

POME & STONE



› **Think**
Innovation

› **Trust**
Quality

› **Expect**
Performance

This booklet contains practical information to assist in the use of SACOA products in Pome & Stone orchards.

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ABOUT THIS BOOKLET

This booklet provides practical information to assist in the effective and safe use of SACOA products in Pome & Stone fruit orchards.

A FOCUS ON SACOA

SACOA Pty Ltd is a leading developer and supplier of spray oils and adjuvants in Australia.

Since our inception in 1991 we have grown to become an international Australian-owned company supported by active partnerships with world-leading manufacturers and research and development groups.

QUALITY AND SERVICE

As a committed industry leader SACOA delivers a range of assurances and services to our reseller clients including QA production facilities, ongoing research programs and extensive marketing support via brochures, guides, manuals and presentations - available in print and online.

SUSTAINABLE FARMING

Conscious of the importance of sustainable farming practices, SACOA offer a range of products perfectly suited to use in Integrated Pest Management (IPM) programs.

INNOVATIVE SOLUTIONS

Beyond their sustainable farming benefits, our range of spray oil and adjuvant products provide reliable and economically proven solutions for modern farming's many challenges.

More information on our company and our products is available at www.sacoa.com.au

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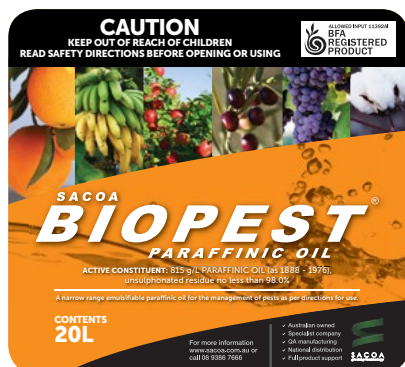
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SACOA'S POME & STONE FRUIT PRODUCTS

SACOA offers a range of products suitable for orchard Integrated Pest Management (IPM) programs:



SACOA BIOPEST® PARAFFINIC OIL

SACOA BIOPEST® (BIOPEST®) is a highly refined iso-paraffinic oil designed for use as a fungicide, insecticide, to manage certain aphid-transmitted viruses and as a premium carrier / adjuvant.

Independent trials conducted in New South Wales and Queensland indicated BIOPEST® to be the most effective petroleum spray oil (when used in conjunction with Integrated Pest and Disease Management programs) available in Australia.

With an unmatched level of purity BIOPEST® represents the most advanced attempt yet to provide orchards with an IPM product capable of controlling multiple, unrelated pests and fungal diseases simultaneously.

As a spray oil, BIOPEST® is ideally suited to organic farming. Organic registration for BIOPEST® with BFA was obtained in 2012.



SACOA SUMMER INSECTICIDAL OIL

SACOA SUMMER Insecticidal Spray Oil (SUMMER) is a high quality horticultural spray oil. SUMMER offers an effective, proven formulation that you can be confident using in your orchard. With increasing pressure to reduce the use of chemicals in the environment, spray oils such as SUMMER are an important part of the pome and stone fruit pest and disease management programs.



SACOA STIFLE® DORMANT SPRAY OIL

SACOA STIFLE® Dormant Spray Oil (STIFLE®) is an emulsifiable, highly refined, agricultural spray oil formulated to control a variety of pests and diseases during the winter dormant period up until budburst / green tip stage.

It is a highly effective controller for a variety of pests including mites, thrips, scale and other pests on pome & stone fruit trees.

QUALITY = EFFECTIVENESS + SAFETY

The quality of the spray oil you use will define two things:

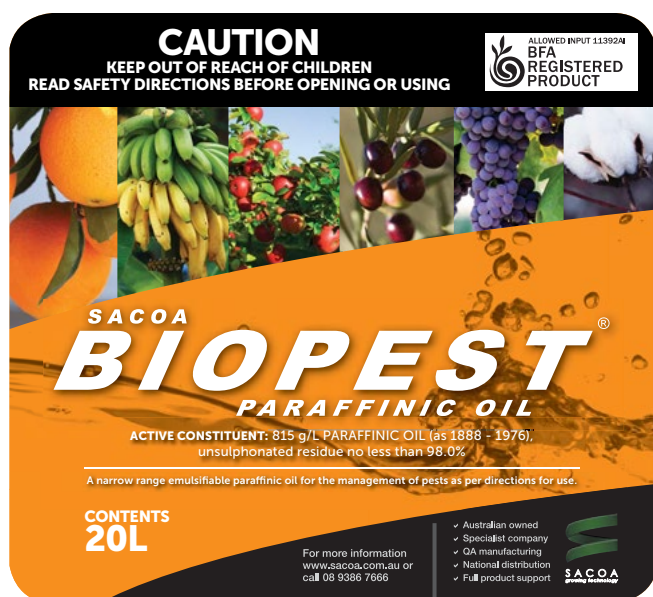
- How effective it is in controlling pests.
- How safe it will be to the fruit and tree.

