

Chapter Eleven

# Major Diseases of Tea in Viet Nam

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## **11.1 How to determine which disease is damaging the crop**

It is not only farmers who have trouble deciding which disease is damaging a tea bush. In fact, no one knows much about tea diseases in Viet Nam! We need farmers to do lots of experiments and make lots of observations to help everyone learn more.

One of the most important things farmers can do is learn how the symptoms of diseases change over time. Especially, what is the very first symptom that appears on the bush? The problem is, if you don't know much about the disease, then you're not sure what its first symptom is!



Our suggestion for how farmers can study this is: when you are out in your field, and you see any unusual symptoms (discolored leaves, dead buds, or anything unusual): mark the location of the symptom in the field (for example, by tying a scrap of cloth around the branch).

Write down the date when you saw the symptom, and what it looked like. Then, return to this same location week after week, and watch how the symptoms develop. Write down a short note each week. If the symptom eventually turns into a disease that you recognize (like dead twig disease), then you will have learned what the early symptoms of that disease are. And if, on the other hand, the symptom just disappears, at least you will have learned a symptom that you don't need to worry about! To help you with this activity, ask other people who are often in the field (such as pickers) to tell you when they see anything unusual. For more information, see the section on "Disease Zoos" in Chapter Ten.

In this chapter, only the major diseases that are common in Asia are described. There may be other tea diseases that are important in some districts or in some tea varieties. So, we hope to write a new version of this chapter once we have more information from farmer observations. If you have any observations or changes to suggest, please write us a letter.

To start trying to identify your disease, use the following table. But remember, several diseases (and even insects and nutrients) can cause the same symptoms. So, after using the table, be sure to check the field carefully (and maybe do a simple experiment) to confirm your idea about what is causing the problem.

Symptoms	Possible cause(s)	See section number:
Curled, deformed leaves	Nutrient deficiencies or physiological disorders or misuse of herbicides (see also Chapter 9: aphids, mites, mosquito bug, green leafhopper)	11.5
Leaves covered with dirty mold or mildew	Aphids or scale insects producing a sugary liquid	9.2.5 and 9.2.6
Leaves and twigs with "horsehairs" attached	Horsehair blight	11.3.1
Leaves with pale blisters	Blister blight	11.2.1
Leaves changing color but most leaves remain alive	Root diseases, or nutrient deficiencies, or physiological disorders (see also Chapter 9: aphids, mites, mosquito bug, green leafhopper)	11.4 or 11.5
Dried, dead leaves that stay on the bush	Root diseases (see also Chapter 9: red borer, termites)	11.4
Dead leaves that drop off the bush	Many leaf diseases and branch diseases (see also Chapter 9: mites, mosquito bug, green leafhopper)	11.2 and 11.3
Young shoots and twigs die	Many branch diseases and root diseases (see also Chapter 9: mosquito bug, red borer, termites)	11.3 or 11.4
Cankers (shallow wounds surrounded by thick bark) on stems or trunk	Dead twig disease, bacterial blight, or swollen trunk disease	11.3.3 or 11.3.4 or 11.3.5
Branches or trunk are swollen at the lower end	Swollen trunk disease	11.3.5
Early flowering or excessive numbers of flowers	Root diseases	11.4
Roots are very short, dead, or deformed	Root diseases	11.4

## 11.2 Leaf diseases

### 11.2.1 Blister blight

Vietnamese name: Bõnh phảng l, ch

Scientific name: *Exobasidium vexans* (a fungus in the Phylum Basidiomycota, Class Ustomycetes, Order Exobasidiales, Family Exobasidiaceae)

#### Importance

This is one of the most important tea diseases in Viet Nam, and certainly the most important leaf disease.

#### Symptom that is easiest to recognize

The disease is easiest to recognize when it forms blisters on young leaves. The blister is shiny gray or white color, and usually swells more on the lower surface of the leaf. The upper surface of the leaf above the blister is sunken (see picture).

#### Symptoms over time

The disease is first seen as a small spot on a young leaf (leaves younger than one month old). At first, the spot is the size of the top of a needle. There may be many spots on a single leaf. Each spot quickly becomes larger, appearing transparent with the color of chicken-fat or light brown (see picture). Often there is a pink or red powder at the center of the spot.

About 7 days after the spots first appear, blisters swell out from the lower surface of the leaf. Young branches and even green fruits sometimes form blisters. The outer surface of the blisters becomes gray, then white. Finally the blisters burst, releasing a white or pale-pink powder. This powder is the spores ("seeds") of the fungus.

