

# COMPARISON OF FUNGICIDE OPTIONS FOR CONTROL OF BOTRYTIS



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- How does a grower or a viticultural advisor choose between Shirlan, Scala or Switch for application at 80% capfall?
- How does Captan compare with Bravo for Botrytis control?

In 1999 I was being asked these questions and was unable to find satisfactory answers. This led to a discussion with Damian Martin, and with assistance from Winegrowers, wine companies, and fungicide manufacturers a series of trials were undertaken to answer these questions.

## 1. Botrytis Infection Pathways

It may be useful to review the process through which Botrytis infects grape bunches, and which we were trying to disrupt with fungicide treatments.

**Flowering to Bunch Closure:** given warm, humid weather during this period Botrytis spreading as conidia (air borne spores) will infect flower debris (caps, stamen, aborted berries) trapped in the bunch.



Fig 1. Floral Debris in bunch, 5 Dec

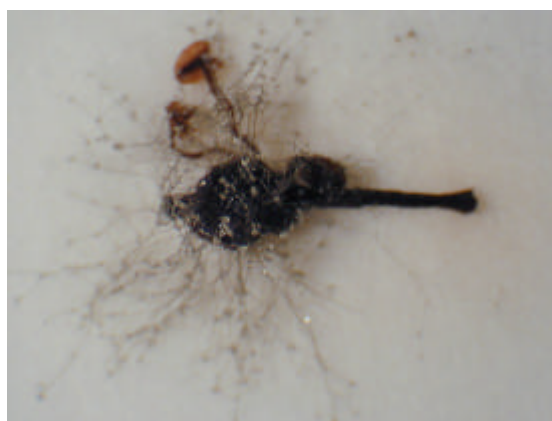


Fig 2. Aborted berry with sporulating Botrytis

The role of latent infections within the developing berry is less clear. Holz reports that in South Africa, infections occurred mostly at the base of the berry and the pedicel. This could be due to infection of fresh abscission scars from flower parts, or infected flower parts remaining attached to the pedicel. Holz seldom found botrytis on the berry cheek or the stylar end.

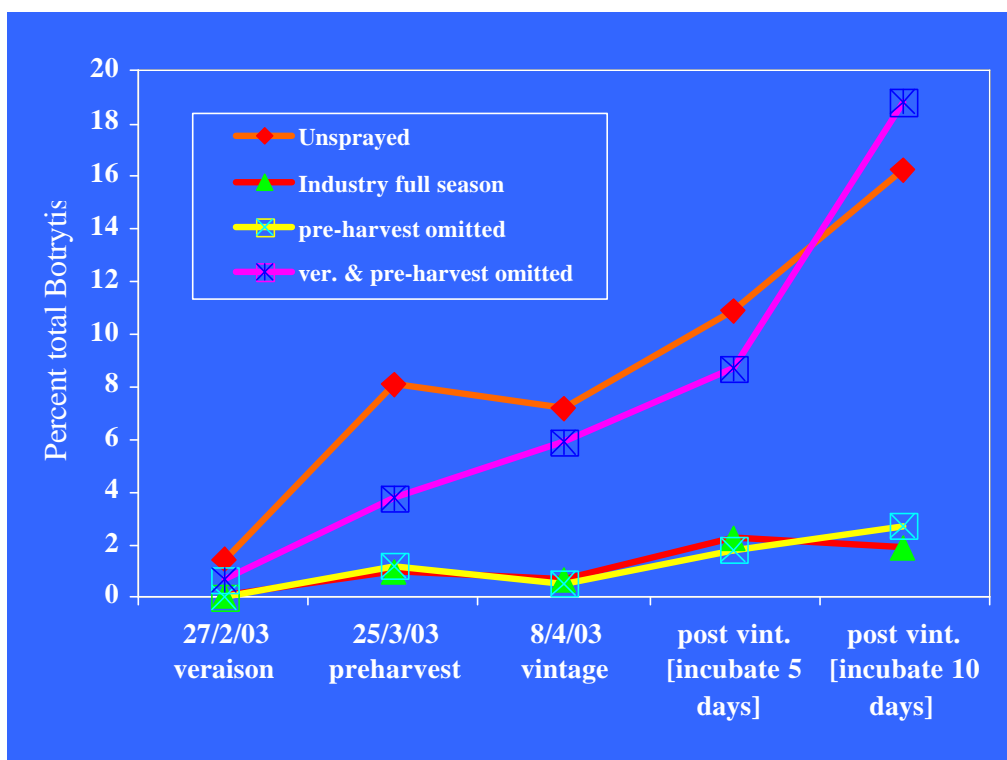
The important points to note are that under conducive weather conditions, Botrytis inoculum levels in bunches can be high following flowering through to bunch closure due to infected dead flower trash. Also, these infections are seldom visible on berries until after veraison.