IT'S CLEAR

BIOPEST® is a revolution in spray oil quality. Formulated with food-grade paraffinic oil, BIOPEST®'s clarity is a clear sign of its quality and purity. The next time you open a drum of oil, check its clarity. Is it 'water clear'?

AND PURE

BIOPEST® has an unsulphonated residue of 98% - the highest practical level achievable with current refining technology and one of the highest available in the market. This is a higher purity than any other spray oil product on the market (based on published USR levels).



HOW DO WE MEASURE PURITY?

By USR - USR stands for Un-Sulphonated Residue and measures the absence of potentially damaging impurities called aromatics. The lower the USR %, the higher the risk of plant damage.

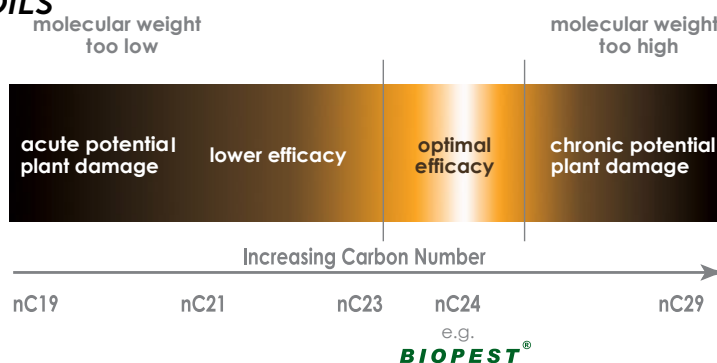
The 'impurities' are generally a grower's worst enemy when applying spray oils. Impurities, when exposed to sunlight, oxidise and form acids on the leaf and fruit surfaces and in certain conditions 'burn' the plant.

THE TRADE-OFF BETWEEN EFFICACY AND PLANT SAFETY

The general rule with mineral spray oils has been that heavier oils offer the best insecticidal properties but carry a greater risk of plant and fruit damage. Until now.

USING CARBON NUMBER TO COMPARE OILS

Carbon number measures the number of carbon atoms in each molecule of oil and is used to indicate an oil's 'weight'. This is a key measure of an oil's potential efficacy and an indicator of the potential for plant damage (other factors also apply).



OPTIMAL EFFICACY + SAFETY

A lighter oil has less potential to damage the plant as a lighter oil volatilises (evaporates) more rapidly, because of this they are less effective in killing pests.

BIOPEST® is rated as an nC24 oil which provides greater efficacy when compared to other summer oils. Due to its unique purity it does not provide any increased risk of plant damage. BIOPEST® may in fact offer reduced damage potential when compared to lower quality, lighter oils.

PARAFFIN CONTENT

Spray oils are composed essentially of hydrocarbons - compounds containing hydrogen and oxygen. There are three types of these molecules found in spray oils that are important in understanding how spray oils work, or don't work. The three types of hydrocarbons found in spray oils are:

- The Paraffinic Chains:** These have the highest insecticidal value and plant safety. Spray oil should comprise at least 62% paraffinic chains to be regarded as paraffinic oil.
- The Naphthalene Rings:** These have a lower pesticidal efficacy than the paraffinic chains.
- The Aromatic Rings:** These are the toxic structures that can cause plant damage.

In terms of phytotoxic potential, the amount of aromatics in the oil is a primary influence on the potential for plant damage as the aromatic oxidise when in contact with sunlight, creating acidic compounds that are common causes of plant burn and damage. BIOPEST® has almost untraceable aromatic content.

WHY IS UNDERSTANDING THESE THREE CLASSES IMPORTANT?

Because the percentage of paraffinic chains in a spray oil is a primary influence on how effective it will be in assisting pest and disease control. BIOPEST® has the highest paraffinic content of any Horticultural Mineral spray oil currently available in Australia, meaning it has the least phytotoxic potential.

