

PESTS AND DISEASES



CHEMICAL MANAGEMENT

The experience of 2010/11 has shown that Australian orchards are susceptible to fungal diseases. Several orchards in 2010/11 lost the total crop and most orchards had extensive losses. Overall, the 2011 Australian crop lost close to 85% of its value, i.e. Australian growers lost \$15 million. The cost of full crop protection is not cheap, but it is not \$15 million!

In the 1990s the northern part of California lost several consecutive crops to diseases caused by *Botryosphaeria* spp. Many orchards were about to be abandoned. The disease was spreading south. The researchers developed a fungicide-based crop protection program, and increased awareness of cultural practices and weather condition responses that assisted orchard protection. The integrated program is extensive and expensive – but it works, and pistachio production in California remains profitable.

Whilst most of the damage in 2010/11 was caused by (*Colletotrichum acutatum*), *Botryosphaeria* was also detected. Both of these fungi are spread by splash, i.e. raindrops hit the spores and launch them to other locations on the trees, leaves and developing fruit. Despite the best efforts of those growers who undertook the recommended sanitation program during the 2011 winter, the spore presence in orchards remained very high. For those growers who did not undertake the removal of racemes and mummy fruit, the spore populations would be even higher. High spore loads imply that the risk of fungal damage in the 2011/12 season is very high, even if we return to only average summer rain. Both fungi may infect fruit early in the season although the damage to nuts may not manifest until the end of the season at harvest time.

Californian experience with *Botryosphaeria* has shown that **a spray program running over the entire growing season with multiple applications of different fungicides**, is essential together with orchard sanitation.

Prior to 2011 in Australia, Anthracnose had not been previously reported as a significant disease of pistachios. There is no hard research on how to control Anthracnose during a growing season. The PGAI developed recommendations following research during the winter of 2011 and advice from California. Orchards that followed this advice during the wet season of 2011/12 had no significant damage from Anthracnose. The practical results so far support the PGAI recommendations that are included in this Manual as Technical Information Sheets.

The fungicide suggestions contained in this manual flow from research commissioned by the PGAI. The PGAI research has been financed by the voluntary contributions of Australian pistachio growers supported by matching funds from the Australian government through Horticulture Australia Ltd.

- The laboratory work of SARDI conducted over the 2011 winter
- The literature review conducted by Dr Prue McMichael of Scholefield Robinson Horticultural Services
- The advice of Californian researchers and growers gained during the PGA study tour of California by Dr McMichael and Andrew Bowring.

It must be appreciated that any suggestions at this time are only interim and based on the best possible and most current knowledge and information. We will continue to learn over the coming seasons from further trials and research, but also from **you** – and the observations and treatments you make. Please record them (and leave some “controls” where possible).

The SARDI laboratory trials were not totally conclusive. Copper was shown to be ineffective against both Anthracnose and *Botryosphaeria* spp. However copper has been included in the proposed program for nutritional reasons and for its general antifungal effects, as there are other fungi that threaten pistachios, but are not specific targets of this suggested program. *Botrytis* sp. for example is likely to cause problems if it rains during bloom, as was the case in spring 2000 affecting the 2001 crop. Captan was tested *in vitro* and was effective at label rates. It has also been shown to provide protection against almond Anthracnose. Laboratory trials with mancozeb gave mixed results. It was very effective *in vitro* but less so when tested on plant material. It has been included because of its *in vitro* success and because it is a registered, contact fungicide available for use on pistachios.

There are two critical aspects of fungal control. The first is orchard **sanitation**. The second is **crop protection (field spraying)**.

Spray Program

The program for these diseases includes both systemic and contact fungicides. The rotation of fungicides in different groups reduces the risk of resistance development.

Systemics	Contacts
Switch™	Adama Captan®
Pristine™	Mancozeb
Octave	Copper

The Contact Fungicides:

- Only provide protection where the spray droplets land; good coverage is critical.
- Need to be applied with a 7-14 day interval to keep new growth protected, and may need reapplication sooner, if rain occurs post-application.
- Can be mixed with a systemic fungicide.

The Systemic Fungicides:

- Provide 10-21 day protection depending on rain events post application.
- Are best applied when leaf area is sufficient to maximise the uptake.

General Crop Protection Advice

- Ensure your spray equipment is correctly calibrated before you start spraying.
- Best to apply fungicides prior to major rain events. Watch the weather forecast.
- Multiple rain events may shorten the protection period of contacts and systemics.
- Follow label rates for each chemical. Switch and mancozeb have emergency use approvals and therefore application rates for pistachios are not on the labels.
- Follow label recommendations regarding use of surfactants and water volumes.
- Do not breach the harvest with-holding periods shown on the APVMA permit.
- Test application coverage - e.g. measure with water sensitive paper, or "Surround".
- Ensure tractor speed matches your canopy size and equipment. The experience of Californian pistachio and Australian olive growers is that slower tractor speeds (~ 3-4 km/hr) are critical for ensuring complete coverage (and optimised efficacy of fungicides).

A suggested spray program follows overleaf. The tree development stages are merely a guide. It is critical that the weather (especially, rain) be the dominant guide to the choice and timing of the applications.

Fungicide Programme			
Fungicide	Mode of Action		
Copper	Contact		
Captan	Contact	Max 5 applications /season	
Mancozeb	Contact	Max 6 applications /season	
Switch	Systemic	Max 2 applications /season	
Pristine	Systemic	Max 3 applications /season	
Crop Stage	Approximate Date	Fungicide	Comments
Bloom – early	Late September	Farmoz Captan or Mancozeb	Contact protection only
Bloom – full	Early October	Switch and/or Copper	Adequate leaf area required for systemic uptake of Switch
Full leaf	Mid October	Farmoz Captan or Mancozeb	
	Early November	Switch or Farmoz Captan and/or copper	Switch if conditions wet, Farmoz Captan as protection if dry
	Mid November	Mancozeb	
	Early December	Pristine or Farmoz Captan	Use Farmoz Captan if conditions still dry since last application
	Mid December	Mancozeb	
	Early January	Pristine	Consider Farmoz Captan or Mancozeb if low disease pressure to preserve Pristine
	Mid January	Mancozeb	
	Late January	Pristine	Only apply the 3rd Pristine if extreme disease conditions

This schedule is based on a 14-day interval, but the required protection period may be 10-21 days. The interval may need to be at the low end of the range if rain is persistent, and if contact products have been used, e.g., if a protectant had been applied prior to a rain event re-application of the fungicide may be necessary in fewer than 14 days; whereas if a systemic had been applied, the full protection period may still apply.

If the protection period of systemic fungicides has been uninterrupted by rain, and the forecast is for continued dry conditions, the next, intended systemic fungicide application may be replaced by a cheaper contact fungicide. This decision however relies on a sound weather forecasts and understanding of the biology of the target fungi.