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# Evaluation of powdery mildew (*Podosphaera pannosa* (Wallr.) de Bary) in roses

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**Abstract.** Roses are one of the main floricultural and decorative crops and are widely used in industrial floriculture and landscape architecture. During cultivation, rose plants are susceptible to various infectious diseases that impair their decorative properties. A common and dangerous pathology is powdery mildew, which is caused by the fungus *Podosphaera pannosa* (Wallr.: Fr.) de Bary. The study aimed to assess the susceptibility of rose varieties to powdery mildew in Kyiv. The study was conducted at the rose garden of the Hryshko National Botanical Garden of the National Academy of Sciences of Ukraine and in the problematic research laboratory of Mycology and Phytopathology of the National University of Life and Environmental Sciences of Ukraine. The spread and intensity of powdery mildew development were assessed against a natural infection background using a scale that included a gradation from 0 to 4 points. A total of 79 rose varieties from 6 garden groups were examined. During the research, powdery mildew developed during May-October on all aboveground parts of plants (except lignified shoots), but most intensively on young shoots. During the vegetation period (2022-2023) in the open field, among the 17 varieties of the floribunda group examined, the disease did not develop in 12 varieties. The evaluation of powdery mildew on 16 varieties of hybrid tea roses showed its absence on 13. Among the 8 varieties of climbing large-flowered roses, the disease developed in 2 varieties. On roses of the shrub group, the pathology was not widespread in 23 varieties out of 33 studied. All 3 varieties of

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musk roses were not affected by *P. pannosa*, while in 2 varieties of ramblers, its presence was noted. In total, the disease was widespread in 22 rose varieties. The study of powdery mildew damage to roses is relevant for the development of control measures and the search for sources of resistance that can be used in the breeding process

**Keywords:** *Rosa* sp.; phytopathogen; resistance; cultivars and garden groups; disease development

## INTRODUCTION

Roses are essential flowers and ornamental crops represented by many varieties. Cultivated roses are widely used in industrial floriculture, landscape architecture, home gardens, pharmaceutical production, food industry and other industries and have a variety of cultural and economic value. During cultivation, rose plants are susceptible to many diseases that significantly affect their decorative properties. One of the most dangerous pathogens on roses is the fungus *Podosphaera pannosa* (Wallr.: Fr.) de Bary (*Sphaerotheca pannosa var rosae* (Wallr.: Ex Fr.) Lev.), which causes powdery mildew.

Y. Bao *et al.* (2022) noted that rose powdery mildew is widespread in different regions of the world. It is dangerous when growing plants for cutting and is also the main disease of garden and indoor roses. The disease is widespread in Ukraine (Roses in the plantings of the city of Kyiv, 2020). It appears both in open and protected ground on all above-ground plant organs: leaf blades, leaf petioles, shoots, buds and flowers. M. Linde & N. Shishkoff (2003) described powdery mildew as one of the most serious diseases of the leaf apparatus. The authors emphasised that almost 40% of fungicides used on roses are designed to control powdery mildew.

In a review of scientific publications analysing a sustainable pest management strategy to reduce pesticide use, C.E. Góngora *et al.* (2024) highlighted the negative impact on the environment, human health and biodiversity of using only synthetic pesticides. There is also an issue related to the development of pest resistance to pesticides, which reduces the effectiveness of their use. At the same time, to ensure better control and environmental sustainability, it is necessary to reduce the use of chemicals by adopting original alternative strategies to maintain pest/pathogen populations below the level of economic harm and to achieve The European Green Deal (2019). Therefore, according to C.E. Góngora *et al.* (2024), one of the control strategies is the identification and cultivation of resistant varieties. A. Khan & S. Korban (2022) noted that the use of plant resistance is considered the most sustainable approach to protecting plants from various pathogens. The same applies to powdery mildew pathogens (Martins *et al.*, 2022).

The literature presents various data on the powdery mildew susceptibility of rose varieties of different garden groups, as well as wild rose species and forms. Y. Bao *et al.* (2022) indicated that powdery mildew caused by the fungus *P. pannosa* is the most common disease in different cultivation technologies of *Rosa multiflora* Thunb. J. Li *et al.* (2021) underlined the harmfulness of the disease, significant yield losses and deterioration of its quality in the areas of cultivation of *R. roxburghii* Tratt. X. Li *et al.* (2023) and K. Wang *et al.* (2024) emphasised the danger of disease development in *R. chinensis* Jacq. Plants, as there is a decrease in their decorative and economic qualities. L. Tan *et al.* (2022), for the first time, highlighted powdery mildew on *R. cymosa* Tratt plants caused by *P. pannosa*. The authors conclude that the occurrence of the disease in *R. cymosa* may pose a potential threat to other crops of the genus *Rosa* or *Prunus spp*.

