EPPO Datasheet: *Stenocarpella maydis*

Last updated: 2023-12-01

IDENTITY

Preferred name: *Stenocarpella maydis*
Authority: (Berkeley) Sutton
Taxonomic position: Fungi: Ascomycota: Pezizomycotina: Sordariomycetes: Diaporthomycetidae: Diaporthales: Diaporthaceae
Other scientific names: *Diplodia maydis* (Berkeley) Saccardo, *Diplodia zeae-maydis* Mekhtieva, *Diplodia zeae* (Schweinitz) Léveillé, *Dothiora zeae* (Schweinitz) Bennett, *Hendersonia zeae* (Léveillé) Hazslin, *Macrodiplodia zeae* (Schweinitz) Petrák & Sydow, *Sphaeria maydis* Berkeley
Common names: leaf spot of maize, seedling blight of maize, stalk rot of maize, white ear rot of maize
view more common names online...
EPPO Categorization: A2 list
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EPPO Code: DIPDMA



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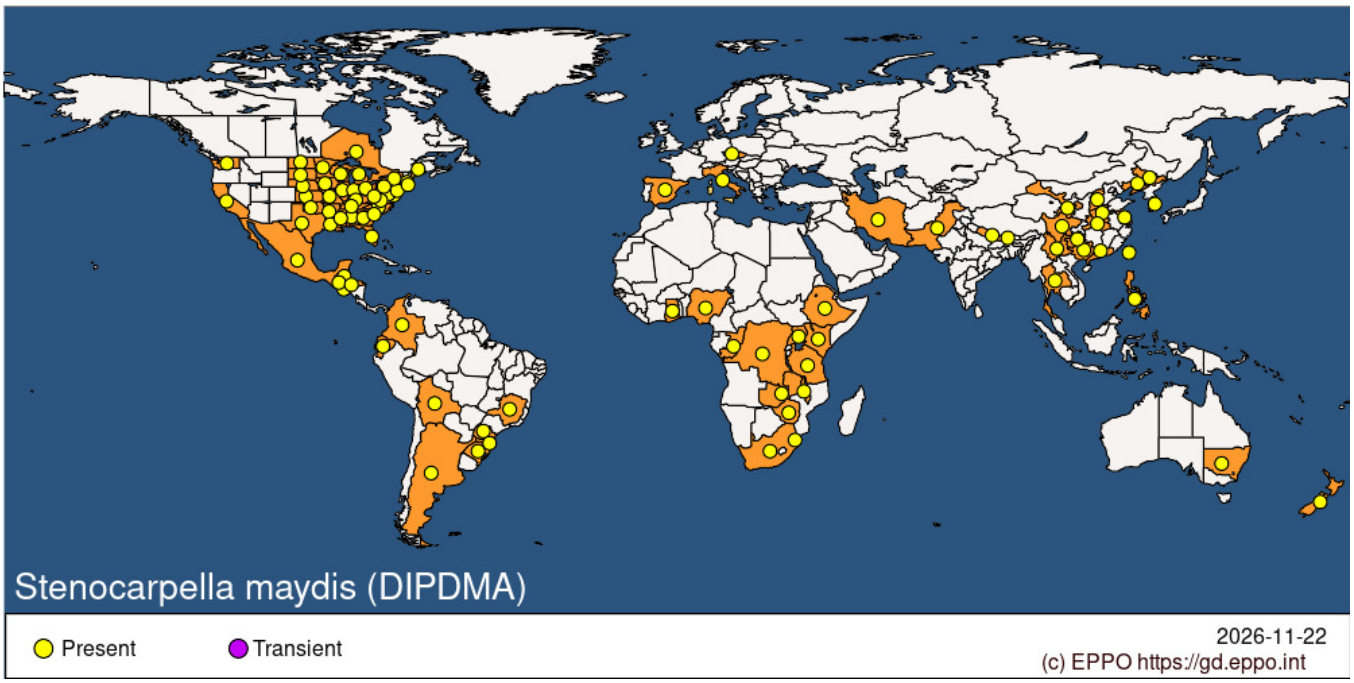
HOSTS

Stenocarpella maydis has a narrow host range with *Zea mays* as the main host. Bamboos (*Arundinaria* species (Sutton & Waterston, 1996) and *Bambusa* species (Farr & Rossman, 2022)) have also been reported as hosts.

Host list: *Arundinaria sp.*, *Bambusa sp.*, *Zea mays*

GEOGRAPHICAL DISTRIBUTION

Stenocarpella maydis is distributed in almost all regions of the world. It can be found in Africa, Asia, America and Oceania. In Europe, it is reported in the Czech Republic (EPPO, 2023), Serbia (EPPO, 2023) and Spain (de la Riva *et al*., 1994). In some EPPO countries it has only been intercepted (e.g. Bulgaria), and in others it has been detected in the past but is no longer present (e.g. Austria) (EPPO, 2023).



