TRI - ADVISORY CIRCULARS

DISEASE MANAGEMENT

DM

T.R.I. ADVISORY CIRCULAR No.DM 1

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PROTECTION OF TEA FROM BLISTER BLIGHT

(This circular cancels Advisory Circular D2, Serial No. 2/88 and D9, Serial No. 4/92)

1. Introduction

Blister blight disease of tea is caused by a fungus (*Exobasidium vexans*) and is spread by wind-borne spores. A high relative humidity (85%) is required for spore production and their release. Most importantly high moisture on the leaf surface favours germination of spores and infection. Therefore, conditions of persistent mist and dew are particularly conducive to high levels of infection. The spores are killed when they are exposed to either direct sunlight or desiccation. The disease is of great economic importance during the rainy seasons at mid and high elevations (>600 m).

Blister blight fungus can infect only young succulent leaves and tender stems. As the leaves and stems mature, they become immune to infection.

2. Control

2.1 Resistant/Tolerant Clones

No clones have so far been found to be totally resistant to this disease. Only gradations of susceptibility have been found in the various clones of tea. Growing resistant clones is the best option if such information is available. The amount of money spent on chemical control can be proportionately reduced with the increase in resistance of a selected clone.

Resistant	Moderately Resistant
DT 1	TRI 3019
N 2	TRI 4053
NAY 3	TRI 4078
KEN 16/3	TRI 4079
PK 2	TRI 4085
TRI 3072	
TRI 4052	
TRI 4067	
TRI 4076	

In the control of blister blight disease, cultural measures have limited potential. The best is to allow maximum possible sunlight during the monsoon by lopping all removable shade. The use of fungicides has become indispensable in any blister blight control programme.

2.2 Chemical Control

i. **Protective - Copper Fungicides**

ii. **Curative - Systemic Fungicides**

2.2.1 Copper Fungicides

Copper fungicides, which are protective in their action, have been found to give adequate protection against blister blight in tea. When sprayed, copper deposited on the leaf surface prevents the germination of spores, thereby preventing infection. However, copper will have no effect if applied after the fungus has penetrated the leaf surface.

The main ingredient of these fungicides is metallic copper (Cu) and can be available in the forms of oxides, oxychlorides, hydroxides or carbonates. Their formulations could be either, wettable powders (WP) and dry-flowable powders (DF). All recommendations are based on copper formulations having 50% copper (w/w). But, there can be instances where different dosages are recommended using different formulations of the same chemical compound. This is due to the differences in fineness of the commercial preparations and their resultant spreadability/missibility in water.

Based on their solubility they have been categorised into two major groups. They are;

Group (a) - Copper Oxides and Copper Oxychlorides (insoluble in water)

Group (b) - Copper Hydroxides (slightly soluble in water)

2.2.2 Systemic Fungicides

These are of relatively recent origin, which have been found to give better control of the disease. Systemic fungicides have both protective and curative properties. Unlike the protectant fungicides, they can cure an established infection. These systemic fungicides include Baycor 300 EC, Folicur 250 EW, Tilt 250 EC, Contaf 5EC, Bumper 25 EC and Calixin 750 EC. By their chemical composition the presently recommended fungicides fall into two broad categories. They are;

Triazoles - e.g. Baycor, Folicur, Tilt, Contaf, Bumper,

Morpholine derivative - e.g. Calixin

The disadvantages of these fungicides are the high costs, potential residues in made tea and the likelihood of the fungus developing resistance to the fungicide. But the latter could be overcome by adopting the following strategies:

i. Using the lowest possible concentration of fungicide as recommended by the TRI.
ii. Alternating the use of systemic fungicides with protectant copper fungicides.
iii. Limiting the total number of applications per season to a minimum possible, following sunshine hours (cumulative total of 20 hours sunshine over the previous five days is sufficient to prevent disease reaching an economic damage level).
iv. Whenever possible, using fungicides that belong to different groups, possessing different modes of action.

