DISTRIBUTION OF DANGEROUS PATHOGENIC FUNGI SPECIES IN THE CYDONIA OBLONGA MILLS OF NAMANGAN AND BUKHARA REGIONS

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Abstract. This article discusses the significance of *Cydonia oblonga* Mill. for human health, including a historical overview of research on pathogenic fungi affecting this plant in Uzbekistan. It also details the current distribution of these fungi in the Bukhara and Namangan regions.

Quince (*Cydonia oblonga* Mill.) is a plant from the Rosaceae family, growing up to 5-8 meters in height and 4-6 meters in width. Its leaves are oval with a pointed tip (Lobachev, 1981). In his work “Tibbiy o‘gitlar” the renowned scholar Abu Ali Ibn Sina enumerates numerous health benefits of quince. For therapeutic use, the fruit is prepared by removing the seeds, filling the cavity with honey, and then burying it in a pile. Quince oil is applied to wounds, while the juice is beneficial for asthma. It helps in stopping hemoptysis and alleviates throat irritation and lung inflammation. Additionally, quince is used as a remedy for diabetes and heartburn. Folk medicine often recommends a decoction made from quince leaves and young branches for patients with these conditions (Abu Ali Ibn Sina, 1991).

Quince is a low-fat, low-calorie fruit that is nutritionally superior to apples, with a fat content of just 0.1 g per 100 g. The key fatty acids present in quince are linoleic acid and oleic acid. Despite being highly nutritious, quince is a lesser-known crop with significant positive effects on human health, making it a valuable dietary product due to its rich composition.

However, like all plants, quince is susceptible to various pathogenic fungi. From 2006 to 2010 in Oregon, USA, studies identified several fungi, including *Diplocarpon mespili* (Sorauer) B. Sutton, *Podosphaera* sp., and *Gymnosporangium* sp., which were found to cause diseases and inflict serious damage on quince plants (Postman, 2012).

Phytophthora cactorum (Lebert & Cohn) J. Schröt was detected in half of the soil samples collected from a quince orchard in New York City, USA. This pathogen can infect the fruit without any physical injury (Sadeghi, 2023).

Peyronellaea obtusa (Fuckel) Aveskamp, Gruyter & Verkley (=*Botryosphaeria obtusa* (Schwein.) Shoemaker) was first observed in Spain during the fall of 2005. Since then, this pathogen has been reported in Canada, Greece, New Zealand, Australia, the USA, and South Africa (Juan Moral Maria, 2007).

In Uzbekistan, several fungi cause various diseases in quince plants. For example, *Sporocadus trimerus* (Sacc.) Arch [=*Stigmina trimera* (Sacc.) B. Sutton] was identified affecting *Cydonia oblonga* Mill. (Rosaceae) in the Karasuv village park, Kosonsoy district, on April 28, 2001, and in Iskovot village, Chortoq district, on June 29, 2001.

Gymnosporangium fusisporum E. Fisch was identified on *Cydonia oblonga* Mill. (Rosaceae) in the Kosonsoy district, Karasuv village, on May 25, 2002, and July 25, 2002 (Gafforov, 2005). *Podosphaera oxyacanthae* f. *cydoniae* was observed on *Cydonia oblonga* Mill. in Korongisoy, Zomin district, in 2022 (Ortiqov, 2023). This species has been identified also across the Fergana, Samarkand, Syrdarya, and Bukhara regions (Запрометов, 1926).

The state scientific and technical program on the diversity, monitoring, and electronic documentation of pathogenic fungi affecting economically important plants (including exportable fruits, vegetables, and sugar crops) has focused on creating a database. As part of this program, it was observed that *Monilinia linhartiana* is one of the most dangerous pathogens for *Cydonia oblonga* Mill. The distribution of this pathogen in various districts of the Namangan region has been mapped (https://www.indexfungorum).

This article is based on research conducted by the scientific staff of the Institute of Botany, Academy of Sciences of the Republic of Uzbekistan, Mycology and Algology Laboratory. The study was part of the 2021-2024 program titled “Diseases in Economically Important Plants, Exportable Fruits, Vegetables, and Sugar Crops.” Herbarium specimens collected during mycological research for the project on “Pathogenic Fungi: Diversity, Monitoring, and Creation of an Electronic Database” served as the primary source of data.

To analyze the fungal species composition, a Kern Optics OBN 132 microscope was utilized. Photographs of fungi-infected plants were taken using a Canon 750D digital camera. The modern nomenclature of the identified fungi was verified through www.indexfungorum.org, while the names of the host plants were referenced from http://powo.science.kew.org.

The methods and formulas outlined by Dementeva (1985) were employed to determine disease prevalence and average disease prevalence. The prevalence of the disease was calculated using the formula:

$$P=n\times 100N\%$$

Here: P - prevalence of the disease in %, N - the total number of examined plants, n - the number of diseased plants.

Average disease prevalence: $Pe=ESp/S$

Here: Pe is the expression of the average spread of the disease in percent, Esp is the area and the percentage of incidence in it, S is the total area studied.

Pathogen: *Monilinia linhartiana* (Prill. & Delacr.) Dennis (formerly *Monilinia cydoniae* Schell.)

