

SOYBEAN AND ITS FUSARIOSIS DISEASES

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Abstract: Oil crops have played an important role in providing food to the population and meeting the demand for oilseed products. Diseases affecting soybean impact plant quality and productivity. This article discusses diseases that may occur in Uzbekistan and measures for their control.

Keywords: oil, soybean, fungus, mycelium, disease, fusariosis, peronosporosis, control

Introduction. Globally, leguminous oil crops, including soybean and peanut, are cultivated on over 135 million hectares in more than 100 countries. These crops are particularly important for meeting global demand for food products, including protein, carbohydrates, and vegetable oils. According to FAO data, peanut yields can be reduced by up to 45% and soybean yields by up to 30% due to various fungal diseases.

Currently, developing modern methods for protecting crops from diseases in leading peanut and soybean-producing countries is a pressing issue. Countries with extensive experience in leguminous oil crop cultivation, such as the USA, China, Brazil, Canada, Serbia, Ukraine, and Russia, have well-established practices for disease identification, monitoring, and effective control measures.

Symptoms of Soybean Diseases. Diseases manifest in soybean seedlings and mature plants as seed and seedling rot, wilting, root and stem darkening and decay, as well as pod and seed damage (E.A. Kholmurodov et al., 2010).

Fungal Pathogens of Soybean. A total of 47 fungal species belonging to 3 divisions, 4 classes, 9 orders, 11 families, and 25 genera were identified in soybean plants. Most species belong to the Deuteromycotina (36 species), Mastigomycotina (6 species), and Ascomycotina (4 species) divisions. The most common genera include *Fusarium* (6 species), *Aspergillus* (5 species), *Mucor* (4 species), *Penicillium* (3 species), and *Alternaria* (3 species). The majority of fungi (37 species) were isolated from seeds, fewer from leaves (25 species), pods (20 species), roots (19 species), and stems (17 species). Forty-seven fungal diseases were identified in soybean, with the main symptoms being wilting (54.8%), spotting (33.9%), and mold growth (11.3%), as well as powdery mildew (46.3%), downy mildew (31.9%), ascochyta blight (30%), sercosporiosis (19.3%), and anthracnose (16%). The most significant yield losses were observed from root rot (27.0%), fusariosis (24.5%), and verticillium wilt (20.7%), while septoria (13.1%) and phyllostictosis (5.4%) were less damaging (Ismatov Z.B., 2018).

Disease Development and Symptoms. Infected seed coats, root collars, and root tissues soften, leading to plant death. Resistant varieties may produce additional roots above the infected areas, which survive and may even bear fruit.

At the beginning of flowering and pod formation, leaf yellowing, edge curling, drying, and shedding are observed, and the stem base turns dark brown, resulting in plant wilting (Presipkin,

1982). In wet weather, dark yellow-pink cushions form on the stem base, often in a spotty pattern. On pods, dark yellow spores appear in humid conditions, indicating fusariosis. Infected seeds are shriveled, often with unformed coats, covered by white-pink fungal growth, losing germination potential.

Fusarium Pathogens. Fusariosis in soybean is caused by imperfect fungi of the genus *Fusarium* (Hyphomycetales). In pods and seeds, *F. gibbosum* App. et Wr. and *F. oxysporum* Schl. are common, while wilting is mainly caused by *F. oxysporum*.

Ascochyta Blight. Ascochyta blight affects aerial parts of the plant from pod development to maturation. Pods exhibit dark brown spots with a dense margin. Leaf lesions are large (0.5–1.0 cm), round, grayish-brown with sharp brown borders, sometimes elongated. Affected leaf tissues may die and fall off, leaving only the brown margin. The disease reduces seed germination, slows plant growth, and decreases both yield and quality, with potential losses of 15–20% or more.

Peronosporosis (Downy Mildew). Downy mildew occurs in all soybean-growing regions, especially in high humidity areas. It manifests as diffuse or localized leaf lesions. Diffuse infection shows chlorotic areas covering the leaf or its base. In wet conditions, grayish-purple fungal growth appears mainly on the leaf underside. Heavily infected plants stop growing and die, while weakly affected plants may survive and bear fruit.

Localized infection begins with pale green spots that later turn brown, with gray-purple fungal growth on the leaf underside. Infected leaves die. This often occurs during flowering and pod formation (Bilay V.I., 1977).

Rust Disease. Rust develops more strongly in the second half of the growing season. Small, round, rust-brown pustules emerge from the epidermis on leaves, stems, and pods. Affected leaves die, and pods contain shriveled seeds.

The causal agent is the basidiomycete *Uromyces sojae* Syd., a biotrophic parasite completing its life cycle on soybean. In spring, infected plants produce large amounts of spermatogonia and aecia. Urediniospores (single-celled, oval, light brown, 15–20×12–20 μm, spiny-walled) and teliospores (single-celled, round, brown, with a pedicel, 20–25 μm) are especially dangerous (Presipkin, 1982).

Disease Control Measures. Measures for protecting soybean include breeding and introducing resistant varieties, crop rotation with a minimum 3–4 year interval, planting after cereals, sugar beet, or potatoes, spatial isolation from fields previously planted with soybean (at least 1 km), using seeds from healthy fields free from fusariosis, ascochyta blight, downy mildew, cercospora leaf spot, rust, powdery mildew, bacterial and viral diseases, thorough seed cleaning and calibration, and maintaining seed moisture below 14%.

Seeds should be treated with fungicides 3–6 months before sowing, or immediately before sowing if pre-treatment is not possible, with increased dosage (0.5 kg/t). Planting in warm soil (above 10°C) reduces mold and fusariosis development, and foliar application of 1% colloidal sulfur (5–6 kg/ha) provides good protection against septoria, ascochyta blight, downy mildew, rust, powdery mildew, and bacterial diseases (E.A. Kholmurodov et al., 2010).

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