Paraffinic type hydrocarbons contained in spray oils are particularly effective in modifying the protective surface wax of plant tissue and insects. BIOPEST® is an optimised paraffinic based spray oil, which extensive independent research has also proven that it acts as a nerve poison in some soft shelled insects such as aphids, killing them as quickly as synthetic contact pesticides.

WHY DOES BIOPEST® WORK BETTER?

BIOPEST® offers a uniquely pure, optimal weight oil without the potential plant damage trade-off.

HERE'S WHY.

A Pure Oil - USR over 98%

Impurities cause damage the longer they stay on the plant surface. BIOPEST's USR rating of over 98% means it can stay on the plant surface and keep working without damaging the plant or restricting growth.

Optimal Weight - nC24

BIOPEST persists on the leaf or fruit surface longer. This means more pests and disease are killed and a significantly greater effectiveness in modifying the behaviour of pests.

Quality Surfactant - Biodegradable

Improves the sticking and spreading properties of the oil in a rapidly biodegradable formula.

Efficacy + Safety
More pest control per spray and for longer with less risk of plant or fruit damage.

BIOPEST® - A REVOLUTION IN SPRAY OIL TECHNOLOGY

SACOA BIOPEST® Paraffinic Oil is a highly refined food-grade iso-paraffinic oil formulation designed for use on a wide range of crops.

BIOPEST® is registered in pome & stone fruit for the management of a range of sucking pests and for use as an adjuvant to improve coverage and kill. Full registration details are available on page 15.

With an unmatched level of purity, BIOPEST® represents the most advanced attempt yet, to provide growers with an IPM compatible product capable of controlling multiple, unrelated pests and fungal diseases simultaneously.

AN ESSENTIAL IPM SOLUTION

BIOPEST®, as an advanced biorational pesticide and adjuvant, is an essential component of integrated pest disease management and has proven effectiveness in disease and pest control by simultaneous management of a range of fungal diseases and pests.

- Ability to modify pest behaviour
- Minimal impact on beneficial insects
- Not persistent in the environment
- Low toxicity to animals and grower
- Safe to handle
- No pest resistance

As mineral oils work at the physical level and not at the biochemical level, they do not invite resistance to develop. This valuable trait is supported by almost a century of mineral oil use in insect and disease control.

- Won't stimulate pest outbreaks like conventional pesticides



AS A CARRIER OR ADJUVANT

BIOPEST® provides a unique combination of functions as a carrier for chemical and biological pesticides in grapes.

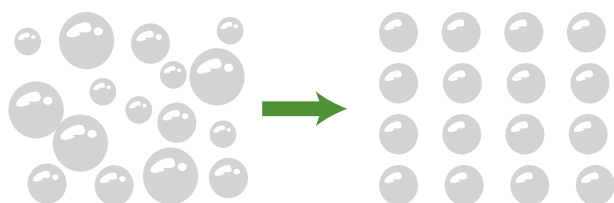
These all work to:

- Get more of the chemical or biological active evenly onto the leaves, branches and fruit.
- Protect the active and keeping it working longer by slowing down volatilisation.

COVERAGE

UNIFORM DROPLETS

Improves spray coverage and reduces loss through drift (small droplets) and runoff (large droplets).



Improves potential contact with pest and improves uptake in plant surface.

STICKING

Improves spray rain fastness.



SPRAY CONDITIONS

Evaporation

Reduces spray loss from evaporation.

Wind Drift

Reduces spray loss from wind drift reducing pesticide spray loss, cost and disruption of beneficials.

BIOPEST® - THREE KEY MODES OF ACTION

As a biorational pesticide, BIOPEST® has three key uses in pest and disease management:

- Insecticide
- Fungicide
- Plant Virus Management

AS AN INSECTICIDE

BIOPEST® effectively manages certain insect pests in three ways:

1. BEHAVIOUR MODIFICATION

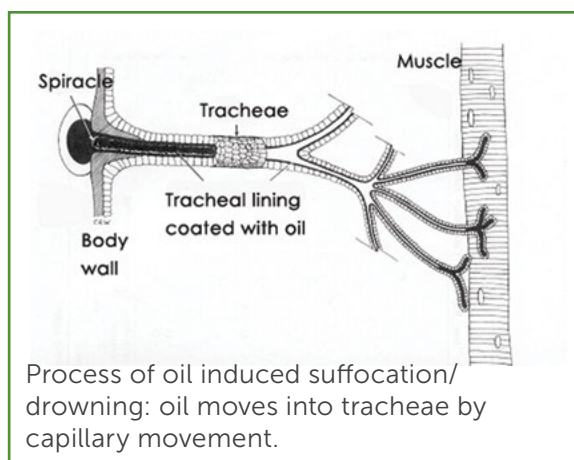
BIOPEST® deters the feeding and egg laying of pest insects. How this occurs is covered in more detail in the section on behaviour modification.

