

SWEET POTATO, YAM & COLOCASIA



SWEET POTATO

Important diseases

1. Stem rot, wilt and surface rot : *Fusarium oxysporum*
f.sp. *batatas*
2. Black rot : *Ceratocystis fimbriata*
3. *Cercospora* leaf spots : *Cercospora ipomoeae*
4. Soil rot : *Streptomyces ipomoeae*
5. Virus diseases
 - Vein mosaic : *Sweet potato vein mosaic virus*
 - Yellow dwarf : *Sweet potato yellow dwarf virus*
6. Storage diseases
 - Rhizopus* soft rot : *Rhizopus nigricans*
 - Dry rot : *Diaporthe phaseolorum* var. *batatatis*
 - Charcoal rot : *Macrophomina phaseolina*

1. Stem rot, wilt and surface rot : *Fusarium oxysporum* f.sp. *batatas*

Symptoms:

- It causes **vascular wilt**.
- First symptom of the **disease is yellowing** of the **youngest leaves**.
- The **vascular system becomes blackened** along stems. Infected plants **wilt, collapse and die**.
- **Infected tubers** have **blackened ring** (about 6 mm) under the skin and develop **surface rot with** shallow, sunken, circular lesions **in storage**.

Etiology:

Fusarium oxysporum* f. sp. *batatas. The fungus produces **micro conidia , macro conidia and chlamydospores**.

Stem rot



Wilt





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Mode of spread and survival :

- The **main** sources of inoculum **are infected tubers and plants.**
- The fungus as **chlamydo spores** can live for several years.
Spread by **water, wind, animals, machinery etc.**
- **Conidia** are produced on the dead leaves and stems and are readily dispersed.

Epidemiology:

The optimum temperature for infection is **30°C.**

Mortality due to the disease is **directly related to nitrogen** and **phosphorous** application.

Management:

The most important means of **controlling stem rot** are by using **healthy planting** material and adopting **crop rotation**.

Dip the setts in **Thiabendazole 0.2 %**.

Grow **resistant** variety.

2. Black rot : *Ceratocystis fimbriata*

Symptoms:

- **Underground** parts of the plants are infected.
- Infection of stems causing **blackening above the soil surface** giving rise to the common name '**black shank**¹.
- Small, slightly **sunken black spots** on the underground parts of the plant.
- **Fungal spores** are often produced in the centre of these areas of infection.
- Infected tubers have **an unpleasant taste** when cooked.



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Etiology:

Ceratocystis fimbriata .

Mycelium is branched and septate.

Pathogen produces **microconidia** (hyaline, one-celled, cylindrical) , **macroconidia** and **chlamydospores**

In **sexual** stage, it produces **ascospores** inside the **perithecia**.

Mode of spread and survival:

The fungus **persists in the soil** between sweet potato crops.

Survives through its **chlamydospores** and **perithecia** in plant and on tubers.

The fungus enters through **bruises or wounds**.

Epidemiology:

Optimum temperature for fungal growth and infection is **23 to 28.5°C** and **23 to 27°C** respectively.

The disease spreads quickly in **stored sweet potatoes**.

In the field, the disease increases with **increase in soil moisture**.

Management:

➤ Use **disease-free** planting stock.

➤ Use **resistant** varieties .

➤ Dipping in **Thiabendazole** , **Benomyl** or **Ferbam** give good control of the disease.

3. *Cercospora* leaf spots : *Cercospora ipomoeae*

Etiology:

Cercospora ipomoeae, *Pseudocercospora timorensis* and *Phaeoisariopsis bataticola*

Cercospora ipomoeae : Conidiophores are septate and dark brown.

Conidia are obclavate, multiseptate, hyaline, straight and curved.

Pseudocercospora timorensis: Conidia are almost hyaline and whip- shaped.

Phaeoisariopsis bataticola : Conidiophores are in cluster which bear pale olivaceous, long cylindrical conidia.

Symptoms:

Symptoms appear as circular, ovoid or irregular yellowish brown spots .

The spots coalesce and form larger patches covering major portion in the leaf blade.

Shot hole formation is often noticed.

Fructifications as black dots are found on blighted areas.

Defoliation is common.



Mode of spread and survival:

Conidia are produced abundantly on the leaf spots and are spread by wind and rain.

Management:

Removal and destruction of **diseased crop debris** reduce the disease incidence.