Fungicides applied from flowering to pre bunch closure provide control of often symptomless infections occurring during this period.

**Veraison to Harvest:** berries become susceptible to infection following veraison from:

- Infected flower debris and aborted berries within the bunch. This is often expressed as rot developing inside the bunch.
- Air borne conidia drifting in from sporulating infections sources such as senescing leaves in the canopy, infections in other bunches, or alternate hosts. These infections appear on external berries in the bunch.

### Timing of Botrytis Fungicide Applications – Hawkes Bay Sauvignon blanc 2002-03



Control of infection occurring at this stage can be compromised by:

- the inability to get fungicides into the bunch to reach the infection site
- restriction on fungicide use due to residues
- Botrytis resistance to fungicides (dicarboximides)

Application of fungicides at or following veraison is often omitted, as weather can be hot and dry at the time. However infections can occur closer to harvest and within pre harvest intervals for fungicide application. The importance of maintaining a cover from veraison was demonstrated during 2002/03 in trials conducted in Pukekohe, Gisborne, Hawkes Bay and Marlborough.

## 2. Comparing Botrytis Fungicide Performance

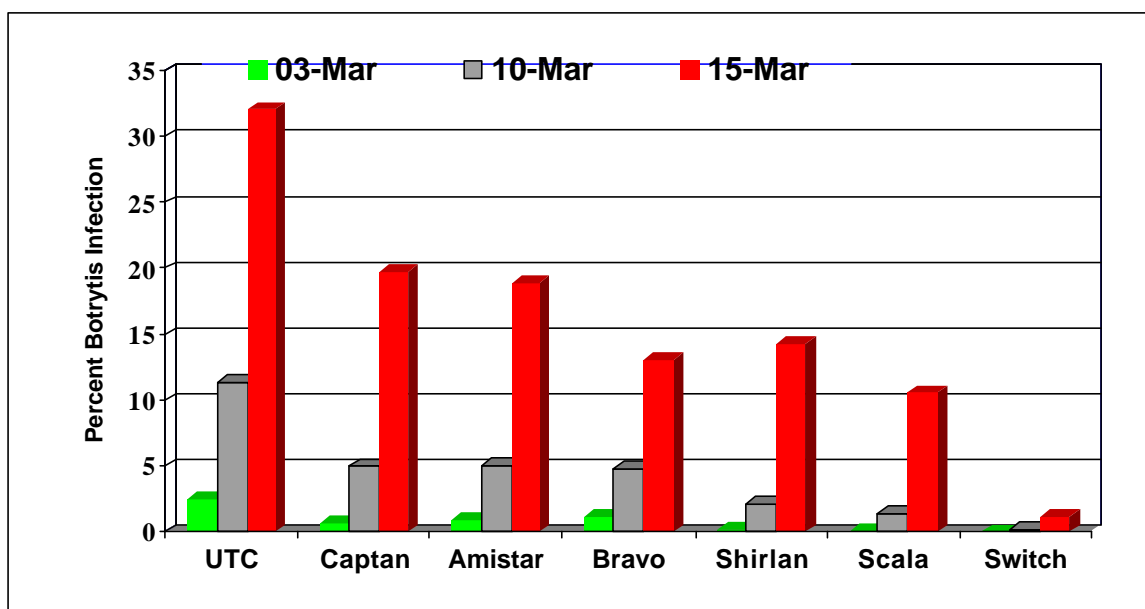
**1999/2000** Trials were conducted on Chardonnay clone 6 in two regions, Gisborne and Hawkes Bay, with differing Botrytis pressure.

	Gisborne	Hawkes Bay
Severe Botrytis Infections	11	5
Rainfall-Flowering to Harvest	438mm	205mm

The following treatments were applied at 5% and 80% capfall, pre bunch closure and veraison.

