



RAYNOX[®]

*A Clear Solution
to Sunburn*

The Leading Preferred
and Most Used
Sunburn Suppressant
Over 20,000 hectares protected
Worldwide

Effective and Convenient Sunburn Protection

The Choice is Clear!

- RAYNOX[®] does not leave a visible residue, allowing growers to colour pick.
- Aggressive cleaning is not necessary to eliminate residues in the packingline.
- Won't wash off easily and does not require reapplication after rain. Can be used with overhead irrigation.
- No negative effects on beneficial insects; does not encourage "mite flare ups".
- Does not cause irritation to nasal passages or skin of orchard workers.
- RAYNOX[®] reduces sunburn by 50% on average.
- RAYNOX[®] is an easy to use liquid formulation, available in 200L & 25L containers.



Raynox is distributed exclusively in Australia by:

Colin Campbell (Chemicals) Pty Ltd

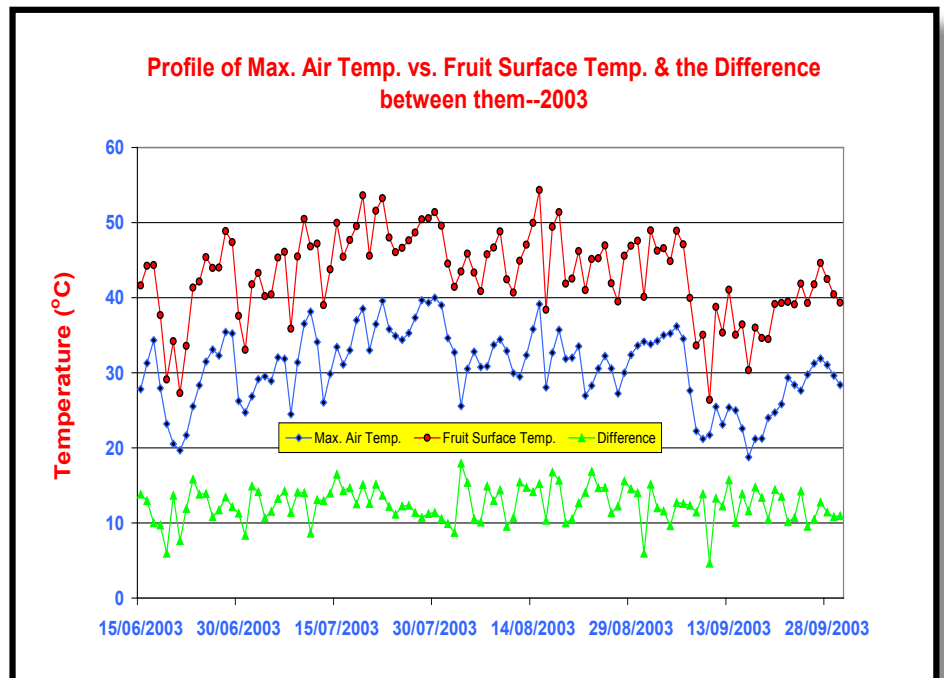
RAYNOX[®] is a
registered trademark
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Manufactured by

Pace
International

Sunburn in Apples

- Is caused by excessive heat and exposure to solar radiation (UV light).
- Sunburn is induced when the apple surface temperature reaches 45°C to 49°C for a period of 1 hour. For this to occur in Australia the key conditions would be an air temperature of about 30°C and/or low humidity, (see graph below).
- Sunburn Necrosis (see below) occurs when the apple surface temperature exceeds 52°C for only 10 minutes. Thermal death occurs and necrosis appears.
- Sunburn is also a major source of cullage in packing sheds, costing growers large amounts of money every year.

This graph illustrates the relationship between air temperature & fruit surface temperature. Note that fruit surface temperature can be considerably higher than air temperature, and it is fruit surface temperature that determines the level of sunburn.



How does RAYNOX® Effectively reduce sunburn?

- RAYNOX is a liquid concentrate formulation that produces a CLEAR film on the fruit surface.
- RAYNOX protects the fruit from Sunburn by reducing the amount of UV and visible light reaching the fruit surface.
- Raynox lowers the "stress load" in the fruit reducing the generation of oxidative molecules, resulting in fewer sunburn symptoms.
- Overseas independent testing has shown that Raynox performs as good as any particle film product available in the market.



