

Citrus information kit—update

Reprint – information current in 1998



REPRINT INFORMATION – PLEASE READ!

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This publication has been reprinted as a digital book without any changes to the content published in 1998. We advise readers to take particular note of the areas most likely to be out-of-date and so requiring further research:

- Chemical recommendations—check with an agronomist or Infopest www.infopest.qld.gov.au
- Financial information—costs and returns listed in this publication are out of date. Please contact an adviser or industry body to assist with identifying more current figures.
- Varieties—new varieties are likely to be available and some older varieties may no longer be recommended. Check with an agronomist, call the Business Information Centre on 13 25 23, visit our website www.dpi.qld.gov.au or contact the industry body.
- Contacts—many of the contact details may have changed and there could be several new contacts available. The industry organisation may be able to assist you to find the information or services you require.
- Organisation names—most government agencies referred to in this publication have had name changes. Contact the Business Information Centre on 13 25 23 or the industry organisation to find out the current name and contact details for these agencies.
- Additional information—many other sources of information are now available for each crop. Contact an agronomist, Business Information Centre on 13 25 23 or the industry organisation for other suggested reading.

Even with these limitations we believe this information kit provides important and valuable information for intending and existing growers.

This publication was last revised in 1998. The information is not current and the accuracy of the information cannot be guaranteed by the State of Queensland.

This information has been made available to assist users to identify issues involved in the production of citrus. This information is not to be used or relied upon by users for any purpose which may expose the user or any other person to loss or damage. Users should conduct their own inquiries and rely on their own independent professional advice.

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Queensland Government

Citrus Information Kit Annual Update 1998

Technical content

John Owen-Turner
Garry Fullelove

Compilation

Noel Vock



Queensland Horticulture Institute
Department of Primary Industries, Queensland

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Enquiries should be addressed to:
The Agrilink Manager
Department of Primary Industries
PO Box 5269 SCMC
NAMBOUR Qld 4560 Australia
Phone: (07) 5444 9690; Fax: (07) 5444 9694
e-mail: agrilink@dpi.qld.gov.au
www.dpi.qld.gov.au/agrilink

Proudly produced by the Agrilink Project Team of Noel Vock, John James, Jerry Lovatt, Irene Kernot, Loraine Chapman, Glenis Ayling, Lourelle Heintjes and Sue Longin.

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Introduction

Welcome to the 1998 edition of the *Agrilink Citrus Information Kit Annual Update*. This is a special service provided to registered purchasers of the *Agrilink Citrus Information Kit* published in 1997.

This booklet is designed to update you with significant changes to the content of the kit since it was published. It does this by providing the specific changes page by page.

It will fit into the front pocket of your kit so that it is available for reference whenever you use the kit.

Thank you for being an Agrilink customer. We look forward to continuing to serve you with quality information products.

Coming soon!

Agrilink Citrus Information Kit on CD

Contact the Agrilink Infoline on 1800 677 640

Contents

Before you start

Specific updates	7
Prices	7
Gross margin and cash flow	9
Other considerations	9

Common questions

Overview	10
Specific updates	11
Mandarin varieties to plant	11
How close to plant	11
Fruit fly control	11
Sending citrus fruit to other states	12

Growing the crop

Overview	13
Specific changes	14
Varieties to consider—Table I	14
Rootstocks for Meyer lemon	16
Tree spacings	16
Very high density planting	16
Watering young trees	16
Mulching young trees	17
Fertilising bearing trees	17
Minor nutrients	17
Watering bearing trees	17
Hedging bearing trees	17
Thinning	18
Control of rind ageing	18
Controlling weeds in bearing trees	18
Equipment and methods for harvesting	19
Fruit treatment line operation	19
Bulk bin dipping	19
Degreening methods	20
The 'Shot Method'	20
Stickers	21
Packing	22

Marketing	23
Interstate movement provisions	23
Quality management	24

Key issues

Specific updates	26
Understanding the citrus tree	26
Economics of citrus production	26
Selecting varieties	26
Selecting rootstocks	28
A program for nutrition management	28
Before planting	28
Bearing trees	28
Zinc and manganese	29
Irrigation and water monitoring	29
Pruning—hedging and topping	29
Fruit thinning—chemicals	29
Marketing—quality management	30
Quality management system standards	30

Problem solver

Specific updates	32
Brown spot	32
Zinc deficiency	33
Queensland fruit fly	33

Contacts and references

Specific updates	34
References	43

Problem solver handy guide	48
---	-----------

Pest and disease management handy guide	50
--	-----------

Crop production handy guide	51
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Before you **START**

Overview of the 1998 season

The 1998 season was notable for a huge increase in the volume of fruit supplied to the Australian domestic market. This was due to two factors:

- Increased production from young trees coming into bearing. For example, it is estimated that production of Imperial mandarins increased from 1.3 million cartons to 1.9 million cartons. The full extent of increased production is yet to be felt as it is estimated that over half of the current plantings of Murcott mandarins are still under six years old.
- The Asian economic downturn that significantly reduced the demand in major Asian export markets. Considerable quantities of fruit, originally destined for export, were directed to domestic market outlets instead.

An example of the increase in volume can be gauged from figures that show throughput of mandarins in the Brisbane wholesale market for 1998 was up to 15% higher than throughput for 1997 and up to 25% higher than 1996 figures. Importantly, throughput in 1998 during the peak early supply months of April and May was up to 50% higher than 1997. Similar increases in volume were recorded in the Sydney wholesale market. This placed further pressure on prices, with average prices being reduced by up to 50% compared to the average price over the three years from 1995 to 1997.

This currently makes citrus growing a dubious business proposition for new growers unless reliable niche markets are researched and developed. This takes considerable time and money as well as commitment. The only other option is to take an optimistic outlook that the global economy will be much improved in five years when production from a new farm is coming on line. The one bright spot is that advances in disinfestation technology may well open up new export marketing opportunities over the next five or so years.

Whatever your view, the current state of the industry makes the need for a thorough business plan more essential than ever for new growers.

The other issue that prospective growers need to be aware of is the growing importance of food safety issues in the marketplace. All of the large retailers are now moving towards purchasing produce only from suppliers that can guarantee food safety under a Hazard Analysis and Critical Control Point (HACCP) based quality management system. This means that, at the very least, growers will need to qualify as approved suppliers to supermarket produce suppliers. Prospective growers should therefore factor in to their analysis the extra costs of these quality management procedures.

Specific updates

Prices (page 3)

Prices generally for citrus have fallen substantially over the last year or so. As an indicator, prices and throughputs for mandarins for the 1997 and 1998 seasons in the Brisbane market are shown in Figures 1 to 3. For comparison, the three-year average for 1994 to 1996 is also graphed. (Data to compile the figures courtesy of Market Information Services, Brisbane—contact details for more information on page 40 of this update.)

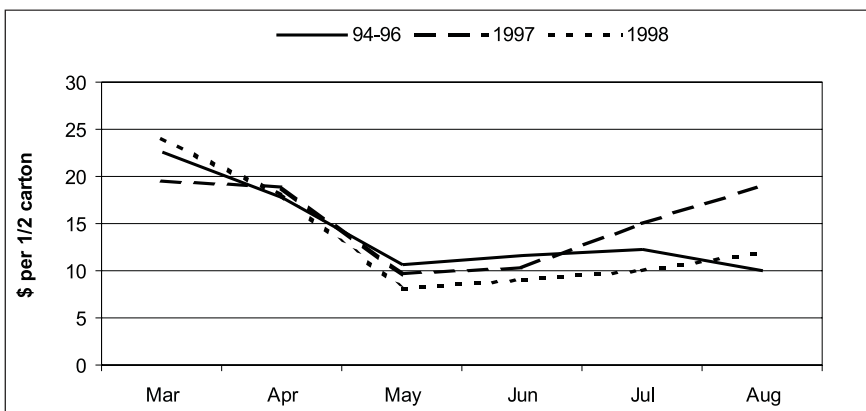


Figure 1. Average monthly price for Imperial mandarins at the **Brisbane** market

