



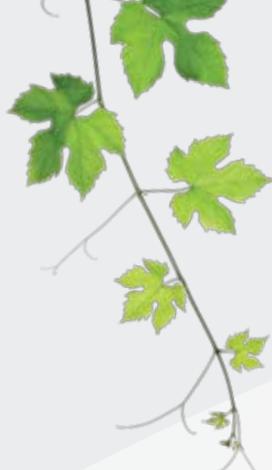
Soil good enough to bottle.

DuPont™
Kocide® Opti™
fungicide

Protection against Downy mildew
in grape vines.



The miracles of science®



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Soil good enough to bottle

With more than 30 years of Research and Development under our belt, we haven't just improved copper fungicide mixing, handling and spraying. We've also reduced the amount of applied elemental copper in DuPont™ Kocide® Opti™ fungicide, which has a huge benefit for your soil and has less impact on the environment.

Why Kocide® Opti™ is better

Kocide® Opti™ uses a fraction of the amount of elemental copper than other products without compromising Downy mildew protection. What's more, Kocide® Opti™ maintains the mixing, handling and spraying benefits of previous formulations, such as Kocide® Blue Xtra.™

Kocide® Opti™

- Excellent protection against Downy mildew
- Less applied copper has less impact on the environment
- Even less dust than previous Kocide® formulations
- Fewer hassles during spraying and mixing
- Less product to handle to spray the same area

Excellent protection against Downy mildew with a fraction of the amount of elemental copper.

The copper in Kocide® Opti™ is so active it uses only a fraction of the amount of elemental copper used by other copper fungicides to protect against Downy mildew. In fact, Kocide® Blue Xtra™ already has one of the lowest amounts of applied elemental copper on the market. Kocide® Opti™ halves that amount again.

A trial (see Figure 2) was conducted in a high pressure Downy mildew area, in a season when spraying had to be delayed due to frequent rainfall. Kocide® Opti™ (at both high and low rates) provided equal disease prevention to Kocide® Blue Xtra.™



Vines treated with Kocide® Opti™ @ 110 g/100 L

Untreated vines

Figure 1: Kocide® Opti™ provides excellent protection versus an untreated plot in the testing programme. Peracto, Stanthorpe, 05-06

Downy mildew in grapes – Pokolbin 2007-08

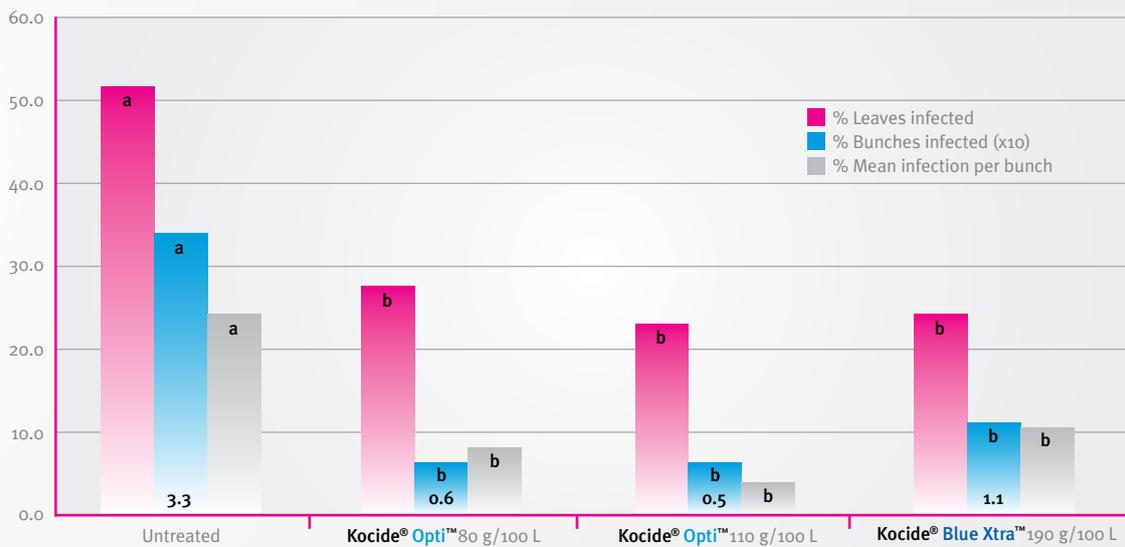


Figure 2: Kocide® Opti™ provides excellent protection against Downy mildew in a high pressure site (a is statistically different to b). Agresearch Pokolbin, 07-08