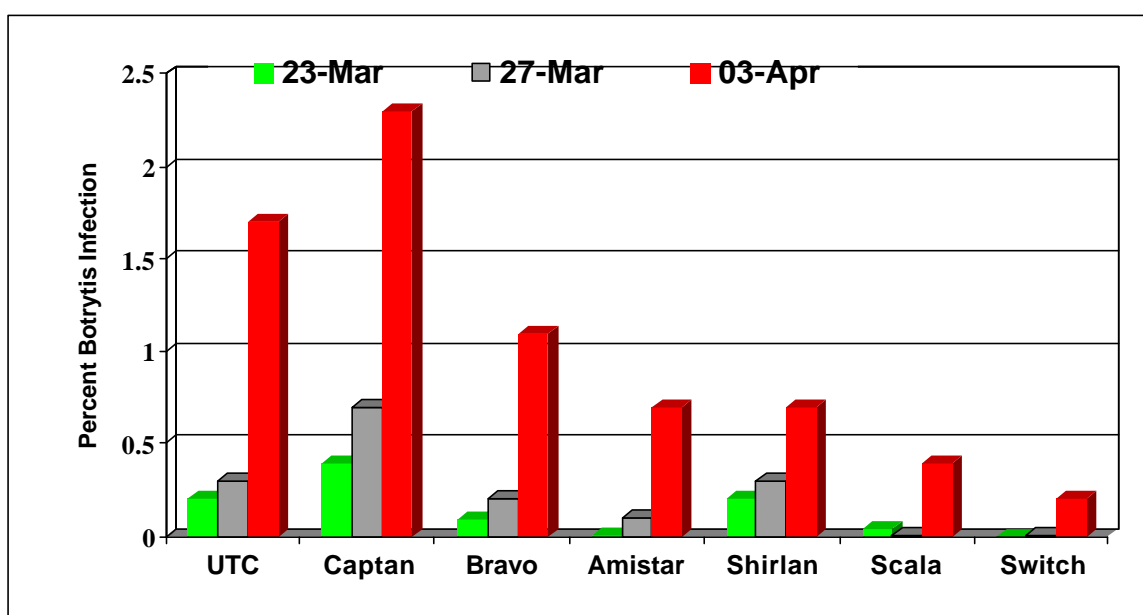
Amistar 50WG @ 400g/ha
Bravo 500F @ 3.0L/ha
Captan 80W @ 1.25kg/ha
Scala 40SC @ 2.0L/ha
Shirlan 50SC @ 1.0L/ha
Switch 62.5WG @ 800g/ha
Untreated Control

**Effect on Percentage Crop Loss - Gisborne**



Wine companies may impose penalties if bunch rot at harvest is greater than 5% total crop infection.

## Effect on Percentage Crop Loss - Hawkes Bay



### Conclusions:

- **Switch was the most effective product**
- **Scala was as effective as Switch initially**
- **Shirlan was inferior to Switch and Scala, but superior to Amistar, Bravo and Captan**
- **Amistar, Bravo and Captan gave moderate control**

**2000/01** Two trials were conducted in Gisborne at the same vineyard used in 1999/2000. In addition to the fungicide treatments, vineyard Botrytis management included the use of a chicory/fescue sward, and an open canopy through leaf plucking and regular close trimming.