Sunburn reduction products in Australia

Sunburn is the primary cause of cullage for apples in Australia. Every year millions of dollars worth of fruit are lost due to sunburn. Application of sunburn suppressant products is becoming a common practice among apple growers to reduce sunburn cullage. Products commercially available in Australia can be divided into two main groups according to their mode of action: "sunblocks" and "sunscreens".

Traditional sunblocks also called particle films are "white-washes" of a reflective material such as kaolin clay, calcium carbonate, etc. They have been used for decades in other parts of the world with satisfactory results but major inconvenience at time of harvest. Sunblocks leave white residues on the fruit. These residues can be an irritant to fruit pickers and may cause difficulties for color-pick and/or cleaning on the packing line. These products can also act as an insect repellent, which may also negatively affect natural predators. In addition, sunblocks are washed off by rain and/or heavy winds, so reapplication after rain events is required.

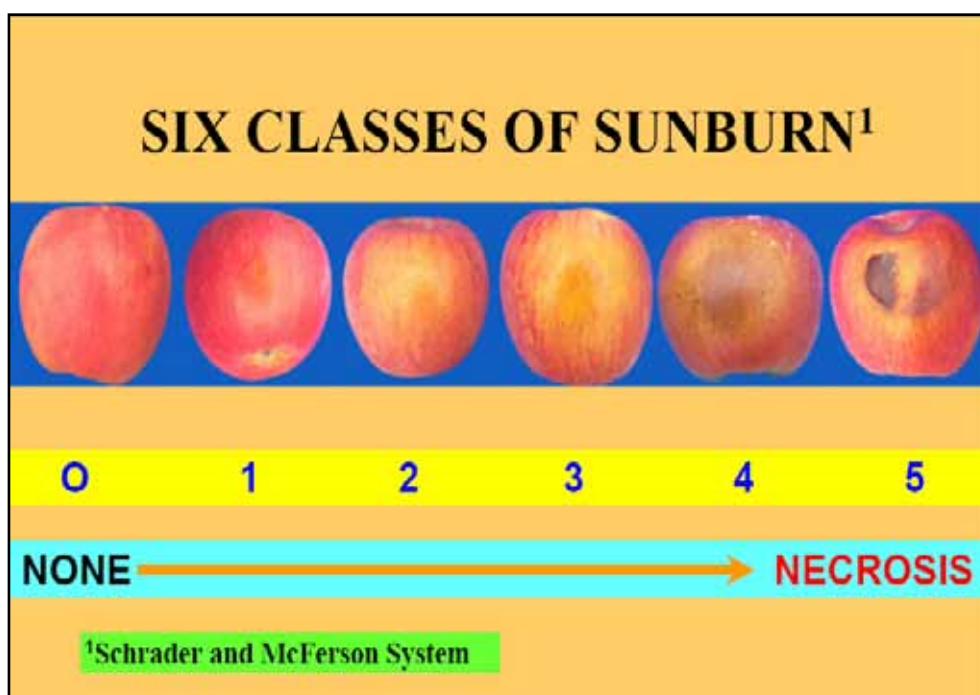
Sunscreens, on the other hand, are an innovative approach to sunburn suppression archiving comparable efficacy without leaving troublesome visible residues. These products reduce sunburn incidence by filtering certain solar radiation wavelengths, thus reducing fruit oxidative stress, which causes sunburn symptoms.

RAYNOX is a clear sunscreen developed at Washington State University by Dr. Larry Schrader. RAYNOX is a carnauba wax-based product that filters a significant portion of ultraviolet radiation, as well as part of the visible and infrared light without leaving visible residues on the fruit. **RAYNOX is rain-fast, so no reapplication after rain events is needed.** RAYNOX does not have negative effects on natural enemies. **RAYNOX was developed to provide growers with a sunburn protectant that could significantly reduce sunburn cullage without the nuisance of traditional sunblocks.** RAYNOX was launched in 2004 and has been slowly replacing the use of particle films in all apple growing regions in the world, including Australia.

Numerous comparative trials conducted by research institutions in different regions of the world (including Australia) have proven that sunburn protectant products significantly increased the amount of premium fruit (i.e., non-sunburned fruit included in packer's premium grade). With regards to visible residues (a common concern within fruit packers) the same research reported that particle film products (i.e., Surround WP, Parasol, Screen, etc.) residues remained in the stem bowls and the calyx end. RAYNOX is still the only product in the market that leaves no visible residues.