Spraying with **Zineb 0.25 % or Mancozeb 0.25 %**. thrice at 15 days interval .

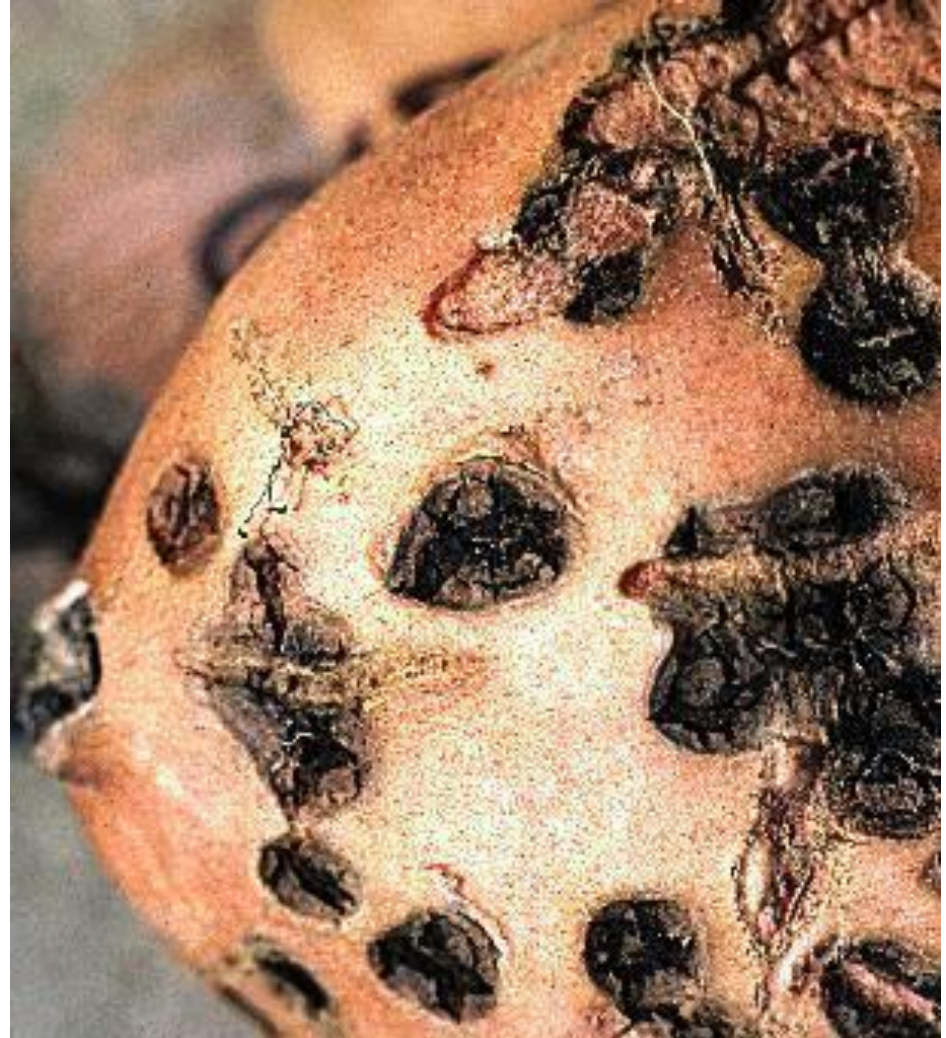
4. Soil rot : *Streptomyces ipomoeae*

Symptoms:

Dwarfed plants which produce one or two short vines with small, pale green, thin leaves.

The most obvious symptom is the development of pits on the tubers.

The tubers may become girdled by lesions.



Actinomycete:

Streptomyces ipomoeae : This actinomycete is a soil-inhabitant.

Epidemiology:

Very dry and poor soils favour the disease development. Optimum temperature for growth of the actinomycete is 30°C.

Management:

Transfer of infected materials (soil and tubers) to uninfected fields should be avoided.

Lowering of pH to 5.0 or less reduces the disease incidence.

5. Virus diseases

a) Feathery mottle

Causal Agent: *Sweet potato feathery mottle virus* (SPFMV).

Classic irregular chlorotic pattern (feathering)

associated with leaf midrib and faint to distinct chlorotic spots, which may have **purple-pigmented borders**.

The virus is transmitted by **aphids** and by **grafting** and also by mechanical means.



b) Vein mosaic

Causal agent: *Sweet potato vein mosaic virus (SPVMV)*.