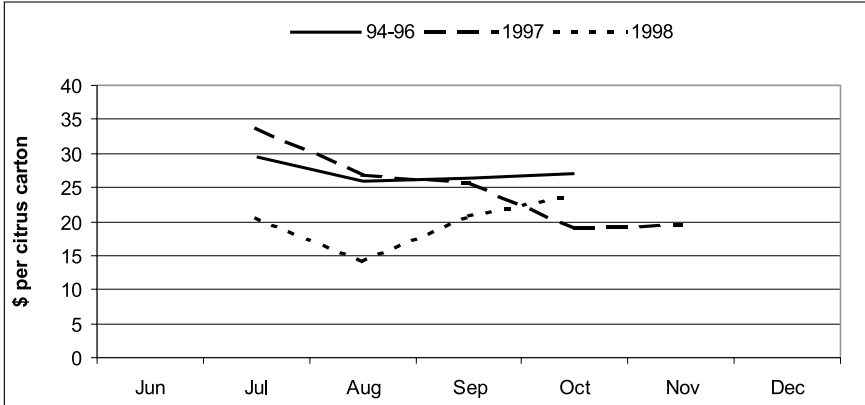


Figure 2. Average monthly price for Murcott mandarins at the **Brisbane** market

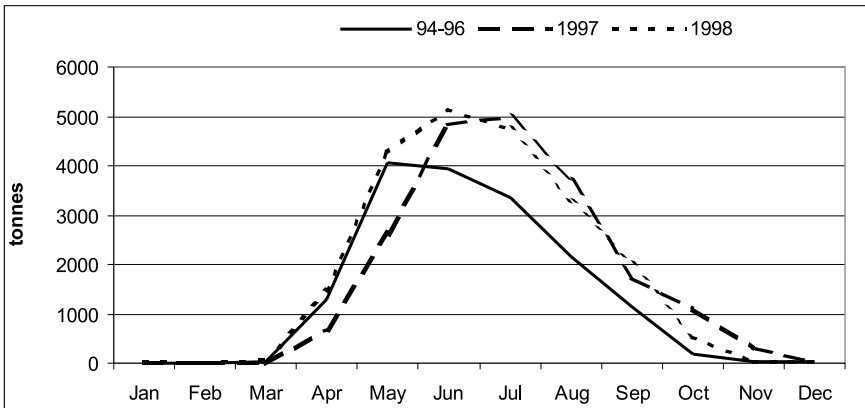


Figure 3. Average monthly throughput of mandarins at the **Brisbane** market

Gross margin and cash flow (page 7)

A significantly lower price structure than that used in the initial economic analysis will reduce the gross margin as well as extend the payback period. It is recommended that new growers, as part of their business plan, recalculate the gross margin and cash flow using the prices shown in this update.

Other considerations (page 10)

With the explosion in information availability via the Internet, access to the Internet and skill in using it are becoming important additional required skills for the grower. For example, the Internet can now be used to access technical information on citrus, overseas research findings, and marketing intelligence.



Common **QUESTIONS**

Overview

Some additional questions, particularly related to diseases, chemical use and quality standards, have been raised since the *Citrus Information Kit* was first published. Following are some questions that Department of Primary Industries' extension officers have been asked recently and their answers.

How do I get spray accreditation?

Spray accreditations can be obtained by attending a course provided by an accredited Chemsafe Training Queensland trainer. *Contacts and references* on page 36 of this update gives a contact to help you find your nearest trainer.

Do I need training in the safe use of chemicals?

In some Australian states you cannot buy chemicals unless you have a current spray accreditation. Currently, by law in Queensland, you only need training in safe use of chemicals if you are a contractor spraying on other people's land or you want to buy restricted chemicals.

However, most wholesalers and retailers now see it as highly desirable for their growers to be able to demonstrate safe responsible use of chemicals. One of the best ways to demonstrate this is to obtain a Chemsafe accreditation. Remember spray accreditations must be renewed every five years.

How should I store my chemicals?

Chemicals need to be stored in accordance with the AS2507-1998 standard. This does not mean you will have to spend a fortune on elaborate storage facilities. You do, however, need to be aware of several safety, environmental and food safety factors whenever you deal with chemicals. Further information on correct use of chemicals is covered in the chemical

user course. Agsafe or Chemsafe accredited trainers also understand these requirements and employees of farm chemical resellers with Agsafe accreditations are also useful sources of information.

Do I need to keep a diary of spraying records?

Yes, you do. Records of chemical application are now one of the most important pieces of documentation you will need to be able to prove what you have done with chemicals. All the merchants and agents supplying the retail sector now expect you to keep spray records showing at **least** what was applied, how much, by whom, and when the application took place.

Specific updates

Mandarin varieties to plant (page 4)

The answer to this question has been revised. The most suitable standard varieties are Imperial, Hickson, Ellendale and Murcott. Promising new varieties are Afourer and Daisy. Sunburst and Fremont are being widely planted but there is insufficient data to form a reasonable opinion.

All of these varieties are generally suitable for drier coastal and inland areas. For the wetter coastal areas, it is suggested that Murcott and Sunburst be dropped from the list.

How close to plant (page 4)

A close-planting alternative for high density planting is the double row system. This has double rows planted 2.4 m apart with 7.3 m between the centres of each double row (centre of double row to centre of double row). Trees are planted within the rows at a spacing of 2.4 m. For a diagram of this planting layout see page 16 of this update.

Fruit fly control (page 8)

In addition to chlorpyrifos, two other insecticides, maldison (Hy-Mal) and trichlorfon (Dipterex), are registered for use in bait sprays on citrus. Like chlorpyrifos, these are mixed with yeast autolysate and water to form the bait spray. Trichlorfon bait spray is not recommended at times of high fruit fly pressure.

For multiple cropping varieties such as Meyer and Lisbon lemons, bait spraying is recommended all year round. For early varieties (e.g. Navel, Imperial), bait spraying should start in January; for mid season varieties (e.g. Ellendale, Hickson), in March; and for late season varieties (e.g. Valencia, Murcott), in May.

Sending citrus fruit to other states (page 8)

Following the successful eradication of papaya fruit fly in Queensland, the special restrictions applying to the movement of citrus out of the Papaya Fruit Fly Quarantine Zone no longer apply.



Growing the **CROP**

Overview

The recipe for growing citrus contained in the *Agrilink Citrus Information Kit* has changed little during the year since publication. The most significant changes are:

- fine-tuning of the variety recommendations and the inclusion of a couple of new varieties for trial;
- inclusion of double row planting as an option for very high density planting;
- availability of new soil moisture monitoring devices;
- registration of the herbicide glufosinate-ammonium (Basta) for weed control in citrus.

However, there have been some very significant changes in the marketing practices for citrus. These include:

- The growing importance of food safety issues in the marketplace. All of the large retailers are now moving towards purchasing produce only from suppliers that can guarantee food safety under a HACCP based quality management system. This means that, at the very least, growers will need to qualify as approved suppliers to supermarket produce suppliers.
- The introduction of Interstate Certification Assurance (ICA's) arrangements for meeting the regulations relating to interstate shipment of citrus. These take the emphasis away from end-point inspections by approved inspectors to grower accreditation where growers manage the treatment themselves.
- The increase in momentum by retailers towards using Price Look Up (PLU) stickers to identify produce for ease of handling at retail checkouts. It is likely that in time PLU's may be a condition of supply to retail outlets.

Farm records

The requirement for growers to meet the needs of approved supplier programs, ICA's, etc brings into sharp focus the issue of farm records. Although the maintenance of a farm block recording system has been recommended best practice for some time, these new requirements make it now almost mandatory. There are many benefits of a farm block recording system:

- meeting the needs of an approved supplier program and ICA protocols;
- record of operations for workplace health and safety audits;
- record of operations for environmental audits that may be required under Farmcare, Landcare and Catchment Management schemes;
- provision of useful information for better business management and business planning.

The options for developing farm block recording systems include:

- available proprietary farm recording software (e.g. FarmPal);
- the system captured in the new *Citrus growing manual—a manual for quality decision making*, due for publication in early 1999;
- your own recording system. (Citrus consultants and extension officers may be able to provide advice in setting this up.)

