

Diseases of Geranium

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Geranium (*Pelargonium*) is a genus of perennial plants. A favourite plant of many flower growers, it is ideal for growing indoors. In addition to its beautiful flowers, geranium has the property of purifying the air, and its fragrance lifts the mood. A combination of colours and harmony, grown in gardens and pots. It is not capricious, but it is attacked by various pests.

DISEASES

Viral diseases

There are several diseases of geraniums caused by viruses. The economic losses caused by these diseases are difficult to assess, since infected plants are often asymptomatic and because both the cultivar and the environment in which the plants grow can significantly influence the expression of symptoms.

Pelargonium ringspot virus (*Tobacco ringspot virus (TRSV)*); *Tomato ring spot virus (TomRSV)*

Symptoms

Viral rings on geraniums may be caused by the tomato or tobacco strain of the ringspot virus. Infections with Tomato ringspot virus (*TomRSV*) produce a wide range of damage types: from yellow to dead (necrotic) spots, rings, vein yellowing of the newly formed leaves in spring. Sometimes symptoms develop on old leaves of asymptomatic plants. Symptom intensity increases towards mid-summer. New leaves formed thereafter are usually symptomless. Sometimes the flowers of infected plants are deformed. Plants show stunted growth.

Damage caused by Tobacco ringspot virus (*TRSV*) may be similar to that caused by *TomRSV*. This virus causes leaf miniaturisation, the appearance of yellow spots and irregular yellow rings. Infection by *TRSV* and *TomRSV* reduces the number of flowers and often causes bud abortion. Plants infected with a mixed infection show much more severe symptoms than those infected with each virus alone. Double viral infections can seriously impair plant growth and appearance.

Pelargonium leaf curl (*Pelargonium Leaf Curl virus (PLCV)*)

Symptoms

This virus is a strain of Tomato leaf curl virus. The incidence of the disease varies up to 45% in different greenhouses. The severity of infection depends on the cultivar. Leaves of infected plants have star-shaped (asteroid) or irregular yellow spots. They become wrinkled, distorted and tear as they grow. The centres of older, yellowish spots dry out and become brown with a chlorotic halo. Severely infected leaves die. In extreme cases, the tip of the infected plant turns brown and also dies. Growth is suppressed and the plants lose their marketable appearance.

Cuttings taken in autumn from apparently healthy plants may show typical symptoms when new leaves appear in winter and early spring. Plants are symptomless during the summer months and it is difficult to isolate *PLCV* from them at that time.

Mosaic mottling of leaves (*Cucumber mosaic virus CMV*)

Symptoms

Symptoms of this disease are characterised by distinct light green or chlorotic areas between the veins, alternating with dark green areas. Sometimes the virus affects only part of the leaf. The purple zones or horseshoe-shaped bands of normal leaves may disappear and be replaced by violet colouring of the veins. This is due to a reduction in the production of anthocyanin pigments. Leaves of heavily infected plants are lighter green than normal, rounded and shaped like ginkgo biloba leaves. Symptoms are masked during summer and flowering.

Control of viral diseases. Use only healthy plants for cuttings; Removal and destruction of diseased plants from mother stock and seedling compartments; Systematic control of weeds, aphids and thrips, which transmit some of the viruses.

Bacterial diseases

Bacterial blight (*Xanthomonas campestris* pv. *pelargonii*)

Symptoms

Symptoms of bacterial leaf spot may vary depending on the cultivar, type of geranium and environmental conditions. Small, water-soaked spots appear on the underside of the leaves. Later, on the upper surface round, light to brown, slightly sunken spots 2–3 mm in size with clearly defined borders are observed. The initial lesions are often followed by wedge-shaped chlorotic to necrotic areas. The bacterium moves from the leaves into the vascular tissues of the plants and they wilt. This is followed by stem rot and plant death. Infected cuttings cannot root and rot at the base. Trailing geranium does not show such symptoms due to the nature of its leaves. Infected leaves lose their gloss and develop symptoms of nutrient deficiency or of mite infestation. Temperatures below 10°C or above 32°C may prevent symptom development, and older plants are less susceptible to systemic infection. Infected plants may not show symptoms, leading to infected daughter plants. The bacterium can infect via the root system, although it does not survive in the absence of hosts or their residues. It can persist on plant leaves as well as on leaves of wild *Geranium* species. It spreads in growing facilities via contaminated tools, irrigation water, infected leaves, water droplets from hanging baskets with trailing geranium and via greenhouse whitefly.