This article is to be featured in Australian Fruit Grower and Tree Fruit magazines October 2009 issues.

The Schrader & McFerson sunburn Scale.

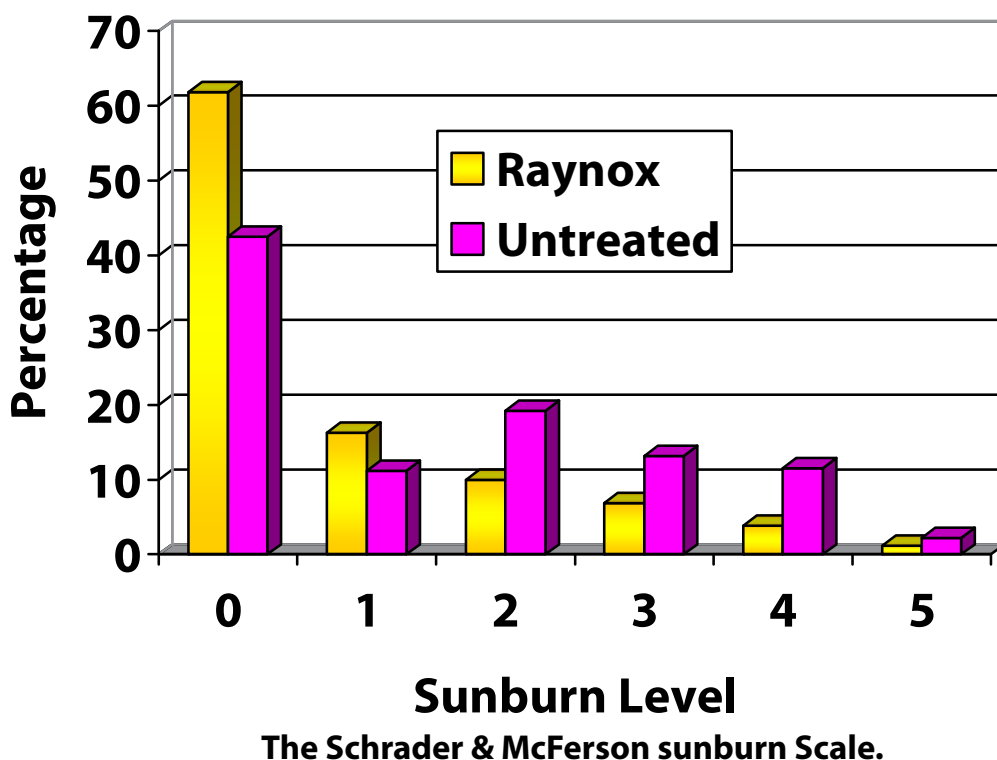


Results of an Australian RAYNOX® trial on Fuji apples Orange NSW 2008,

The results show that the Raynox block gave a higher level of non-sunburn fruit (approx 20%), and higher level of marginal sunburn that is still acceptable as Class 1 fruit (approx 15% for Raynox, against approx 10% for untreated).

This means a total of approx 75% of fruit treated with Raynox is Class 1 compared to only approx 50% of the untreated fruit.

This result shows the typical response of fruit to its application - more fruit moves into Sunburn levels 0 and 1.