Specific changes

Varieties to consider—Table I (page 6)

The table of varieties has been refined and updated to distinguish between suggested standard varieties (currently well established and known in the marketplace) and promising new varieties (worth watching and perhaps trying in smaller numbers).

Note: Unless otherwise indicated under 'Comments', listed varieties are suitable for both domestic and export markets.

Citrus type	Variety	District suitability	Comments
Oranges	Standard varieties:		
	Washington Navel (mid season)	All	
	Joppa (mid season)	All	
	Valencia (late season)	All	
	Promising new varieties:		
	Fukumoto Navel (early season)	All	Early: before Washington Navel to target early Navel market
	Navelina Navel (early season)	All	Early: before Washington Navel to target early Navel market
Mandarins	Standard varieties:		
	Imperial (early season)	All	Domestic market
	Hickson (mid season)	All	
	Ellendale (mid season)	All	
	Murcott (late season)	Not wet coastal	Highly susceptible to brown spot
	Promising new varieties:		
	Afourer (late season)	All	Low seeded Murcott replacement
	Daisy (mid season)	All	Seeded
	Varieties widely planted (insufficient data as yet):		
	Sunburst (mid season)	All	Export market
	Fremont (early to mid season)	All	
Tangelos	Standard variety:		
	Minneola (mid season)	Not wet coastal	Emerging variety for niche market; highly susceptible to brown spot
Lemons	Standard varieties:		
	Meyer	All	Domestic market
	Eureka	Not wet coastal	Highly susceptible to rots, blemishes
	Lisbon	Not wet coastal	Highly susceptible to rots, blemishes
	Promising new variety:		
	Fino (early season)	All	
Grapefruit	Standard variety:		
	Marsh (early to mid season)	All	Domestic market
	Promising new varieties:		
	Red and pink varieties (e.g. Ruby Red, Star Ruby, Henderson, Rio, Flame, Thompson) (mid season)	All	
Limes	Standard varieties:		
	Tahitian	All	Domestic market
	West Indian	All	Domestic market

Rootstocks for Meyer lemon (page 7)

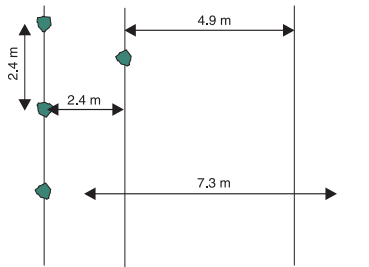
For replant land or where soil is less than 75 cm deep, there are still no proven rootstocks for Meyer lemon. Do not use Swingle because of incompatibility problems. The current best strategy is to fumigate the soil and use rough lemon.

Tree spacings—Table 3 (page 8)

The figure for trees per hectare for Murcott and other mandarins should be 507, not 570.

Very high density planting (page 9)

Another alternative for very high density planting is the double row system. This has double rows planted 2.4 m apart with 7.3 m between the centres of each double row (centre of double row to centre of double row). Trees are planted within the rows at a spacing of 2.4 m (see diagram).



Planting layout for very high density planting

This system produces a tree density of about 1170 trees per hectare. It is less dense than the 3.6 m x 1.8 m system mentioned in the kit but still requires a high level of management, including pruning, side trimming and careful attention to pest and disease control.

Watering young trees (page 17)

In addition to tensiometers, the neutron probe and the Enviroscan probe, other soil moisture monitoring systems are now available. Three to add to the list are:

- **Gopher soil capacitance probes;** (These operate in a similar way to the Enviroscan probe.)

- **Thetaprobes;** (These consist of a soil moisture sensor connected by a cable to a data logger.)
- **gypsum blocks.** (These are blocks of gypsum inserted into the soil and connected to a digital ohmmeter to measure electrical resistance.)

Mulching young trees (page 19)

Although the kit indicated that mulching is only viable on small orchards, it is important to reiterate that mulching is considered best practice for all young trees. It is also worthwhile on larger orchards where the expense can be justified.

Fertilising bearing trees (pages 22–25)

All of the recommendations in this section are based on the interpretation of tissue analysis by the **dried** tissue analysis technique. The recommendations are not relevant to sap analysis techniques.

Minor nutrients (page 25)

As zinc deficiency is becoming more and more widespread, there is an emerging opinion that foliar applications of zinc are no longer adequate in supplying the tree's needs. It also makes interpretation of leaf tissue analysis results more difficult. The current recommendation is to use a combination of leaf and soil analysis to determine required rates, and then either spray the zinc solution on the ground under the trees or apply it by fertigation.

Foliar sprays of manganese are best applied in a mixture with urea (up to 1 kg per 100 L of spray) and a small quantity of non-ionic wetter (10 mL per 100 L of spray). Use the low biuret urea (0.4%), not the high biuret (1%) form, as this may cause leaf burn.

Watering bearing trees (pages 25–26)

Alternative soil moisture monitoring devices (see page 16 of this update) are available.

Hedging bearing trees (page 27)

It is important to note that trimming the sides of trees reduces the crop on that part of the tree for the coming season. Consequently, a trimming strategy needs

to be carefully planned. The information in the kit suggested trimming one side of each row each year. Another option would be to prune both sides of every second block each year, leaving alternate blocks untouched for that year.

Thinning (page 28)

The rate of ethephon quoted for thinning (50 to 60 mL/100 L water) applies to the products Ethrel, Bounty and Promote only. It does not apply to Ethrel 1000, which is used at 24 to 29 mL/100 L water.

Control of rind ageing (page 28)

The rate of gibberellic acid quoted for control of rind ageing (10 mL/100 L water) applies to the products Progibb and Grocel only. It does not apply to other formulations of gibberellic acid that may be available. Check the label of these other products carefully before use.

Note also the **Cit-tite** correction in Section 3, page 29 of the kit (already posted to kit holders)—the rate of use of Cit-tite is 120 to 200 mL/1000 L, not 120 to 200 mL/100 L.

Controlling weeds in bearing trees (page 29)

The previous comment about mulching for young trees (page 17 of this update) applies equally well for bearing trees.

Table 10. Registered herbicides (page 30) has been updated (as of November 1998).

Chemical name	Trade names
For all citrus:	
2,2-DPA	Propon
amitrole+ammonium thiocyanate	TL Plus
bromacil	Hyvar X, Bromacil
bromacil+diuron	Krovar
dichlobenil	Casoron
diquat	Reglone
diuron	Die-It, Di-On, Diuron, Diurex, Diugranz, Diurmax, Karmex, Striker, Zee-Uron
diuron+glyphosate	Nomix G-D
fluazifop	Fusilade

Chemical name	Trade names
fluometuron	Cottonex, Fluometuron
glufosinate-ammonium	Basta
glyphosate	Gysel, Glyphos, Glyphosate, Glyphosate, Harpoon, Ken-Up, Nomix, Pacer, Ranger, Ricochet, Roundup, Sanos, Squadron, Touchdown, Trigger, Weedmaster, Weed Out, Wipe-Out
haloxyfop-R methyl ester	Typhoon, Verdict
norflurazon	Solicam
paraquat	Gramoxone, Maxitop, Nuquat, Para-Di, Paraquat, Uniquat
paraquat+diquat	Spray Seed, Tryquat
pendimethalin	Stomp
simazine	Gesatop, Simagranz, Simamax, Simanex, Simatox, Simazine, Sipcam
For oranges and grapefruit only:	
oryzalin	Surflan
oryzalin+simazine	Flandor

The most significant change is the availability of glufosinate-ammonium (Basta) for use in citrus. This is a knockdown herbicide similar in action to glyphosate but with a broader spectrum of weed control. Our recommendation would be to continue using desiccant herbicides such as paraquat and paraquat/diquat mixtures with the odd application of glyphosate or Basta for any difficult-to-control weeds.

Equipment and methods for harvesting (page 36)

Harvest the rewards, an industry training video on harvesting citrus, is available from some industry sources. The video shows equipment and methods, including demonstrations of clipping and plucking. It was produced by Focus Consulting Pty Ltd and Apricot Productions.