After the blisters burst, the diseased spots turns violet then brown, and finally shrink. However, leaves and shoots that have many blisters die and fall off the bush. Diseased buds are black and the disease can reduce tea yield. Dead, blackened shoots and buds can become infected by other rot fungi. Processed tea from affected buds has a bitter taste. Also, regrowth is slowed, and sometimes can not be harvested until 2 months after the disease.



#### **Early symptom of blister blight.**

Source: Nguyen Phong Thai (editor). 1998. *Insect pests, diseases, and weeds of tea and prevention methods (in Vietnamese)*. Agricultural Publishing House, Hanoi, Viet Nam.



**Well-developed blisters.** Top row of leaves shows upper surfaces; bottom row shows under-surfaces. Source: Suh-Neu Hsiao. 1983. *Monograph on tea pests and diseases (in Chinese)*. Wen Shan Tea Improvement Station, Taiwan.

## **Disease cycle**

Spores from the blisters are carried by the wind to the leaves of other tea plants. The spores are easily killed by drought or bright sunlight. But if a spore lands on a leaf that is covered with a film of water or dew, the spore will sprout. It produces a thin thread that grows into the leaf. The thread branches and grows to produce a mass of threads inside the leaf. After about 10 days, you can see the fungus inside the leaf as a chicken-fat colored spot. It eventually causes the leaf to swell into a blister, and grows spores inside the blister.

## **Conditions that make the disease worse**

The disease grows best in moderate temperatures (15-20 degrees) and high humidity (90% or more). Especially, the disease becomes most serious in the years with warmer spring and more drizzling rain. The problem is more serious during February-April. In Dinh Hoa and Dai Tu (near the forest), outbreaks can last even until May. Hot temperature (25-27 degrees or more) stop the fungus from growing.

The problem is more serious in tea fields with heavy shade. Also, it is more serious at the bases of the hills, in low poorly-drained areas, and in dense bushy tea plantations rather than in well-ventilated and well-spaced plantations.

The disease is more severe and spreads more quickly in tea fields where large amounts of nitrogen have been applied. Probably for this reason, the garden tea is affected more seriously than the hill tea.

The midland tea variety is more susceptible than the other varieties. Varieties with large leaves seem to be more affected than varieties with small leaves.

## **Natural enemies**

Not known.

## **Management practices: Prevention and control**

### **a. Prevention**

- Avoid applying too much nitrogen fertilizer. When applying fertilizers, the amounts should be made suitable to the age of the tea and also to the condition of the soil. Also, avoid applying early in the spring, when weather is most suitable for blister blight.
- Don't do "tipping" (light pruning in spring) too early. The pruned shoots are very susceptible to blister blight.
- Grow tea bushes with the correct density and spacing, to permit air to circulate and reduce humidity.
- If you are growing tea under shade trees, and you have trouble with blister blight year after year, you may want to reduce or eliminate the shade trees. But think carefully before you do this. Remember: if you eliminate shade trees, you probably will have more problems with insects like thrips and mites.
- When the disease occurs, pluck out the affected leaves and buds to help limit the spread of the disease. Burn all diseased leaves.
- If suitable for your climate and your marketing, plant varieties that are somewhat resistant like Shan or Indian varieties.

## **b. Field monitoring and decision making**

During the period when the disease can become a big problem (February-April), search carefully for the young leaf spots. Based on your experience and the experience of your neighbors, decide whether the disease seems to be building up to cause a severe outbreak. When making your decision about whether you need to spray, consider the weather forecast. Cool rainy weather will make the disease grow fast, but dry weather and extreme temperatures (either hot or cold) will slow down or stop the disease.

## **c. Control methods**

If you decide that you must spray, most experts recommend using fungicides with copper as the major element. But remember: copper fungicides tend to increase problems with mites (see Chapter Nine). If you spray, it is recommended to also spray a second time, with the second spray about 5-10 days after the first. Then, continue evaluating the disease in your agro-ecosystem analysis until the danger has passed (usually by April).

### 11.2.2 Gray blight and brown blight

Vietnamese name: B nh  m n u, B nh  m tr ng, B nh  m x m

Scientific names: Several fungi can cause gray and brown blight on tea in Asia, including *Colletotrichum coccodes*, *Pestalotia* (= *Pestalozzia*) *theae*, and *Pestalotiopsis theae*. These fungi are in the Phylum Deuteromycota, Class Deuteromycetes, Order Coelomycetidae, Family Melanconiales.

Several of these species may be present at the same time.

### **Importance**

These are weak parasites that usually do not reduce yield unless they can enter the plant through a wound (for example, wounds from insect damage, pruning, or sunscorch).