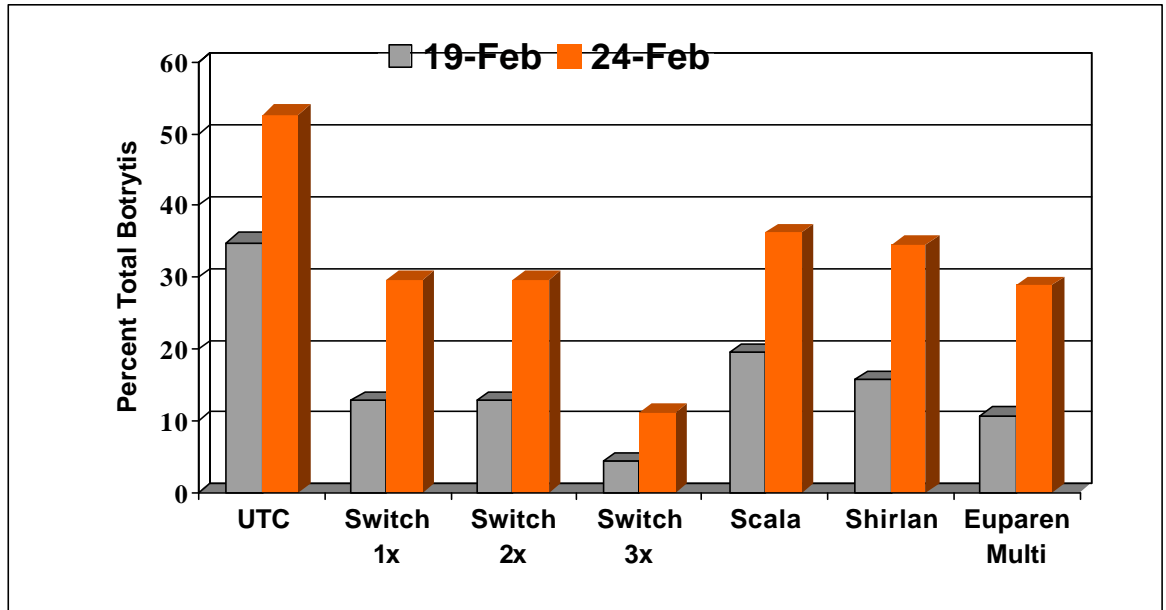
The season was particularly favourable for Botrytis with 12 severe infection periods and 348mm of rain from flowering to harvest. February was warm and wet with 112mm of rain and 5 severe infection periods.

### Flowering to Pre Bunch Closure Trial

This trial repeated the previous seasons comparison of key Botrytis fungicides. In addition the longevity of Switch was examined. The following treatments were applied:

5% capfall	80% capfall	Pre bunch closure
Switch @ 800g/ha		
Switch @ 800g/ha	Switch @ 800g/ha	
Switch @ 800g/ha	Switch @ 800g/ha	Switch @ 800g/ha
Euparen multi @ 2.0kg/ha	Euparen multi @ 2.0kg/ha	Euparen multi @ 2.0kg/ha
Scala 40SC @ 2.0L/ha	Scala 40SC @ 2.0L/ha	Scala 40SC @ 2.0L/ha
Shirlan 50SC @ 1.0L/ha	Shirlan 50SC @ 1.0L/ha	Shirlan 50SC @ 1.0L/ha
Untreated Control	Untreated Control	Untreated Control

### Effect on Percentage Crop Loss – Early Season



The extreme Botrytis infection conditions resulted in over 30% crop infection in the untreated on 19 February. By 24 February this had increased to over 50%. Under this pressure, and with no veraison Botrytis fungicide, all treatments developed over 10% crop infection by 24 February.

#### Conclusions:

- **Switch was the superior fungicide**
- **there was no advantage from applying 2 Switch applications at flowering**
- **pre bunch application significantly reduced crop loss**

#### Veraison to Pre Harvest Trial

Amistar, Captan and Bravo had been included in the previous year's trial as 4 applications from flowering to veraison. These products showed moderate Botrytis control, but their use is more typically between applications of key Botrytis sprays, or closer to harvest. This trial was conducted to observe the performance of these and other fungicides closer to harvest.

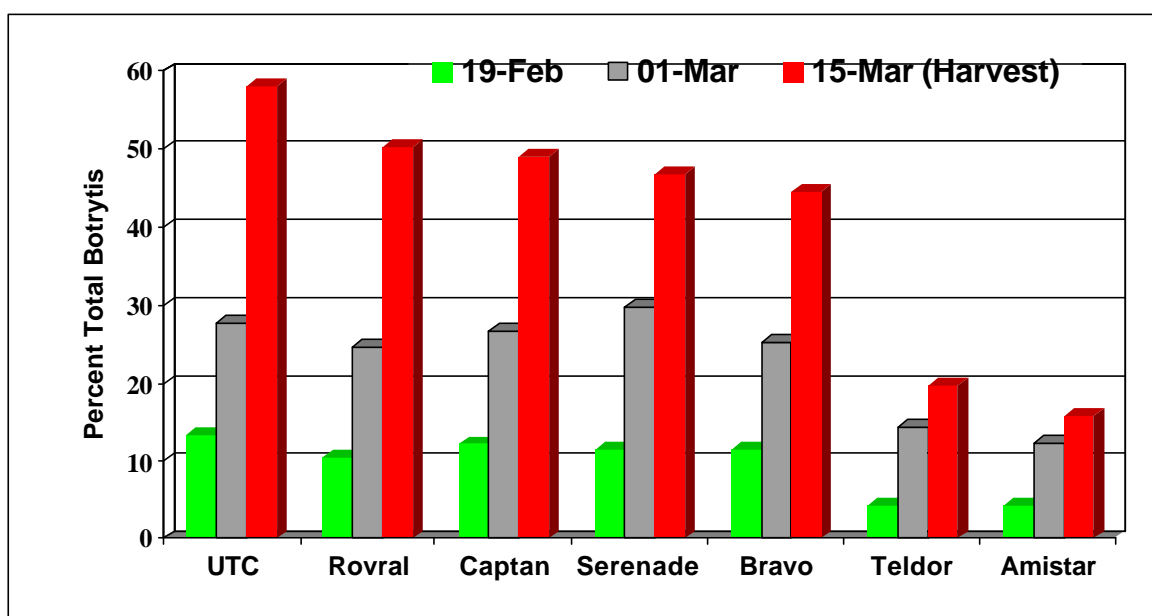
The trial site had received prior treatments of:

<b>5% capfall</b>	Euparen multi
<b>80% Capfall</b>	Scala
<b>Pre bunch closure</b>	Captan

Treatments were applied at 14 and 16 day intervals.

Early Veraison (25 Jan)	Late Veraison (8 Feb)	Pre Harvest (24 Feb)
Amistar 50WG @400g/ha	Amistar 50WG @400g/ha	Amistar 50WG @400g/ha
Bravo 500F @ 3.0L/ha	Bravo 500F @ 3.0L/ha	Bravo 500F @ 3.0L/ha
Captan 80W @ 1.25kg/ha	Captan 80W @ 1.25kg/ha	Captan 80W @ 1.25kg/ha
Rovral Flo @ 2.0L/ha	Rovral Flo @ 2.0L/ha	Rovral Flo @ 2.0L/ha
Serenade 70WP @ 6.0 kg/ha	Serenade 70WP @ 6.0 kg/ha	Serenade 70WP @ 6.0 kg/ha
Teldor 50SC @ 1.0L/ha	Teldor 50SC @ 1.0L/ha	Teldor 50SC @ 1.0L/ha
Untreated Control	Untreated Control	Untreated Control

Effect on Crop Loss – Late Season



Under strong Botrytis challenge, and with a relatively light Botrytis fungicide regime from flowering to pre bunch closure, most treatments failed to show any control. This is possibly due to pre-existing symptomless infections which occurred between flowering and bunch closure. Dicarboximide resistance tested at 33%. Rovral would have been expected to show some control at this level. The interesting result was the performance of Amistar and Teldor.

### 3. Programmes for Botrytis Control in 2002-03

In this season the focus was on combining some of the more promising treatments from previous work, and trying to control Botrytis inoculum build up within the bunches prior to pre bunch closure.

This was compared to an industry standard export programme, and Botry-Zen, a bio control for Botrytis presently under commercial development.