Fruit treatment line operation (page 38)

Some treatment lines now include descaling machines (high pressure water blasters to remove scale insects). These are normally positioned after the bin tip.

Bulk bin dipping (pages 38–39)

The top-up rate for the Panocline dip is now 130 mL/100 L, not 260 mL/100 L.

Degreening methods (page 39)

Because of requests for more detail on the 'Shot Method' of degreening, here is some additional information.

The 'Shot Method'

In the 'Shot Method', comparatively high levels of ethylene are injected into the room as single 'shots'. After each eight-hour period, the room is ventilated for 5 to 10 minutes and then re-injected with ethylene. The initial ethylene level established is generally about 250 ppm (one volume of ethylene to 4000 volumes of room air). Through natural leakage, the level continually falls until the next injection is made.

In reasonably airtight rooms, rising carbon dioxide levels can slow ripening. Rooms with low natural leakage rates must be ventilated 5 to 10 minutes before each fresh ethylene injection to clear the room of accumulated carbon dioxide. This can be achieved effectively by leaving the door open with the air circulation fans running.

Ethylene can be metered from a pressure cylinder through a calibrated flow meter equipped with a 'dead man valve'. This is a spring-loaded push button valve that must be manually held down to inject the ethylene. Injection times typically range from a few seconds to about 60 seconds. The metering gauge is calibrated in litres per minute.

Example:

A 3 m x 3 m x 3 m room of 27 cubic metres volume (equivalent to 27 000 L) to be injected with 250 ppm of ethylene (one volume of ethylene to 4000 volumes of room air) requires an ethylene volume of $27\ 000/4000 = 6.75$ litres.

To inject the ethylene, the metering gauge could be set on 13.5 L per minute and the valve held down for 30 seconds to inject the required 6.75 L of ethylene.

The usual injection point is through the room wall behind the room fan. The ethylene cylinder must be securely clamped to the external room wall or at some convenient point adjacent to the room.

The system is simple to equip and operate and the capital cost of ethylene

metering equipment is cheaper than that required for the trickle system. Disadvantages include the higher cost of electrical equipment (has to be flameproof to comply with safety regulations) and the need to attend the system three times daily. Carbon dioxide levels are also not controlled as effectively as they are in the trickle system. Approval of the system requires extra safety precautions from the Department of Mines and Energy.

The major difference between the 'Shot Method' and the 'Trickle Method' is the method of injecting the ethylene. All other factors such as humidity and temperature management are similar for both methods.

Stickers (page 43)

The move to using Price Look Up (PLU) stickers to identify produce for ease of handling at retail checkouts is gaining momentum. In time, these will probably be demanded for all produce. Growers using stickers should therefore move towards incorporating PLU numbers on their stickers.

Relevant PLU numbers for citrus

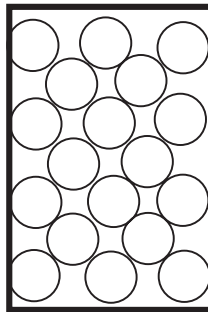
Commodity	PLU number	Commodity	PLU number
Grapefruit – large (count 27–41)	5254	Mandarins:	
Grapefruit – medium (count 48–64)	5255	Ellendale – large (count 36–60)	5381
Grapefruit – small (count 72–80)	5256	Ellendale – medium (count 72–88)	5382
Grapefruit – organic	5829	Ellendale – small (count 100 plus)	5383
Cumquat	4303	Hickson	5385
Lemonade fruit	5299	Murcott – large (count 36–60)	4453
Lemons – large (count 64–80)	5300	Murcott – medium (count 72–88)	5386
Lemons – medium (count 100–125)	5301	Murcott – small (count 100 plus)	5839
Lemons – organic	5302	Imperial – large (count 60 and less)	5387
Lime leaves	5369	Imperial – medium (count 64–88)	5388
Limes	5370	Imperial – small (count 96 plus)	5389
		Mandarin – organic	5380
Oranges:		Satsuma	5775
Blood	4381	Sunburst	5391
Navel – large (count 36–60)	5478	Clementine	4450
Navel – medium (count 72–88)	5479		
Navel – small (count 100 plus)	5480	Pomelo – large	5560
Valencia – large (count 48–56)	5483	Pomelo – medium	5561
Valencia – medium (count 64–88)	5484	Pomelo – small	5562

Commodity	PLU number	Commodity	PLU number
Valencia – small (count 100 plus)	5485	Tangelo	5687
Navel – Late Lane	5798		
Seville	5481		
Juicing	4382		

Packing (page 43)

The kit mentions pattern packing but does not provide any information on the technique. Use the illustration to follow this explanation for pattern packing.

Pattern packing involves placing layers of fruit in a rectangular carton. The terminology used refers to fruit numbers horizontally across the narrow side of the carton (called ‘sideways’ or ‘pack’ numbers) and fruit numbers vertically across the wide side of the carton (called ‘front on’ or ‘row’ numbers). In the illustration, ‘sideways’ numbers are 3x2 (three fruit followed by two fruit, then three fruit and so on down the package). ‘Front on’ numbers are 4x3 (four fruit followed by three fruit, then four fruit and so on across the package). This produces a layer of 18 fruit using the ‘open pocket’ pattern illustrated.



Pattern packing—‘open pocket’ pattern

A range of pattern pack configurations for common counts of the major citrus types is given in the table. Details of others are generally available from citrus consultants and extension officers.

Citrus type	Count	Front on	Sideways	Fruit per layer
Imperial	125	5x5	3x2	25
	100	4x4	3x2	20
	88	6x5	2x2	22
	64	4x4	2x2	16
	48	3x3	2x2	12

Citrus type	Count	Front on	Sideways	Fruit per layer
Navel	125	5x5	3x2	25
	100	4x4	3x2	20
	88	4x3	3x2	18/17
	64	4x4	2x2	16
	36	4x4	2x1	12
Murcott/Ellendale (domestic market)	125	5x5	3x2	25
	104	6x7	2x2	26
	88	6x5	2x2	22
	64	4x4	2x2	16
	36	4x4	2x1	12
Lemons	125	5x5	3x2	25
	100	4x4	3x2	20
	88	4x3	3x2	18/17
	64	4x4	2x2	16

Marketing (pages 44–45)

Major city chain stores and supermarkets. The demand for improved quality and the growing importance of food safety issues in the marketplace mean that all of the large retail chain stores and supermarkets are now moving towards buying produce only from suppliers that can guarantee food safety under a HACCP based quality management system. To supply these outlets direct, growers will need to implement a HACCP based quality management system such as SQF 2000.

Interstate movement provisions (page 46)

Following the successful eradication of papaya fruit fly, the special restrictions applying to the movement of citrus out of the Papaya Fruit Fly Quarantine Zone no longer apply.

While the regulations applying to the shipment of citrus to other states have not changed greatly since the kit was published, the way in which the regulations are administered has. The major change has been the introduction of Interstate Certification Assurance (ICA) arrangements. An ICA now covers each treatment procedure, such as dipping in dimethoate after harvest.

ICA's take the emphasis away from end-point inspections by approved inspectors to grower accreditation where growers manage the treatment themselves. ICA's offer greater flexibility to the grower as well as ultimately saving them

money by not having to engage inspectors. To achieve accreditation, growers must undergo training, pass an inspection and then be subject to regular audits. While the choice of end-point inspections will remain, these will become increasingly expensive.

As regulations and the implementation of ICA's are subject to on-going change, details of specified treatments and protocols are not updated here. Instead, growers intending to consign fruit to another state are advised to contact quarantine authorities in the relevant state (see page 38 of this update booklet).

Quality management (page 48)

The demand for quality management systems at the farm and packhouse levels has grown significantly since the kit was published. The major catalyst for this has been the growing demand from consumers and retailers for safety standards for all food, including fruit. These standards include minimal chemical residues, lack of food contamination organisms and freedom from foreign matter. This builds on top of the demand for other quality parameters such as good shelf life, sweetness and juiciness. In addition, retailers are moving towards demanding individual produce labels containing Price Look Up numbers (PLU's)—see 'Stickers' on page 21 of this update.