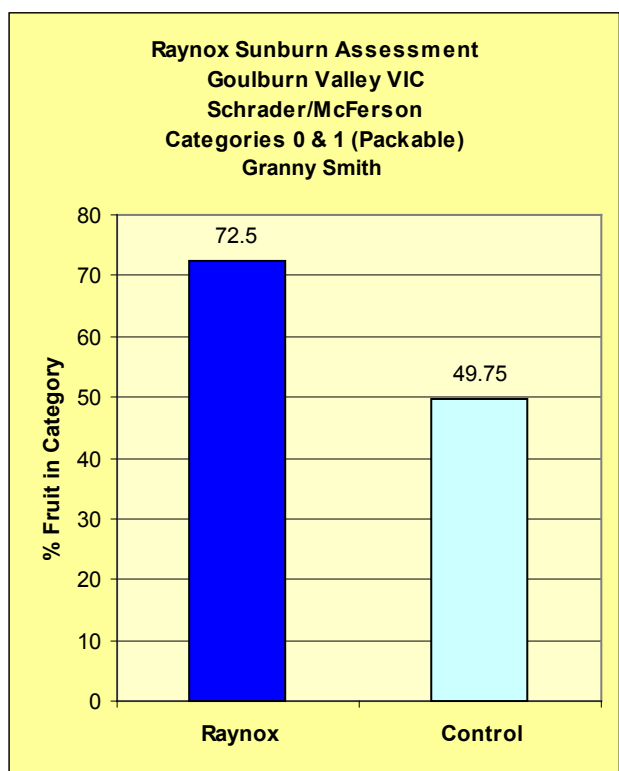


RAYNOX® leaves no residues

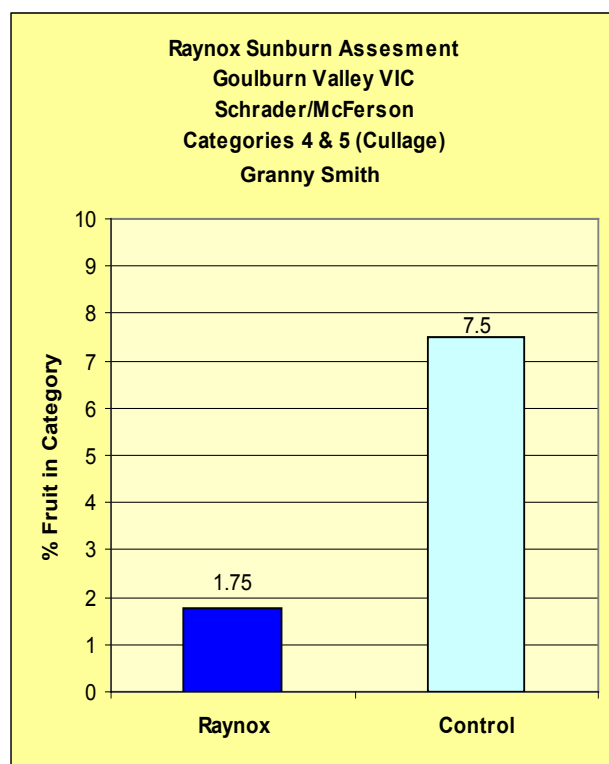
- No residues in dump tanks and or drenchers that require special disposal.
- No need to use special cleaners in packing line.
- No white residues in calyx and/or stem ends of the fruit



Results of an Australian RAYNOX® trial, 2005.



Assuming only top quality fruit is packed (sunburn level 0 or 1 from Schrader/McFerson scale left) RAYNOX® treated fruit had 46% more fruit for packing as first grade than untreated fruit.



Assuming that sunburn levels 4 and 5 (from Schrader/McFerson scale left) are cullage, RAYNOX® treated fruit had 77% less cullage than untreated fruit.

RAYNOX® Program

Applications of Raynox need to **start before sunburn occurs and effective sunburn reduction occurs using a 4-5 spray program.**

1. The first application should be applied 7 weeks after full bloom. This usually occurs about mid-late November but make sure that you apply it before the first heat event around this time.
2. A second application should be made 7 – 10 days later.
3. The third application should be made 3 weeks later
4. The fourth application should be made 4 weeks later.
5. The fifth application (if needed) should be made 4 weeks later.

Any subsequent applications that are needed should be made at 4 weekly intervals.

Apples are most vulnerable to sunburn when air temperature is 30°C with low humidity.

If these conditions are likely to occur around the time an application of Raynox is due, apply Raynox **before** these conditions occur.

How much do I use?

For the commonly ground application (by airblast) apply 25L Raynox/975L treated water for each hectare (ha) (1:40 ratio). Apply this solution at a rate of 1,000L per ha.

