Alternative Copper fungicides for Blister blight management

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Plant Pathology Division

Tea Research Institute of Sri Lanka

Pathogen: *Exobasidium vexans*

Impact: Crop loss
Extends non-harvestable period
- Protective
- Effective for short period
- Frequent application required
- Low residual effect

- Curative & protective
- Effective for long period
- High residual effect

Protectant

*e.g. Copper fungicides*

Systemic

*e.g. Hexaconazole*
Copper fungicides

- Different forms of copper
  - Copper hydroxide
  - Copper oxide
  - Copper oxychloride
  - Copper sulfate
  - Chelates of Copper with organic acids

- Type of formulation
  - Wettable powders (WP)
  - Dry prilled copper (DP) - Granule
  - Suspension concentrate (SC)

- Amount of metallic Copper
- Amount of formulated Copper compound

Tea Research Institute of Sri Lanka
New formulation of Copper fungicides - Suspension concentrate (SC)

1. Copper oxychloride 10%+Copper hydroxide 10%, SC)- AIRONE (272 g Cu/l)

2. Tribasic Copper sulphate- CUPROXAT (345 g/l SC)

Testing Airone against Blister blight

<table>
<thead>
<tr>
<th></th>
<th>Trial 1</th>
<th>Trial 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental site</td>
<td>Field No 02 Upper Division, St. Coombs Estate</td>
<td>Field No 9, Lower Division, St. Coombs Estate</td>
</tr>
<tr>
<td>Test Period</td>
<td>July to September, 2014</td>
<td>June to August, 2015</td>
</tr>
<tr>
<td>Cultivar</td>
<td>TRI 2025</td>
<td>TRI 2025</td>
</tr>
<tr>
<td></td>
<td>1st year of pruning cycle</td>
<td>1st year of pruning cycle</td>
</tr>
</tbody>
</table>
**Experimental design:**

The design had been Randomized Complete Block Design (RCBD). The basic experimental unit, a plot, had 40-50 tea bushes.

**Trial 1**
- T1 - 0.08% Airone
- T2 - 0.10% Airone
- T3 - 0.12% Airone
- T4 - Untreated Control

**Trial 2**
- T1 - 0.12% Airone
- T2 - 0.14% Airone
- T3 - 0.16% Airone
- T4 - 0.2% Copper oxychloride
- T5 - Untreated Control

The treatments were applied weekly after plucking until the end of the experiment. Each plot was plucked separately at 7-8 days interval. One hundred shoots with bud plus three leaves were selected randomly. Blister blight severity was assessed on 3rd leaf from the bud using 0-6 score blister blight assessment key.
Airone residue trial (Declining)

Copper residue < 40 ppm after 7 days when sprayed Airone at 0.12-0.14%,

Weather Data

Jun – Aug (2nd Trial) 2015

June 2016 (Residue trial).
### Cuproxat against blister blight disease in tea

<table>
<thead>
<tr>
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<th>Trial 2</th>
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<tr>
<td><strong>Experimental site</strong></td>
<td>Field No 09 Upper Division, St. Coombs Estate</td>
<td>Field No 9, Lower Division, St. Coombs Estate</td>
</tr>
<tr>
<td><strong>Test Period</strong></td>
<td>June - August 2015</td>
<td>October-December 2015</td>
</tr>
<tr>
<td><strong>Cultivar</strong></td>
<td>TRI 2025</td>
<td>TRI 2025</td>
</tr>
<tr>
<td><strong>1st year of pruning cycle</strong></td>
<td></td>
<td>1st year of pruning cycle</td>
</tr>
</tbody>
</table>

*Experimental design:* 05 treatments and each replicated thrice. Randomized Complete Block Design (RCBD).

- T1- 0.1% Cuproxat
- T2- 0.2% Cuproxat
- T3- 0.4 % Cuproxat
- T4- 0.5% Cuproxat
- T5- 1.0 % Cuproxat
- T6- 0.2% Copper oxychloride 50% W/W
- T7- Untreated Control

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### Screening Cuproxat against Blister blight

#### Graph 1: Disease severity index vs. Time (weeks)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Disease severity index</th>
<th>Time (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td></td>
<td></td>
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<tr>
<td>T5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Graph 2: AUDPC vs. Treatments

<table>
<thead>
<tr>
<th>Treatment</th>
<th>AUDPC</th>
<th>Treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td></td>
<td>T1- 0.1% Cuproxat</td>
</tr>
<tr>
<td>T2</td>
<td></td>
<td>T2- 0.2 % Cuproxat</td>
</tr>
<tr>
<td>T3</td>
<td></td>
<td>T3- 0.4 % Cuproxat</td>
</tr>
<tr>
<td>T4</td>
<td></td>
<td>T4- 0.5% Cuproxat</td>
</tr>
<tr>
<td>T5</td>
<td></td>
<td>T5- 1.0 % Cuproxat</td>
</tr>
<tr>
<td>T6</td>
<td></td>
<td>T6- 0.2% Copper oxychloride 50% W/W</td>
</tr>
<tr>
<td>T7</td>
<td></td>
<td>T7- Control</td>
</tr>
</tbody>
</table>

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Cuproxat residue trial (Declining)

Copper residue < 40 ppm after 7 days when sprayed Cuproxat at 0.5%

Weather data
### Cost comparison considering only chemical cost

<table>
<thead>
<tr>
<th></th>
<th>Airone at 0.14%</th>
<th>Cuproxat at 0.5%</th>
<th>Copper oxychloride at 0.2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume required for an hectare (170 L water)</td>
<td>238 ml</td>
<td>850 ml</td>
<td>280 g</td>
</tr>
<tr>
<td>Pack size</td>
<td>1000 ml</td>
<td>1000 ml</td>
<td>1000 g</td>
</tr>
<tr>
<td>Cost of 1 L or 1 kg in LKR</td>
<td>1900</td>
<td>1500</td>
<td>1600</td>
</tr>
<tr>
<td>Coverage with 1000 ml or g</td>
<td>4.2</td>
<td>1.1</td>
<td>3.57</td>
</tr>
<tr>
<td>Chemical cost per ha (approximately)</td>
<td>452</td>
<td>1275</td>
<td>448</td>
</tr>
</tbody>
</table>

- **Chemical cost of Airone/ha is comparable to Copper oxychloride**
- **Cost of Cuproxat is higher than Copper oxychloride**

### Summary

- **Airone 0.12-0.14 % and Cuproxat 0.5% can be recommended for blister blight management**
Advantages

- Better performance
- Lower Copper content
- Leave less residue in the environment
- Dust free liquid formulation
- Disperse rapidly
- User & environmentally friendly

Acknowledgements

- Superintendent & field staff of St. Coombs Estate
- Head & staff of Process Technology Division
- Head & staff of Soils and Plant Nutrient Division
- Plant Pathology team
Thank you