X.Q. Qiu *et al.* (2015), in an analysis of the resistance of wild rose species to powdery mildew, proved that the genotypes of *R. laevigata* Michx., *R. longicuspis* Bertol., *R. luciae* Franch. & Rochebr. and *R. banksiae* R.Br. were immune to *P. pannosa*. High resistance to this pathogen was found in 12 samples of the *Pimpinellifoliae* section, *R. rubus* H. Lev.& Vaniot, *R. rugosa* Thunb. and others. The results of the experiments also showed that three sections *Pimpinellifoliae*, *Laevigatae* and *Banksianae* were more resistant to *P. pannosa* than others.

R.K. Mesta *et al.* (2021), among nine rose genotypes, Bugati, Carlet, Cherishma, Folklar, Gold Strike, Nobless and Tineke determined a moderately sensitive reaction to rose powdery mildew. Two genotypes Tajmahal and Papaya Red were susceptible to the disease. In general, none

of the genotypes was resistant. N.K. Chandran *et al.* (2020) described the presence of resistance to powdery mildew at the genetic level in the IIHRR13-4 genotype. The comparison was made with the susceptible commercial variety Konfetti.

Despite active scientific research on the resistance of roses to powdery mildew in different countries of the world, this issue remains understudied in the conditions of Kyiv urban plant communities. Given that new varieties of roses are emerging that are resistant to diseases, there is a possibility of the emergence of new races of pathogens that can overcome plant resistance. Therefore, there is a need to study these processes. The study aimed to assess the intensity of powdery mildew damage to rose varieties of different garden groups.

## MATERIALS AND METHODS

The study was conducted at the rose garden of the M.M. Hryshko National Botanical Garden of the National Academy of Sciences of Ukraine. Powdery mildew was diagnosed visually based on typical and atypical symptoms (Pikovskyi & Solomiichuk, 2022). Samples of plant material with atypical symptoms were analysed in the problematic research laboratory of Mycology and Phytopathology of the National University of Life and Environmental Sciences of Ukraine. For this purpose, temporary solutions were produced, and the morphological structures of the pathogen were analysed and identified. Pathogen identification was carried out by microscopy of mycelium and conidial sporulation of *P. pannosa* and was performed using a Sigeta MB-103 40x-1600x LED mono monochrome microscope.

The assessment of the spread and intensity of powdery mildew development was conducted on a natural infectious environment (with preventive measures) during the period of its maximum development (second-third decade of September 2022-2023), using the following scale: 0 points – no disease symptoms; 1 point – up to 10% of the leaf surface (or bush surface) is affected; 2 points – 11 to 25%; 3 points – 26 to 50%; 4 points – more than 50% of the leaf surface (or bush surface). A total of 79 rose varieties from 6 garden groups were examined (Table 1). The study complied with the ethical standards set out in the Convention on Biological Diversity (1992) and the Convention on the Trade in Endangered Species of Wild Fauna and Flora (1973).

**Table 1.** Rose varieties used in the research

| A group of roses | Varieties |
|---|---|
| Floribunda | Red Leonardo da Vinci, Europeana, Tornado, Aspirin, Lilli Marlen, Diamant, Gebruder Grimm, Rose der Einheit, Rosen Grafin, Constanz Mozart, Abracadabra, Fortuna, Rosenromantic, Herzogin Christiana, Out of Rosenheim, Eiesprinzessin, Friesia |
| Hybrid tea | Sophia Loren, Dame de Coeur, Red Queen, Marselaise, Laeticia Casta, Bell Ange, Gloria Dei, Royal Dane, Grand Mogul, Anne de Kiev, Kazakhstanskaya Yubileinaya, Kronenburg, Athena, Bellevue, Bob Hope, Paris 2000 |
| Twisty large-flowered | Laguna, Flammentanz, Fortunes Double Yellow, Polka, Alchemist, Golden Gate, Alyaska, Florentina |
| Shrub | Caramella, Hope for Humanity, Chippendale, Star Profusion, Angela, Astronomia, Michael, Kashmir, Dornröshen, Maria Bauman, Gruss an Heidelberg, Morden Blush, Larissa, Fruhlingsduft, Khortitsa, Madam Boll, Margarita Hilling, Hansaland, Persian Yellow, Cardinal de Richelieu, Ferdy, La Villa Cotta, Weg der Sinne, Kölner Flora, Rosarium Uetersen, Shwanensee, Henry Kelsey, Robusta, C.F. Meyer, Isabella Skinner, My Girl, Music Box, John Davis |
| Musk | Dinky, Ballerina, Mozart |
| Ramblers | Dorothy Perkins, Weilchenblau |

**Source:** compiled by the authors

The prevalence of powdery mildew on each rose variety was determined by the formula:

$$P = \frac{n \times 100}{N}, \quad (1)$$

where $P$ – disease spread, %; $N$ – overall number of plants in samples, pcs.; $n$ – number of diseased plants in samples, pcs.