Bacterial leaf spots (*Pseudomonas cichorii* and *P. syringae*)

Symptoms

Both bacteria cause leaf spots that are difficult to distinguish and vary depending on environmental conditions. Plants subjected to excessive leaf wetness develop large, irregularly shaped, dark brown to black spots. In the absence of moisture on the leaves, the spots are smaller with light centres and a dark halo. Yellowing is always observed. The optimal temperature for *P. syringae* (15°–21°C) is lower than that for *P. cichorii* (24°–29°C), otherwise their life cycle is similar. The bacteria are transmitted via seed, cuttings and other hosts. Chrysanthemums are known to carry populations of *P. cichorii* and should be kept separate from geraniums and other known hosts. Development of the pathogens is favoured by periods of high humidity and prolonged retention of water droplets on the leaves.

Bacterial wilt (*Ralstonia solanacearum*)

Symptoms

The bacterium causing bacterial wilt has two races. One is widespread in the warmer southern regions. The other is a quarantine pathogen for many countries, including Bulgaria, and poses a threat to agricultural crops. The bacterium is a soil-borne pathogen that enters the plant through the root system and is a typical tracheobacteriosis that causes wilting. The disease almost always leads to plant death. High temperatures (27°–32°C) and high soil moisture contribute to disease development. It causes necrosis in the area of the root collar.

Control of bacterial diseases

Strict adherence to good plant protection practices is essential for the management of bacterial diseases; There are no registered plant protection products providing adequate control; Diseased plants must be removed and destroyed; Infected plant residues must be removed from growing facilities immediately; Frequent washing of hands during work and immediately after working with infected plants or soil; Overhead irrigation should be kept to a minimum; Minimise leaf wetness by watering early in the day or by drip irrigation; Do not handle plants when they are wet; Optimal balanced fertilisation; Frequent disinfection of cutting tools; Growing media for seedlings should not be reused; Do not place pots with trailing geraniums above seedlings; The bactericides copper hydroxide and copper sulphate are only weakly effective when treating bacterial diseases.

Fungal diseases

Black leaf spot (*Alternaria alternata*)

Symptoms

Usually small, slightly raised, water-soaked spots appear on the underside of the leaves. Later, the tissue in the spots darkens and on the upper surface sunken brown-black spots with a concentric structure appear. They can be confused with bacterial blight, but *Alternaria* spots are larger. Under conditions of high air humidity they become covered with a fluffy dark brown coating of fungal spores.

Control

Observe good plant protection practices; Avoid overhead watering of plants; Clean and remove plant residues from the previous crop; Use cuttings from healthy plants for rooting; Remove diseased plants; Apply plant protection products when necessary. None are registered for geranium. Products registered for other crops may be used: Azaka 80 ml/ha; Acrobat Plus WG 200 g/ha; Bordeaux Mix 20 WP 500 g/ha; Dithane DG (Dithane M-45) 200 g/ha; Cerial Star 60 ml/ha; Ortiva Top SC 100 ml/ha; Polyram DF 0.2%; Score 250 EC 0.04%; Cidely Top 100 ml/ha.

Pythium root rot (*Black leg*) (*Pythium spp.*)

Symptoms

The disease causes more serious damage to cuttings during rooting, but can also affect plants at any age. Water-soaked spots appear at the base of the cuttings or in certain wounds. Later they become black-brown and watery. Plants die when the pathogen invades the entire stem.