Monilinia linhartiana affects the leaves, flowers, and branches of quince trees, with ripened fruits rarely showing symptoms. The disease, known as moniliosis, begins with small, pointed spots on the leaves. The fungus overwinters on dry, waxy fruits and other damaged plant parts. Fruit infection can occur through apple worms, other insects, birds, hail, and scab disease.

Within 3-5 days of damage, affected fruits turn brown, and after 8-10 days, fungal spores become visible. The disease spreads rapidly in cool air temperatures and high humidity during the flowering period in spring. Optimal conditions for spore development are air temperatures of 24–28°C and relative humidity above 75%.

In addition to quince, the pathogen also affects apples, apricots, and plums during the flowering season when humidity is high. Quince trees are particularly susceptible because their hairy fruit buds and leaves retain more moisture from precipitation and dew, creating favorable conditions for fungal growth. This results in branches with fruit buds drying out suddenly, resembling burns or frostbite, hence the term “monilial” burn.

Infection begins when fungal spores land on the mother’s anther of the flower in spring, causing the mycelium to invade the fruit branch tissue and quickly dry it out (Fig. 1). The leaves on affected branches often persist without shedding, later serving as a source of disease spread. During the next season, these branches produce a large number of spores, leading to widespread dissemination of the fungus.

Consideration of plant diseases

Mycological and Phytopathological Observations. To determine the distribution of moniliosis in the Namangan region, mycological and phytopathological observations were conducted in the meadows of several farms in Mingbulok, Uychi, and Torakorgan districts. A total of 200 quince trees were selected from each region using a checkerboard pattern for observation. Mingbulok District: Turdaliev Ulug‘bek Private Orchard: In an area of 1.1 ha, 180 out of 200 plants were infected to varying degrees, while 20 plants were not infected. Khakimov Sardorbek Farm: In an area of 1.1 ha, 176 out of 200 plants were infected to varying degrees, and 24 were not infected.

Figure 1 – Moniliosis disease of Quince: A – infected leaves;
B – secondary saprotrophic fungi under a microscope.

Uychi District: Khamrayev Ravshan Farm: In an area of 1.2 ha, 172 out of 200 plants were infected to varying degrees, and 28 plants were not infected.

Boronov Biloliddin Farm: In an area of 1.2 ha, 191 out of 200 plants were infected to varying degrees, while 11 plants were not infected.

Shukurov Bakhromjon Farm: In an area of 1.2 ha, 184 out of 200 plants were infected to varying degrees, and 16 plants were not infected.

Norin District: Komiljon Ota Horticulture Farm: In an area of 1.3 ha, 187 out of 200 plants were infected to varying degrees, and 13 plants were healthy. Nuriddin Fayz Farm: In an area of 1.3 ha, 185 out of 200 plants were infected to varying degrees, and 15 plants were healthy.

Torakorgan District: Eastern Star Farm: In an area of 1.3 ha, 170 out of 200 plants were infected to varying degrees, and 30 plants were healthy.

Due to the limited cultivation of quince in other districts of the region, similar studies have not been conducted there.

Based on Dementeva formula (1985), the prevalence of moniliosis disease in the studied areas was calculated as follows:

Mingbulok District: Abdumajidkhanov Muhammadsolikh Farm: P=180×100:200=90%., Khakimov Sardorbek Farm: P=176×100:200=88%., Zamin Sakhovati Farm: P=185×100:200=92.5%

Uychi District: Khamrayev Ravshan Farm: P=172×100:200=86%., Boronov Biloliddin Farm: P=191×100:200=95.5%., Shukurov Bakhromjon Farm: P=184×100:200=92%.

Norin District: Komiljon Ota Horticulture Farm: P=187×100200=93.5%., Nuriddin Fayz Farm: P=185×100200=92.5%., Sharq Yuluduzi Farm: P=170x100:200=85%.

To account for the number of infected plants and cultivated areas, the distribution of the disease in the studied districts was further analyzed using the formula:

Pe=EspSP

Here: Pe is the expression of the average spread of the disease in percent, Esp is the area and the percentage of incidence in it, S is the total area studied. Accordingly, the prevalence of quince moniliosis in Mingbuloq district was 90.2%, in Uychi district 91.2%, and in Norin district 90.3%.

Summary

In summary, the pathogenic fungus *Monilinia linhartiana*, which causes moniliosis in quince plants, poses a significant threat due to its high economic importance in the region. This threat is evident from the documented incidence rates and damage detailed in the article. *Monilinia linhartiana* primarily affects the leaves, fruits, and growth points of quince trees. Damage to the leaves leads to a reduction in chlorophyll, disrupting photosynthesis and metabolic processes. As

autumn approaches, healthy branches transition from green to brown and reddish as their bark thickens and a protective layer forms underneath. However, when infected with moniliosis, the quince bark does not thicken properly before winter frost. This results in frostbite and dieback of the branches, severely impacting the following year's harvest. Given the significance of quince in the food and pharmaceutical industries, as well as its export value, it is crucial to conduct extensive scientific research to understand and manage this disease. Efforts are needed to prevent the spread of moniliosis and develop effective countermeasures. Research on this issue is ongoing, led by the staff of the Laboratory of Mycology and Algology.

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