pansies, dahlias, hydrangea, petunia, cock's crest and primroses.

The species in which the simultaneous attack of three key pathogens was registered was the rose.

Keywords: pathogens, degree of attack, frequency of attack, pathogenic fungi.

INTRODUCTION

Flowering plants grown in pots or pots are attacked by pathogenic agents from the category of viruses, bacteria and phytopathogenic fungi that cause quantitative and qualitative losses.

Currently, more than 25 diseases of a viral nature with economic importance are described for ornamental plants.

Unlike other pathogens, viruses cause hardly visible or noticeable symptoms only after several years, during which the disease becomes generalized and causes damage that is difficult to remove (Bădărău, 2008).

Also, ornamental plants are attacked by a number of phytopathogenic bacteria, but most diseases are caused by fungi.

Specialized literature claims that the oldest proof of the knowledge of flowers is a medal discovered in a tomb in Altai, dated

about 7000 years ago, and which had a rose in relief on one side (Cantor, 2015).

Flowers have always represented an occasion of great joy for the human being, they played the role of messenger of the feelings and thoughts that he wanted to convey (Toma, 2003).

Since ancient times, the documents speak of a floriculture developed in China, Japan, India, Persia, Babylon, Palestine, Egypt, Greece, known flowering plants such as: the blueberry, the poppy, the rose, the lily, the tulips, the chrysanthemums, etc. (<https://www.floricultura.ro/istoria-dezvoltarii-culturii-florilor/>).

In China and Japan since ancient times azaleas, chrysanthemums, peonies, camellias were cultivated. Confucius, 500 BC calls the chrysanthemum the "golden flower". In Japan, the art of growing dwarf trees "Bonsai" and the art of arranging flowers "Ikebana" was created starting from the 6th century (Cantor, 2015).

In India, the luxuriant natural vegetation leaves its mark on the gardens, the assortment found within them being very rich. The rose, the lotus, the homage were cultivated, and a law from 1280 BC. provided the punishment for those who stole flowers.

In fact, the knowledge of flowers since antiquity is also recorded in Europe, but without reaching the sophistication of the art of gardens in the East. Here flowers were mainly used as an offering or reward to deities and personalities.

Ancient Greece is an eloquent example of this, some of the most famous flowers borrowing the names of famous deities, such as: Narcissus, Adonis, Iris, Nemesis. (Toma, 2003).

In a vase or in a pot, in a bouquet or in an arrangement, in the house, in the garden or in the park, alone or in combination, flowers are just as many

occasions of joy that we give to ourselves or to our loved ones.

Unfortunately, if each of us understood - even just for a moment - the extraordinary message that a flower so eloquently conveys, then the world we live in would be much better. (Toma, 2003).

MATERIALS AND METHODS

The research was undertaken in the period 2021-2022 on different flowering plants grown in the green spaces of the Municipality of Craiova (table 1)

In order to establish the specific pathogenic mycoflora of some flowering plants, often found in the green spaces of the Municipality of Craiova, repeated visual checks were carried out on their above-ground organs in order to detect possible symptoms of attack.

Table 1. Host Plants

No.crt.	SPECIES POPULAR NAME	SPECIES SCIENTIFIC NAME	LOCATION IN THE FIELD
1	Gladioli	<i>Gladiolus communis</i> L.	Gardens in front of dwellings
2	Tulips	<i>Tulipa gesneriana</i> L.	English Parck
3	Peony	<i>Paeonia officinalis</i> L.	Gardens in front of dwellings
4	Lily	<i>Lilium candidum</i> L.	Botanical
5	Stânjenel	<i>Iris germanic</i> L.	Botanical
6	Lion's mouth	<i>Antirrhinum majus</i>	Gardens in front of dwellings
7	Ox's eye	<i>Callistephus chinensis</i> L.	Gardens in front of dwellings
8	Chrysanthemums	<i>Chrysanthemum</i> sp	Gardens in front of dwellings
9	Marigold	<i>Calendula officinalis</i> L.	Gardens in front of dwellings
10	Cârciumărese	<i>Zinnia elegans</i>	Gardens in front of dwellings
11	Iuca	<i>Yucca filamentosa</i> auct.	Botanical
12	Pansies	<i>Viola tricolor</i> L.	Botanical
13	Dahlia	<i>Dahlia variabilis</i>	Gardens in front of dwellings
14	Hydrangea	<i>Hydrangea hortensis</i>	Botanical
15	Hyacinth	<i>Hyacinthus orientalis</i> L.	Gardens in front of dwellings
16	Queen of the Night	<i>Nicotiana Alata</i> Link et otto	Gardens in front of dwellings
18	Petunias	<i>Petunia hybrida</i> hort.	Gardens in front of dwellings
19	Sage	<i>Sage</i> sp.	Botanical
20	Garden mallow	<i>Althaea officinalis</i> L.	Gardens in front of dwellings
21	Rooster's crest	<i>Celosia cristato</i> L.	Gardens in front of dwellings
22	Primule	<i>Primula</i> sp.	Gardens in front of dwellings
23	Cloves	<i>Alyssum maritimum</i>	Gardens in front of dwellings
24	Rose	<i>Rosa</i> sp	Gardens in front of dwellings