The following formula was used to determine the intensity of powdery mildew development:

$$Rx = \frac{\sum(a \times b) \times 100}{N \times K}, \quad (2)$$

where $Rx$ – disease development, %;  – sum of the product of the number of diseased plants and the corresponding damage score; $N$ – total number of

plants (healthy and diseased); *K* – highest score on the accounting scale.

Statistical processing of the experimental data was performed using Microsoft Excel.

## RESULTS AND DISCUSSION

During the research period, powdery mildew first appeared on the leaf blades of roses in the form of an underdeveloped white spider web coating. The latter eventually spread to the entire lesion of the affected leaves (Fig. 1a). The disease also caused the leaf blades to curl upwards (Fig. 1b). On shoots affected by *P. pannosa*, well-defined white pads were formed (Fig. 1c). A developed felt bloom formed on the peduncles. The affected buds were covered with a continuous powdery coating. When the powdery mildew pathogen affected the petals, a coating formed on their surface (Fig. 1d). There are also symptoms that are atypical for the disease. In particular, the infected areas of leaf blades changed colour to anthocyanin (Fig. 1e) and chlorotic, acquiring a deformed appearance.

The fungus *P. pannosa* developed on all aboveground parts of plants (except lignified shoots), but most intensively on young shoots. The disease caused a decrease in the photosynthetic surface and even drying of the leaves. The result was a deterioration in the decorative properties of the plants. Powdery mildew on roses during the research period was manifested in May-October. The intensity of plant damage depended on meteorological conditions. Dry periods with low relative humidity led to the weakening of plants. Roses that were exposed to shade for a long time were more susceptible to the disease.

During the phytopathological monitoring of roses of the floribunda group during the growing season of 2022-2023 powdery mildew did not appear on the varieties 'Red Leonardo da Vinci', 'Lilli Marlen', 'Diamant', 'Gebruder Grimm', 'Rose der Einheit', 'Rosen Grafin', 'Constanz Mozart', 'Fortuna', 'Herzogin Christiana', 'Out of Rosenheim', 'Eiesprinzessin', 'Friesia' (Fig. 2). On the 'Rosenromantic', 'Europeana', 'Aspirin', 'Tornado', the disease spread was 50%, while its development was in the range of 12.0-16.6%. On "Abracadabra" roses, the disease reached 100% prevalence with 25.0% development.

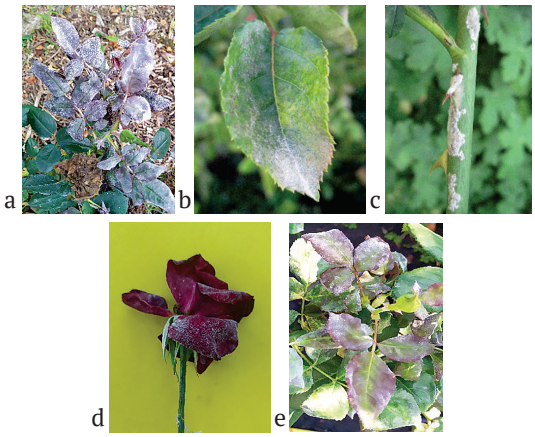


**Figure 1.** Symptoms of powdery mildew on the rose

**Note:** a – intense leaf lesions; b – curling of leaf blades; c – disease signs on annual growth; d – disease manifestation on petals; e – discolouration of infected leaf tissues