At present, all major retailers are putting in place systems where produce will only be bought from suppliers that can guarantee food safety standards under a HACCP based food safety quality management system. These systems are likely to come into operation for fresh produce during 1999.

As most fruit is currently supplied to retailers through produce wholesalers (agents and merchants in the major metropolitan produce markets), these wholesalers will have to meet the HACCP requirements. In turn, growers that supply them will be required to meet certain food safety standards and become approved suppliers. It is likely that in time, other quality issues and PLU's will also be required as conditions of approved supplier status. Without approved supplier status, growers will be left to supply the non-supermarket sector of the market that is now minor and decreasing year by year.

Growers who wish to supply major retailers direct will need to implement an on-farm HACCP based quality management system such as SQF 2000.

Details on the requirements for approved suppliers are available in a new booklet *Developing an approved supplier program for fresh produce—a guide for customers and suppliers*. To order this booklet, see *Contacts and references* on page 43 of this update.



Key **ISSUES**

Specific updates

Understanding the citrus tree (page 4)

The diagram of the annual crop cycle in Figure 1 shows natural fruit drop occurring in November and December. Natural fruit drop in Imperial mandarin, however, starts in early October.

Economics of citrus production (page 6)

Interested readers are referred to more recent analyses of the economics of growing citrus in Queensland. Relevant publications are:

- *Economics of citrus in the Central Highlands*, Donaghy, P. (1996), Department of Primary Industries, Brisbane, Information Series QI96011.
- *Production and marketing of citrus*, McRuvie, J. & Garner, P., (1996), Department of Primary Industries, Brisbane, Information Series QI96013.

This new data will be incorporated into the first major revision of the kit in 2000.

In Table 1—Whole orchard profit and loss statement (at steady state) in Section 4 page 7, the figure for harvesting the 7 ha farm should be \$23 525, not \$223 525.

Selecting varieties (page 22)

Refer to the revised table of varieties to consider under *Growing the crop* on page 14 of this update. Brief notes on the characteristics of new varieties in the table are shown on the next page.

Variety	Approximate harvest time in Queensland	District suitability	Main markets	Comments
Oranges				
Fukumoto	March–May	All	Domestic, export	Very limited data in Australia to date. Very round fruit excellent for packing. To target early Navel market.
Navelina	March–May	All	Domestic, export	Smaller fruit than Navel but good colour and flavour. Fruit oblong in shape, tapered at the navel end. Fruit hangs well for an early Navel. Tree semi-dwarfed. To target early Navel market.
Mandarins				
Afourer	July–September	All	Domestic, export	Potential Murcott replacement. Less seeded with good colour and flavour.
Daisy	April–June	All	Domestic, export	Seeded, large fruit, excellent colour and flavour, fine rind, carries well. Tight but still relatively easy to peel.
Tangelo				
Minneola	June–July	Not wet coastal	Domestic, export	Large fruit, some seeds, good colour, distinctive neck, medium to thick rind, does not peel easily. Good flavour but acidic early in the season. Subject to alternate bearing. Very susceptible to brown spot.
Lemon				
Fino	January–February (main crop) but throughout year	All	Domestic, export	Small to medium sized fruit with thin rind. Some seeds. Good quality fruit, good yield potential. Limited data to date.

DPI's Plant Breeder for citrus, Malcolm Smith, established a trial planting of early mandarin varieties near Bundaberg in 1998. The trial will evaluate three potential new early varieties (Fallglo, Nova and deNules) against the standard early variety, Imperial. Each variety will be evaluated on 10 different rootstocks. We will keep you posted on the results.

Selecting rootstocks (page 32)

Swingle citrumelo. One of the bonuses listed ‘*produces good yields of large fruit of excellent quality*’ has been modified to ‘*produces good yields of large fruit*’. Also, under *Major problems*, Swingle is incompatible with Meyer lemon as well as Eureka.

New rootstock. A promising new rootstock under evaluation is the Volkamer lemon (*Citrus volkameriana*). A strain of rough lemon, it is a potential alternative to rough lemon in some situations. Trees grown on Volkamer lemon are similar in most characteristics to rough lemon, with exceptionally good vigour, good yields, early bearing, resistance to viroid diseases and drought tolerance. However, it shares similar problems, being susceptible to root and collar rot, blight and nematodes. Fruit quality appears similar to that produced on rough lemon rootstocks. Despite these similarities, trials in Florida report its performance to be superior to rough lemon.

A program for nutrition management (page 38)

Before planting

Creasing, the important fruit quality disorder, is generally considered to be caused by calcium deficiency brought on by an imbalance of calcium with other cations (magnesium, potassium and sodium). For this reason, Table 1 has been amended to include these recommended cation balance figures:

- **Cation balance (%)**: calcium 65–80; magnesium 10–15; potassium 1–5; sodium less than 5
- **Calcium:magnesium ratio**: 3–5: 1.

Bearing trees

In Table 2—Optimum leaf nutrient levels, exceptionally high levels of elements such as copper, zinc and manganese generally indicate contamination of the leaves by applied chemical sprays. Use soil analysis results in conjunction with leaf analysis to interpret the figures properly.

Also note the following comments about zinc and manganese in relation to the recommendations for these nutrients in Table 3—Fertiliser timing and comments.

Zinc

As zinc deficiency is becoming more and more widespread, there is an emerging opinion that foliar applications of zinc are no longer adequate in supplying the tree's needs. It also makes interpretation of leaf tissue analysis results more difficult. The current recommendation is to use a combination of leaf and soil analysis to determine required rates, and then either spray the zinc solution on the ground under the trees or apply it by fertigation.

Manganese

Foliar sprays of manganese are best applied in a mixture with urea (up to 1 kg per 100 L of spray) and a small quantity of non-ionic wetter (10 mL per 100 L of spray). Use the low biuret urea (0.4%), not the high biuret (1%) form, as this may cause leaf burn.

Irrigation and water monitoring (pages 43–44)

In addition to tensiometers, the neutron probe and the Enviroscan probe, other soil moisture monitoring systems are now available. Three to add to the list are:

- **Gopher soil capacitance probes.** These operate in a similar way to the Enviroscan probe.
- **Thetaprobes.** These consist of a soil moisture sensor connected via cable to a data logger.
- **Gypsum blocks.** These are blocks of gypsum inserted into the soil and connected to a digital ohmmeter to measure electrical resistance.

Pruning—hedging and topping (page 57)

Trimming the sides of trees reduces the crop on that part of the tree for the coming season. Consequently, a trimming strategy needs to be carefully planned. The information in the kit suggested trimming one side of each row each year. Another option would be to prune both sides of every second block each year, leaving alternate blocks untouched for that year.

Fruit thinning—chemicals (page 63)

The rate of ethephon quoted for thinning (50 to 60 mL/100 L water) applies to the products Ethrel, Bounty and Promote only. It does not apply to Ethrel 1000, which is used at 24 to 29 mL/100 L water.

Marketing—quality management (pages 65–67)

The demand for quality management systems at the farm and packhouse levels has grown significantly since the kit was published. The major catalyst for this has been the growing demand from consumers and retailers for safety standards for all food, including fruit. These standards include minimal chemical residues, lack of food contamination organisms and freedom from foreign matter. This builds on top of the demand for other quality parameters such as good shelf life, sweetness and juiciness. In addition, retailers are moving towards demanding individual produce labels containing Price Look Up numbers (PLU's)—see 'Stickers' on page 21 of this update.

At present, all major retailers are putting in place systems where produce will only be bought from suppliers that can guarantee food safety standards under a HACCP based food safety quality management system. These systems are likely to come into operation for fresh produce during 1999. As most fruit is currently supplied to retailers through produce wholesalers (agents and merchants in the major metropolitan produce markets), these wholesalers will have to meet the HACCP requirements. In turn, growers that supply them will be required to meet certain food safety standards and become approved suppliers. It is likely that, in time, other quality issues and PLU's will also be required as conditions of approved supplier status. Without approved supplier status, growers will be left to supply the non-supermarket sector of the market that is now minor and decreasing year by year.