BioActive™ copper

1. More copper ions available for disease protection (bio-available copper)
2. More copper stays on the crop to prevent diseases
3. Sustained release of copper ions in the presence of moisture
4. Formulation excellence





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Why Kocide® Opti™ is a huge step forward in the control of Downy mildew

Copper fungicides inhibit fungal spore germination and mycelial growth. The active agents are free copper ions (Cu^{++}) released from the applied copper. Effectiveness of disease control should be the determining factor when choosing a copper fungicide, and a direct measure of a product's effectiveness is the amount of copper ions it produces, not its metallic copper content alone.

The most effective copper compounds for the prevention of plant diseases are the fixed coppers, particularly copper hydroxide, as crystals of these compounds have the largest surface area for the release of copper ions. These crystals adhere to the leaf surface and act as ion reservoirs, continuously releasing Cu^{++} ions, forming a protective barrier that prevents infection.

Kocide® Opti™ crystal compared with Copper Oxychloride



Figure 3: The Kocide® Opti™ crystal has a large surface area that results in more release sites for Cu^{++} ions.

Less copper, more copper ions

Kocide® Opti™ protects against Downy mildew with less applied copper through a new development called BioActive™ copper.

BioActive™ copper is the sum total of having;

- (i) more available copper ions, and
- (ii) an effective carrier to get them to the target and retaining these ions on the target plant.

This results in more copper ions available for disease protection. Before we apply the copper to the target plant we can measure the bioavailability or amount of copper ions that are available in the spray tank.

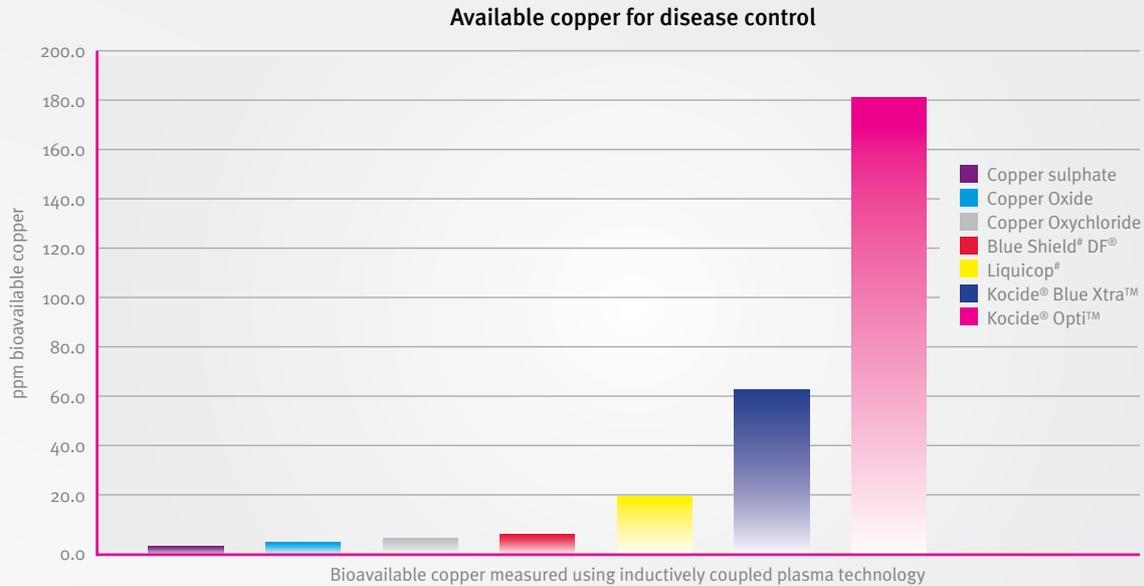
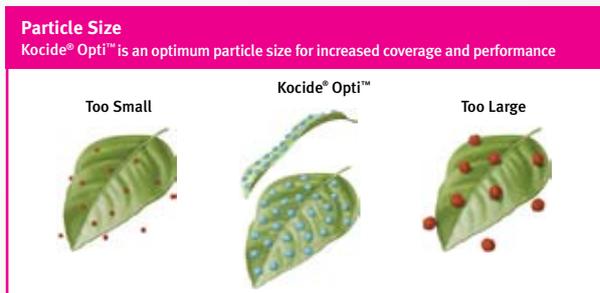