**Source:** authors' photo

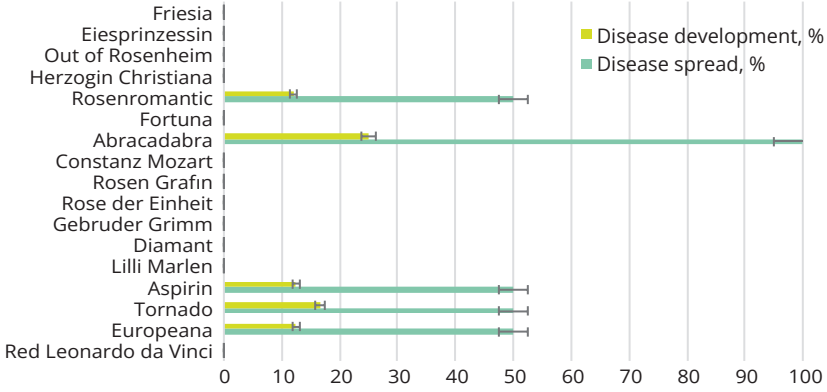


**Figure 2.** Powdery mildew incidence in floribunda rose varieties (average for 2022-2023)

**Source:** compiled by the authors

Powdery mildew did not appear on the plants of hybrid tea roses of 'Sophia Loren', 'Dame de Coeur', 'Red Queen', 'Marselaise', 'Laeticia Casta', 'Bell Ange', 'Gloria Dei', 'Royal Dane', 'Grand Mogul', 'Anne de Kiev', 'Kronenburg', 'Athena' and 'Bellevue' varieties during the periods of surveys (Fig. 3). Among the varieties 'Kazakhstanskaya Yubileinaya', 'Bob Hope' and 'Paris 2000', the disease occurred on 50% of plants with a plant damage intensity of 12.5%.

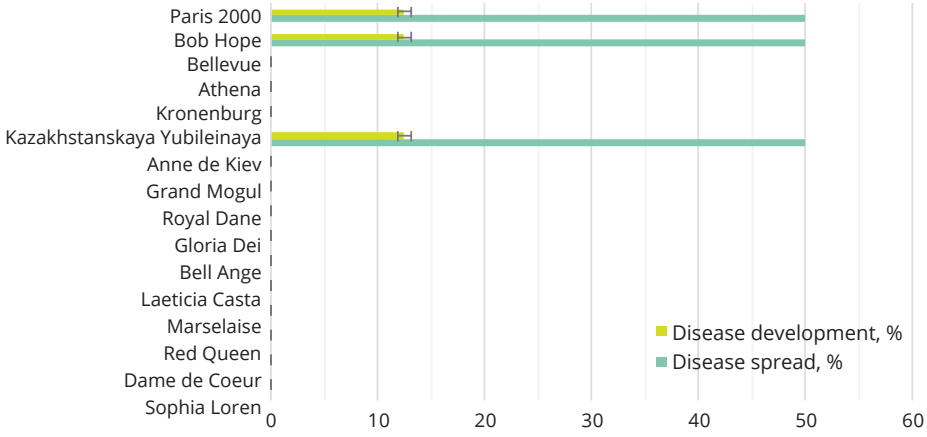


**Figure 3.** Spread and development of powdery mildew on varieties of hybrid tea roses (average for 2022-2023)

**Source:** compiled by the authors

During the years of observation, powdery mildew was not recorded on plants of the twisty large-flowered rose varieties 'Flammentanz', 'Polka', 'Alchemist', 'Golden Gate', 'Alyaska' and 'Florentina' (Fig. 4).

At the same time, the disease was prevalent in the varieties 'Fortunes Double Yellow' and 'Laguna', with a prevalence of 30 and 33%, respectively. At the same time, the development of the disease was 6.5% and 8.3%.

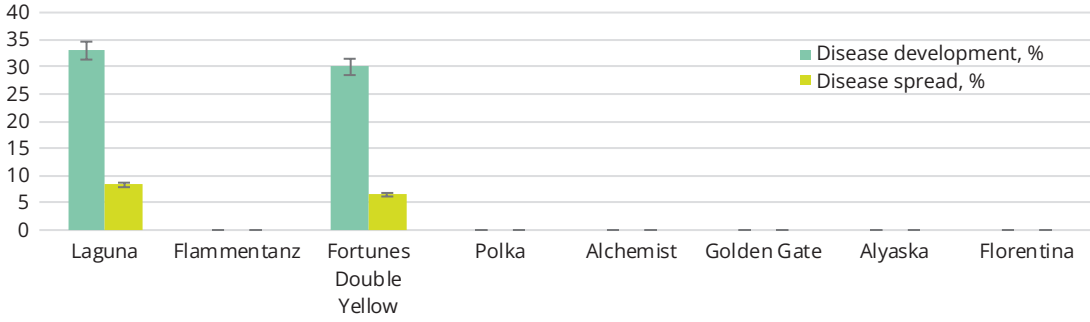


**Figure 4.** Powdery mildew incidence in varieties of climbing large-flowered roses (average for 2022-2023)

**Source:** compiled by the authors

Monitoring of powdery mildew did not reveal the disease on several rose varieties in the shrub group: 'Hope for Humanity', 'Chippendale', 'Star Profusion', 'Kashmir', 'Gruss an Heidelberg', 'Morden Blush', 'Larissa', 'Fruhlingsduft', 'Madam Boll', 'Margarita Hilling', 'Hansaland', 'Persian Yellow', 'Ferdy', 'La Villa Cotta', 'Weg der Sinne', 'Rosarium Uetersen', 'Shwanensee', 'Henry Kelsey', 'Robusta', 'C.F. Meyer', 'Isabella Skinner', 'My Girl', 'Music Box' (Fig. 5). The disease was spreading on plants of the varieties 'Caramella' (12.5%); 'Angela', 'Astronomia', 'Michael', 'Dornröshen',