2. SUFFOCATION / DROWNING

BIOPEST® blocks the air holes (spiracles) and lines the breathing tubes (tracheae) through which insects and mites breathe.

3. POISON

In some cases, BIOPEST® may also act as a 'poison', interacting with the fatty acids of the pest and interfering with normal metabolism.



AS A FUNGICIDE

BIOPEST helps manage a number of different fungi in two ways:

1. HOST PLANT PROTECTION

It is believed that BIOPEST® may protect the host plant by interfering with the attachment of the fungi to the plant.

2. ERADICATION OF FUNGI

It is believed that BIOPEST® may help eradicate existing fungi by targeting and breaking down the fungi's cell walls.

AS A PLANT VIRUS MANAGER

BIOPEST® is useful in managing non-persistent viruses transmitted by sucking pests such as aphids by interfering with their feeding behaviour and hence disrupting the virus transmission process. As the viruses are generally transferred via the pests' stylet (the piercing and sucking mouthpart) it is prevented from inoculating healthy plants and transmitting the virus from diseased ones.

"So significant are the behavioural effects of mineral oils that they should be regarded as the most important mode of action against arthropods."

Prof. Andrew Beattie et al, 2000

NEW LEARNINGS = NEW OPPORTUNITY

Extensive research by the University of Western Sydney over many years, has opened the door to a new understanding of how a high quality horticultural mineral oil affects insects by modifying certain key insect behaviours such as feeding and egg laying.

INSECTS SHOWN TO BE POTENTIALLY VULNERABLE			
Whitefly	Codling Moth	Leafminer	Grape Leafhopper
Mites	Leafrollers	Aphids	Thrips
Fruit Fly	Psyllids	Budworm	Bollworms
Helicoverpa spp.	Lace bugs	Source: University of Western Sydney	

HOW BEHAVIOUR MODIFICATION OCCURS

1. In order to feed or lay eggs on a host plant, insects and mites must first detect a host plant at the chemical level. This is done through tiny, hollow hairs (sensillae) located on their mouthparts, feet and abdomen.
2. Inside the sensillae are nerve endings which sense specific chemicals produced by the host plant and are detected in the process of probing. Contact with these chemicals can trigger or stimulate an insect to feed or lay eggs at specific locations within the plant.
3. BIOPEST plugs these sensillae. This effectively 'blinds' the insect from identifying food sources or oviposition sites.



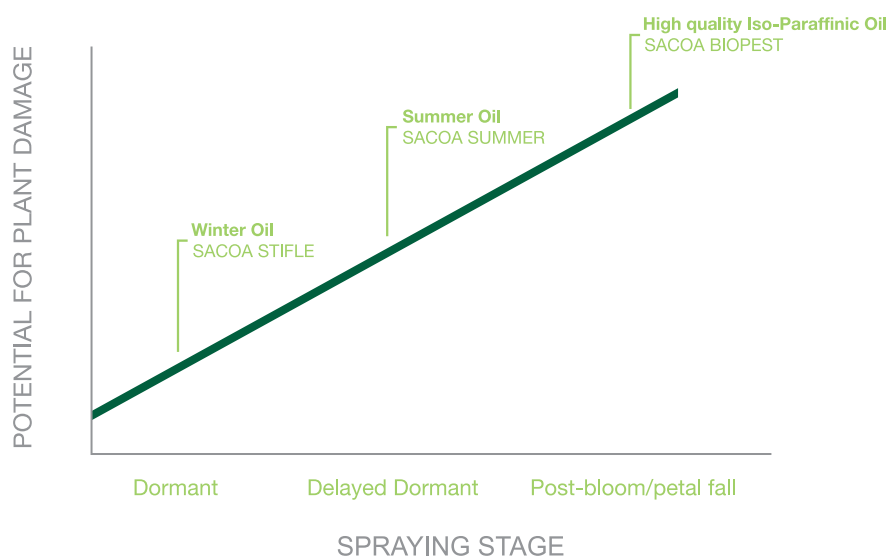
Small hairs called sensillae

BENEFICIAL INSECTS ARE MINIMALLY AFFECTED

As beneficial insects are insect-attacking rather than plant-attacking they have evolved a different set of host detection mechanisms and are minimally affected.