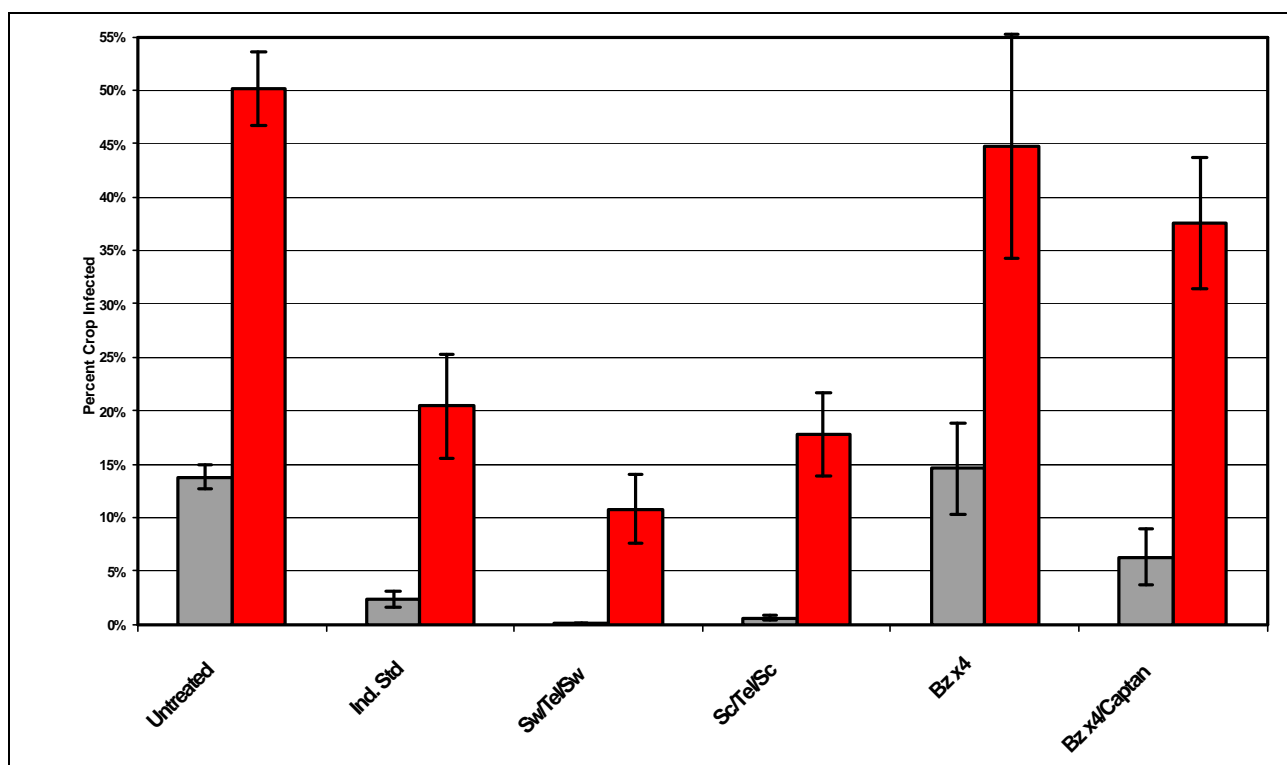
Due to frost damage the trial was located in a different vineyard. Canopy management was open with close trimming and leaf plucking. Vineyard sward was ryegrass/chicory.

Treatments and timing were:

5% Capfall	80% Capfall	Berries Pea Size	Pre Bunch Closure	Early Veraison	Late Veraison
8 November	18 November	6 December	23 December	27 January	12 February
Untreated	Untreated	Untreated	Untreated	Untreated	Untreated
Euparen multi @ 2kg/ha	Switch @ 800g/ha	Bravo 500F @ 3.0L/ha	Euparen DF @ 2.0kg/ha	Bravo 500F @ 3.0L/ha	Bravo 500F @ 3.0L/ha
Euparen multi @ 2kg/ha	Switch @ 800g/ha	Teldor @ 0.75L/ha	Switch @ 800g/ha		
Euparen multi @ 2kg/ha	Scala @ 2L/ha	Teldor @ 0.75L/ha	Scala @ 2L/ha		
Botry-Zen @ 5L/ha	Botry-Zen @ 5L/ha	Botry-Zen @ 8L/ha	Botry-Zen @ 8L/ha	Captan 80W @ 1.25kg/ha	Captan 80W @ 1.25kg/ha
Botry-Zen @ 5L/ha	Botry-Zen @ 5L/ha	Botry-Zen @ 8L/ha	Botry-Zen @ 8L/ha		

There were 13 severe infection periods during the season with 314mm of rainfall from flowering to harvest. January to late February were hot and dry. However 88mm of rain fell between 23 February and 3 March, with a further 98mm falling between 7 to 12 March. Commercial harvest occurred on 7 March at 21.3 Brix.

#### Winegrowers Botrytis Fungicide Trial Gisborne 2002/03 Percentage Crop Infected 4 and 14 March 2003



The Switch/Teldor/Switch and Scala/Teldor/Scala treatments gave superior control to the industry standard at commercial harvest despite no Botrytis fungicide applications since pre bunch closure.

Botry-Zen failed to control Botrytis due to manufacturing problems. Botry-Zen is a Botrytis antagonist that competes with Botrytis for senescing tissue. This mode of action is suited to use in the flowering to bunch closure period.

By reducing Botrytis inoculum levels, Botry-Zen has an indirect effect on conidial infection pressure from veraison to harvest, but it does not act like a protectant fungicide during this period. The combination of Botry-Zen with two veraison applications of Captan halved the level of Botrytis in this treatment at harvest.