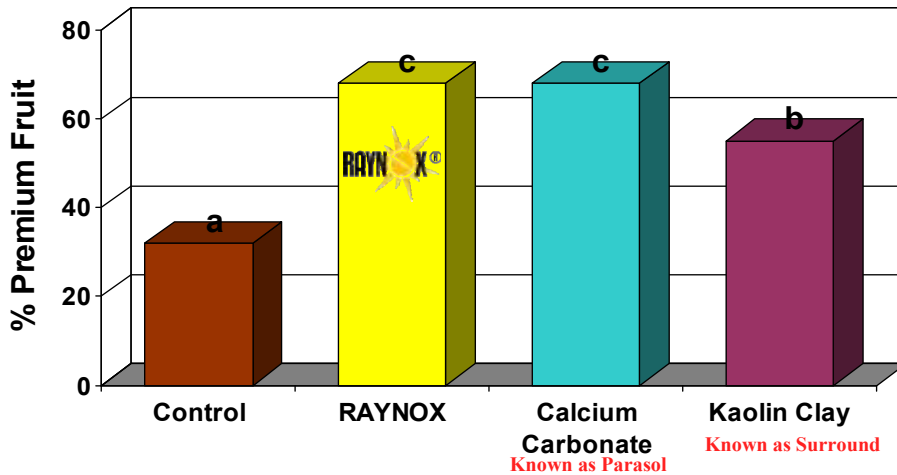
For aerial application (by helicopter only) apply 25L Raynox per hectare in 120L of solution per hectare (120L solution = 25L Raynox & 95L treated water).

No matter what application method you use make sure that use you the correct amount of Raynox Water Softener!



RAYNOX® vs Particle Films (2005)

RAYNOX vs Particle Films
Golden Delicious - 2005 Trials



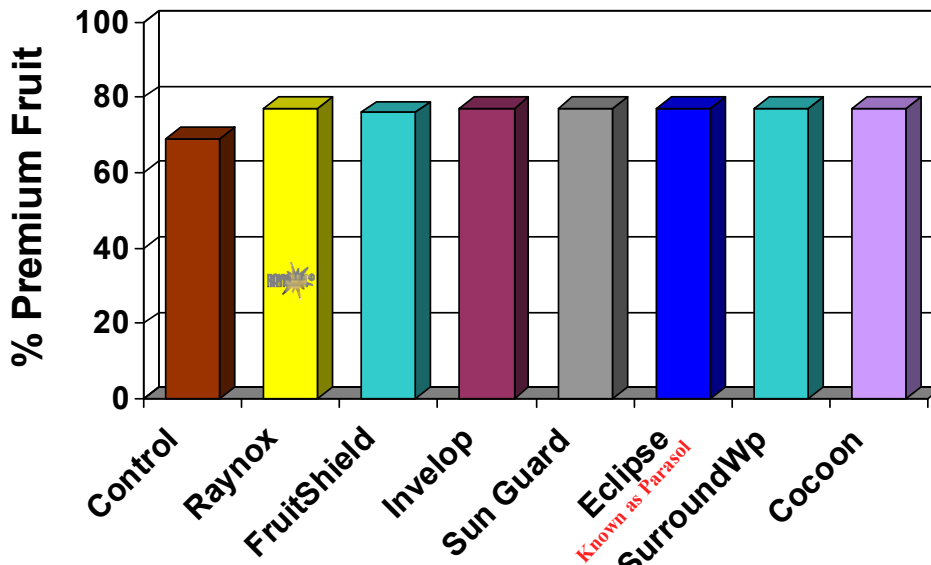
RAYNOX works as good as or better than other sunburn protectant products available in the market. RAYNOX leaves no visible residues

Source: WTFRC, 2005



RAYNOX® vs Particle Films (2007)

RAYNOX vs Particle Films
Granny Smith - 2007 Trials



RAYNOX works as good as or better than other sunburn protectant products available in the market. RAYNOX leaves no visible residues