### **Symptoms over time**

First, small spots appear on young leaves. The spots are oval in shape and pale yellow-green in color, often surrounded by a narrow yellow or purple zone. The spots can be in the center of the leaf, or can extend inward from the borders of the leaf (see pictures). As the spots grow, they become brown or gray. They often have many rings like a target, and are sprinkled with tiny black dots. Later, as the spots spread, the leaf becomes a skeleton and then falls into bits.

### **Disease cycle**

The fungus produces spores on the surface of the leaf spots (these are the target-like rings and the tiny black dots). The spores are transported by the wind to young leaves of other tea plants. If the spores land on a wet leaf, they sprout and produce a thread that grows inside the leaf. This starts a new leaf spot where more spores will form.

### **Conditions that make the disease worse**

High humidity; the disease comes and goes with the cycle of the wet and dry seasons.

### **Natural enemies**

Not known.



**Early symptoms of gray or brown blight.**

Source: Source: Suh-Neu Hsiao. 1983. *Monograph on tea pests and diseases (in Chinese)*. Wen Shan Tea Improvement Station, Taiwan.



**Well-developed lesions.** Source: original photograph by Michael Zeiss.

**Management practices: Prevention and control**

The disease usually attacks only weakened bushes and damaged shoots. Therefore, it can be reduced by good tending and practices that help tea plants recover quickly from injury (balanced fertilization, mulching, etc.). In particular, potassium (“kali”) fertilizer is said to help plants resist the disease.

Grow tea bushes with the correct density and spacing, to permit air to circulate and reduce humidity. Avoid excessive shade.

Pick and burn all infected leaves. Usually it is not necessary to control with fungicides.

**11.2.3 Wet leaf blight**

Vietnamese name: Bõnh th, n th-

Scientific name: *Gloesporium theae sinensis* , a fungus in the group Deuteromycotina, Deuteromycetes, Coelomycetidae, Melanconiales).

**Importance**

Little is known about this disease, but it can be important in certain areas.

**Symptoms over time**

The disease starts as translucent, wet-green spots on mature leaves (see picture). The spots begin at the tip and the edges of the leaves. The water-soaked appearance of the spots, and the fact that they are more common on mature leaves, are the most useful symptoms for separating this disease from gray or brown blight.

Infected leaves then turn yellow and finally red-brown, then die and fall off. Wet leaf blight sometimes can spread from the infected leaves into shoots and kill the shoots. In fact, it may be the same fungus that is called *Colletotrichum theae-sinensis*, which causes bud-decay.



**Wet leaf blight.** Source: Nguyen Phong Thai (editor). 1998. *Insect pests, diseases, and weeds of tea and prevention methods (in Vietnamese)*. Agricultural Publishing House, Hanoi, Viet Nam.

### **Disease cycle**

Probably similar to gray and brown blight (above). Little is known about this disease.

### **Conditions that make the disease worse**

- High humidity, especially prolonged rain. Probably because the fungus needs high humidity, the disease is often more severe in fields with dense populations of tea trees.
- Low temperatures (around 20 degrees).
- High dosages of nitrogen fertilizer.

### **Natural enemies**

Not known.

### **Management practices: Prevention and control**

Avoid excessive applications of nitrogen. When fertilizing, use a balanced mixture (potassium and phosphorous as well as nitrogen). Grow tea bushes with the correct density and spacing, to permit air to circulate and reduce humidity. Avoid excessive shade.

Pluck and burn infected leaves. Watch this disease carefully during agro-ecosystem analysis. The disease is more serious than gray or brown blight, and may sometimes require control with fungicides.

## **11.3 Bud and branch diseases (shoot die-back and/or branch cankers)**

### 11.3.1 Horse hair blight

Vietnamese name: Bõnh tặc ®en

Scientific name: *Marasmius crinis-equi* (a fungus in the Phylum Basidiomycota, Class Basidiomycetes, Order Agaricales, Family Tricholomataceae).

#### **Importance**

Quite common, though the impact on yield has not been well studied.

#### **Easiest symptom to recognize**

Black shiny “horse hairs” attached by small brown disks to the upper branches, twigs, and leaves. Above the brown disks, a hair is sometimes divided into several branches.

#### **Symptoms over time**

The hairs are white or yellow at first. Later, they turn brown, and then dark brown or black.

Small, tough mushrooms with thin stalks sometimes grow on the “horse hairs”. The mushroom caps are cone-shaped, colored yellow-brown or red-brown, and are about 8 mm in diameter. If the soil is covered with mulch, sometimes the mushrooms grow on the surface of the mulch.

#### **Disease cycle**

Little is known about how this disease spreads. The mushrooms of horsehair fungus produce spores (“seeds”) that probably are spread by wind to other tea trees. The spores probably require moisture and shade to sprout, and it is probably easier for the sprouting spores to enter through scratches or wounds.