Fig 3. Botry-Zen sporulating on a berry

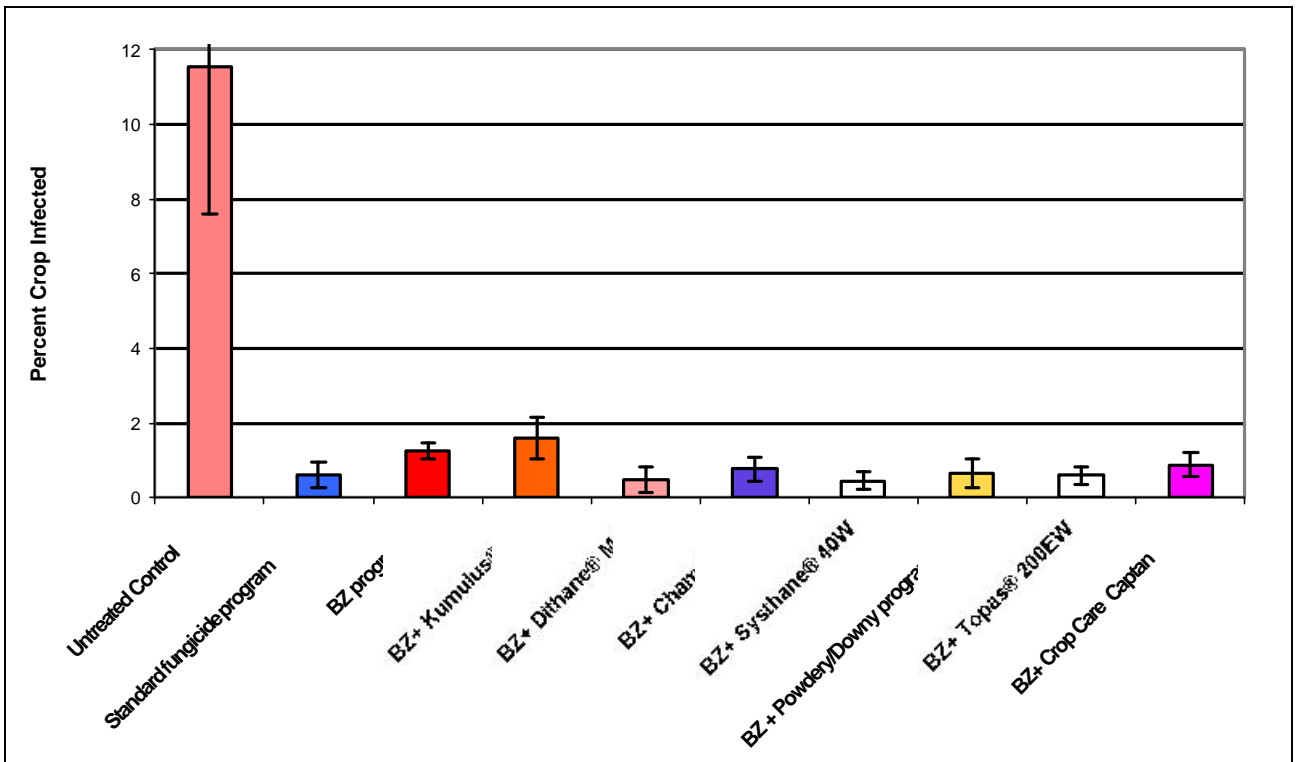
#### 4. Progress with Botry-Zen Development

**Formulation:** The initial Botry-Zen formulation was a chilled liquid with a shelf life of 7-10 days. During 2002/03 this was changed to a frozen paste with shelf life extended to 6 weeks. During the 2003/04 season commercial field evaluation on over 50 hectares is being conducted with Botry-Zen formulated as a dry granule. This has a storage life of over 6 months frozen, with a further month shelf life at room temperature.

**Compatibility with Other Vineyard Agro Chemicals:** Initial recommendations aimed to provide Botry-Zen with the most favourable environment for germination and establishment. This involved applying Botry-Zen on its own, with application timed early morning, evening or prior to light rainfall.