The infected leaves show **general chlorosis** with a diffuse **mosaic in inter-veinal areas**.

Leaves distorted with distinct **vein clearing**.

The plants have **shortened** internodes, resulting in overall **stunting**.

c) Latent virus disease

Causal agent: *Sweet potato latent virus (SwPLV)*.

It was first reported from **Taiwan**.

As the name suggests, sweet potato infected by the virus do not have obvious foliar symptoms.

It is transmitted **by grafting**.

d) Mild mottle

Causal agent: *Sweet potato mild mottle virus (SPMMV)*.

The symptoms include leaf mottling and stunting.

The virus is flexuous rod and has a coat protein.

This virus is transmitted by the whitefly, *Bemisia tabaci*.

e) Yellow dwarf

Causal agent: *Sweet potato yellow dwarf virus (SPYDV)*.

It includes **mottling**, **chlorosis**, and **dwarfing**.

Virus is transmitted by whitefly, *Bemisia tabaci* in a persistent manner.

It is also transmitted by **mechanical inoculation** and by **grafting**.



6. Storage diseases

a) *Rhizopus* soft rot : *Rhizopus nigricans*

b) Dry rot : *Diaporthe phaseolorum* var. *batatatis*

c) Charcoal rot : *Macrophomina phaseolina*

a) *Rhizopus* soft rot

Etiology: *Rhizopus nigricans*

The fungus produces root like **rhizoids**.

Sporangiophores bear terminal, dark, globular sporangia.

Each **sporangium** has prominent columella.

Sexual spores (**zygospores**) formed germinate by a germ tube and bear terminal sporangia.





Symptoms:

- **Soft, watery rot** and it progresses rapidly.
- Whole tuber **decays with in 4 - 5 days**.
- Skin breaks and **straw coloured liquid** drops out.
- If the skin is not broken, affected tubers become a **shrivelled mummy**.
- When the skin is ruptured fungal growth covers the tuber surface. Tissues turn **brown and emit mild odour**.

Mode of spread and survival:

The fungus (**saprophyte**) subsists on crop residues for a longer period. **Zygosporoes** help in the survival.

Rapid decay of tubers occurs at **15 - 23°C. RH 75 to 84 %**.

Management:

Avoid bruises and wounds to tubers.

Dry tubers in sunlight for 1 to 2 h.

Storage house should be clean and washed with Copper sulphate 2.5% solution.

b. Dry rot

Causal agent: *Diaporthe phaseolorum* var. *batatatis*

Mycelium is hyaline to pale, septate.

Pycnidia produced are globose, brown to black.

Ascospores are produced inside the **perithecia**.

Disease begins at the **stem end of** the roots.

Diseased roots **are shrunken and wrinkled**.

The fungus survives and spreads through diseased planting materials.

Left over **crop residues** serves as **source of inoculum**.

Optimum temperature for growth is **24 - 32°C**.

c) Charcoal rot

Causal agent:

*Macrophomina
phaseolina*

The tissue becomes chocolate to cinnamon brown and later dark red brown.

Black, minute sclerotia are seen on the surface. Decay is spongy at first turning to a hard, mummified consistency.



9.Minor diseases

Collar rot : *Sclerotium rolfsii*

Alternaria leaf spot : *Alternaria capsici annui*

Helminthosporium leaf spot : *Helminthosporium*
euphorbiae

White rust : *Albugo ipomoeae-panduranae*

Concentric ring spot : *Septoria bataticola*

Phyllosticta leaf spot : *Phyllosticta batatas*

Yam

Important diseases

1. Anthracnose : *Colletotrichum gloeosporioides*
2. Leaf spots / Leaf blights : *Cercospora carboanceae*
3. Wilt : *Sclerotium rolfsii*
4. Dry rot : *Penicillium sclerotigenum*

1. Anthracnose

Etiology: *Colletotrichum gloeosporioides* f. sp. *alatae*.

Mycelium - septate, branched and light pink to brown.

Acervuli - simple, globose and dark brown.

Conidiophores - erect and hyaline.

Conidia - one celled, smooth, oval to oblong or cylindrical with one or two oil drops.

Symptoms:

Symptoms vary between species of yam. They are given below,

***Dioscorea alata* (asiatic yam/greateryam)**

Small, brown spots with a yellow edge, appear on the lower leaves and stems.