Figure 4: Kocide® Opti™ formulation produces more copper ions for disease control than other copper formulations (DuPont test).

Copper particle size matters



Copper particles of varying size are formed during any copper fungicide manufacturing process. This can be a problem because very large and very small particles are easily dislodged from leaves. DuPont's research has shown

that copper particles of less than one micron contribute little or no crop protection. Kocide® Opti™ has a median particle size of approximately 2.5 microns, maximising the amount of the fungicide that is retained on the leaf and providing excellent retention after rainfall events.

Superior plant tenacity

Although Kocide® Opti™ creates an optimum particle size, some smaller copper crystals can occur. To retain more of these on the leaf surface and thus increase the level of BioActive™ Cu⁺⁺ ions for disease prevention, DuPont has developed a special patented co-formulant for

Kocide® Opti™ that binds these very small particles to form copper complexes. These are retained on the surface of the plant in an adhesive film, a further source of copper ions for disease control. Trials indicate Kocide® Opti™ provides superior rainfastness performance.

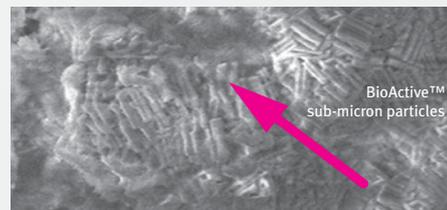
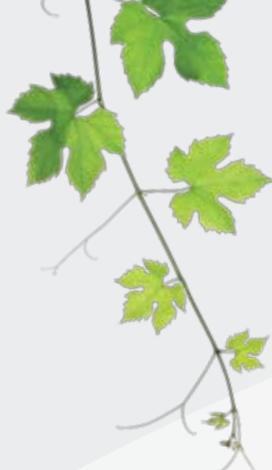


Figure 5: The small particles (less than 1 micron in size) are bound together in a co-formulant and retained on the leaf. This provides effective use of more of the copper ions for disease prevention.



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Hassle-free spraying

Kocide® Opti™ can also improve the spraying process. The unique dry flowable formulation:

- Mixes well - superior dispersion and suspensibility
- Handles and pours like a liquid
- Readily passes through filters and nozzles
- Is easy to measure and handle
- Further reduces dust levels
- Is low-foaming.

Superior dispersion and suspensibility

Kocide® Opti™ has superior bulk wetting properties and completely disperses as soon as it is added to the spray tank. With 85% suspensibility, the particles stay in suspension longer, resulting in better mixing,

improved compatibility and easier spraying. As with all copper fungicides agitation is required to maintain suspension. Sprays containing Kocide® Opti™ should be used within three hours of preparation, but will remain stable and re-suspend easily if left standing.

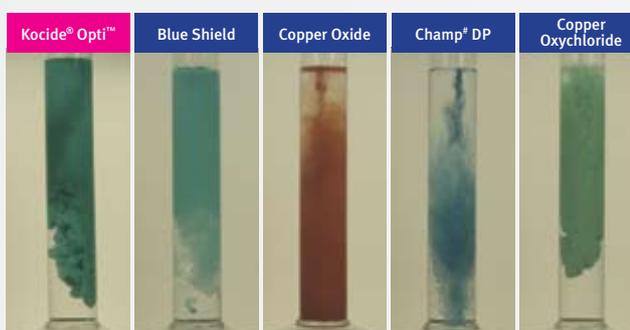


Figure 6: Kocide® Opti™ mixes instantly in water, and suspends and re-suspends readily (DuPont test).

