CIAT
Centro Internacional de Agricultura Tropical
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NARO

INTEGRATED DISEASE AND PEST MANAGEMENT FOR BEANS

FARMERS' GUIDE
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BEAN ROOT ROTS

Bean root rots are diseases caused by soil borne pathogenic fungi. Root rot damage prevents the bean root system from being able to take in the nutrients the plant needs. Beans are hardest hit on land where they are being cropped continuously and where soil nutrients have bean depleted.

Symptoms:

Above ground symptoms:(see pictures on page 2)

- Poor germination
- Premature yellowing of leaves
- Premature leaf defoliation
- Un even plant growth and stand
- Leaf necrosis

Below ground symptoms:(see pictures on page 2),

These symptoms show on the roots and hypocotyls of the bean plant and are characteristic of different fungal pathogens (see pictures on page 2)

- The hypocotyls and taproot are initially water soaked, and gradually the tissue dies (Pythium characteristic)
- Diseased plants develop secondary roots
- Narrow, longitudinal, red to brown streaks on the hypocotyl and taproot of young seedlings. The plant also forms lesions that crack longitudinally. (Fusarium characteristic)
- White fungus growth and numerous seed like bodies (sclerotia) that form around the base of plants (southern blight infection)
- Damping off in young seedlings, the hypocotyl and taproot show elongate, sunken reddish brown lesions or cankers. (Rhizoctonia characteristic)

BEAN ROOT ROT DAMAGE ON BEANS





Fields showing premature yellowing, stunting and wilting of young bean plants

Above ground symptoms:

Below the ground symptoms:

Secondary roots above the dead hypocotyl region

Destroyed secondary roots and rotting of hypocotyls





Factors that result in increased prevalence and severity of root rots:

- Continuous cropping of susceptible bean varieties
- Improper, ineffective or inadequate crop rotation
- High soil inoculum levels
- Poor drainage
- Low soil fertility
- Compacted and acidic soils

Management of root rots:

- Plant early in the season before the soil has accumulated a lot of moisture, to discourage infection
- Plough deeply into the sub soil to break the hard pan. Prepare the seed bed to minimize excess soil water and improve drainage. In wet seasons, plant on raised beds or ridges to enhance good drainage
- Plant seed shallowly to reduce hypocotyl injury and the severity of root rots
- Practice continuous rotation with non-host crops such as cereals (rotation reduces the level of inoculum in the soil)
- Apply soil organic matter (such as mulches, green manures, farm yard manure, selected crop residues) and inorganic amendments
- Use of resistant varieties e.g. SCAM-80-CM/5(KK8), MLB-49-89A (KK15),
- MLB-40-89A (KK14), RWR 719(KK22)
- Climbing beans that have bean found to be resistant are Umubano and vuninkingi

Integrated management

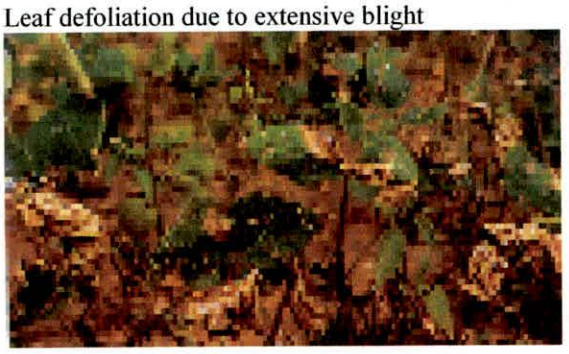
Given the nature and complexities of root rots, use of a single control measure is not likely to give adequate control. A good management technique is to combine 2 or more of the effective and practical control measures available so as to take advantage of their cumulative or complementary effects

ASCOCHYTA BLIGHT

Symptoms: (see pictures on page 4)

- Dark grey to black spots appear on leaves and later become concentric ringed, these lesions develop also on petioles, stem nodes, peduncles, and pods
- Stem girdles, blackening of nodes
- Extensive blight and premature defoliation occur under severe attack