Note that growers who wish to supply major retailers directly will need to implement an on-farm HACCP based quality management system such as SQF 2000.

Details on the requirements for approved suppliers are available in a new booklet *Developing an approved supplier program for fresh produce—a guide for customers and suppliers*. To order this booklet, see *Contacts and references* on page 43 of this update.

Quality management system standards

Quality management systems formalise the knowledge, experience and methods developed to deliver a product the customer wants into a simple documented process. Several quality management systems exist and they vary in

complexity and purpose. These are the main ones relevant to the citrus industry.

- **ISO 9002** is an internationally recognised system used around the world and is the system on which most others are based. It consists of 20 elements covering all aspects of producing products and servicing customers. It is expensive to establish, costing \$5000 to \$20 000 to implement and about \$3000 to \$5000 in annual auditing and registration fees.
- **HACCP 9000** (Hazard Analysis and Critical Control Point) is a relatively new food industry system combining elements of risk management and quality management. It involves a process of identifying risks or hazards and applying specific control measures, primarily to prevent food from being unsafe to eat. It adds about 20% to the cost of the ISO 9002.
- **SQF 2000** (Safe Quality Food) was developed by Agriculture Western Australia for small businesses in the food industry. The system consists of six elements incorporating aspects of ISO 9002 and includes the HACCP system. It is recognised in Australia, but not internationally at this stage. It costs upwards of about \$2500 to implement and about \$500 in annual auditing costs.



Problem **SOLVER**

Specific updates

Brown spot (pages 2, 6, 9 and 11)

The recommendation for spraying bearing trees for brown spot has been amended. On bearing trees of the susceptible varieties, there are normally three main leaf flushes requiring spray protection—a spring flush in about September–October, a summer flush in about December–January and an autumn flush in about March–April.

As the spring flush generally coincides with the application of copper and oil spray/s for black spot at petal fall, there is generally little need for additional brown spot sprays at this point.

The summer flush sometimes coincides with the application of the later copper or mancozeb sprays for black spot, and again there may be little need for additional brown spot sprays at this point.

However, the autumn flush and sometimes the summer flush (if it is not in synchrony with the black spot sprays) will require special protection. For these sprays, the current suggestion is cuprous oxide, as it appears to cause less rind darkening. It may be beneficial to add oil to the sprays provided the normal limits for oil application during a season have not been exceeded. The copper oxychloride plus additives spray mentioned in the kit is becoming less popular because of the risk of skin damage and the practicalities of mixing.

There is also the opportunity to use the fungicide iprodione at times when the tree is not bearing a crop because the fungicide is currently registered for non-bearing trees only. Investigations have shown that this chemical, when applied

in winter after the crop has been harvested, has a significant impact on reducing the levels of the fungus available for infection of the spring flush.

Zinc deficiency (page 4)

As zinc deficiency is becoming more and more widespread, there is an emerging opinion that foliar applications of zinc are no longer adequate in supplying the needs of the tree. It also makes interpretation of leaf tissue analysis results more difficult. The current recommendation is to use a combination of leaf and soil analysis to determine required rates, and then either spray the zinc solution on the ground under the trees or apply it by fertigation.

Queensland fruit fly (page 12)

The bait spray program has been amended. For multiple cropping varieties such as Meyer and Lisbon lemons, bait spraying is now recommended all year round. For early varieties (e.g. Navel, Imperial), bait spraying should start in January; for mid season varieties (e.g. Ellendale, Hickson), in March; and for late season varieties (e.g. Valencia, Murcott), in May.



Contacts and **REFERENCES**

Note: The Department of Primary Industries gives no warranty as to the quality or suitability of goods or services provided by companies and businesses listed in this citrus update. Trade names are used in this update solely for providing specific information. Mention of a trade name does not constitute a guarantee or warranty by the Department of Primary Industries or the authors, nor is it an endorsement of these products over others not mentioned.

All nine-digit telephone numbers in Australia have been upgraded to ten digits under the Australian Communications Authority numbering upgrade. Nine-digit number upgrades are:

Existing	New
(070) xxx xxx	(07) 40xx xxxx
(071) xxx xxx	(07) 41xx xxxx
(076) xxx xxx	(07) 46xx xxxx
(079) xxx xxx	(07) 49xx xxxx
(066) xxx xxx	(02) 66xx xxxx
(043) xxx xxx	(02) 43xx xxxx

Specific updates

Citrus grower associations (page 4)

Australian Citrus Growers Inc. has e-mail and a website:
e-mail: austcitrus@msn.com.au
www.farmwide.com.au/nff/acg/acg.htm

Organic grower associations (page 4)

Updated details:

Bio-Dynamic Agricultural Association of Australia

c/- Post Office

POWELLTOWN VIC 3797

Ph: (03) 5966 7333; Fax: (03) 5966 4333

Biological Farmers of Australia has e-mail:

bfa@icr.com.au

Ph: (07) 4639 3299; Fax: (07) 4639 3755

Organic Retailers and Growers Association of Australia

c/- The Secretary

PO Box 12852

A'Beckett Street Post Office

MELBOURNE VIC 3000

Ph: (03) 9737 9799

e-mail: organic@alphalink.com.au

National Association for Sustainable Agriculture Australia Ltd has e-mail:

nasaa@dove.mtx.net.au

Pest consultants (page 4)

Additional pest consultants:

Agrotek Consultancy

Andrew Olley

PO Box 5106 SCMC

NAMBOUR QLD 4560

Ph/Fax: (07) 5479 4101; Mobile: 0412 002 375

Ironside Agricultural Pest Management Pty Ltd

David Ironside

7 Lingard Street

PALMWOODS QLD 4555

Ph: (07) 5478 9008; Fax: (07) 5478 9386; Mobile: 014 665 800

Pesticides and spraying (page 6)

AVCARE Ltd has e-mail:

e-mail: avcare@ozemail.com.au

For training in pesticide application contact the address below to find the nearest accredited trainer.

Chemsafe Training Queensland

PO Box 3128

SOUTH BRISBANE QLD 4101

Ph: (07) 3844 7261; Fax: (07) 3844 7307

e-mail: chemsafe@powerup.com.au

Beneficial insect suppliers (page 5)

Updated details:

Bio-Protection Pty Ltd has e-mail:

bioprotn@flexi.net.au

Irrigation consultants (page 6)

Updated details:

Hortech Services Pty Ltd

(Peter Broomhall) has e-mail and a website:

e-mail: hortech@ats.com.au

www.ats.com.au/~hortech

Irri-Scan North

PO Box 370

KALLANGUR QLD 4503

Mobile: 0418 878 484; Fax: (07) 3886 0389

e-mail: irriscannorth@internetnorth.com.au

Integrated Pest Management, also trading as Bugs for Bugs

has e-mail and a website:

e-mail: dan@bugsforbugs.com.au

www.bugsforbugs.com.au

Crop Tech Laboratories Pty Ltd has e-mail:

CROPTECH@b130.aone.net.au

Piccone Horticultural Consultancy Pty Ltd/Piccone PHC

201 Bruce Highway

EDMONTON QLD 4869

Ph: (07) 4045 3277; Fax: (07) 4045 3613; Mobile: 0417 616 476

e-mail:piccone1@internetnorth.com.au

Agrotek Consultancy

Andrew Olley

PO Box 5106 SCMC

NAMBOUR QLD 4560

Ph/Fax: (07) 5479 4101; Mobile: 0412 002 375

Suppliers of other specialised services (page 6)

Soil nematode/disease diagnostic and advisory service

Updated details:

Biological Crop Protection has e-mail:

biolcrop@powerup.com.au

Suppliers of specialised degreening equipment

This new service has been added. Suppliers are:

Knights Refrigeration Pty Ltd

Lot 4

West Street

PO Box 887

BOWEN QLD 4805

Ph: (07) 4786 2511; Fax: (07) 4786 1656; Mobile: 0418 775 665

e-mail: knights@tpgi.com.au

Bundaberg Refrigeration and Electrical

90 Woongarra Street

BUNDABERG QLD 4670

Ph: (07) 4153 1411; Fax: (07) 4152 2444; Mobile: 0418 628 772

Citrus seed and budwood suppliers (page 7)

Note the phone and fax numbers of:

Australian Citrus Propagation Association Inc.

