Olives 101
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Characteristics of the California Olive Industries

- California produces 99% of US Olives 16,000 to 165,000 tons per year
- 25,000 acres in the Central Valley, declining.
  - 2/3 in the San Joaquin Valley (Tulare County)
  - 1/3 in the Sacramento Valley (Tehama, Glenn and Butte Counties)
- 25,000 acres table vs. 25,000 oil
- 95% of table olive are black ripe style

Climatic Considerations

- Mild Winters- less than 20 degrees F can result in winter injury
- Long, warm dry summers – rain during the summer can result in leaf diseases
- Winter temperatures between 35 and 65 are ideal for supplying necessary winter chilling

Propagation

- Leafy cuttings with hormone treatment and misting
- 12 to 18 months
- Micro propagation – 12 months
- Truncheon- wood 1-3 inch dia by 6 inches

Freeze Injury
Factors Effecting Freeze Severity

- Cold temperatures and the duration of freezing
- Acclimatization
- Variety: *Manzanillo* most susceptible followed by Sevillano, Ascolano, Baroni and Mission
- Tree age
- Irrigation
- Time of Pruning
- Previous Crop load

Irrigation

- Traditional
  - Flood
- Currently
  - Micro irrigation
    - Drip
    - Micro sprinklers
- Crop coefficient – $K_c$ .75 of reference $E_To$

Olive oil Irrigation Summary

- To optimize olive oil production, don’t fully irrigate trees
- Oil production is optimized between 40 and 70% $E_Tc$
  - Best production is at the high end of this range
  - Best oil quality is at the lower end
- Full irrigation increases pumping costs, promotes unnecessary vegetative growth, can reduce flowering, and increases pruning costs

Bearing Habit

fruit born on last years shoots
Many Olive Varieties are partially self compatible, they will benefit from cross pollination when conditions are less than ideal for example isolated Manzanillos will benefit from cross pollination from Sevillano.

- Nitrogen - 100 to 150 lbs N per Acre per year (1/2 to 1.5 lbs/tree).
- Potassium deficiency, rare, corrected with annual or mass doses of K2SO4 or KCl - 5 to 20 lbs/tree banded on soil surface
- Boron deficiency - rare (foothills) corrected with soil or foliar application

Nitrogen Deficiency

Potassium Deficiency
Potassium Deficiency

Olive Knot
*Pseudomonas syringae, pv. savastoni*

Boron Deficiency ---
- Defective fruit, a “monkey face” symptom
- Premature fruit drop

Freeze Damage

Developing Olive Knot
Hail Damage

Olive Knot Variety Susceptibility
- **Very susceptible** – Manzanillo, Arbequina
- **Susceptible** – Empeltre, Sevillano, Hojiblanca, Koroneiki, Moraiolo, Penedolino, Picual
- **Resistant** – Ascolano, Blanqueta, Frantoio, Leccino, Mission

Peacock Spot symptoms

Peacock Spot Variety Susceptibility
- **Very susceptible** – Mission, Blanqueta, Cornicabra, Empeltre, Picual
- **Susceptible** – Aglandou, Arbequina, Sevillano, Manzanillo, Pendolino, Picudo
- **Resistant** – Beauteillan, Cayon, Coratina, Leccino, Maurino, Moraiolo
- **Very Resistant** – Frantoio, Arbosana, Koroneiki

Control-Continued
- Use same materials for both diseases
- Copper Sprays
- Timing-preventative
- More sprays are better
- Central Valley recommendation- 2 sprays, fall and spring.
- Fall for Peacock Spot spring for olive knot
- Spray after injury which creates openings

Verticillium Wilt
- Soil borne fungus
- Survive in the soil as microsclerotia – 30 yrs. Moved with soil or infected plant part
- Grow into root and plug vascular tissue resulting in wilt
- Infections in cool moist soil in winter
- Symptoms in spring and summer
Verticillium Wilt Variety Susceptibility

- **Very susceptible** – Arbequina, Cornicabra, Hojiblanca, Picual, Picudo
- **Susceptible** – Kalamata, Leccion, Manzanillo, Mission, Maraiolo, Pendolino
- **Resistant** – Aglandou, Ascolano, Koroneiki
- **Very resistant** – Oblonga, Empeltre, Frantoio

Insects

- Olive Fly
- Black Scale

Olive Fly in California

- First detected in 1998 in Los Angeles County
  - Blue: 1998
  - Yellow: 1999
  - Orange: 2000
  - Green: 2001
  - Purple: 2002

Adult female

Oviposition punctures

Olive fly on trap
Olive fly biology

**Oviposition**

**1st instar**

**3rd instar**

**Feeding chamber**

**Emergence hole**

**Feeding tunnels**

**Puparia**

**Application of Bait Spray**

- Aerial applications not recommended
- Use alternate row coverage
- Treat north or east sides of trees

**AgriSense “attract & kill” trap**

- ammonia (white) and pheromone (blue) lures attached to trap
- 20 mg of lambda-cyhalothrin pyrethroid coat entire surface
- reportedly lasts for 5-6 months in Europe

**Surround**

Three to six 4-5mm (3/16 – ¼ inch) holes drilled or melted into neck
1.5 to 2.0 liter plastic bottle. Fill 2/3 full with a 3-5% solution of di-ammonium phosphate or ammonium bicarbonate and water. Sometimes vinegar and protein hydrolysate bait is added.