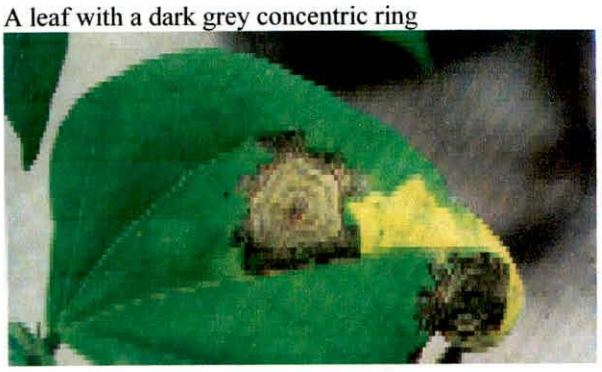
Leaf defoliation due to extensive blight



Lesions formed as a result of ascochyta blight



A leaf with a dark grey concentric ring



Spread:

- The fungus that causes ascochyta blight is seed borne and also survives on bean straw
- Secondary spread occurs through rain splash
- Severity increases during high relative humidity and cool temperatures

Control measures:

- Use of clean seed
- Field sanitation
- Intercropping reduces severity
- Mulching and crop rotation with a cereal crop
- Seed dressing with Dithane M- 45 or mancozeb
- Use of partial resistant varieties, that have been identified

The best control strategy is a combination of partial resistance, mulching and rotation

HALO BLIGHT

Symptoms: (see pictures below on page 6)
Halo blight is characterized by small, water-soaked lesions, which appear on the leaves and quickly develop yellow haloes. Pods, stems, and petioles also exhibit water soaked lesions
Systemic infection causes general chlorosis



Yellow haloes due to halo blight infection

Spread:

- Seed infection is the chief means of carryover.
- The pathogen can also survive in plant residues
- The disease spreads by rain splash

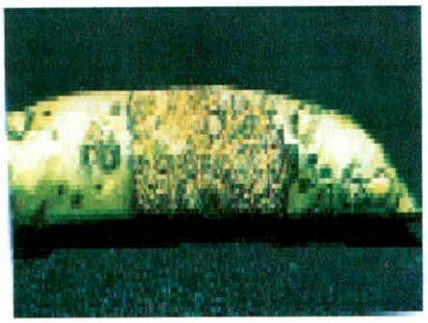
Control:
Host plant resistance is considered the most efficient control measure

ANTHRACNOSE

This is one of the most important bean diseases worldwide.

Symptoms:(see pictures below on page 7)

- ❖ Dark red to black lesions occur along the veins. On larger veins these lesions expand into sunken cankers
- ❖ Lesions also commonly develop on cotyledons, petioles, branches, stems and pods



Sunken pod lesions



Dark red lesions along the veins

Spread:

The fungus is disseminated by:

- Rain splash
- Wind
- Physical contact between plants
- Through seed

Infection and spread are favored by cool temperatures and high relative humidity

Control measures:

- Use of clean seed
- Spraying with fungicides

BEAN COMMON MOSAIC

It is a viral disease that is wide spread throughout Africa and causes serious losses.

Symptoms:

- Leaf symptoms are expressed as dark green sectors on a lighter green background, usually accompanied by downward curling of leaf margins
- Severe infection causes stunting of growth, distortion of flowers and small pods.

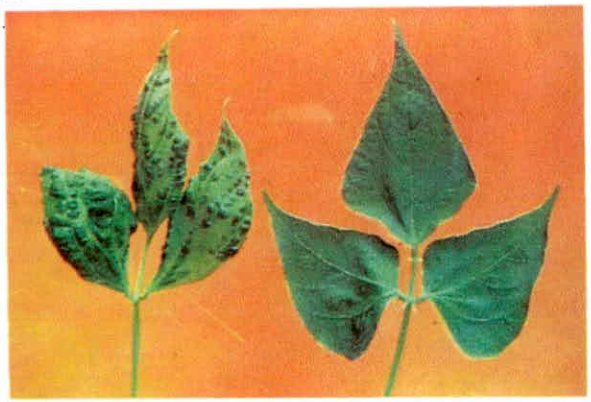
Spread:

The virus is transmitted by aphids and through seed of susceptible cultivars

Control:

Use of resistant varieties

Symptoms of bean common mosaic infection



Leaf distortion as a result of bean common mosaic



Dark green sectors on a lighter green background typical of bean common mosaic infected leaves

PESTS

BEAN STEM MAGGOTS (BSM)

Bean stem maggot is the principal insect pest of beans throughout Africa

Symptoms of BSM damage:(see pictures on page 10)
The principle indications of bean stem maggot damage are dead seedlings or weak and stunted plants. Stems become dry or swollen and split.