Source: WTFRC, 2005



WATER SOFTENER CHART

Vat volume	1) Level of water hardness detected in water (as ppm CaCO ₃ equivalent)													
	40ppm	50ppm	100ppm	150ppm	200ppm	250ppm	300ppm	400ppm	500ppm	600ppm	700ppm	800ppm	900ppm	1,000ppm
	2) mL of Raynox Water Softener to add into vat.													
100L	30	40	80	120	160	200	230	310	390	470	550	620	700	780
400L	120	160	310	470	620	780	940	1,250	1,560	1,870	2,180	2,500	2,810	3,120
1,000L	310	390	780	1,170	1,560	1,950	2,340	3,120	3,900	4,680	5,460	6,240	7,020	7,800
1,500L	470	590	1,170	1,760	2,340	2,930	3,510	4,680	5,850	7,020	8,190	9,360	10,530	11,700
2,000L	620	780	1,560	2,340	3,120	3,900	4,680	6,240	7,800	9,360	10,920	12,480	14,040	15,600
2,270L (500gallons)	710	890	1,770	2,660	3,540	4,430	5,310	7,080	8,850	10,620	12,390	14,160	15,940	17,710
3,000L	930	1,170	2,340	3,510	4,680	5,850	7,020	9,360	11,700	14,040	16,380	18,720	21,060	23,400
3,500L	1,090	1,370	2,730	4,100	5,460	6,830	8,190	10,920	13,650	16,380	19,110	21,840	24,570	27,300

To confirm the correct amount of water softener has been added, we recommend a jar test with Raynox be carried out at water hardness above 100ppm.

Instructions for Use of the Raynox Water Softener Chart

- 1 Test the level of your water hardness using either the test strips provided by Colin Campbell Chemicals or via laboratory testing
- 2 Find your level of water hardness in the chart above and move down that column to your vat size and the figure where the two points intersect is the amount of water softener that you need. For example a water hardness of 150ppm would require 1.17L of Raynox Water Softener in a 1,000L spray vat.

If in any doubt as to the correct amount of water softener to add, contact:

Colin Campbell (Chemicals) Pty Ltd
 Telephone : (02) 9725 2544
 Fax : (02) 9604 7768
 Email : info@campbellchemicals.com.au

Apply the correct amount of water softener for your water hardness. Most importantly start your Raynox applications on time.

Frequently Asked Questions (FAQ)

Do I need to use this water softener?

YES! The use of the correct amount of Raynox Water softener is crucial to the use and performance of Raynox. If you do not use the correct amount of water softener you can suffer product degradation and it may adversely affect Raynox's performance and fruit finish.

Does Raynox need to be re-applied after rain?

No! Raynox is rainfast within about 1 hour after application and does not need to be re-applied after rain.

Can I just spray my crop when temperatures are hot?

To get sufficient sunburn reduction you must follow the 4-5 spray program. The multiple sprays are designed to keep up with the apples natural growth and coat newly grown areas with Raynox. If applications are too far apart then newly grown areas are unprotected and are easily sunburnt.

My spray tank holds more than 1,000L water. Do I still put 25L Raynox in?

You must maintain a dilution of 1:40. Using 25L of Raynox in more than 1,000L will dilute Raynox too much and result in lower efficacy.

This means if your tank holds:

1,500L water add 37.5L of Raynox

2,000L water add 50L of Raynox

2,500L water add 62.5L of Raynox

My spray equipment is calibrated to less than 1,000L per hectare. What should I do?

A water volume of 1,000L/ha is preferable. However, if a lower volume of water is used (minimum 500L/ha) a Raynox rate of 25L/ha must be maintained.

I don't think a 1,000L per hectare is enough water volume to effectively treat my trees?

When applying Raynox we do not need coverage on the whole tree. We are mainly concerned with treating the exposed fruit and the tops of the trees. It is always advisable to shut off the bottom 2 nozzles on each side of the sprayer. This will help you achieve 1,000L/ha and get full coverage.

It is during the season and I see sunburn on my fruit, why hasn't Raynox worked?

On the contrary Raynox has been working! Like all sunburn products Raynox reduces the effect of sunburn and moves the majority of your fruit into categories 0 and 1 of the Schrader McFerson sunburn scale. There will always be sunburnt fruit but when you use Raynox there will be less of them!

Also unlike particle film products Raynox is clear and does not hide any sunburn, so the human eye will automatically go towards that sunburnt fruit. The best way to assess the performance of Raynox is to analyse the pack out percentages of that particular block.

Australian growers have reported at least 10-15% better packout after using Raynox!

Can I tank mix Raynox with any other product?

NO! Raynox needs to be applied on its own as compatibility and interaction with any other product in a tank mix has not been established.

Make the clear choice and call us today for the location of your nearest retailer and to learn more about how RAYNOX can help reduce your cullage and increase your profits.



Campbell

Raynox is distributed exclusively in Australia by:

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5 Blackfriar Place, Wetherill Park NSW 2164

Ph: (02) 9725 2544

www.campbellchemicals.com.au

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