'Maria Bauman', 'Khortitsa', 'Kölner Flora', 'John Davis' (50%) and 'Cardinal de Richelieu' (75%). On these varieties, the development of powdery mildew was: 'Caramella' – 3,1%, 'Astronomia' – 8,5%, 'Dornröshen' – 9,4%, 'Kölner Flora' – 10,0%, 'Angela' – 11,5%, 'Khortitsa' and 'John Davis' – 12,0%, 'Michael' and 'Maria Bauman' – 12,5% and 'Cardinal de Richelieu' – 18,7%.

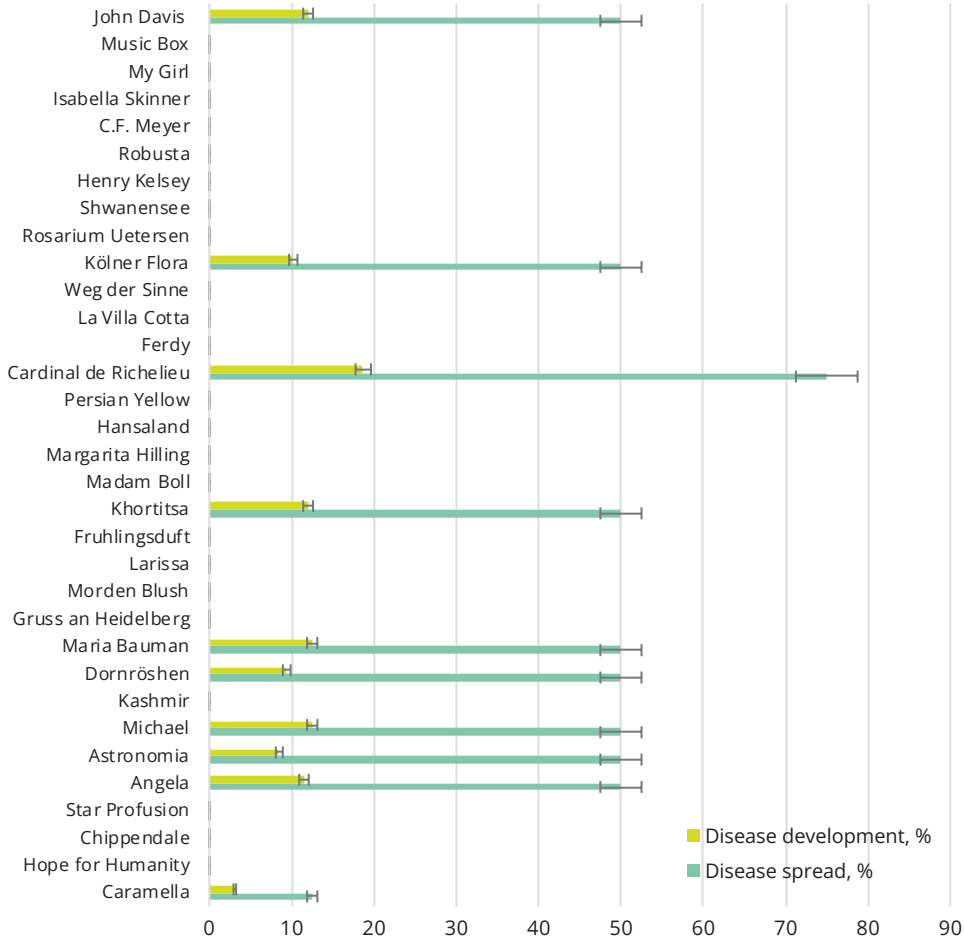


**Figure 5.** Powdery mildew incidence in rose varieties of the shrub group (average for 2022-2023)
**Source:** compiled by the authors

Among the rose varieties 'Dinky', 'Ballerina' and 'Mozart' (musk group), powdery mildew did not occur during the growing season (2022-2023) (Fig. 6). In contrast, in the two varieties 'Dorothy Perkins' and 'Weilchenblau' (rambler group), 45-50% of plants were affected, and the disease development was 10.5% and 12.5%, respectively.