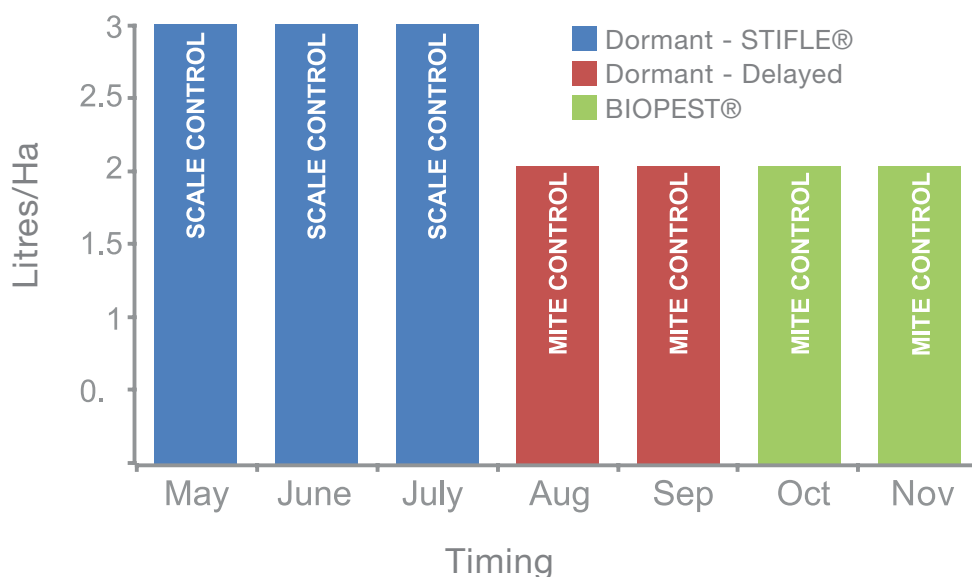
CORRECT USE OF SPRAY OILS IN ORCHARDS

SACOA provides the range of products needed to assist with winter through to summer orchard pest management programs. It is important to understand the different requirements at each stage to ensure effective pest control and to minimise the risk of tree or fruit damage. These requirements are outlined in the chart below.



SPRAY TIMING AND PEST TARGETING

Correct spray timing and rate is vital to successfully control pests. There are many different factors that must be considered when spraying, such as the state of the crop, the timing, and the litres you must use. These requirements are outlined in the chart below.



DORMANT AND DELAYED-DORMANT SPRAYING

A true “dormant spray” with STIFLE® should be applied before bud break – (before growth starts). A “delayed-dormant spray” with SUMMER is applied after bud break and up to flowering.

The timing of oil spray applications is dependent upon:

- The type of fruit tree;
- The stage of development of the fruit tree;
- The life cycle of the targeted insect pest; and
- Timing of the dormant oil can influence the degree of control of some pests.

DORMANT OIL SPRAYING - TIMING

Pome & stone fruit growers should be applying a delayed-dormant oil spray unless San Jose scale is a major problem.

DORMANCY

- Dormant oil applications provide the best control of San Jose scale and should be used where infestations are heavy.

GREEN-TIP

- Green-tip applications provide better control of European red mites and moderate control of San Jose scale.

WHAT IF I DON'T SPRAY DURING DORMANCY?

Failure to apply either a dormant or delayed-dormant oil may require that additional in-season treatments be applied. These are not only more costly, but are more disruptive to beneficial arthropods that keep secondary pests under control.

WHY CAN'T I USE A SUMMER OIL IN MY WINTER SPRAYING?

Traditional summer horticultural oil sprays applied at delayed dormant will not, in most cases, provide the degree of control with one spray which we have come to expect from most conventional insecticides.

POST BLOOM AND COVER SPRAYING

With the introduction of flowering trees comes the need to provide effective pest management and ensure tree and fruit safety. This is where spray oil quality becomes critical and BIOPEST® is recommended as the essential choice.