Spots enlarge, spread and give the stem **a blackened appearance**.



The leaves **wither**.

Brown to black acervuli are observed on the lesions in concentric rings.

Stem infection results **in death of** the plant.

***Dioscorea esculenta* (Turkey liver yam)**

The **brown spots** appear with **yellow halo**, on the leaves.

Enlarge and develop **concentric circles**.

Spreads across **the leaf**, reaches the petiole, the leaf **droops and then falls off**.

The stem is infected through the **petiole**.

In very humid conditions, **direct infection of the stem** occur.

Dioscorea bulbifera: (aerial yam/potato yam)

Symptoms are similar.

However, a greater number of leaves are attacked.

Necrosis is more rapid.

On the stem, the area of attachment of the petioles is affected.

Dioscorea rotunda: (white yam)

Brown spots develop on the leaves.

Stems are not attacked.

Mode of spread and survival:

The fungus survives on crop debris as acervuli. Spores are mainly dispersed by rain splash.

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Epidemiology:

Heavy rains favour the development in epidemic form.

Dry weather reduces the incidence.

Higher temperature, sun light and diffused light favour formation of acervuli.

Management:

Crop debris should be removed and burnt.

Use **resistant** varieties.

Benomyl 0.1 % alternating with

Mancozeb 0.2 % at weekly interval controls the disease.

Copper fungicides produce phytotoxic symptoms and they should not be used.

2. Leaf spots and Leaf blights

a) Leaf spot

Causal agent: *Cercospora carboanceae*

C. dioscoreae and *Pseudocercospora contraria*.

C. carbonacea:

Most common and produces **brown angular spots** on leaves.

Darken with **age and coalesce**.

Affected leaves **dry and fall prematurely**.

Conidiophores - erect, 1 to 2-septate, simple, equally broad at the apex.

Conidia - borne singly, cylindrical, rod-shaped, 4 to 8-septate, apex narrowed, straight.

Conidia - obclavate, straight or slightly curved, pale orange brown.



C. dioscorea produces spots which are dirty brown on the lower surface producing yellowish brown discolouration on the upper surface.

Conidiophores - brown, few septate.

Conidia - subcylindrical, slightly narrow upward, 3 to 8-septate, hyaline to yellowish in colour.

Pseudocercospora contraria produces amphigenous leaf spots which are sub-circular and light brown.

Conidiophores - fasciculate, pale to olive brown, erect, simple, smooth, septate, straight to more or less sinuous.

Conidia – cylindro-clavate, obtuse or rounded at the apex.

Mode of spread and survival:

Survive on **crop debris**.

Conidia are spread by **rains**.

Warm and wet weather favours the disease.

Management:

Two or three sprays with **Maneb or Captan 0.2 % or Mancozeb 0.25 %** every 10 days has been found to be effective.

Fungicides may be used when the disease is found in a **epidemic** form.

b) Leaf spot

Causal agent: *Phyllosticta dioscoreicola*.

It appears as **minute tan coloured spots** on the leaves which gradually increase in size from 2 mm to 4 mm in dia.

These spots are **dark tan in colour with a yellowish halo** surrounded them.

c) Leaf blight

Causal agent: *Thanatephorus cucumeris*

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The infected areas have a **water-soaked appearance**. Spreads **rapidly over** the leaf lamina and **become flaccid**, collapse and **turn brown**.

A **concentric light and dark brown colour zonation** is noticed.

After collapse of the leaf, the infection may spread via the **petiole to the stem**.

d) Leaf blight

Causal agent: *Cladosporium cladosporioides*

Small, light brown spots on leaf lamina, which enlarge, coalesce and give a **blighted appearance**.

Hyphae - dark. **Conidiophores** - dark and branched.

Conidia - dark.



3. Wilt

Causal agent: *Sclerotium rolfsii*

The infected plants show initially yellowing of leaves.

The leaves lose their turgidity and begin to wilt.

If the infected plant is uprooted and the stem bark is removed black mustard-like sclerotial bodies can be seen.

Drenching the soil with Wet Ceresan 0.1 % controls the disease.

4. Dry rot

Causal agent: *Penicillium sclerotigenum*

- Tubers show **complete drying of tissues** and produce a hard brown mass presenting dry rot.
- **Shrinkage** and **darkening** of affected parts.
- **Rot** progresses and the **skin wrinkles**.
- The underlying tissues **discolored** - dark brown to black which become dry and **cavities lined with the fungal mycelium**.
- The affected tubers are **usually hard and much lighter in weight**.