Attack incidence (attack frequency) was determined for pathogens whose symptoms were present.

The attack frequency (F%) represents the number of plants, or organs of the attacked plant, compared to the number or organs analyzed, expressed as a percentage according to the formula:

$$F\% = (n \cdot 100) / N$$

where: n - the number of plants or organs of the attacked plant;

N – number or organs attacked.

For each host plant, the attack frequency range of each specific pathogen was noted as follows:

+ = attack frequency between 1-25%;

+ + = attack frequency between 26-50%;

+ + + = attack frequency between 51-75%;

+ + + + = attack frequency between 76 – 100 %.

Depending on the incidence of the attack, the pathogens were classified into: main, secondary and potentially harmful pathogens.

As part of the monitoring and preparation of the structure of the pathogenic mycoflora for the host plants where the attack of several pathogens was reported, they were presented in systematic order.

RESULTS AND DISCUSSIONS

In order for the flowering plants to achieve the purpose for which they are

cultivated, it is imperative to know the harmful agents, in the category of which phytoparasites also belong, whose attack can lead to quantitative, but especially qualitative, sometimes difficult to estimate impairments.

As can be seen from the data entered in table 2, in the case of the 23 flowering plants on which observations were made, the attack of 32 mycomycetes was identified. Of the 32 pathogens, two species produced diseases known as downy mildew, eight species produced powdery mildews, seventeen species were responsible for diseases known as spotting, two species produced gray rot, and seven species produced rusts.

The two species that produced galls were *Peronospora violae* and *Peronospora tabacina*, and the host plants were pansies and nightshades, respectively.

Symptoms characteristic of the diseases called powdery mildew were reported in the case of eight host plants (lion's mouth, chrysanthemums, marigolds, pansies, hydrangea, petunias, sage and rose), being produced by species of the genera *Sphaerotheca* (*Sphaerotheca fuliginea* (Schlecht.ex Fr) Pall, *Sphaerotheca pannosa var.rosae* (Wallr.ex Fr) Lev, *Sphaerotheca fusca* (Fr.) Bluner) and *Erysiphe* (*Erysiphe orontii* cast. emend.V.Braun, *Erysiphe cichoracearum* DC, *Erysiphe orontii* cast errend V.Braun, *Erysiphe salviae* (Jacz) Blum.).

Table 2. The diseases of some flowering plants grown in different green spaces in Craiova (original)