EPPO Region: Czechia, Italy (mainland), Spain (mainland)
Africa: Congo, Congo, The Democratic Republic of the, Eswatini, Ethiopia, Ghana, Kenya, Malawi, Nigeria, South Africa, Tanzania, United Republic of, Uganda, Zambia, Zimbabwe
Asia: China (Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Jiangsu, Jilin, Liaoning, Shanxi, Sichuan, Yunnan), India (Sikkim), Iran, Islamic Republic of, Korea, Republic of, Nepal, Pakistan, Philippines, Taiwan, Thailand
North America: Canada (Ontario), Mexico, United States of America (Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Virginia, Washington, West Virginia, Wisconsin)
Central America and Caribbean: Belize, El Salvador, Guatemala, Honduras
South America: Argentina, Bolivia, Brazil (Minas Gerais, Parana, Rio Grande do Sul, Santa Catarina), Colombia, Ecuador
Oceania: Australia (New South Wales), New Zealand

BIOLOGY

Stenocarpella maydis is necrotrophic, exhibiting a parasitic phase in the developing plant and saprophytic phase in the crop residue. *S. maydis* overwinters as viable pycnidia and mycelium on maize debris in the soil (Flett *et al*., 1992) or on seed. Under warm, moist conditions spores are extruded from pycnidia in long cirrhi and disseminated by wind and rain and, probably by insects.

Maize plants are infected primarily through the crown, mesocotyl and roots and, occasionally, at the nodes between crown and ear. Following this, stalks are invaded. The development of the stalk rot phase is favoured by dry weather early in the growing season, followed by extended periods of rainfall shortly after silking. In stalk infections, injury to the vascular system disrupts translocation and, consequently, reduces grain size.

McNew (1937) recovered *S. maydis* from field soil planted with maize which suggests it can survive in the soil. Luna *et al*. (2017) suggest survival in the soil can be for up to 17 months.

Unbalanced fertility, low potassium, poor drainage, mechanical and insect damage, cultivar, and planting density all influence disease severity. The ear and grain rotting phase is similarly favoured by above-normal rainfall from silking to harvest, ears being most susceptible during the weeks after silking. Invasion of the ear is usually by way of the shank. Hybrids with poor husk coverage or thin pericarps are often highly susceptible.

For more information, see Koehler (1960), Dhanraj (1966), Sutton & Waterston (1966), Christensen & Wilcoxson (1967), Walker (1969), Shurtleff (1980).

DETECTION AND IDENTIFICATION

Symptoms

Seedlings

Infected seed gives rise to pre-emergence death in cold soils or blighted seedlings in warmer soils. Seedlings develop brown, cortical lesions on the internode between the scutellum and coleoptile, and the seminal roots are frequently destroyed.

Stalk rot

Symptoms do not usually appear until several weeks after silking, and generally arise following root infection. Oval, irregular or elongate, single or confluent lesions, 1-10 cm long, with pale cream-brown centres and indeterminate darker borders are frequently associated with stalk rot infection. Leaves wilt, become dry and appear greyish-green, the symptoms resembling frost damage. Affected plants may die suddenly. The green colour of the internodes fades and they become brown to straw-coloured, spongy and easily crushed. The pith disintegrates and becomes discoloured, with only the vascular bundles remaining intact. Dark, sub-epidermal pycnidia may be seen clustered near the nodes, and white fungal growth may also be present on the surface (Sutton & Waterston, 1966; Christensen & Wilcoxson, 1967; Walker, 1969; Shurtleff, 1980).

Ear rot

Infection usually begins at the ear base, moving up from the shank. If infection occurs within 2 weeks after silking, the entire ear turns greyish-brown, shrunken and completely rotten and light. Alternatively, early infections result in bleached or straw-coloured husks. Lightweight ears usually stand upright with inner husks adhering tightly to one another or to the ear because of mycelial growth between them. Black pycnidia may be scattered on husks, floral bracts and the sides of kernels. Late-infected ears show no external symptoms, but when ears are broken and grains removed, a white mould is commonly found growing between the grains whose tips are discoloured. For more information, see Sutton & Waterston (1966), Christensen & Wilcoxson (1967), Walker (1969), Shurtleff (1980).

Morphology

Since a number of primary and secondary fungi may be present, microscopic observation of fruiting bodies is recommended.

Pycnidia are immersed, spherical to subglobose, 150-300 µm in diameter, with multicellular walls and a circular protruding papillate ostiole, 30-40 µm in diameter. Conidia in *S. maydis* are straight, curved or irregular, 1 (0-2) septate, smooth-walled and pale-brown with rounded or truncated ends, 5-8 x 15-34 µm Sutton & Waterston (1966).

Detection and inspection methods

Visual examination in a site of production is not an appropriate method for the detection of *S. maydis*, and samples should be sent directly for laboratory testing (EPPO, 2021).

