

China Export Quarantine IPM Guide

by Steven Falivene, (NSW DPI), January 2008 (V2)

The following is a guide for growers to implementing an integrated pest and disease management (IPM) program to fulfil the requirements for exporting citrus to China. The IPM program is specifically designed to address the pests and diseases of quarantine concern to China.

The following program is a guide only and should be tailored to your circumstances. Minimum standards for a China Export Quarantine IPM program are outlined in the “Summary of Standards for Compliance for the China, Korea and Thailand Export Program” fact sheet. This standard requires growers to conduct an IPM program (monthly monitoring from flowering to harvest : from January for 2008 program). The standard explains the specific information that needs to be recorded on the IPM monitoring record sheet. Two examples of a monitoring record sheet that meets these requirements have been included in this fact sheet. Additional information about IPM programs is available from the following sources:

- Citrus Pests and their Natural Enemies , by Smith, D, Beattie GAC and Broadley, R. Available from the Queensland DPI site: <http://dpishop.dpi.qld.gov.au/bookweb>
- Australasian biological control (ABC): www.goodbugs.com.au
- Bugs for bugs: www.bugsforbugs.com.au
- A picture and descriptive guide to pests and disease of Quarantine concern to China is available.

Orchard Hygiene

Skirting and Weed Control Management Practices – To assist in reducing the incidence of Fuller’s Rose Weevil (FRW) climbing into trees, skirt trees and maintain a good weed control program.

Sample size

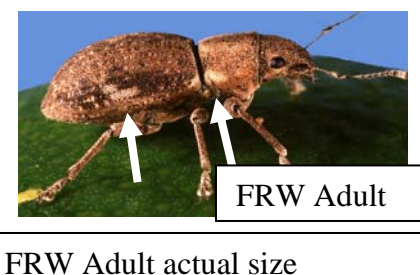
Number of trees to be samples shall be according to the size of the block. Five fruit shall be sampled from each tree. Blocks larger that 20 ha, add 1 tree for every 1 ha above 20ha.

Monitoring : Pick 5 fruit randomly from each randomly selected tree.

Area (Ha)	Number of trees Sampled	Total Number of Fruits/shoots
<2	10	50
2 - 3	12	60
4	15	75
5 - 8	20	100
9 - 16	25	125
17 - 20	30	150
+1	+1	+1tree per +1ha

Fruit : Look under calyx, in navel end & around fruit surface

- 1) **FRW Eggs & Adults** - Note that eggs are yellow in colour and glued together in yellowish ‘papery’ masses of 20–30. FRW are about 8mm in size, it has two pale markings on the side of its body (arrowed), and a short snout.
- 2) **LBAM Eggs & larvae** - Note that eggs overlap to give a fish scale in appearance and that LBAM larvae can vary in size from 2-20mm. LBAM larvae can also bore into fruit.



3) **Borers Eggs & Larvae** – Cut any holes in the rind and check for the presence of borers (incl. LBAM). Bore holes can be small (3mm) and can sometimes be seen as a prematurely coloured spot on green fruit. Eggs can appear as overlapping clusters. Check for signs of webbing or gouging of fruit, especially between touching fruit.



Sorghum head caterpillar



Blastobasid - borer



Orange fruit borer



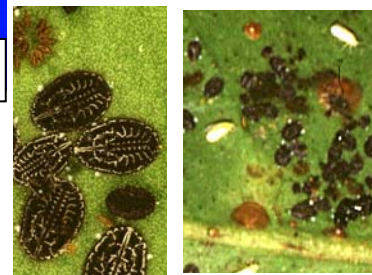
Golden mealybug adult and egg mass

4) **Fruit Flies:** All species of fruit fly have similar features. Larvae found in fruit up to 8mm in length. Large rounded abdomen tapering to a small back coloured head. When disturbed curl into a C shape and hop/jump.



Fruit Fly Larvae

5) **Golden Mealybug:** Adults 4-5mm with distinct yellow and black colours



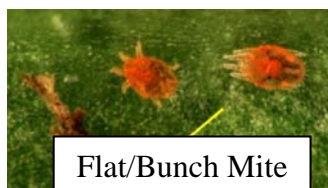
Aleurocanthus White fly: nymph (left), nymph and adults (right)

6) **Pacific Mealybug:** Very similar to Citrus mealybug. When squashed exuded yellow/clear fluid. Citrus mealy bug more common in QLD. Do not confuse with Long Tailed mealybug or Citrophilous mealybug. Citrophilous mealybug. Exude a claret red body fluid when squashed.



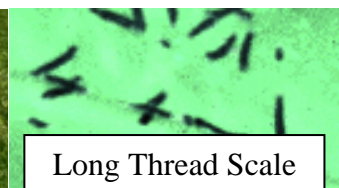
Pacific mealybug

7) **Flat/Bunch Mite:** 0.3mm long, red, flatter than other mites and slow moving. Seen on fruit. Look for evidence of mite scarring.



Flat/Bunch Mite

8) **Long Thread Scale:** Long slender black to dark brown armoured scale to 3.5 mm long. Do not confuse with round shaped black scale.



Long Thread Scale

9) **Diseases** –

- Septoria:** small, round pits / depressions 1-2 mm in diameter that extend no deeper than the rind surface (flavedo). Pits are light tan with a narrow greenish margin, becoming reddish-brown as the fruit matures.
- Phytophthora:** first appears as a slight surface discolouration and then extends rapidly. Fruit rind turns light to olive brown. The fruit remains firm with a leathery texture, and has a distinctive smell. In damp weather, a white fungal growth often develops on the fruit surface and common blue mould may follow.