2.3 Control of Blister Blight in Nurseries

Nursery tea plants are maintained under constant shade and humid conditions and as a result, are susceptible to infection most of the time. Therefore, it is necessary to apply fungicides more frequently to protect these young plants.

Use the following rates for 30,000 nursery plants (approximately 250 m^2, area):

Copper fungicides, sprayed at 4-day intervals

Group (a) - 120 g in 45 l of water (4 oz in 10 gallons of water)

Group (b) - 90 g in 45 l of water (3 oz in 10 gallons of water)

Systemic fungicides, sprayed at 10-day intervals

Baycor, Folicur, Tilt, Contaf, and Bumper at the rate of 25 ml in 45 l of water
Calixin at the rate of 50 ml in 45 l of water

2.4 Control of Blister Blight in Young Tea

Tender young plants are also prone to heavy attacks of blister blight. Repeated heavy infections could seriously damage newly establishing plants. Therefore, it is essential to pay more attention for the control of blister blight at this stage of growth.

Chemical control is the answer. Closer rounds are recommended using a knapsack sprayer in order to wet all the young foliage and tender stems for maximum protection.

Copper fungicides, sprayed at 4-5 day intervals

Group (a) - 420-560* g in 170 l of water per hectare
(6-7 oz in 15 gallons of water per acre)
Group (b) - 320-420* g in 170 l of water per hectare
(5-6 oz in 15 gallons of water per acre)

* The lower rates of copper fungicides are for normal monsoon conditions and the higher rates, for heavy misty and cloudy conditions.

Systemic fungicides, sprayed at 10 day intervals

Baycor, Folicur, Tilt, Contaf, Bumper - Sprayed @ 85 ml/ha (1.25 fl.oz/ac) in 170 l of water

Calixin - Sprayed @ 170 ml/ha (2.5 fl.oz/ac) in 170 l of water

2.5 Control of Blister Blight in Tea Recovering from Pruning

On account of blister blight, the most critical time for a tea bush is during the period it is recovering after pruning. During this time all its leaves and shoots are young and tender. The loss of newly emerging stems and leaves at this stage will cause a serious setback to growth. The regeneration growth to replace dead shoots is possible only at further expense of food reserves. Therefore, if the pruned bushes are not adequately protected, incidence of blister blight could cause very poor recovery, which may even lead to their death.

2.5.1 Cultural

Lopping of shade trees: Allow shade trees to be intact at least until one week after pruning of tea. This will provide additional shade to tea bush frames, reducing the effect of sun scorching, which in turn will lead to future wood rotting.

2.5.2 Chemical

Blister blight disease could be effectively controlled in pruned fields by strictly following the fungicide spray schedules as recommended by the TRI.

Application of fungicides should commence with the bud break (approximately three weeks from pruning) and be continued up to the time of tipping (approximately three months). For maximum protection, it is preferable to use knapsack sprayers in order to wet all the young foliage and tender stems. The last two applications prior to tipping should be carried out carefully, by making every effort to get the lance into the bush. This would ensure that the tender parts, that would be exposed, following tipping are also protected by the fungicides.

Copper fungicides - same as in young tea, commencing from bud break, applied once in 4-5 days.

Systemic fungicides - same as in young tea, commencing from bud break, applied once in 10 days.

2.6 Control of Blister Blight in Tea in Plucking

2.6.1 Cultural

Reduce natural shade by lopping them at the beginning of the monsoons;

i.e. April/May, in the Western sector
September/October, in the Eastern sector.

This allows maximum available sunshine falling on the plucking table, which in itself has fungicidal properties.

2.6.2 Chemical

Fungicides could be applied using knapsack sprayers or mist-blowers. Spraying should be done on the day following plucking or immediately thereafter. In the event of plucking rounds being delayed or extended, the spraying rounds must be made sufficiently flexible, enabling a pre-harvest interval of 3-4 days with copper fungicides and 7 days with any systemic fungicide, prior to plucking.