If stings exceed 3% - one mg of microencapsulated liquid spiriketal pheromone is added
3 Torula Yeast Tablets

**McPhail Trap**

**Torula Yeast tablets**

From Varela & Vossen 2002

**Olive Fruit Fly**

OLIPE Olive Fruit Fly Trap from Spain

Hang in the inside of the south side of the tree in the shade

June – Sept. 8-18 traps/acre
Sept. – Dec. 16-20 traps/acre

Three to six 4-5mm (3/16 – ¼ inch) holes drilled or melted into neck
Black Scale Damage

- Suck sap from tree - honeydew
- Suits mold
- Reduces photosynthesis and respiration
- Can reduce fruit bud formation, cause leaf drop and dieback

Control

- Biological
  - Don’t disrupt
  - Promoted by open airy canopy
- Spray crawlers with oil
  - Monitor for crawler emergence with 2 sided sticky tape

Biological Control

Control ants - deny access to tree
Cool environment is preferable
Oil/ and or Insecticide Treatment

- Crawler emergence (July 1) to Aug. 1
  - To prevent damage to subsequent crop
- Post Harvest
  - Until scale develops to rubber stage
  - Light to moderate populations

Varieties

- Manzanillo
- Sevillano
- Ascolano
- Mission
- Barouni
- Kalamata

Manzanillo

Spain - 1875
Low spreading growth
Frost sensitive
Susceptible to olive knot disease
Alternate bearing
Roots easily-rooted cuttings on own root
Partially self incompatible

Manzanillo Fruit

Most popular variety
Oval and uniform in size
Medium size ave. 4.8 grams, 6/oz.
Freestone
Good flesh to pit ratio 8.2 to 1
20% oil

Manzanillo Uses

- Lye cured – black and green ripe
- Spanish style – Lye + fermentation
- Fermented
- Oil

Sevillano (Gordal)

- Spain (Seville) 1885
- Approximately 20% of acreage
- Moderate vigor
- Moderately susceptible to olive knot
- Resistant to peacock spot
- Difficult to root – grafted tree (Mission)
- Alternate bearing
- Used to pollinate Manzanillo
Sevillano Fruit

- Ovate to elongated oval
- Harvest green – Oct.
- Clingstone
- Flesh to pit ratio 7.3 to 1
- Parthenocarpic fruit set – Shot berries
- Low oil – 12%
- Soft when ripe

Uses for Sevillano

- Canned ripe (Lye cured) – black or green
- Green
  - Lye + fermentation – Spanish
  - Fermented – Sicilian
- Oil for blending

Ascolano Fruit

- Round to oval
- Large 10-11 grams, 2.5 to 3/oz.
- Freestone
- Good flesh to pit ratio 8.2 to 1
- Soft fruit shows bruises

Uses: black and green ripe

- Fermented green
- Oil

Ascolano

- Italy – 1885
- Vigorous rounded shape
- Cold hardy
- Regular bearer
- Disease resistant
  - olive knot
  - peacock spot
  - some resistance to verticillium wilt
- Vegetatively propagated – own root

Mission Fruit

- Broad oval, elongated slightly pointed
- Small to medium size – ave. 4.1 grams, 6 to 7/oz.
- Flesh to pit ratio 6.5 to 1
- Late maturing – Nov. to Dec.
- Firm when ripe and bitter
- Freestone
- 22% oil

Mission

- Selected at Spanish missions
- Brought from Mexico in 1769
- Vigorous upright tree
- Cold hardy – has survived lows of 8 degrees F.
- Susceptible peacock spot
- Resistant to olive knot
- Medium rooting - propagated by cuttings on own root
Mission Uses

- Green and black ripe
- Salt dried
- Oven dried
- Naturally fermented
  - Green
  - Black
- Oil

Barouni

Tree – small and spreading, cold resistant.
Regular bearing, susceptible to olive knot
Somewhat resistant to peacock spot

Fruit – oval to elongated, large,
Flesh to pit ratio 6.8 to 1
Oil content 16.5%
Harvest mid-Oct. to early Nov.
Uses – fresh market for home curing,
Black ripe, green fermented?

Kalamon (Kalamata)

Source – Greece
Upright extremely vigorous tree
Susceptible to peacock spot and moderately susceptible to olive knot
Medium cold hardiness
Flowers later than Manzanillo,
Sevillano and Mission
Medium to low rooting – propagated on rootstock = Mission or Frantoio

Kalamon Fruit

Medium size
Asymmetric and elongated and pointed
Firm fruit holds up in processing
Freestone
Harvest when black – Nov. to Dec. depending on crop load.
Risk – light frost can cause the fruit to shrivel
Oil – medium per cent

Kalamon – Uses

- Greek style black olive brine cured fermented
- Oil

Arbequina Olives

Spain
Small Clingstone