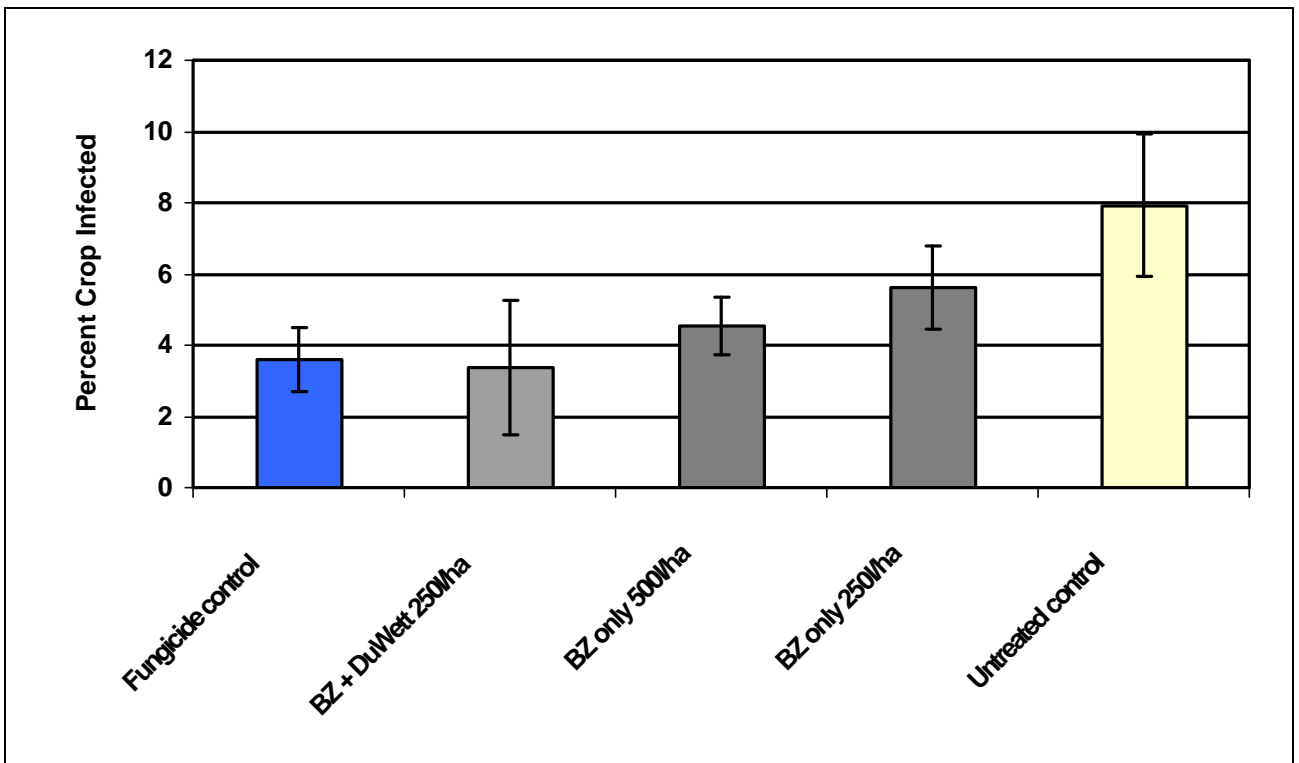
Laboratory and field studies along with field experience confirm that Botry-Zen can be safely applied with a number of fungicides for powdery and downy mildew control during normal vineyard spray application timings. This is demonstrated in the results of a field study conducted by Peter Wood (Hort Research) in Hawkes Bay last season. Botry-Zen tank mixed with a range of other fungicides and applied in the middle of the day gave comparable Botrytis control to a standard fungicide programme.

**Percent Crop Infected, Hawkes Bay - Chardonnay 10/4/03**



**Water Rates:** Initial recommendations again aimed at providing Botry-Zen with a favourable environment were to use water rates of 500-800 litres per hectare. Many modern vineyard sprayers are operated at 250-400 litres per hectare. Peter Wood's trial with a vineyard sprayer demonstrated Botry-Zen's ability to work when applied at lower water rates, and with the addition of the super wetter Duwett.

**Percent Crop Infected, Hawke's Bay - Semillon at Vintage - 28/3/2003**



## 5. Key Points For Controlling Botrytis

- Prevent Botrytis establishing on senescing flower debris in the bunch between late flowering and pre bunch closure.
- From veraison to pre harvest maintain a cover against conidial infections.
- Reducing water rates may reduce coverage: consider the use of horticultural “super wetters.”
- Label rates per hectare are based on a “standard” trellis on a 3 metre row spacing. If spraying a vineyard with a row width or canopy density that differs from the “standard”, consider adjusting the rate per hectare to take into account additional row length or canopy density.