Control

Observe good plant protection practices; Take cuttings only from healthy plants; Avoid waterlogging of the soil; Disease development is favoured by high humidity and low oxygen levels; Remove diseased plants; Systematic control of insects important for pathogen dissemination (fleas and others); Preventive and post-emergence treatment with plant protection products; Watering or spraying with: Ridomil Gold MZ 68 WG 0.25%; Ridomil Gold R WG 500 g/ha; Alial 80 WG 0.3% (valid until: 30.04.2021); Alfil WG 0.3% (valid until: 30.04.2021); Proplant 722 SL 0.1%. Bioproducts based on *Trichoderma harzianum* T-22 may also be applied.

Black root rot (*Thielaviopsis basicola*)

Symptoms

Black, dry spots appear on the stem at the soil surface line or below it. Such spots are also observed on the petioles of young plants. Rooting of cuttings may be delayed or may not occur at all. Their leaves turn yellow, fall off and the plant dies.

Control

Observe good plant protection practices; Take cuttings only from healthy plants; Avoid waterlogging. Disease development is favoured by high humidity and low oxygen levels; Remove diseased plants; Treat (water) with plant protection products upon occurrence: Topsin M 70 WDG 0.1%; Top Plus 70 WP 0.1%.

Grey mould (*Botrytis cinerea*)

Symptoms

It attacks stems, leaves and flowers. Symptoms of the disease may appear at any stage of geranium production. Under high air and soil humidity, the typical abundant grey mould of fungal mycelium and spores may develop on any infected part and tissue, as well as on plant residues. Symptoms on leaves range from individual spots to large dead areas, often with concentric rings. V-shaped spots may also appear and can be confused with symptoms of bacterial blight. Spots can also develop when spent petals fall onto the leaves. On cuttings and stems, symptoms appear at their base as light to dark brown spots, which may lead to basal rot. Brown spots may develop on the branches of mother plants after taking cuttings. On flowers, the first signs are premature fading and drying. They turn brown and fall prematurely. During periods of high soil and relative humidity, diseased flowers become covered with abundant grey mould.

Control

Observe good plant protection practices; Take cuttings only from healthy plants; Do not mist and water cuttings early in the day; Regulate relative humidity by ventilation and heating; Remove diseased plants; Treat with plant protection products upon occurrence. There are no registered products for geranium, but the following may be used: Difcor 250 EC 50 ml/ha; Prolectus 50 WG 80–120 g/ha; Signum WG 60–75 g/ha; Switch 62.5 WG 60 g/ha. Biocontrol with products based on *Trichoderma harizanum* T-22; Alternate several products to prevent the pathogen from developing resistance.

Rust (*Puccinia pelargonii-zonalis*)

Symptoms

Small yellow spots appear on the upper surface of the leaves. Rust-coloured pustules are formed in these areas on the underside of the leaf. After ripening, the pustules rupture and release the rust-coloured spores that give the disease its name. In cases of severe infection, leaves turn yellow and fall prematurely. The disease is mainly a problem for zonal geranium.

Control

Observe good plant protection practices; Take cuttings only from healthy plants; Avoid overhead watering of plants and strong air currents; Remove diseased plants (before they sporulate, if possible); Treat with plant protection products. None are registered against rust on geranium, but the following may be used: Azaka 100 ml/ha; Bounty 60 ml/ha; Dithane DG (Dithane M-45) 200 g/ha; Difcor 250 SC 50 ml/ha; Impact 25 SC 50 ml/ha; Caramba 60 EC 100 ml/ha; Comrade, Kamrat, Ciprozo – 100 ml/ha; Custodia 50–100 ml/ha; Osiris 200–300 ml/ha; Priaxor EC 5–100 ml/ha; Prosaro 250 EC 100 ml/ha; Signum WG 100 g/ha; Soligor 425 EC 70 ml/ha.