Item No.C	Item No.C.	Item No.C.	Pathogen	Attack frequency (F%5)	The period of manifestation
1.	Gladioli (<i>Gladiolus communis</i>)	Brown staining	<i>Septoria gladioli</i> Pass.	+	May-July
2	Tulips (<i>Tulipa gesneriana</i>)	Gray rot	<i>Botrytis tulipa</i> Lind	+	May
3	Peony (<i>Paeonia officinalis</i>)	Cladosporiosis	<i>Cladosporium paeoniae</i>	++	May-September
4	Lily (<i>Lilium candidum</i>)	Rust	<i>Uromyces lili</i> (Link) Kunge	+	June-August
5	Stânjel (<i>Iris germanica</i>)	Leaf staining	<i>Heterosporium pruneti</i> (Nikolas & Aggery)	++	April-October
6	Lion's mouth (<i>Antirrhinum majus</i>)	Flouring	<i>Erysiphe castontii</i> . emend. V.Braun	+	July
		Rust	<i>Puccinia antirrhini</i> Diet g Hole	+++	May-October
7	Ox's eye (<i>Callistephus chinensis</i> L.)	Septoriosi	<i>Septoria callistephus</i> Gloyer	++	May-September
8	Chrysanthemums (<i>Chrysanthemum</i> sp)	Flouring	<i>Erysiphe cichoracearum</i> DC	++	June-August
		Septoriosi	<i>Septoria callistephus</i> Gloyer	++	May-September
		White rust	<i>Puccinia havana</i> P. Henn	+	September
9	Marigold (<i>Calendula officinalis</i> L.)	Flouring	<i>Sphaerotheca fusca</i> (Fr.) Bluner	+++	May-August
		Cercosporiosis	<i>Cercospora calendulae</i> Sacc.	+	June-August
10	Cârciumăreșe (<i>Zinnia elegans</i> joca.)	Leaf staining	<i>Alternaria zinniae</i> Pape	+++	June-September
11	Luca (<i>Yucca filamentosa</i> auct.)	Leaf staining	<i>Coniothyrium concentricum</i> (Desm.) sacc.	++++	Throughout the vegetation
12	Pansies (<i>Viola tricolor</i> L.)	Mana	<i>Peronospora violae</i> de Bary ex schroet	+	May
		Flouring	<i>Erysiphe orontii</i> cast errend V.Braun	+	June
13	Dahlia (<i>Dahlia variabilis</i> (wild.) Dosf.)	Gray rot	<i>Botrytis cinerea</i> Pers.ex Pers	+	July-September
14	Hydrangea (<i>Hydrangea</i> sm. hortensis)	Flouring	<i>Oidium hydrangeae</i> e Just.	++	September-November
		Cercosporiosis	<i>Cercospora hydrangeae</i> Ell et. Age.	+	September-November
15	Hyacinths (<i>Hyacinthus orientalis</i> L.)	Rust	<i>Uromyces muscari</i> (Duby) Lev.	++	June-August
16	Queen of the Night (<i>Nicotiana alata</i> Link & otto)	Mana	<i>Peronospora tabacin</i>	++	October
17	Petunia (<i>Petunia hybrida</i> hart.)	Flouring	<i>Sphaerotheca fuliginea</i> (Schlecht.ex Fr)Pall	+	October
18	Sage (<i>Sage</i> sp.)	Flouring	<i>Erysiphe salviae</i> (Jacz) Blum.	++	June-October
19	Garden mallow (<i>Althaea officinalis</i> L.)	Rust	<i>Puccinia malvacearum</i> Mont.	+++	May-September
20	Rooster's crest (<i>Celosia cristato</i> L.)	Gray rot	<i>Botrytis cineraria</i> Pers. De Pers	+	September
		Alternariosi	<i>Alternaria celosiae</i> (Tassi)	+	August
21	Primule (<i>Primula</i> sp.)	Leaf staining	<i>Ranularia primulae</i> Thum.	+	April
22	Cloves (<i>Alyssum maritimum</i>)	Rust	<i>Puccinia arenariae</i>	+++	June
23	Rose (<i>Rosa</i> sp)	Flouring	<i>Sphaerotheca pannosa</i> var.rosae (Wallr.ex Fr) Lev	+++	May-October
		Black spotting	<i>Diplocarpon rosae</i> wolf.	++++	May-October
		Rust	<i>Phragmidium mucronatum</i> (Pers.) schlecht.	++++	June-October

Of the 12 species of phytoparasites that produced diseases called spots on different host plants, 3 belonged to the genus *Septoria* (*Septoria gladioli* Pass, *Septoria callistephus* Gloyer, *Septoria callistephus* Gloyer), 2 to the genus *Cercospora* (*Cercospora calendulae* Sacc., *Cercospora hydrangeae* Ell et. Ev.), 2 of the genus *Alternaria* (*Alternaria zinniae* Pape,

Alternaria celosiae (Tassi)) and one species each of the genera *Cladosporium* (*Cladosporium paeoniae*), *Heterosporium* (*Heterosporium pruneti* (Nikolas & Aggery)), (*Coniothyrium Coniothyrium concentricum* (Desm.) sacc.), *Ranularia* (*Ranularia primulae* Thum.) and *Diplocarpon* (*Diplocarpon rosae* wolf.).

Gray rot produced by *Botrytis cinerea* has been reported on dahlias and on crown plants.