The assessment of the damage to roses by the powdery mildew pathogen, conducted under natural infection conditions during two growing seasons, showed a different degree of pathology development. Even a high level of disease spread on certain rose varieties was not always accompanied by a high degree of disease development. For instance, on roses of the "Abracadabra" variety (floribunda group), powdery mildew reached 100% of the disease incidence, while its development was 25.0%. The disease spread on the variety 'Cardinal de Richelieu' (scrub group) reached 75% with the development of the disease at 18.7%. Among hybrid tea roses, on 'Kazakhstanskaya Yubileinaya', 'Bob Hope' and

'Paris 2000', the disease occurred on 50% of plants, while the disease intensity was 12.5%. On the varieties 'Dorothy Perkins' and 'Weilchenblau' (rambler group), 45-50% of plants were affected, and the disease development was 10.5% and 12.5%, respectively.

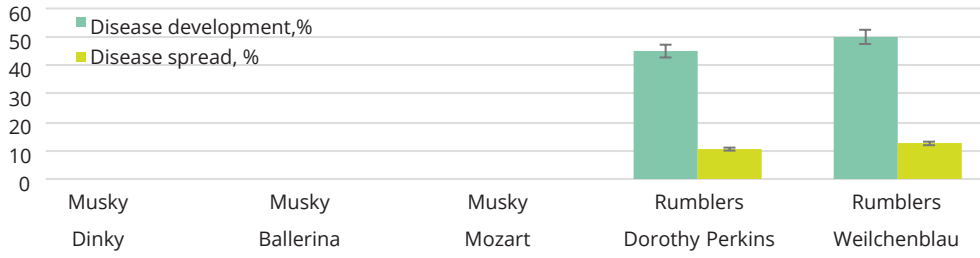


**Figure 6.** Powdery mildew incidence in rose varieties of the musk and rambler groups (average for 2022-2023)
**Source:** compiled by the authors

The research revealed varieties of different groups of roses on which the disease was not common, namely: floribunda – 'Red Leonardo da Vinci', 'Lilli Marlen', 'Diamant', 'Gebruder Grimm', 'Rose der Einheit', 'Rosen Grafin', 'Constanz Mozart', 'Fortuna', 'Herzogin Christiana', 'Out of Rosenheim', 'Eiesprinzessin', 'Friesia'; hybrid teas – 'Sophia Loren', 'Dame de Coeur', 'Red Queen', 'Marselaise', 'Laeticia Casta', 'Bell Ange', 'Gloria Dei', 'Royal Dane', 'Grand Mogul', 'Anne de Kiev', 'Kronenburg', 'Athena' and 'Bellevue'; twisty large-flowered – 'Flammentanz', 'Polka', 'Alchemist', 'Golden Gate', 'Alyaska' and 'Florentina'; groups of shrubs: 'Hope for Humanity', 'Chippendale', 'Star Profusion', 'Kashmir', 'Gruss an Heidelberg', 'Morden Blush', 'Larissa', 'Fruhlingsduft', 'Madam Boll', 'Margarita Hilling', 'Hansaland', 'Persian Yellow', 'Ferdy', 'La Villa Cotta', 'Weg der Sinne', 'Rosarium Uetersen', 'Shwanensee', 'Henry Kelsey', 'Robusta', 'C.F. Meyer', 'Isabella Skinner', 'My Girl', 'Music Box'; musky – 'Dinky', 'Ballerina' and 'Mozart'. In general, during the vegetation period (2022-2023) in the open field, among the 17 varieties of the floribunda group examined, the disease did not develop in 12 varieties (Fig. 7).


**Figure 7.** Powdery mildew damage to rose varieties of different groups
**Source:** compiled by the authors

Monitoring of powdery mildew on 16 varieties of hybrid tea roses showed its absence on 13 varieties. Among the 8 varieties of climbing large-flowered rose, the disease developed on 2 varieties. On roses of the shrub group, the pathology was not widespread on 23 varieties out of 33 studied. All 3 varieties of musk roses were not affected by *P. pannosa*, while in 2 varieties of ramblers, its presence was noted.

Many rose varieties exist, and botanical gardens maintain collections of plants that are of great theoretical and practical importance for rose

culture. In Ukraine, various aspects of the use of rose varieties in landscape gardening are being studied. O.L. Rubtsova & V.I. Chizhankova (2016) and R. Myalkovsky *et al.* (2023) studied the decorative characteristics and biological features of varieties of different groups and outlined the main directions for further introduction and selection of roses. However, few studies characterised plant resistance to biotic factors, which makes it difficult to compare this indicator with the results obtained in the regions where roses are cultivated.