DAMAGE FROM TRADITIONAL SUMMER OILS

There are limitations and concerns with the use of spray oils, particularly during the foliar period. Fruit marking and leaf damage have been seen with some traditional summer oil applications in the past.

A number of factors should be considered before using summer oil to minimise detrimental effects on fruit finish.

These include:

- The type of cultivar.
- Whether the trees have adequate moisture.
- Spraying conditions, particularly humidity – sprays need to be able to dry.

Small necrotic leaf lesions can occur, especially when high-rate (>2%) applications are used under poor drying conditions with the use of traditional summer oils.

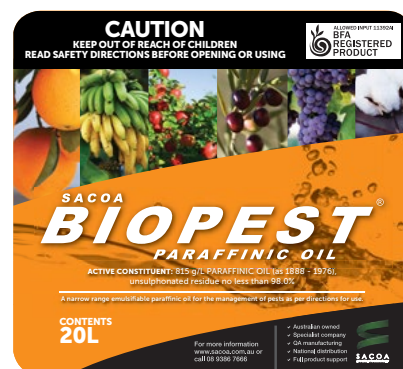
USING BIOPEST® IN POME & STONE IPM PROGRAMS

Grower interest and experience with the use of spray oils in the post-bloom, foliar period has increased in recent years, and several research projects have been investigating this use further. There are a number of reasons driving this interest including pest resistance to synthetic pesticides.

Through its unique formulation and quality BIOPEST® optimises its insecticidal properties across a range of unrelated pests and minimises the risk of tree or fruit damage. It also offers range of unique benefits for IPM programs as covered previously (such as no pest resistance and behaviour modification).

Field research trials conducted in commercial and experimental apple orchards in Australia and overseas during the past few years have shown the effectiveness of using a highly refined iso-paraffinic oil like BIOPEST® in a seasonal program to control mites and other pests throughout the summer.

Foliar oil applications have also been studied for the control of powdery mildew on apples. Applications made repeatedly in November and December showed control being achieved under heavy disease pressure, with no leaf or fruit damage seen.



APPLICATION AND TIMING

With the new highly refined iso-paraffinic oils like BIOPEST®, the application timing has been modified to correlate with the development of the insect pest. These oils are much safer to fruit trees than traditional summer oils when applied correctly.

Our recommended approach is to make two to three applications, on a preventive schedule, immediately after the bloom period, before mite populations have a chance to build.

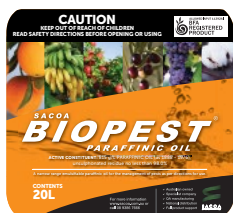
The first application can be any time from petal fall to 1-2 weeks later, followed by 2-3 additional sprays at 10-14 day intervals. These, in effect, will destroy any possible late infection or hatchings. The requirement for follow up treatment and fruit damage is negligible.

If mite pressure is still medium at harvest, an additional application might be required post harvest with hygiene sprays of copper or other fungicides.

NOTES ON SPECIFIC TREE CROPS MIXING

It is important to ensure safety and compatibility when mixing spray products.

CROP	NOTES
Apples	Oil sprays are used in controlling mites, scale insects as well as some thrips and aphids. If the grower has not had a problem with these insects previously, one oil spray application at the tight cluster to pre-pink stage is recommended. If there is a known insect problem, two oil applications are necessary. Apply the first between bud break and the half-inch green stage and the second with BIOPEST® only at the tight cluster to pre-pink stage.
Pears	Pears require two applications of an oil spray to control pear rust mites, blister leaf mites, European red mites and scale insects. Spray the first application at the swollen bud stage of development on a warm day. The second application is sprayed between the green cluster stage and the development of the white bud, or "popcorn" stage.
Peaches, Nectarines and Apricots	These should have an oil spray applied before the swollen bud stage. This will control European red mites, San Jose scale and green peach aphids.
Plums and Prunes	These should have an oil spray applied before the swollen bud stage. This will control scale insects and mites.
Cherries	Cherries require only one oil spray application at the beginning of the swollen bud (bud break) stage. This will control scale insects, aphids and European red mites.



SACOA BIOPEST PARAFFINIC OIL

BIOPEST® is registered for the control of mites and scale in pome & stone.

