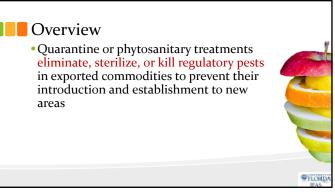
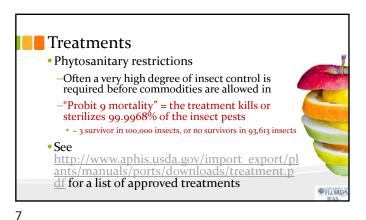


Overview
 If accepted disinfestation measures are not available, quarantine pests will prohibit marketing of fresh agricultural products
 Between countries
 Between geographical areas within countries (e.g., between Florida and other states)



Treatments
 Treatment protocols are under the authority of the USDA Animal and Plant Health Inspection Service (APHIS)
 This includes overseeing treatment application



Treatments Protocol Strategy
1. Kill the most resistant life stage of the pest (insect, etc.)
2. Cause NO physiological injury to the host commotidy
That's a TALL order! And it doesn't always work...

8

Postharvest quarantine treatment factors are related to horticultural commodity differences

-Maturity

-Variety

-Source

-Handling procedures

-Cost

Treatments

Chemical

Fumigation

Detergent
washes

Insecticides

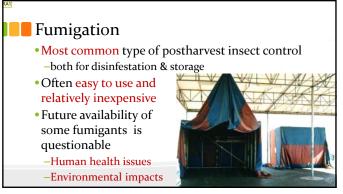
Flat treatments

Heat treatments

Irradiation

Controlled
Atmospheres

9 10



Methyl Bromide (MeBr)

• Most commonly used (general biocide)

• Under the Montreal Protocol (UN treaty):

-2005 phase out for developed countries

-2015 phase out for developing countries

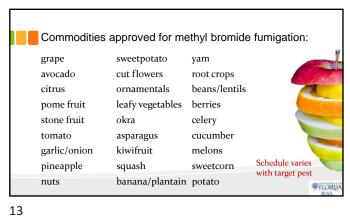
-Quarantine treatments & "critical uses" are exempt

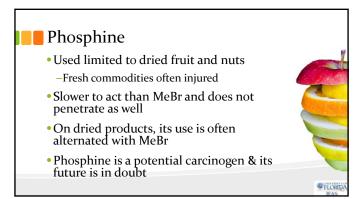
• In general, there is a time temperature relationship

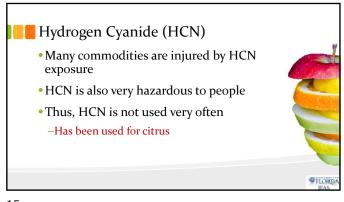
-Higher temperatures require shorter exposure to the fumigant

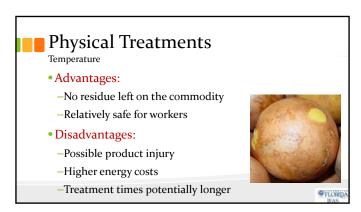
11 12

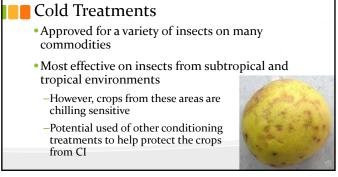
**RA1** Ritenour, Mark A, 10/3/2018

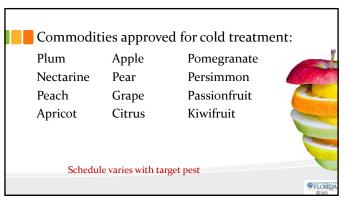


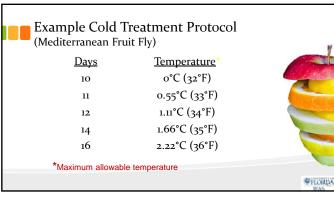








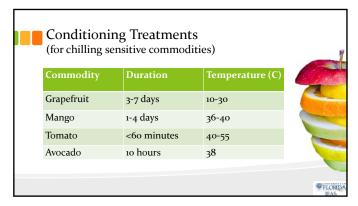




Cold treatments can be applied during marine transport

However, if the temperature exceeds the maximum allowable, even by a fraction a degree at one reading, the treatment must be started over

19 20



Heat Treatments
 Hot water dips, vapor heat, and high-temperature forced air treatments

 e.g., mango, lychee, papaya, citrus

 Vapor heat was one of the first postharvest insect control methods (1920's)

21 22



Mango Hot Water Treatment

• Min. pulp temp. at start of tmnt. 21°C (70°F)

• Fruit must be submerged >4 inches

• Water must circulate constantly and be min. of 46.1°C (115°F)