Appearance:
The adult bean stem maggot is a small, black fly with clear wings that reflect metallic blue in blight sunlight. There are 3 species. The maggots are similar in size and shape but the pupae can be readily distinguished, some appear brown while others shiny black.

Control:

- Sowing early avoids high rates of infestation
- Improving soil fertility by adding inorganic fertilizers, farmyard manure or other soil amendments improves plant vigor and enhances tolerance to insect attack and damage.
- Earthing up enhances growth of adventitious roots.
- Increasing plant density reduces maggot infestation. The phenomenon may be that the increased number of plants per unit area improves the ratio of plants to maggots
- Insecticides offer the most effective control but they may not be available at the time of need or may be very expensive
- Resistant varieties offer the most ideal strategy for integrated pest management, some of the resistant lines are available from the CIAT Regional Programme

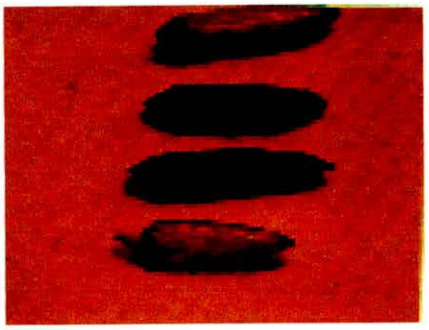
BEAN FLY (BEAN STEM MAGGOTS) (Ophioyia spp.)
DAMAGE ON BEANS



Bean fly adult



Maggots in bean stem



Pupae stage of the bean fly



Wilted bean tap root resulting from bean stem maggots damage



Bean seedlings damaged by bean stem maggots

BLACK BEAN APHIDS

Aphids attack the common bean wherever it is grown, especially during dry spells

Appearance and description:
One type is dull black and has a powdery white secretion on the abdominal segments, while the other is shiny black and lacks the white secretion (see picture on page 11 below)



Damage:
Aphids colonize bean plants, especially around the stems, growing points, and leaves where they feed by sucking sap. Plants may become desiccated and die. The aphids also transmit bean common mosaic disease.

Control:
Spray with insecticides

BEAN FOLIAGE BEETLES

Description:
Adults have orange to black elytra and an orange to brown thoracic plate

Damage:(see pictures on page 13)
Bean foliage beetles inflict severe damage on the plant in the primary leaf stage.
Symptoms of the attack are interveinal holes in the leaves of young plants
Larvae feed on roots of young plants and may cause premature senescence.

Control:
- Delayed sowing, where practicable, allows the crop to escape from dense colonizing populations
- Spray with insecticides

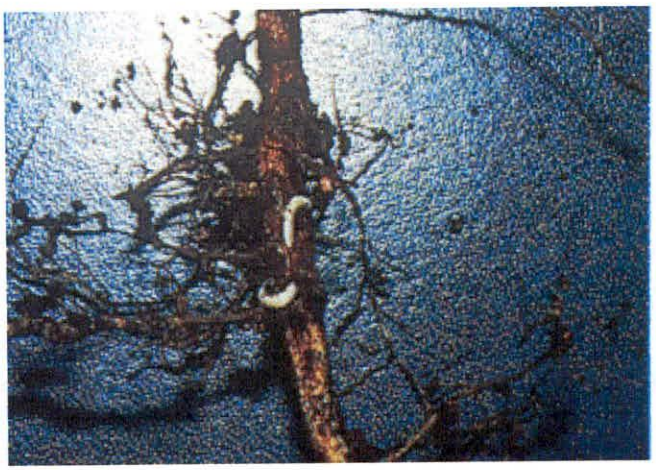
BEAN FOLIAGE BEETLES (Ooetheca spp) DAMAGE ON BEANS



Bean foliage beetle (Ootheca spp) adult



Bean leaves damaged by adult bean foliage beetle



Bean foliage beetle larvae feed and damage roots and stems



Premature senescence of bean plants as a result of bean foliage larval feeding

BEAN BRUCHIDS

Bean bruchids are the most important storage pests.

Damage:

Damaged seeds are covered with eggs glued to the seed coat and are perforated with the feeding chambers of the pest

See pictures below (page 16)



Adult male bruchid



Adult female bruchid



Bean seeds perforated by bruchids with eggs glued to the seed coat

Control measures:

- Good storage hygiene
- Coating seed with various edible oils
- Addition of ashes or dust formulations of various chemicals