Septoria



Phytophthora

10) **Canopy : FRW leaf feeding** – Scan the 1/2 of the skirt line of each tree that is inspected (about first 50cm above skirt) for evidence of FRW feeding..

Shoots & Leaves : Check 5 shoots per tree. Try to include shoots with leaves of various ages including shoots with 4-6 month old leaves (i.e. spring flush).



FRW leaf damage

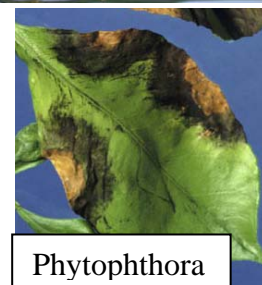
11) **FRW adults, LBAM, Borers, Pacific mealybug, Golden mealybug & Long Thread scale** - Check leaves if rolled /webbed for LBAM borers or pupae, Borer & LBAM eggs, FRW adults, mealy bugs and long thread scale

12) **Diseases** -

- Septoria:** small raised, blister-like black spots with a yellow halo
- Phytophthora :** leaf infections appear on the edges or leaf tips as dark brown, watery, roughly circular, spreading blotches.



Septoria



Phytophthora

IPM INSECT PEST MONITORING RECORD (China Export Compliant)

Block & Monitors name	Date	% of Fruit or shoots infested with Pest						China Quar. Pest or Disease*	Comments & Action

* If any China Quarantine Pest of concern (list attached to this sheet or printed on the back of this sheet) or leaf damage from FRW is detected, enter “Yes” in this column and name the pests or damage either in this column or in the Comments & Action column.

China Export Quarantine IPM Monitoring Record Sheet

Block/Orchard Name & Pest monitor name	Date	Skirting & Weeds Control	Pest stage & % infestation					Comments & Recommended Action (i.e. FRW leaf damage, pest below thresholds-natural predation, insecticide spray)
			FRW eggs, adults or larvae	Disease on leaf or fruit	LBAM eggs, larvae or adults	Borer eggs, larvae or adults	Flat mite, Golden & Pacific mealy bug, Long threaded scale, Fruit Flies, Aleuro. White fly	
House block	12 Oct 2007	OK	Nil	Nil	Nil	Nil	Nil	All OK,
House block	10 Nov 2007	OK	Nil	Nil	Two larvae detected	Nil	Nil	<u>LBAM spray required</u> LBAM spray - 18 Nov
House block	15 Dec 2007	OK	Nil	Nil	Nil	Nil	Nil	All OK
House block	12 Jan 2008	Some weeds	Nil	Nil	Nil	Nil	Nil	<u>Weeds need herbicide,</u> Weed sprayed- 16 Jan
House block	7 Feb 2008	OK	Nil	Nil	Nil	Nil	Nil	All OK
House block	17 Mar 2008	OK	Nil	Nil	Nil	Nil	Nil	All OK
House block	20 Apr 2008	OK	3 adults	Nil	Nil	Nil	Nil	<u>FRW spray required</u> FRW spray - 24 Apr
House block	10 May 2008	OK	Nil	Nil	Nil	Nil	Nil	All OK
House block	13 June 2008	OK	Nil	Nil	Nil	Nil	Nil	All OK

(Print this sheet on the back of the monitoring record sheet or staple it to the monitoring record sheet)

China Pest and Diseases of Quarantine Concern

Scientific name	Common name	Requirements
a) <i>Aleurocanthus valenciae</i>	Whitefly	Controlled
b) <i>Asynonychus cervinus</i>	Fuller's rose weevil	Orchard Free
c) <i>Bactrocera aquilonis</i>	Northern Territory fruit fly	Controlled
d) <i>Bactrocera jarvisi</i>	Jarvis' fruit fly	Controlled
e) <i>Bactrocera neohumeralis</i>	Lesser Queensland fruit fly	Controlled
f) <i>Bactrocera tryoni</i>	Queensland fruit fly	Controlled
g) <i>Blastobasis spp</i>	Blastobasid fruit borer	Orchard Free
i) <i>Brevipalpus californicus</i>	Bunch mite	Controlled
j) <i>Ceratitis capitata</i>	Mediterranean fruit fly	Controlled
k) <i>Cryptoblabes adoceta</i>	Sorghum head caterpillar	Orchard Free
l) <i>Dirioxa pornia</i>	Island fruit fly	Controlled
m) <i>Epiphyas postvittana</i>	Light brown apple moth	Orchard Free
n) <i>Ischnaspis longirostris</i>	Black thread scale	Controlled
o) <i>Isotenes miserana</i>	Orange fruit borer	Orchard Free
p) <i>Nipaecoccus aurilanatus</i>	Golden mealy bug	Controlled
q) <i>Phytophthora hibernalis</i>	Brown Rot	Orchard Free
r) <i>Phytophthora syringae</i>	Fruit rot	Orchard Free
s) <i>Planococcus minor</i>	Pacific mealy bug	Controlled
t) <i>Septoria citri</i>	Septoria spot	Orchard Free

Requirements

Orchard Free = Upon official inspection it must be established that orchards are free of these pests

Controlled = Pests need to be controlled to acceptable levels