CROP	PEST	STATE	RATE	CRITICAL COMMENTS
Apples	Mites (Eggs), including European Red Mites, Scale (Hard & Soft)	NSW, ACT, VIC, SA, WA, TAS only	2L/100L	Dormant or delayed dormant to half green tip
		QLD	3L/100L	
	Mites	NSW, ACT, VIC, SA, WA, TAS only	1L/100L	Summer (Foliar or Cover) or Post Harvest
Pears	European Red Mites, Eggs, Scale	NSW, ACT, VIC, SA, WA,	1-2L/100L	Dormant or delayed dormant (up to and including petal fall)
		TAS Only	2L/100L	
		QLD	3L/100L	
	Two Spotted Spider Mites	NSW, ACT, VIC, SA, WA, TAS Only	1L/100L	Summer (Foliar or Cover) or Post Harvest
	Brown Mites, Pear Rust Mites	NSW, ACT, VIC, SA, WA, TAS only	1-2L/100L	
	Pear Leaf Blister Mites	NSW, ACT, VIC, SA, TAS, WA only	1.5-2L/100L	

BIOPEST® has now been registered with Biological Farmers Australia (BFA) for use on organic orchards, vineyards and farms.



CROP	PEST	STATE	RATE	CRITICAL COMMENTS
Apricots, Cherries	San Jose Scale	NSW, ACT, VIC, SA, WA only	2L/100L	Dormant
		QLD	3L/100L	
	Mites and Scale	NSW, ACT, VIC, SA, WA, TAS only	1-1.5L/100L	Summer (Foliar or Cover) or Post Harvest. Applications should not be made over oil sensitive varieties. Do not apply to trees lacking adequate moisture.
Almonds, Peaches, Nectarines	Aphids (Eggs), Mites (Eggs),	NSW, ACT, VIC, SA, WA, TAS Only	3L/100L	Dormant or delayed dormant
	San Jose Scale	NSW, ACT, VIC, SA, WA only	2L/100L	Dormant
	Mites and Scale	NSW, ACT, VIC, SA, WA only	1-2L/100L	Summer (Foliar or Cover) or Post Harvest
Plums, Prunes	Aphids (Eggs)Scale, Mites (Eggs)	NSW, ACT, SA, WA, TAS only	1.5-2L /100L	Dormant or delayed dormant. To half green tip.
	Mites, Scale	NSW, ACT, VIC, SA, WA, TAS only	1-1.5L/100L	Summer (Foliar or Cover) or Post Harvest Do not apply over fresh market fruits after bloom starts to form as the oil will remove the bloom. Application should not be made over sensitive varieties.

CAUTION: Spray no more than 4 times during growing season with two weeks minimum application interval. Do not spray when buds are fully opened and shoot elongation is occurring. Do not spray when there is no obvious moisture in the leave or the plant is under stress. Avoid spraying open blooms. Bleaching and spotting has been observed with open blooms of certain plants. Do not spray walnut foliage.



S A C O A SUMMER INSECTICIDAL SPRAY OIL

SUMMER is registered for the control of mites and scale in pome & stone.

CROP	PEST	STATE	RATE	CRITICAL COMMENTS
Pome Fruit Trees	Codling moth	All states (except NSW)	500 to 750mL/100L	Refer to insecticide label for further instructions.
Pome Fruit, Stone Fruits	San Jose Scale*, OysterShell Scale, Bryobia Mites Eggs, European Red Mites Eggs.	VIC, SA, WA, Tas, NSW	2L/100L	Apply during dormant period up to green tip (Pome fruit) or bud swell (stone fruit). *In WA, this must be applied in combination with appropriate chemical treatments for control of San Jose Scale.
		QLD	3L/100L	
	Oyster Shell Scale, Bryobia Mites Eggs, European Red Mites Eggs.	TAS	2L/100L	
	Two Spotted Mites	NSW, QLD	3L/100L	



S A C O A
STIFLE
 INSECTICIDAL SPRAY OIL

STIFLE® is registered for the control of mites during dormancy.