Seed infested with *S. macrospora* show discoloration and are shriveled, moldy and may be rotten when heavily infected. These symptoms are not specific to this pest as may fungal infestations show similar symptoms. Seeds may be infested asymptomatically.

Isolation of *S. maydis* is possible from the infected kernels, seed, cob and stalk rind or pith and root tissues (Flett & Wehner, 1991; Flett *et al*., 1992).

Seeds of maize should be placed on 1% malt agar and incubated at 20°C for 7 days. Subsequent microscopical observation should then reveal the presence of the fungi. The Japanese Plant Protection Service proposed a procedure which required less time by removing the outer layers of the seeds halfway through the incubation period, with subsequent microscopic examination (Dai *et al*., 1987).

Stenocarpella maydis and *S. macrospora* can be collectively detected using a genus-specific primer (Xia & Achar, 2001). A molecular biology approach based on real-time PCR is an easy, fast, and sensitive test for specific targets compared to conventional methods of diagnosis. Barros *et al*. (2014) and Pinto *et al*. (2022) have developed and validated real-time PCR tests for *S. maydis.*

PATHWAYS FOR MOVEMENT

International spread by *S. maydis* will most probably take place through infected maize seed for planting and intended for animal feed. Studies showed that the mycelium of *S. maydis* is present in the endosperm and embryo of maize seeds (Zad & Ale Agha, 1985). EFSA (2022) note that as *S. maydis* can survive in host plant debris in soil, therefore soil and other growing media may be a pathway for movement. Non-host plants with infected debris in the growing media may be a pathway for entry. EFSA (2022) also note that mycelium, pycnidia and conidia may also be a contaminant other substrates (e.g. straw, used machinery and equipment). Natural spread of the fungi can be regarded as rather limited.

PEST SIGNIFICANCE

Economic impact

Stenocarpella maydis has been shown to cause between 5 and 37% reduction in germination (Nwigwe, 1974), as well as being a serious pathogen of maturing plants. Stalk and grain rots are universally important and among the most destructive diseases of maize throughout the world. In most cases, rots are caused by a complex of several species of fungi and bacteria, rather than by a single species, so it is difficult to assess the loss due to *S. maydis* alone.

Losses due to stalk and grain rots vary from season to season and between regions. Baer *et al*. (2021) detail that *S. maydis* can affect yield with losses varying from 1-2 % to as high as 80 %. In the USA, 5-20 % annual yield losses were estimated due to stalk rot and lodging (Christenson & Wilcoxsen, 1966). Differences in grain weight between stalk-rotted and healthy plants in a naturally infected field ranged from 0 to 26.2%. Relating these data to disease incidence in Illinois, state-wide losses were estimated to be 8.6% (Hooker and Britton, 1962). In artificial conditions, Chambers (1988) found yield losses (grain weight per plant) as high as 97% from Diplodia ear rot inoculations made 10 days after silking.

Grain infected by *S. maydis* has been reported to cause Diplodiosis when fed to cattle and sheep. Different toxic metabolites have been isolated from *S. maydis* including diplodiatoxin , dipmatol, diplonine and chaetoglobosins K and L (Steyn *et al*., 1972; Wicklow *et al*., 2011; Snyman *et al*., 2011; Masango *et al*., 2015).

Control

A balanced nutritional status of the soil, reducing stress, general good agronomic and tillage practices and the planting of tolerant maize hybrids all form part of an integrated approach to reducing the probability of disease. Cultural methods are the main management strategies for *S. maydis*, since the fungus overwinters as pycnidia on corn residues (which can include leaves, stalks, and cobs) and can remain viable for at least one growing season. Seed treatments are fairly effective in controlling seedling blight, but once the fungus is established in the soil, crop rotation for at least two seasons is necessary to eliminate it.

Phytosanitary risk

Maize is an important silage and grain crop in the EPPO region, and *S. maydis* is one of the most prevalent ear and stalk rot pathogens of maize globally, causing reductions of grain quality and yield. There is the potential for further

establishment in EPPO countries where it does not occur. Host plant availability and climate are favourable for the establishment of the fungi in maize-growing areas. There is the potential for further spread of this fungi in the EPPO region It has been repeatedly found in certain countries in the EPPO region, without having established.

PHYTOSANITARY MEASURES

Certified *Z. mays* seed should be used. Seeds of *Z. mays* from countries where *S. maydis* occurs should come from pest free areas or in a pest-free place of production. For the inspection of consignments of seed or grain, the EPPO Standard PM 3/78(2) can be used (EPPO, 2021).

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Datasheet history

This datasheet was first published in the EPPO Bulletin in 1982 and revised in the two editions of 'Quarantine Pests for Europe' in 1992 and 1997, as well as in 2023. It is now maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', ‘Hosts’, and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

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