15 Bowen Crescent

WEST GOSFORD NSW 2250

Ph: (02) 4325 0247; Fax: (02) 4324 2563

Inspections for interstate produce shipments (page 7)

Special officers have been appointed within DPI to manage the implementation of Interstate Certification Assurance (ICA) arrangements. Contact your local DPI office to obtain the name of your nearest ICA officer.

Information on interstate quarantine requirements

Queensland

Senior Operational Support Officer

Department of Primary Industries

GPO Box 46

BRISBANE QLD 4001

Ph: (07) 3239 3330; Fax: (07) 3211 3293

New South Wales

Regulatory Operations Coordinator (Plants)

Locked Bag 21

ORANGE NSW 2800

Ph: (02) 6391 3583; Fax: (02) 6361 9976

Australian Capital Territory

Quarantine and Inspection Officer

Environment ACT

PO Box 1038

TUGGERANONG ACT 2901

Ph: (02) 6207 2265; Fax: (02) 6207 2268

Victoria**Supervisor Plant Standards**

Plant Standards Centre

Box 126

FOOTSCRAY VIC 3011

Ph: (03) 9687 5627; Fax: (03) 9687 6746

Tasmania**Quarantine Officer**

Quarantine Centre

PO Box 347

NORTH HOBART TAS 7022

Ph: (03) 6233 3036; Fax: (03) 6234 6785

South Australia**Program Leader—State Quarantine Inspection Service**

46 Prospect Road

PROSPECT SA 5082

Ph: (08) 8269 4500; Fax: (08) 8344 6033

Western Australia**Senior Inspector**

Western Australian Quarantine and Inspection Service

280 Bannister Road

CANNING VALE WA 6155

Ph: (08) 9311 5333; Fax: (08) 9455 3052

Northern Territory**Senior Adviser, Plants**

NT Quarantine & Inspection Branch

GPO Box 2268

DARWIN NT 0801

Ph: (08) 8981 8733; Fax: (08) 8941 0223

Market price information (page 80)

Contacts for market price information have changed. Here are the latest details:

For market price information for the Brisbane market, contact:

Market Information Services

D Block Brisbane Market

PO Box 229

BRISBANE MARKETS QLD 4106

Ph: (07) 3379 4576; Fax: (07) 3379 4103; Mobile: 0417 712 427

Infocall: 1902 262 580 (\$2.50 per minute, covers Adelaide, Brisbane, Sydney and Melbourne)

e-mail: Ausmarket@bigpond.com

For market price information for all other Australian metropolitan markets, contact:

Ausmarket Consultants

D Block Brisbane Market

PO Box 229

BRISBANE MARKETS QLD 4106

Ph: (07) 3379 4576; Fax: (07) 3379 4103

www.users.bigpond.com/Ausmarket

Wholesaler information

Contact the appropriate number below for information about farm produce commercial wholesalers in the markets.

Adelaide

Adelaide Produce Markets Ltd

Diagonal Road

POORAKA SA 5095

Ph: (08) 8349 4493; Fax: (08) 8349 6574

Brisbane**Market Line**

Freecall: 1800 631 002

www.brisbanemarket.com.au

Melbourne**Victorian Chamber of Fresh Produce Wholesalers Inc.**

PO Box 113

542 Footscray Road

FOOTSCRAY VIC 3011

Ph: (03) 9689 3233; Fax: (03) 9689 9223

Perth**Perth Market Authority**

Mail Point 1

280 Bannister Road

CANNING VALE WA 6155

Ph: (08) 9455 2900; Fax: (08) 9455 2902

Sydney**Sydney Markets Ltd.**

PO Box 2

SYDNEY MARKETS NSW 2129

Ph: (02) 9325 6200; Fax: (02) 9325 6288

e-mail: sydma@sydneymarkets.com.au

www.sydneymarkets.com.au

Export associations (page 8)

Details of export associations have changed. Updated details are:

Australian Horticultural Exporters Association

Institute of Horticultural Development

Private Bag 15

SOUTH EASTERN MAIL CENTRE VIC 3176

Ph: (03) 9210 9380; Fax: (03) 9210 9381; Mobile: 0419 999 889

e-mail: ahea@ozdocs.net.au
www.ozdocs.net.au/~ahea

Queensland Horticultural Exporters Association
PO Box 857

HAMILTON CENTRAL QLD 4007
Ph: (07) 3868 1888; Fax: (07) 3868 4722

Queensland Government technical services (page 9)

Citrus technical enquiries (commercial growers)

These can now be directed to:

Department of Primary Industries

Garry Fullelove
Senior Development Extension Officer (Citrus)
GAYNDAH QLD 4625
Ph: (07) 4161 1166; Fax: (07) 4161 1397
e-mail: fullelg@dpi.qld.gov.au

The **DPI Call Centre** on 13 25 23 provides help with enquiries on all other agricultural matters.

Agricultural booksellers (page 11)

Additions and changes:

D & A Information Services has e-mail:
service@dadirect.com.au

DPI Publications

GPO Box 46
BRISBANE QLD 4001
Ph: 1800816 541; Fax: 3239 6509
e-mail: books@dpi.qld.gov.au
www.dpi.qld.gov.au/catalogue/Welcome.html

Granny Smith's Bookshop

PO Box 27

SUBIACO WA 6008

Ph: (08) 9388 1965

e-mail: granny@aoi.com.au

www.aoi.com.au/granny

Landlinks Press

PO Box 1139

COLLINGWOOD VIC 3066

Freecall: 1800 645 051; Ph: (03) 9662 7666

Fax: (03) 9662 7555

e-mail: sales@publish.csiro.au

Morescope Publishing has e-mail:

mscope@internex.net.au

Agmedia have ceased business; many of their titles are sold by:

NRE Information Centre

8 Nicholson Street

PO Box 500

EAST MELBOURNE VIC 3002

Ph: (03) 9637 8080; Fax: (03) 9637 8150

References

DPI information products—new citrus books/booklets (page 13)

Citrus pests and their natural enemies (field guide), Smith, D., Beattie, G.A.C., & Broadley, R.H., (1997), Department of Primary Industries, Brisbane and HRDC.

Developing an approved supplier program for fresh produce: a guide for customers and suppliers, National Quality Management Working Group (1999), Department of Primary Industries, Brisbane and HRDC.

Available from:

DPI

Queensland Horticulture Institute
80 Meiers Road
INDOOROOPILLY QLD 4608
Ph: (07) 3896 9385; Fax: (07) 3896 9446

Economics of citrus in the Central Highlands, Donaghy, P., (1996), Department of Primary Industries, Brisbane, Information Series QI96011.

Production and marketing of citrus, McRuvie, J. & Garner, P., (1996), Department of Primary Industries, Brisbane, Information Series QI96013.

Other books—general citrus culture and issues (page 15)

A new updated edition of the *Citrus growing manual—a manual for quality decision making* will be available in 1999.