At the same time, several studies also confirm the different reactions of rose varieties to the pathogen. In particular, Y. Saidulu *et al.* (2021) evaluated rose genotypes and found a diverse response to the disease. The analysis of data for two seasons demonstrated that the maximum disease intensity was recorded on Taj Mahal (42.7%), which was on par with White Miniature (42.6%), Royal Circus (42.4%) and Grand Gala (42.2%). On the Five Star variety, the intensity of powdery mildew development was 27.0%. According to the results of the research, no varieties tolerant or resistant to powdery mildew were found. Y. Bao *et al.* (2022) determined significant differences in powdery mildew resistance among three *R. multiflora* plants: *R. multiflora* 13 was highly resistant, while *R. multiflora* – 4 and 1 were highly susceptible.

V. Kumar & S. Chandel (2019) screened rose cultivars for powdery mildew resistance under natural and greenhouse epiphytic conditions and found that none of the rose cultivars showed immunity. Six varieties, namely 'Super Star', 'Barbara Bush', 'Peter Frank Field', 'Monalisa', 'Raktime' and 'Pink Ice', were found to be resistant. Eight varieties of roses – 'Sweet Surrender', 'Heart-O-Gold', 'Delicia', 'Gladiator', 'Phuljhari', 'Silk Hat', 'Citrus Tree' and 'Tropical Sunset' were moderately resistant. Furthermore, 24 rose varieties were characterised by moderate susceptibility: 'Bride', 'Sweet Water', 'Morning Sun', 'Maria Callus', 'Estrusa', 'Honest Red', 'Red Triumph', 'Summer Fragrance', 'Megia Nera', 'Courage', 'White Magic', 'Lynn Anderson', 'Olympiad', 'Milky Way', 'Dr Jo', 'Excellence', 'New Zealand', 'Shah Alam', 'Belles Epoque', 'Paradise', 'Elle', 'Flash', 'Calico' and 'World War II'. Twelve cultivars – 'Queen Elizabeth', 'Peach Beauty', 'Izume', 'Ashlesha', 'Deletta', 'Machoman', 'Dance of Joy', 'Decan Delight', 'Sun Star', 'Lutin', 'Viola' and 'White Weight' were susceptible to the disease. None of the varieties showed high susceptibility to powdery mildew. In greenhouse conditions, the varieties 'High and Yellow', 'Upper Class', 'First Red', 'Grand Galla', 'Hollywood', 'High and Peace', 'High and Magic', 'Saludo', 'Konfetti', 'High and Sparkling' and 'Golden Gate' were susceptible to powdery mildew.

In a study by G.M. Salcă Roman *et al.* (2024), conducted in Romania, all studied varieties 'Simina', 'Rusticana', 'Pasiune mov', 'Petrina', 'Maria-Cristina', 'Splendid', 'Foc de Tabără', Bonica, Cristiana, Mirato, Lavendula, Orangeade, Crown P.M., Fisherman's Friend were affected by powdery mildew. The development of the disease ranged from 14.9 to 29.3%. However, the disease developed less intensively on shrub rose varieties 'Bonica', 'Maria-Cristina', 'Simina', as well as 'Foc de Tabără', 'Crown P.M.', which belong to the floribunda group.

The study of collection cultivars of the genus *Rosa* L. conducted by A.B. Marchenko (2017) in the Forest-Steppe of Ukraine determined that the group of hybrid tea roses was characterised by powdery mildew damage within 11.6% with a weighted average score of 0.8, climbing roses – 8.5% and 0.86, English roses – 2.3% and 0.8, floribunda – 6.3% and 0.52 points. G. Xiang *et al.* (2019) analysed the mechanisms of interaction between plants and the powdery mildew pathogen and determined that *P. pannosa* and *R. gigantea* species are susceptible to pathogen damage. At the same time, *R. longicuspis* was characterised by high resistance and can be valuable for the gene pool when creating new rose varieties.

H. Hosseini Moghaddam *et al.* (2014), using the example of *Rosa wichurana* Crep. and *Rosa* "Yesterday", demonstrated that powdery mildew susceptibility reactions in roses not only trigger different resistance mechanisms depending on the rose genotype but also depend on the pathogen pathotype. As noted by R.K. Horst & R.A. Cloyd (2007), the resistance of rose varieties may decrease over time due to the emergence of new strains of *P. pannosa*. According to G.N. Agrios (2005), cultivars that are resistant in certain geographical areas may be susceptible to the disease in other conditions, even in the same area.

The study of rose resistance to powdery mildew is necessary to find sources of resistance that can be used in the breeding process. Characteristics of the variety in terms of pathogen damage and

disease development are also of practical importance for adjusting agronomic measures and choosing a method of plant treatment during rose cultivation.