A temperature of above **25°C**, **RH above 80 %** and **injuries are favourable** for the development.



Mycelium - slender, dense and crowded.

Conidiophores - septate, smooth hyaline.

Conidia - arranged in chains, elliptical, pale yellow or green smooth.

Sclerotia - formed in clusters, globose, dark brown.

Injured tubers should not be stored for planting.

When cut tubers are used, the cut ends should be **protected with fungicides.**

Post-harvest dip of tubers with Carbendazim reduces the rot disease and prolongs the shelf life of tubers.

Colocasia

Important diseases

1. Corm rot : *Phytophthora cinnamomi*,
Phytophthora nicotiana var. *parasitica*
and *Pythium* spp.
2. Leaf blight : *Phytophthora colocasiae*
3. Soft rot : *Fusarium oxysporum*

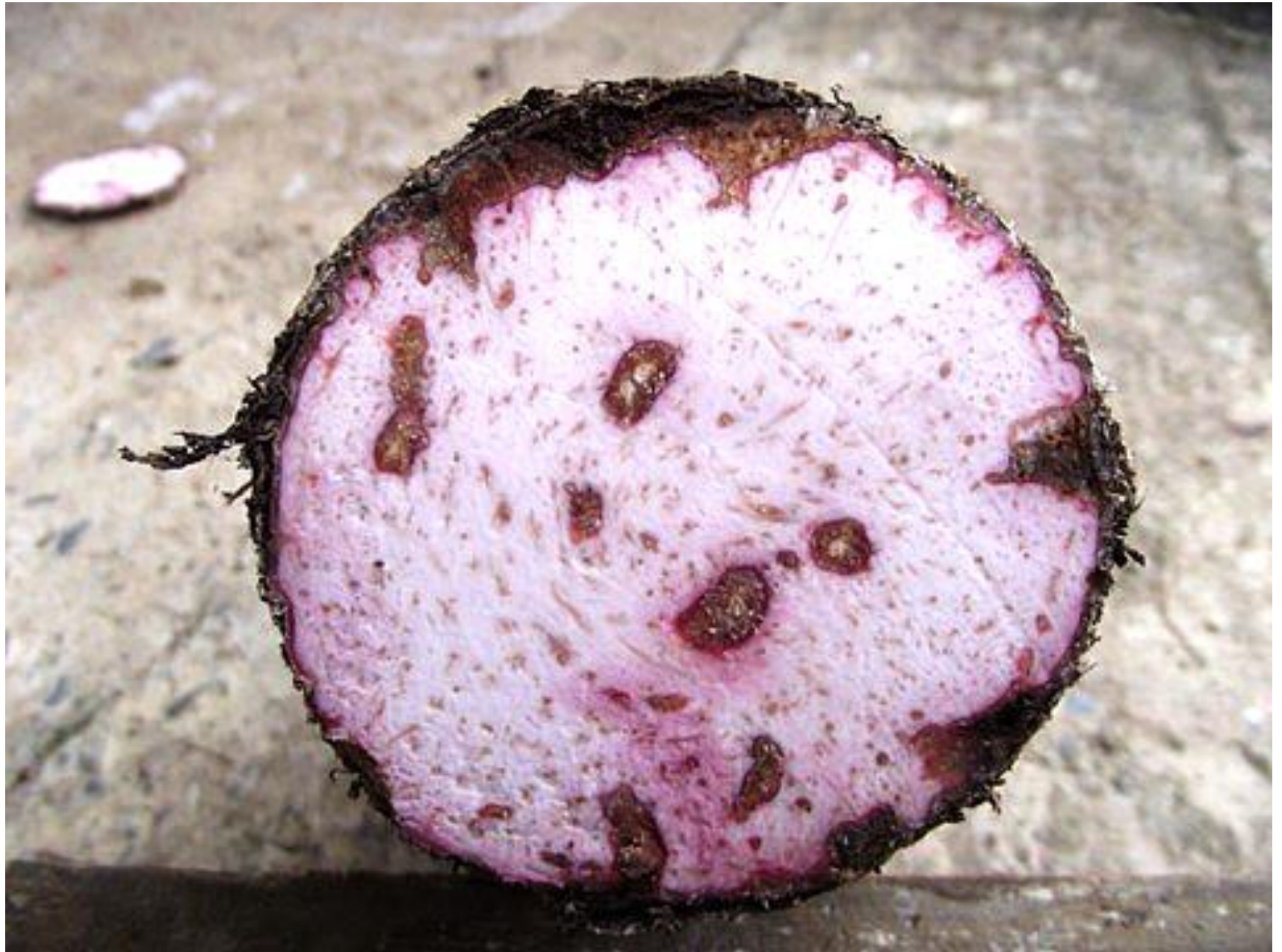
1. Corm rot

Fungi:

***Phytophthora cinnamomi*, *Phytophthora nictotianae*
and *Pythium* spp.**

Symptoms:

- Young plants **die without producing leaves, wilting, chlorosis** and **stunting** occurs.
- The whole plant **collapses**.
- **Rotting of corm** starts at the base, progress upwards and affects the whole corm.
- The rotted tissue is firm and may be **whitish-yellow to grey and blue or dark purple**.
- The diseased tissue **crumbles like cheese** and has an **offensive smell**.





There is often **secondary infection** with *Erwinia chrysanthemi* which causes **white soft rot** (strong smelling.)

Roots decay in association with the corms.

Rotting may also spread **from the main corm**.

Rotting may also spread **from the main corm** to **lateral suckers**.

Mode of spread and survival:

Species of both *Pythium* and *Phytophthora* are soil-borne and survive in **crop residues**.

Epidemiology:

Fungi are favoured by **high moisture, warm temperature** and **poor soil** conditions.

Damage is particularly severe **in wetland areas** and **poorly drained soil**.

Management:

➤ **Crop debris** should be removed.

➤ Diseased plants should be **rogued out and destroyed**.

Avoid water stagnation.

➤ Use **healthy planting** materials.

➤ **Dipping and Soil drenching** of planting material in fungicides such as **Copper sulphate or Captan 0.2 %** is recommended.

2. Leaf blight

Etiology: *Phytophthora colocasiae*

Mycelium - coenocytic, hyaline, inter - and intra-cellular.
Haustoria slender, long and unbranched.

Sporangiophores – unbranched

Sporangia - pear shaped, **biflagellate zoospores**.

Chlamydospores - hyaline, thick walled and round.

Symptoms:

Lesions are **small, dark and round** but rapidly enlarge and become **purplish to brown**.

Chlorotic halo around the spot.

Drops of a **clear liquid exude from the spots** and turn yellow, orange or purple when dry.

Spots coalesce and have **characteristic rings of yellow and brown colour**.

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Under favourable weather conditions ,the whole field may show blighting of leaves **in a period of 7 to 10 days**. Pathogen infects the **petioles and corms** also making the plant to collapse rapidly.

Mode of spread and survival:

Spores produced on the leaf spots are readily spread by rain.

Spores in the field conditions survives for only 16 days.

Epidemiology:

Favoured by **humid, cloudy conditions** and poor soil fertility.

The disease is favoured by a temperature of **25 - 28°C** with **RH 65 - 100 %**.

Management:

Using healthy corms, wider spacing and crop rotation reduces the incidence.

Crop residues should be burnt off.

Mancozeb sprays of 2.25 or 4.50 kg/ha at an interval of 5 to 7 days gives effective control.

Copper oxychloride 0.25 % (4 - 6 times) at an interval of 7 - 15 days depending on weather conditions.

Spraying of Zineb 0.25 % or Metalaxyl 0.25 % at fortnightly is also effective.

Use resistant varieties.

3. Soft rot

Etiology: *Fusarium oxysporum*, *F. solani*, *F. proliferatum*

Symptom:

Whitish-grey, spongy soft rot with definite brown margin.
Decay starts at the base or side of the corms.

F. solani – dry corky or powdery rot with definite margin.
Rotten corms have an mushy odour.

Mode of spread and survival:

Survive in soil in the form of thick walled resting spores.
Fusarium spp. produces abundant conidia which causes infection through wounds during harvest.

Epidemiology:

Warm temperature (30°C), humid condition of storage (90 – 100 %) and continuous darkness favours the disease.

Management:

Field sanitation, long crop rotation, corm selection for planting, devastation of **collateral hosts** and avoiding **injuries** while harvesting and storage.

Application of **Benlate** 15 days prior to harvesting.

Dipping of corm **in hot water (50°C) + Benomyl** suspension (200 ppm) for 5 minutes will be effective.
