

Spotting and Stopping of Mango Malformation

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Mango malformation

Causal Organism: *Fusarium moliliforme* var. *subglutinans*

Other names

- Mango malformation disorder
- MMD

Symptoms

Mango malformation is a common disease that changes how a mango plant grows. It causes the stems, leaves, and flowers to grow abnormally, making them look crowded and deformed. **Based on the growth stages of the mango plant, the disease shows three main types of symptoms:**

1. Bunchy Top Phase (In Nurseries)

This happens when the plants are still very young babies in the nursery.

- **What it looks like:** The tiny shoots at the very top of the plant become short, thick, and stunted.
- **The "Bunchy" Effect:** They grow a bunch of tiny, underdeveloped leaves that crowd together. It looks exactly like a tight, leafy bunch at the tip of the stem, which is why it's called "bunchy top."



2. Vegetative Malformation (In Seedlings)

This affects the growing stems and leaves of seedlings.

- **What it looks like:** The plant suddenly grows way too many leafy branches, but they don't grow long.
- **The "Bunchy" Effect:** The spaces between the leaves (internodes) become very short and swollen. This creates crowded clusters of leaves in various sizes, giving the top of the seedling a messy, bunched-up look.



3. Floral Malformation (In Flowers)

This happens when the tree tries to produce flowers (the panicle). **What it looks like:** Instead of normal, healthy flowers, the flower heads become heavily deformed and crowded.

- **The "Witches Broom" Effect:** The tiny side branches of the flowers transform into clusters of miniature leaves, making the whole thing look like the messy bristles of an old broom (often called a witches' broom).
- **The End Result:** These deformed flower heads eventually dry up, turn into a crusty black mass, and stubbornly hang onto the tree for a very long time without falling off.



Where is the Disease Found?

Mango malformation is a global problem. It can be found in many countries where mangoes are grown:

- **Africa:** Egypt, South Africa, Sudan, and Swaziland.
- **Asia:** India, Pakistan, China, Burma, Malaysia, Oman, Sri Lanka, and Israel.
- **Europe:** Spain.
- **The Americas:** USA (specifically Florida), Mexico, Brazil, El Salvador, Nicaragua, and Venezuela.

What about Australia?

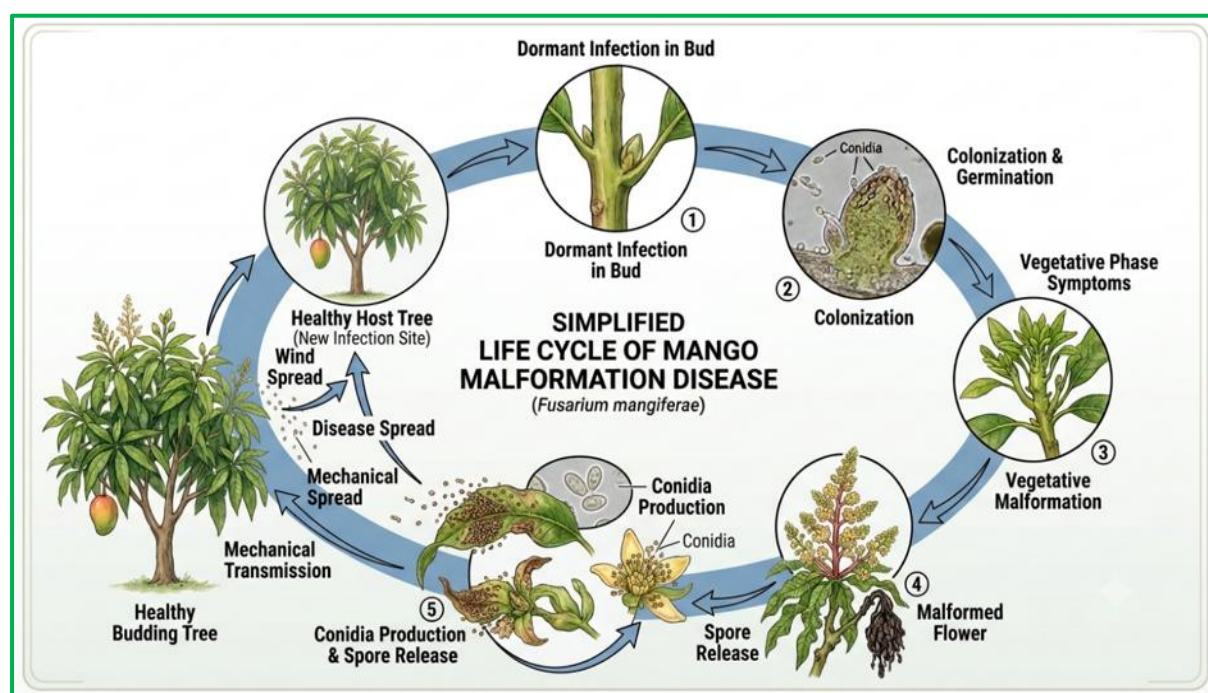
Australia has a unique situation with the different fungi that cause this disease:

- **Fungus 1 (*Fusarium mangiferae*):** First found in Australia in 2007. It lives in the Northern Territory. It was also found once in Queensland in 2009, but scientists successfully wiped it out there.
- **Fungus 2 (*Fusarium mexicanum*):** Has never been found in Australia.
- **Fungus 3 (*Fusarium sterihyphosum*):** This has been found in Australia, but only on other plants-not on mango trees, and it hasn't caused the malformation disease there.

How the Disease Works (Life Cycle)

- **Where the fungus hides:** The disease is caused by a fungus that creates tiny seeds called **spores**. These spores form on both living and dead parts of the infected plant (like the old, deformed flower heads). As those deformed flowers get older, they produce even more spores.
- **How it infects:** The spores wake up (germinate) and attack new, emerging flower buds and young shoot buds. Once inside, the fungus stays trapped in that specific bud or stem—it doesn't actually travel through the rest of the tree's body.
- **How it spreads:** The disease spreads very slowly from tree to tree within an orchard. Scientists still don't fully understand the exact mechanism of how the spores travel between the trees.
- **The "Hidden" Phase:** A tree can be infected but look perfectly healthy. The disease can stay quiet and **dormant (sleeping) for several years** before any bunchy or deformed symptoms actually show up.
- **Safe Fruit:** Thankfully, the disease does not spread through the mango fruit or its seeds.

Disease Cycle of mango malformation



How to Manage the Disease (Control Measures)

Since there is no single cure for mango malformation, farmers use a combination of clean farming habits, pruning, and chemical schedules to keep it under control.

General Control Steps

- **Destroy Infected Plants:** Heavily diseased young plants or seedlings should be completely destroyed so they cannot infect healthy trees.
- **Use Clean Material:** Farmers should only plant certified, disease-free young plants and grafting materials.
- **Smart Pruning:** Cut off the deformed branches and flower clusters. To make sure no fungus is left behind, cut **15 to 20 cm below** the sick part, into the healthy-looking wood.
- **Follow-up Spray:** Immediately after pruning, spray the tree with a fungicide like **Carbendazim (0.1%)** or **Captafol (0.2%)** to protect the open cuts.
- **Basic Hormone Spray:** Spraying the trees with a plant hormone called **NAA (100–200 ppm)** during October helps reduce the chances of the disease appearing.

Advanced Management Schedules (Modules)

For commercial orchards, researchers have created two specific step-by-step spraying schedules (called Modules) to fight the disease at different growth stages.

Module 1: The Multi-Spray Protection Plan

This plan uses a mix of copper, fungicides, mite-control sprays, and growth hormones:

1. **Step 1 (When new leaves emerge):** Spray **Copper Oxychloride (0.3%)** during the vegetative flush to protect new leaves.
2. **Step 2 (20 days later):** Spray a fungicide called **Carbendazim (0.1%)**.
3. **Step 3 (20 days after Step 2):** Spray a chemical called **Propargite (0.18%)** to kill mites (which can spread the disease).
4. **Step 4 (Mid-December):** Spray **200 ppm NAA** (a plant hormone).
5. **Step 5 (When flower buds start to form):** Finish by spraying **500 ppm Ethephon (Ethereal)** to help uniform flowering.

Module 2: The Growth-Regulator Plan

This alternative plan uses special growth regulators like Paclobutrazol and GA3 to manage the tree's health:

1. **Step 1 (First week of October):** Start by spraying **100 ppm Paclobutrazol** (a chemical that controls tree growth).
2. **Step 2 (Soon after):** Spray **Copper Oxychloride (0.3%)**.
3. **Step 3 (20 days later):** Spray **Carbendazim (0.1%)**.
4. **Step 4 (20 days after Step 3):** Spray **Propargite (0.18%)** to control mites.
5. **Step 5 (When flower buds start to form):** Finish by spraying **100 ppm GA3 (Gibberellic Acid)** to encourage healthy flower development.