Readily passes through nozzles and filters



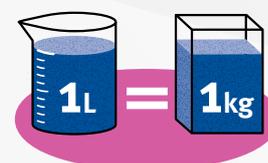
Figure 7: Kocide® Opti™ easily passes through 100 and 200 mesh filters.

Kocide® easily passes through filters and nozzles. To ensure best results when tank-mixing with other insecticides, fungicides and foliar fertilisers, ensure you follow the correct mixing procedure and DO NOT pre-mix Kocide® Opti™ with water before adding the slurry to the spray tank.

Easy to mix and handle

Kocide® Opti™ is formulated into a dry flowable granule. Due to the size and shape of the small uniform granules, Kocide® Opti™ will flow and handle like a liquid. There is no sticking or clumping as there sometimes is with wettable powders. Should you accidentally spill some material it can effectively be cleaned up with a broom and/or dustpan.

DuPont Kocide® Opti™
50 g = 50 mL
100 g = 100 mL
150 g = 150 mL
200 g = 200 mL
250 g = 250 mL
300 g = 300 mL
500 g = 500 mL
1000 g = 1000 mL



Even lower dust levels

Continual improvements in formulations have resulted in **Kocide® Opti™** becoming virtually dust-free. A real bonus for workers and the environment.



Figure 8: A 30 g sample is allowed to fall under standard conditions in a chamber releasing dust. Dust is collected on filter paper placed on a glass sided filter box. The filter paper is re-weighed and the difference in weights is defined as the “collected dust”.

International standard assessment of dustiness		
Category	Dust gravimetric collection (mg)	Interpretation
1	0 – 12	Nearly dust free
2	12 – 30	Essentially non-dust
3	>30	Dusty

Low foaming

Unlike some other copper formulations **Kocide® Opti™** does not foam up during the mixing and spraying operation.

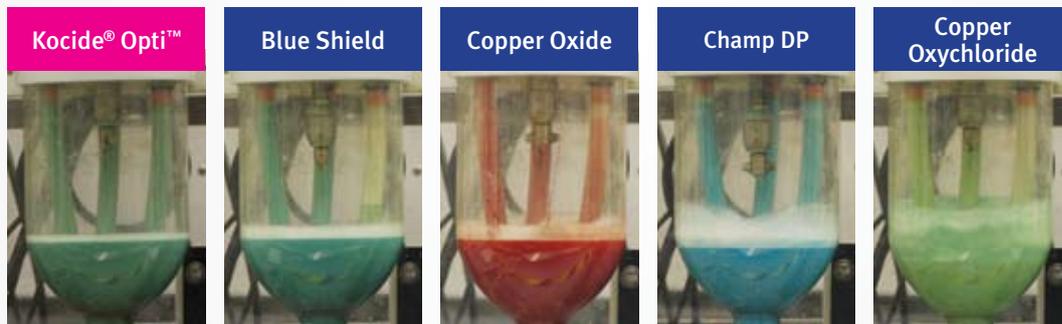


Figure 9: Kocide® Opti™ is low foaming, resulting in less mess during the mixing and spraying operation (DuPont test).

Mixing directions

Kocide® Opti™ wets instantly when added to the spray tank, suspends quickly and stays in suspension with minimal agitation.

Fill the spray vat to half the required volume using good quality water. With the agitation system operating, slowly pour the required quantity of **Kocide® Opti™** into the spray vat. DO NOT dump the product into the spray vat. DO NOT attempt to premix **Kocide® Opti™** in water before adding to the spray vat. If tank-mixing, add the other products after the **Kocide® Opti™** is thoroughly dispersed.