Copper fungicides, sprayed at 7-10 day intervals

Group (a) - 280-420* g in 170 l of water per hectare
(4-6 oz in 15 gallons of water per acre)

Group (b) - 220-320* g in 170 l of water per hectare
(3-5 oz in 15 gallons of water per acre)

Systemic fungicides, sprayed at 10-14 day intervals

Baycor, Folicur, Tilt, Contaf, Bumper - Sprayed @ 85 ml/ha (1.25 fl.oz/ac) in 170 l of water

Calixin - Sprayed @ 170 ml/ha (2.5 fl.oz/ac) in 170 l of water

[Only those systemic fungicides for which residue limits in made teas were tested are recommended.]

Copper and Systemic fungicides

The best would be to use both copper and systemic fungicides in alternate rounds (as indicated below) to avoid risk of building up of resistance by the fungus to systemic fungicides.

Day 1	Day 14	Day 21	Day 35	Day 42
Systemic	Copper	Systemic	Copper	Systemic

Alternatively, both copper and systemic fungicides could be tank-mixed at half the dosage rates of each individual fungicide and sprayed at 10 day intervals, using same amount of water.

For the control of blister blight in plucking tea fields both, High Volume Sprays (using Knapsack Sprayers) or Low Volume Sprays (using Mist-blowers) could be used. The dilution rates given above are for Knapsack sprayers. If mist-blowers are used mix the same amount of fungicide in 30-45 l of water per hectare or in 3-4 gallons of water per acre.

For effective control of the disease following points are important:

i. Good protection depends on good supervision.

ii. It is important that the recommended amount of fungicides be sprayed on to the stipulated area for effective control.

iii. Spraying during continuous heavy rain is not warranted for two reasons. First, there is less likelihood of infection as the spores too could get washed off. Second, any fungicide applied during this time could also get washed off. Cool humid weather with overcast skies is very conducive for infection and spraying is best carried out during such periods. During light drizzles spraying could be undertaken when they are not likely to wash off the fungicides from leaves. For better adherence properties of the chemicals, a sticker could be used.

iv. Spray equipment should be periodically checked and maintained in good condition.

v. Wettable powders should be first made into a paste with a little water and then diluted to the required volume.

Summery chart

Stage of growth of tea	Amount of fungicide	Interval (days)	Dilution	
			Knapsack sprayer	Mist-blower
Nursery				
Copper (a)	120 g per 30000 plants	4	45 l per 30000 plants	-
Copper (b)	90 g per 30000 plants	4	45 l per 30000 plants	-
Other systemic fungicides	25 ml per 30000 plants	10	45 l per 30000 plants	-
Calixin (systemic fungicide)	50 ml per 30000 plants	10	45 l per 30000 plants	-
Young tea				
Copper (a)	420-560 g per ha	4-5	170 l per ha	-
Copper (b)	320-420 g per ha	4-5	170 l per ha	-
Other systemic fungicides	85 ml per ha	10	170 l per ha	-
Calixin (systemic fungicide)	170 ml per ha	10	170 l per ha	-
Pruned tea				
Copper (a)	420-560 g per ha	4-5	170 l per ha	-
Copper (b)	320-420 g per ha	4-5	170 l per ha	-
Other systemic fungicides	85 ml per ha	10	170 l per ha	-
Calixin (systemic fungicide)	170 ml per ha	10	170 l per ha	-
Plucking tea				
Copper (a)	280-420 g per ha	7-10	170 l (15 gals/ac)	40 l per ha
Copper (b)	220-320 g per ha	7-10	170 l (15 gals/ac)	40 l per ha
Other systemic fungicides	85 ml per ha	10-14	170 l (15 gals/ac)	40 l per ha
Calixin (systemic fungicide)	170 ml per ha	10-14	170 l (15 gals/ac)	40 l per ha

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