Annual publications (page 17)

Brisbane markets business directory

Available from:

Brisbane Market Authority

PO Box 8
BRISBANE MARKETS QLD 4106
Ph: (07) 3379 1062; Fax: (07) 3379 4903
www.brisbanemarket.com.au

Prices and throughput for the Brisbane market

Available from:

Market Information Services

PO Box 229
BRISBANE MARKET QLD 4106
Ph: (07) 3379 4576; Fax: (07) 3379 4103; Mobile: 041 771 2427
e-mail: Ausmarket@bigpond.com

Melbourne markets business directory

Available from:

Melbourne Market Authority

PO Box 1

542 Footscray Road

FOOTSCRAY VIC 3011

Ph: (03) 9258 6100; Fax: (03) 9687 7714

e-mail: info@mma.vic.gov.au

Sydney markets users guide

Available from:

Sydney Market Ltd

PO Box 2

SYDNEY MARKETS NSW 2129

Ph: (02) 9325 6200; Fax: (02) 9325 6288

e-mail: sydma@sydneymarkets.com.au

www.sydneymarkets.com.au

Articles, brochures and other items (page 18)

Useful items from Horticultural Research & Development Corporation (HRDC)

1997 national citrus resource guide (1997), HRDC, No. 1/97

HRDC citrus reports (page 19)

Recently released reports that may be of interest to Queensland growers:

- *Long term storage of citrus fruits under biological control* (CT015)
- *National assessment of red-fleshed grapefruit cultivars being released from quarantine—Phase 1* (CT223)
- *Attractants and repellents for fruit piercing moths* (CT 301)
- *Seedless triploid Murcott mandarin breeding* (CT315)
- *Combined report of the 1996 South African citrus study tours* (CT626)
- *Review of citrus scion breeding* (CT560)
- *Commercial trial of citrus postharvest oil for removal of surface pests* (CT558)
- *Improving the efficacy of bait sprays for the control of fruit flies* (CT540)
- *Citrus study tour to Spain and Corsica (emphasis on marketing of mandarins)* (CT448)

- *Review of international literature on use of calcium nitrate in citrus* (CT437)
- *Development of a quality management system for citrus growing and packing* (CT426)
- *Citrus crop estimates* (CT326)
- *Evaluation of modified atmosphere packaging for citrus* (CT 312)
- *Impact force reduction during handling and packing of citrus* (CT636)

Useful websites

Citrus sites

Australian Citrus Growers (useful national and international links):

www.farmwide.com.au/nff/acg/acg.htm

Citrus Research Board:

<http://www.citrusresearch.com/>

Decision Information Systems for Citrus:

<http://members.aol.com/chettown/disc/disc.html>

Economic and Market Research, Florida:

<http://www.fred.ifas.ufl.edu/citrus/>

Florida Citrus Mutual:

<http://www.fl-citrus-mutual.com/>

International Society of Citriculture:

<http://tangelo.lal.ufl.edu/conghome.htm>

The New Ultimate Citrus Page—International Citrus Links:

<http://members.aol.com/chettown/citrus/international.html>

General Australian sites

AQIS:

www.aqis.gov.au

Australian Bureau of Statistics:

<http://www.abs.gov.au>

Commonwealth Government—main entry point:

<http://www.fed.gov.au>

Department of Primary Industries, Queensland:

www.dpi.qld.gov.au

Horticultural Research & Development Corporation:

www.elders.com.au/Elders/merch/hortic/hrdc/index.html

National Registration Authority

<http://www.dpie.gov.au/nra/welcome.html>

PIENet: Department of Primary Industries & Energy Network (main entry point to electronic information from DPIE):

<http://www.dpie.gov.au/rural/portfolio/authorities/part9.html>

Queensland Fruit & Vegetable Growers:

www.qfvg.org.au

Rural Industries Research & Development Corporation (RIRDC) home page:

<http://www.rirdc.gov.au/>

IPM and spraying

Florida Pest Management Guide

<http://hammock.ifas.ufl.edu/txt/fairs/31592>

IPP—biological control tactics

http://www.bugsforbugs.com.au/INTEGRATED_PEST_MANAGEMENT.html

IPMnet

<http://www.ipmnet.org/>

Micromaster Sprayers:

<http://www.peg.apc.org/~croftstone/main.html>

Radcliffe's IPM world text book:

<http://ipmworld.umn.edu/ipmsite.htm>

University of California IPM home page:

<http://www.ipm.ucdavis.edu/>

University of California IPM on-line resources:

<http://www.ipm.ucdavis.edu/IPMPROJECT/online.html>



Problem solver
HANDY
GUIDE

Note: This is a guide only. The product label is the official authority. Use it to confirm all data before use. In no event shall the authors or their respective organisations be liable for any damage resulting from use of the data in this update or the original *Problem Solver Handy Guide*. This table updates new additions or major changes in use only. New trade names of chemicals already registered have not been included to keep the table as simple as possible. Check with your chemical reseller for new trade names. Unless otherwise indicated under 'Comments', all new additions are registered for citrus.

Current November 1998

Pest or disease	Amendment	Details			
		Active ingredient	Trade names	WHP (days)	Comments
Black spot	Add	cuprous oxide	Nordox, Norshield	1	Generally used with oil.
	Add	zineb+copper oxychloride	Copperneb	7	
Broad mite	Add	sulphur	NRA permit	0	
Brown spot	Add	cuprous oxide	Norshield	1	Registered for mandarins only. Generally used with oil. Preferred to other copper fungicides as it appears to cause less rind darkening
	Add	zineb+copper oxychloride	Copperneb	7	Registered for mandarins only.
Mealybugs	Add	petroleum oil	NRA permit	1	
	Add	chlorpyrifos	Chlorfos, Chlorpyrifos, Cyren, Iban	14	

Pest or disease	Amendment		Details		
		Active ingredient	Trade names	WHP (days)	Comments
Melanose	Add	cuprous oxide	Nordox, Norshield	1	Generally used with oil.
Queensland fruit fly	Update	chlorpyrifos bait spray	Chlorfos, Chlorpyrifos, Cyren, Iban, Lorsban, Pyrinex, Strike-Out	14	Mixed with yeast autolysate and water.
	Add	maldison bait spray	NRA permit	3	Mixed with yeast autolysate and water.
	Add	trichlorfon bait spray	Dipterex	2	Mixed with yeast autolysate and water.
Red scale	Add	omethoate	Folimat	7	For mandarins only.
	Add	parathion-methyl	Penncap	14	
Rust mites	Add	zineb+copper oxychloride	Copperneb	7	
Scab	Add	cuprous oxide	Nordox, Norshield	1	Generally used with oil.
Scales	Add	paraffin oil	All-seasons oil	1	
Scales – wax types	Add	azinphos-methyl	Azinphos, Benthion	14	Registered for black and soft brown scales only.
	Add	parathion-methyl	Penncap	14	Registered for soft brown scale only.
	Add	aldicarb	Temik	182	Registered for soft brown scale only.
White louse scale	Add	sulphur	Cosavet, Flosul, Kumulus, Microsul, Microthiol, Sulphur, Thiovit, Vinsul, Wettasul	0	
	Add	chlorpyrifos	Chlorfos, Chlorpyrifos, Cyren, Iban,	14	
	Update	methidathion	Supracide, Suprathion	21	Use with a surfactant, not oil.

NRA: National Registration Authority permit.



Pest & disease

HANDY GUIDE

Essential sprays (fruit fly)

Bait spraying is recommended all year round for multiple cropping varieties such as Meyer and Lisbon lemons. For early cropping varieties such as Imperial and Navel, bait spraying should start in January and continue to harvest. For mid season cropping varieties such as Ellendale and Hickson, bait spraying should start in March and continue to harvest. For late cropping varieties such as Murcott and Valencia, bait spraying should start in May and continue to harvest. Varieties with the highest risk are Meyer lemons, grapefruit and late-hanging Murcott mandarins.

Apply bait sprays weekly. Increase to twice weekly during wet weather, where an increase in fly activity is detected in Cue-lure traps, and where flies are seen in the trees or on fruit.

Probable sprays (mites)

We suggest bringing forward the commencement of broad mite sprays to the start of October, rather than mid October.

Probable sprays (scales)

The best time for sprays for both soft scales (wax types) and hard scales (such as red scale and white louse scale) is from late October to mid December. This is when the young crawler stages are exposed and most vulnerable. Two sprays may be required four to six weeks apart. Petroleum oil is recommended, as it does not disrupt natural or introduced parasites and predators.



Crop production

HANDY GUIDE

Crop cycle

The diagram shows natural fruit drop occurring in November and December. Natural fruit drop in Imperial mandarins, however, starts in early October.

These are all the changed items that we are aware of. If there are any additional changes, please contact our Customer Service officer on 1800 677 640 or send fax details to (07) 5444 9694.