

Foliacin and copper compatibility trial



Copper toxicity is a potential side effect of using copper sprays

Copper sprays are commonly used to control and prevent the spread of *Pseudomonas syringae*, in stonefruit, pipfruit, kiwifruit and many vegetable crops. Copper sprays are also applied to control other bacterial diseases such as fireblight (*Erwinia amylovora*) in apples. A potential side effect of using copper sprays is copper toxicity.



Leaf showing copper stress

About copper toxicity

- Symptoms are stunted root growth, which affects mineral and water uptake, and leaf chlorosis.
- Copper chlorosis is caused by copper ions blocking photosynthetic electron transport and a reduction in chlorophyll content of leaves. Chlorosis has a negative impact on crop yield.
- Prolonged use of copper sprays can result in copper levels building up in the soil to phytotoxic levels and the target organism (*Psa*) can become resistant to copper sprays.

Apply Foliacin with copper sprays to reduce phytotoxicity

Biostart Foliacin is an elicitor of plant defence mechanisms. Foliacin contains extracts from the fermentation of beneficial bacteria which stimulate the plant's defence system to protect itself against a range of pathogens.

- Foliacin reduces phytotoxicity caused by chemical sprays
- Improves the plant's recovery from disease and environmental stress
- Increases levels of resveratrol which prevents the spread of bacterial and fungal pathogens within the plant
- Increases photosynthesis, flower and fruit set, and late-season carbohydrate storage

Copper sprays maintain their antibacterial activity against *Psa* when Biostart Foliacin is co-applied

Common copper sprays; copper oxide, copper hydroxide and copper sulphate, were tested with Biostart Foliacin against three strains of copper sensitive *Pseudomonas* bacteria isolated from Kiwifruit leaves and blackcurrants.

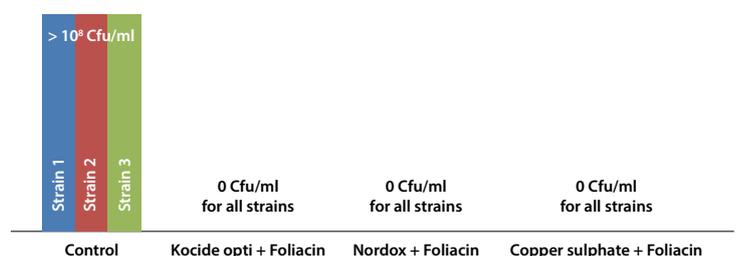
This test was conducted at a typical copper rate of 25g Cu/100ml with Foliacin at 1 L/100 L and 0.25 L/100 L. Foliacin application rate is 0.5 L/ha in 200-600 L of water.

The test was also repeated at a lower copper rate of 10g Cu/ml with Foliacin at 1 L/100 L.

All tests results showed zero CfU/ml of each *Pseudomonas* bacteria strain after treatment, showing Foliacin did not affect copper spray efficacy.

Efficacy of the copper sprays was not affected at a typical or low copper rate or by varying the rate of Foliacin.

Number of *Pseudomonas* bacteria present after treatment with copper sprays (25g Cu/100 L) + Foliacin 1 L/100 L



Biostart Foliacin Copper Spray Compatibility Guidelines

February 2014

COPPER SPRAYS – Copper hydroxides

Product	Active Ingredient	Compatible	Incompatible	Comment
Kocide Opti	Copper hydroxide 30%	✓		Tested compatible at 10g - 25g Cu/100 L with up to 1 L/100 L of Foliacin. Recommended rate of Foliacin: 0.5 L/ha in 200 – 600 L of water.

COPPER SPRAYS – Copper oxides

Product	Active Ingredient	Compatible	Incompatible	Comment
Nordox 75 WG	Copper oxide 75%	✓		As above

COPPER SPRAYS – Copper sulphates

Product	Active Ingredient	Compatible	Incompatible	Comment
Graphic Biocide	Copper sulphate 36%	✓		As above
Winter Clean-Up Spray	Copper sulphate 36%	✓		

Important Notes

1. Growers should check products are on the Zespri approved list of products, prior to application.
2. If the product that you want to co-apply is not listed here, then call Biostart on 0800 116 229. Meanwhile presume it is not compatible.
3. The product actives were tested at the active level listed in the comments field. Higher application rates, different formulations, or other factors may result in compatibility.
4. Different brand names with the same active constituents may have the same compatibility, however, the varying solvents or carriers may result in incompatibility.