## CONCLUSIONS

According to the results of studies against a natural infectious background, powdery mildew did not appear on several types of different groups of roses: floribunda – 'Red Leonardo da Vinci', 'Lilli Marlen', 'Diamant', 'Gebruder Grimm', 'Rose der Einheit', 'Rosen Grafin', 'Constanz Mozart', 'Fortuna', 'Herzogin Christiana', 'Out of Rosenheim', 'Eiesprinzessin' and 'Friesia'; hybrid teas – 'Sophia Loren', 'Dame de Coeur', 'Red Queen', 'Marselaise', 'Laeticia Casta', 'Bell Ange', 'Gloria Dei', 'Royal Dane', 'Grand Mogul', 'Anne de Kyiv', 'Kronenburg', 'Athena' and 'Bellevue'; twisty large-flowered – 'Flammentanz', 'Polka', 'Alchemist', 'Golden Gate', 'Alyaska' and 'Florentina'; shrub groups – 'Hope for Humanity', 'Chippendale', 'Star Profusion', 'Kashmir', 'Gruss an Heidelberg', 'Morden Blush', 'Larissa', 'Fruhlingsduft', 'Madam Boll', 'Margarita Hilling', 'Hansaland', 'Persian Yellow', 'Ferdy', 'La Villa Cotta', 'Weg der Sinne', 'Rosarium Uetersen', 'Shwanensee', 'Henry Kelsey', 'Robusta', 'C.F. Meyer', 'Isabella Skinner', 'My Girl' and 'Music Box'; musk groups Dinky, Ballerina, Mozart.

On the affected rose varieties of the floribunda group, the disease spread was 50-100%, and the development was 12.0-25.0%. Among the varieties of hybrid tea roses, the disease prevalence was at the level of 50% with a development intensity of 12.5%. The disease was prevalent in varieties of twisty large-flowered roses in the range of 30-33% with a development rate of 6.5-8.3%. On rose varieties of the shrub group, the number of affected plants was 12.5-75%, and the development of the disease was in the range of 3.1-18.7%. The 2 studied rose varieties of the rambler group were affected by the pathogen, with the spread of powdery mildew in the range of 45-50% and its development – 10.5-12.5%.

Further, long-term screening of powdery mildew damage to rose varieties of different groups in specific soil and climatic conditions is relevant, especially in the case of epiphytic development of the disease. It is also necessary to evaluate the resistance of varieties against an artificial infection background and study the defence reactions of plants.

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## CONFLICT OF INTEREST

None.

## REFERENCES

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## Оцінка уражуваності троянд борошнистою росою (*Podosphaera pannosa* (Wallr.) de Bary)

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**Анотація.** Троянди є однією з основних квітниково-декоративних культур і широко використовуються в промисловому квітникарстві та ландшафтній архітектурі. Під час вирощування рослини троянд сприйнятливі до впливу різних інфекційних хвороб, які погіршують їх декоративні властивості. Поширеною і небезпечною патологією є борошниста роса, яку викликає гриб *Podosphaera pannosa* (Wallr.: Fr.) de Bary. Метою дослідження було оцінити уражуваність сортів троянд борошнистою росою в умовах міста Києва. Дослідження проводили у розарії Національного ботанічного саду імені М.М. Гришка Національної академії наук України та у проблемній науково-дослідній лабораторії Мікології і фітопатології Національного університету біоресурсів і природокористування України. Оцінку розповсюдження та інтенсивності розвитку борошнистої роси проводили на природному інфекційному фоні з використанням шкали, яка включала градацію від 0 до 4 балів. Загалом було обстежено 79 сортів троянд із 6 садових груп. Під час досліджень борошниста роса розвивалася протягом травня-жовтня на всіх надземних частинах рослин (окрім здерев'янілих пагонів), але найбільш інтенсивно – на молодих пагонах. Під час вегетації рослин (2022-2023 рр.) у відкритому грунті серед 17 обстежених сортів групи флорибунда хвороба не розвивалася на 12 сортах. Оцінка борошнистої роси на 16 сортах чайно-гібридних троянд, засвідчила її відсутність на 13. Серед 8 сортів витких великоквіткових троянд, захворювання розвивалося на 2 сортах. На трояндах групи шрабів патологія не мала поширення на 23 сортах із 33 досліджених. Усі 3 сорти мускусних троянд не уражувалися грибом *P. pannosa*, тоді як на 2 сортах групи рамблери він розвивався. Загалом хвороба була розповсюдженою на 22 сортах троянд. Дослідження ураження троянд борошнистою росою є важливою для розробки заходів її контролю та пошуку джерел стійкості, які можуть бути використані у селекційному процесі

**Ключові слова:** *Rosa* sp.; фітопатоген; стійкість; сорти та садові групи; розвиток хвороби