Mixing directions continued

Add products in the following order:

1. **Kocide® Opti™** and other dry flowable or water-dispersible granules
2. Wettable powders
3. Water-based suspension concentrates
4. Water-soluble concentrates
5. Oil-based suspension concentrates
6. Emulsifiable concentrates
7. Adjuvants and surfactants
8. Soluble fertilisers: e.g. calcium nitrate

Wetting agents

The addition of a wetting agent is only required when **Kocide® Opti™** is applied as a concentrate spray or by aircraft. Add a wetting agent suitable for this purpose, at the specified label rates, and irrespective of the spray volume.

Compatibility

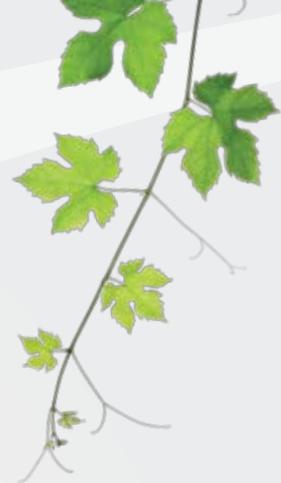
Kocide® Opti™ is compatible with most insecticides/pyrethroids, dormant spraying oils, DuPont™ Manzate® DF® (mancozeb), ziram, wettable sulphur and urea. Mixtures with more than one of the above products are not recommended. Complex mixtures may be ineffective and/or may cause serious crop damage. **Kocide® Opti™** may NOT be compatible with some foliar fertilisers and a test should be conducted before use.

Crop safety

Kocide® Opti™ should not be applied in a spray solution of a pH less than 6.5 or greater than 9.0. Phytotoxicity may occur below 6.5, while greater than 9.0 may result in reduced disease control. Environmental conditions, such as extended periods of wet weather (which alter the pH of the leaf surface), may affect the performance of **Kocide® Opti™**. DO NOT apply when temperatures exceed 35°C. DO NOT apply in frosty weather or when drying conditions are poor.

Fungicide resistance warning

DuPont™ **Kocide® Opti™** is a member of the Inorganic group of fungicides. For resistance management the product is a Group M1 fungicide. Some naturally occurring individual fungi resistant to Group M1 fungicides may exist through normal genetic variability in any fungal population. The resistant individuals can eventually dominate the fungal population if these fungicides are used repeatedly. These resistant fungi will not be controlled by this product or other Group M1 fungicides, thus resulting in a reduction in efficacy and possible yield loss. Since the occurrence of resistant fungi is difficult to detect prior to use, DuPont accepts no liability for any losses that may result from the failure of this product to control resistant fungi.



Directions for use

Restrictions:

DO NOT apply when temperatures exceed 35°C.

DO NOT apply when slow drying conditions prevail.

DO NOT apply to copper-shy crops or cultivars.

DO NOT apply if it is likely to rain before the spray is dry.

DO NOT apply to wet crops.

DO NOT apply in spray solutions having a pH of less than 6.5 as phytotoxicity may occur.

All states

All rates are for dilute spraying. For concentrate spraying rates, refer to the Mixing/ Application section. If using concentrate application, apply the same total amount of product to the target crop.

CROP	DISEASE	DILUTE SPRAYING RATE	CRITICAL COMMENTS
Grapes	Downy mildew (<i>Plasmopara viticola</i>)	80 to 115 g/100 L	Apply when shoots are 10 cm long and repeat at 10 to 14 day intervals while weather conditions favour infection. Use the higher rate when conditions are highly favourable for infection. Leaf damage may occur on 'copper-shy' varieties. Apply as a dilute or concentrate spray. DO NOT use a concentration factor greater than 3X. For concentrate application use a minimum spray volume of 250 L per hectare.

NOT TO BE USED FOR ANY PURPOSE, OR IN ANY MANNER, CONTRARY TO THIS LABEL UNLESS AUTHORISED UNDER APPROPRIATE LEGISLATION.

WITHHOLDING PERIOD: DO NOT HARVEST FOR 1 DAY AFTER APPLICATION.

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