#### **Conditions that make the disease worse**

- Humid air and soil (after rain or watering). Probably because the fungus needs humidity, the disease is often more common in heavily-mulched fields and in fields with a thick density of plants.
- The horse hairs often start at scratched or wounded areas in the crown of the tea bush (the “plucking table”).
- More serious in fields that have been mulched with forest plants such as *Camelia*.

#### **Natural enemies**

Not known.

#### **Management practices: Prevention and control**

For prevention, be careful to avoid scratching or wounding the bushes if possible. Grow tea bushes with the correct density and spacing, to permit air to circulate and reduce humidity. Avoid excessive shade. Also, avoid mulching with *Camelia* and other forest plants; use straw instead.

Once you have the disease, the best management is picking out and burning all the horse hairs and mushrooms. Also remove and burn any dead twigs that had horse hairs.



### 11.3.2 Bud decay or Bud blight (sometimes called anthracnose)

Vietnamese name: Bõnh thèi bóp chĩ

Scientific names: May be caused by three (or more) different fungi:

*Colletotrichum theae-sinensis* (a fungus in the Phylum Deuteromycotina, Class Deuteromycetes, Order Coelomycetidae, Family Melanconiales)

*Glomerella cingulata* (a fungus in the Phylum Acomycota, Order Phyllachorales, Family Phyllachoraceae)

*Phyllosticta gemiphilae* (a fungus in the Phylum Deuteromycotina, Class Deuteromycetes, Order Coelomycetidae, Family Sphaeropsidaceae)

All three species may be present at the same time.

#### **Importance**

This disease usually does not develop very quickly. But under favorable conditions (hot, wet weather), the disease occurs over quite a big area. It can reduce both yield and quality.

#### **Symptoms over time**

The disease usually starts as small dark spots on the soft parts of the tea leaves and buds, especially at the bases of the buds. The spots spread out to affect the young buds, the leaves of sleeping shoots, and young stems (see picture on following page). As the spots grow bigger, leaves and young shoots become black and decay. Serious outbreaks make the leaves fall off and the buds decay completely, producing no yield. However, the disease stops when it reaches brown woody tissue. Unlike dead twig diseases, bud decay does not spread downwards into mature twigs or branches.



***Early symptoms of bud decay.***

Source: Nguyen Phong Thai (editor). 1998. *Insect pests, diseases, and weeds of tea and prevention methods (in Vietnamese)*. Agricultural Publishing House, Hanoi, Viet Nam.

## **Disease cycle**

The fungus produces spores (“seeds”) on the surfaces of the blackened buds, leaves, and shoots. Spores are blown by wind to other tea bushes. If spores land on moist buds or leaves, they sprout and grow a thread that grows into the tender green tissue. These threads divide and grow inside the buds and shoots, and eventually produce more spores.

## **Conditions that make the disease worse**

- High temperature and humidity. The disease often occurs from May-November but is most damaging during the months of July, August, and September.
- Often more serious on tea fields where high doses of urea have been applied instead of balanced amounts of different chemical fertilisers.
- The PH1 tea variety is more seriously affected by the disease as compared to the small leaf Midland variety of tea.

## **Natural enemies**

Not known.

## **Management practices: Prevention and control**

### **a. Prevention**

Avoid excessive applications of nitrogen. When fertilizing, use a balanced mixture (potassium and phosphorous as well as nitrogen). Grow tea bushes with the correct density and spacing, to permit air to circulate and reduce humidity. Pluck and burn infected shoots. If you or your village often have problems with bud decay disease, consider planting Midland variety instead of PH1.

### **b. Field monitoring and decision making**

Check carefully for this disease during hot wet months (especially July, August, and September). When making a decision about spraying, consider the weather forecast. Cooler and (especially) drier weather will slow down the disease.

### **c. Control methods**

If you decide that you must spray, many experts recommend the use of fungicides with copper as the major element.

### **11.3.3 Dead twig diseases / die-back diseases**

Vietnamese name: Bõnh lốt cùn, Bõnh kh« cùn

Scientific names: **many different fungi cause twigs to die on tea in Asia**, including *Aglaospora aculeata*, *Botryodiplodia theobromae*, *Corticium salmonicolor*, *Hypoxyton serpens*, *Macrophoma theicola*, *Nectria* spp., and *Phomopsis* (= *Leptothyrium*) *theae*. Even the fungi that cause gray and brown blights (Section 11.2.2) are capable of killing shoots and twigs if they enter through wounds.

Several of these fungi may be present at the same time.