The rusts reported in the field were produced by 2 species belonging to the genus *Uromyces* (*Uromyces lillii* (Link) Kunge *Uromyces muscari* (Duby) Lev.), 4 species from the genus *Puccinia* (*Puccinia havana* P. Henn, *Puccinia antirrhini* Diet g Hole, *Puccinia arenariae*, *Puccinia malvacearum* Mont.) and 1 species of the genus *Phragmidium* (*Phragmidium mucronatum* (Pers.) schlecht.).

The two species of the genus *Uromyces* whose attack was manifested during the research period were *Uromyces lillii* and *Uromyces muscari*, whose host plants are the lily and the hyacinth, respectively.

The attack of the mycomycete *Uromyces muscari* was identified on hyacinths grown in green spaces in front of homes.

The 4 species of the *Puccinia* genus that produced rusts were: *Puccinia antirrhini*, *Puccinia horiana*, *Puccinia malvacearum* and *Puccinia arenariae* responsible for the rust of snapdragons, chrysanthemums, mallows and carnations.

The rust of lion's mouth plants appeared on leaves and shoots, the attack being present from spring to late autumn.

Another rust reported in the field was that of chrysanthemums produced by the fungus *Puccinia horiana*.

Garden mallow rust was observed in the spring-late summer months, the characteristic attack being on the leaves.

The attack of the fungus *Puccinia arenariae* was reported in June on the clove plants grown in the gardens in front of the houses.

The rust of the rose was among the rusts that manifested itself with a high incidence, in all the places where the rose was present.

From the data of the same table, the period of signaling the attack for each pathogen is observed.

It can be seen that of the 32 species, 7 are key pathogens (*Antirrhinum majus*, *Chrysanthemum sp*, *Calendula officinalis* L, *Zinnia elegans joca.*, *Rosa sp*, *Yucca filamentosa auct* and *Althaea officinalis* L.). Analyzing from a taxonomic point of view the structure of the mycoflora identified in the field, it is observed that most of the phytoparasites are part of the Fungi Kingdom and only 2 species are represented of the Chromista Kingdom.

It is observed, on the other hand, that most fungi belong to the class Ascomycetes, followed by Uredinomyces.

In terms of species richness, the genera with the most representatives were *Puccinia* (4 species), *Sphaerotheca*, *Erysiphe*, *Septoria* (with 3 species each), followed by the genera *Cercospora*, *Alternaria*, *Botrytis* and *Uromyces* with 2 species each.

The single-species genera were *Cariothyrium*, *Heterosporium* and *Diplocarpon*.

Most of the species whose attack has been identified in the field have a strict specialization, except for *Botrytis cinerea* and *Erysiphae orontii* with two host species each.

Regarding the distribution of micromycetes for each host plant, it can be observed that the rose was the host that was attacked by 3 key parasites, which certainly leads to the qualitative deterioration of the flowers.

For peony, sycamore, bull's eye, hydrangea, hyacinth, queen of the night, sage and cloves, there was an attack of some pathogens that were included in the secondary group, because the attack frequency did not exceed the value of 50

CONCLUSIONS

During the research period on some flowering plants in different green spaces of the Municipality of Craiova, the attack of thirty-two phytoparasites from the fungi category was identified;

The attack of the thirty-two pathogens was reported on twenty-three host plants, in seven of which the simultaneous attack of two or at most three phytoparasites was observed;

Most host plants (sixteen species) presented the attack of a single specific parasite falling into different categories;

Of the thirty-two pathogens reported to attack, two species produced scab, eight species produced powdery mildew, twelve species caused spotting, two species, two species were responsible for gray rot, and seven species produced rust;

The two species that produced powdery mildew belong to the genus *Peronospora*, the eight species responsible for powdery mildew belong to the genera *Sphaerotheca* and *Erysiphe*, and twelve stains were produced by fungi from seven genera

(*Septoria*, *Cladosporium*, *Heterosporium*, *Cercospora*, *Alternaria*, *Coniothyrium*, *Ramularia*), while the species that produced rusts belong to the genera *Uromyces*, *Puccinia*, *Phragmidium*;

The thirty-two pathogens whose attack was reported in the field, depending on the values identified for the attack, were classified into the categories: main pathogens (nine phytoparasites), secondary pathogens (eight phytoparasites) and potential pests (thirteen fungi);

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