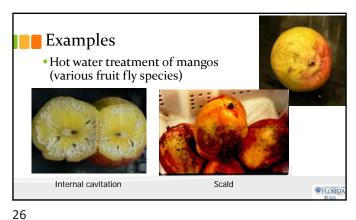
• Duration 65 to 90 min. depending on fruit origin, size and shape (variety)

• Fruit may be hydocooled after hot water tmnt. in water that is max. of 21°C (70°F)

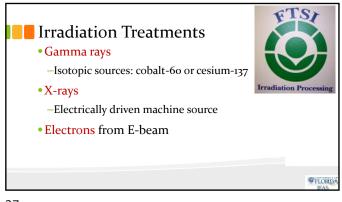
• If hydrocooled: a) wait 30 minutes, or b) hot water treatment must be extended 10 minutes

23 24



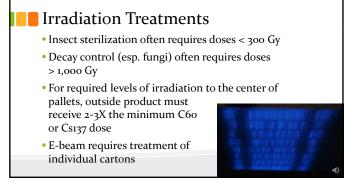


25 2



Irradiation as a Quarantine Treatment
Irradiation is approved for fruits and vegetables up to 1,000 Grays (Gy) (FDA 1986)
APHIS requires generic minimum doses of 70-400 Gy for various Tephritid fruit flies and other arthropod plant pests
-'Generic' in that the required dose is not dependent on the commodity that is being treated, just the pest species

27 28



Sterilizing Dose versus Lethal Dose

Sterilization Dose

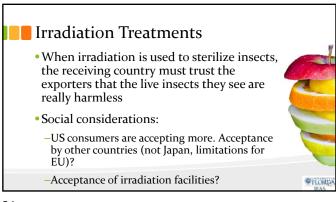
150 Gy for fruit flies

300 Gy for other insects

Lethal Dose - varies with species

750 - 1000 Gy

29 30



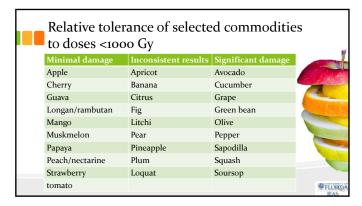
Irradiation Effects on Ripening and Senescence

Inhibits ripening of subtropicals and tropicals at 250-350 Gy

Accelerates lemon degreening at >500 Gy

May see uneven ripening and accelerated deterioration after treatment

31 32



Examples of injury (<1000 Gy) which may occur with storage

Commodity

Type of Injury

Avocado

Internal browning; skin discoloration

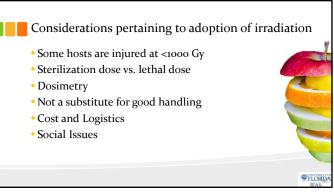
Lemon / Limes

Oranges / Grapefruit
Table Grapes
Peppers

Table Grapes
Peppers

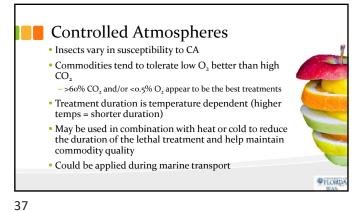
Calyx discoloration; accelerated discoloration

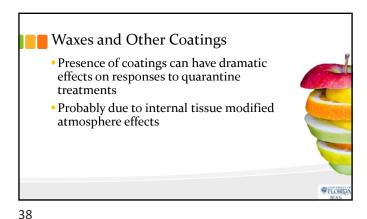
33

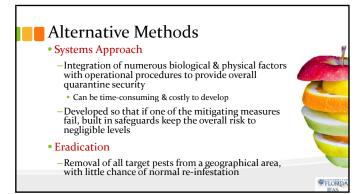


• CA quarantine treatments involve raising the level of CO<sub>2</sub> and/or lowering the level of O<sub>2</sub> in combination with heat or cold to reduce the duration of the lethal treatment and help maintain commodity quality

35



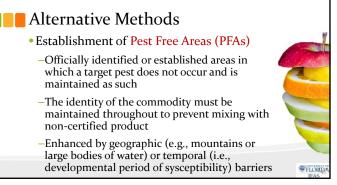


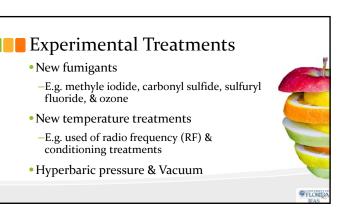


Alternative Methods
 Declaration as a Nonhost for all or part of its growth cycle

 E.g., Unblemished, mature green 'Cavendish' bananas from Hawaii can be harvested and shipped to the mainland as a nonhost commodity even though ripe bananas are a preferred host for fruit flies
 Fruit flies will not lay eggs on mature green bananas
 This can be difficult because the physiological basis for host non-preference or non-suitability by a pest is often not understood

39 40





41 42