CROP	PEST	STATE	RATE	CRITICAL COMMENTS
Pome & Stone fruit	San Jose Scale	VIC, SA, WA	2L/100L	Spray during the dormant period, preferably on still, sunny days. Do not spray after bud swell.
		NSW, QLD	3L/100L	
	Oyster Shell Scale, Pear Scale	TAS	2L/100L	
	Bryobia Mites, European Red Mites	VIC, SA, TAS	2L/100L	
		NSW, QLD	3L/100L	
	Bryobia Mites	WA	2L/100L	
	Two Spotted Mites	VIC, SA, WA	2L/100L	
		NSW	3L/100L	

MIXING INSTRUCTIONS

1. a) Add water to the mixing tank to allow proper agitation by pump or paddles.
b) If wettable powder formulation – mix water and powder thoroughly so that powder is totally suspended in the water before the oil is added.
2. a) Add other desired pesticides.
b) If other pesticides to be added are an emulsifiable formulation, do so after the oil and the water has been thoroughly mixed.
3. Add oil under agitation when tank is $\frac{3}{4}$ full. Top off with water to form a milky solution.
4. Maintain agitation until solution is completely used.
5. In a small equipment lacking agitators, stir or shake diluted spray frequency during applications.
6. It is important for users to read and follow all instructions on the labels of the proposed tank mixed products.
7. Flush fluid in sprayer hose lines back into tank reservoir if fluid is allowed to stand for more than 20 minutes.

APPLICATION INSTRUCTIONS

- The target must be completely covered in spray solution.
- Oil residue on the plants surface often acts as a feeding and oviposition deterrent. However, the primary target is the pest itself as oil is a contact pesticide.
- Dilute applications. (Greater than 1400L spray per hectare) in most cases ensure best cases.
- Speed of travel is extremely important, tractor speed from 1.6kph to 5.4 kph is recommended, depending on crop size and target pest.
- Do not spray when shade temperatures are or exceed 32°C on day of application plus 2-3 days following.

COMPATIBILITY

- Do not use spray oil with Dimethoate, or any other product containing sulphur.
- If possible, either keep the spray equipment used for these compounds separate from the equipment used for BIOPEST® or make sure that the sprayer is thoroughly cleaned, so that no residue from these compounds remain.
- Do not use with Carbaryl on deciduous fruit trees.

CROP SAFETY

SPRAY UNDER APPROPRIATE CONDITIONS

Oil can cause leaf damage (phytotoxicity) under cool temperatures, high humidity, or wet conditions because the leaf does not have sufficient wax (cuticle) to protect itself. The oil also breaks down on the leaf when exposed to near freezing temperatures. Therefore oils should only be applied under good drying conditions.

FOLLOW PROPER TANK MIXING PROCEDURES

Check labels before and do a jar compatibility test prior to tank-mixing. Check to make certain that the oil emulsifies if adding other dry flowables or wettable granule pesticides. Cheaper quality pesticides can be of questionable quality, particularly copper formulations.

THE IMPORTANCE OF GOOD AGITATION

Growers should also take care to maintain good agitation in the spray tank.

ENSURE COMPATIBILITY BEFORE SPRAYING

Certain spray materials, like Carbaryl Captan or Morestan (oxythioquinox), cannot be applied within a certain time before or after oil sprays (10 days) because of the risk of damage to foliage and fruit. Trees are at more risk of damage when treated with oil rates that are too high, during high temperatures, or when trees are stressed.



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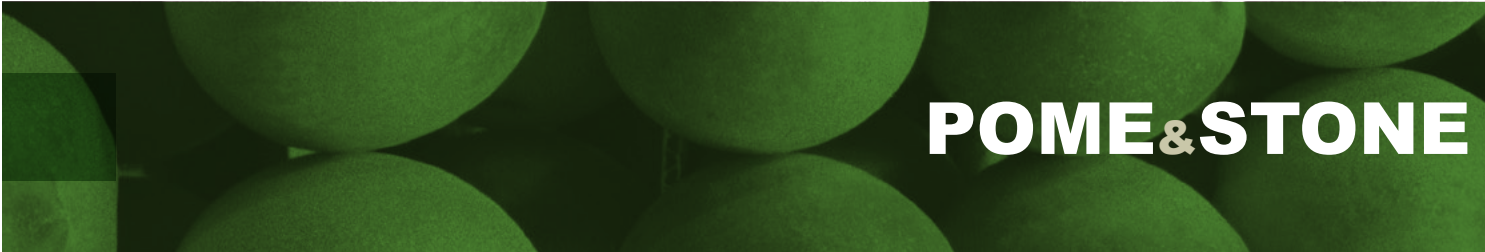
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POME&STONE

A FOCUS ON SACOA

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INNOVATIVE SOLUTIONS

Beyond their sustainable farming benefits, our range of spray oil and adjuvant products provide reliable and economically proven solutions for modern farming's many challenges.



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