
Vineyard Health
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Weather Impacts on Grapevine Health

Top issues from 17 growers:

1. Heat stress affecting vine health (5)
2. Berry shrivel or raisining (3)
3. Freeze damage to buds/shoots(3)
4. Poor fruit set due to spring weather (2)
5. Others: leaf drop, early color change, uneven ripening, early rain (1 each)

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Pest Problems

Top pest problems

1. Powdery mildew (7)
2. Eutypa dieback(6)
3. Birds: robins, starlings, flickers (5)
4. Leafhoppers (3)
5. Gophers (2)

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Drought, Freeze, & Other Winter Woes

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Dry winter/winter drought

- Insufficient winter rain increases freeze risk and slows early growth
- Dry soil in fall/winter reduces root mass, which can cause Delayed Spring Growth (DSG)
- Post-harvest irrigation reduces winter freeze damage and helps rehydrate vines when they emerge from dormancy
- Maintain soil moisture through winter reduces DSG
- Consider irrigating if soil is dry after 3 weeks of no rain
- Maintain 15% soil moisture at 24" depth

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Other Impacts of Winter Drought

- Drought-induced Boron deficiency
  - Affects new growth: short, zigzag internodes, crinkled fan-shaped leaves
  - Fruit set - shot berries: round to somewhat flattened; uniform size
  - Reduced cluster size
- Potassium (K) deficiency symptoms mid-season
- Winter drought exacerbates diseases, e.g. Eutypa

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Freeze Protection

- If you don't track local weather daily - start now!
- Saturate soil before freezing temperatures: adds 2-3°
- Apply biologically active mulch/compost in fall under vine rows – increases winter soil temperatures 4-8°
- Delay pruning to reduce freeze risk => buds break earlier on pruned vines
- Double pruning delays basal buds, reducing freeze risk
- Double pruning reduces Eutypa and other trunk infections

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Vine Heat & Water Stress

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Heat & Water Stress in Vines

- Our weather is NOT what it used to be!
- Temperature: high heat ***and*** temperature fluctuations
- Wind: daily constant in many areas. Need more water, more frequently to avoid desiccation & raisining
- Low Relative Humidity (RH): pulls water out of vines
- Soil moisture: insufficient root zone water causes leaves to heat up and literally cook

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Vine Water Stress Symptoms

- Angle of leaf blade to petiole
  - indicates soil moisture deficit
  - blade becomes more perpendicular
  - severe stress: leaf blades almost touch petiole
- Leaves in sunlight feel hot
- Reduced number & length of lateral shoots
- Reduced canopy may reduce leaf area causing insufficient ripening of fruit
- Abscission of oldest leaves
- Delayed veraison

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Heat & Water Stress Symptoms

- Bleached leaves, scorched leaf margins
- Chlorotic basal leaves, may drop
- Leaf drop and early color change
- Smaller berries, loose clusters
- Berries shrivel/raisin and may drop
- Reduced root growth and root system
- Leaf loss reduces fall nutrient uptake; affects vine development the next spring
- Increased insect and mite populations
- May exacerbate disease- e.g. Eutypa

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Critical Periods: Vine Water Stress

- Flowering and fruit set:
  - Stress can cause berry drop or desiccation
- Fruit set to veraison
  - Reduction in berry size
  - Reduces bud fruitfulness for the following year
- 4-6 weeks after veraison: berry size reduced
- From 6 weeks after veraison to harvest, yield is least susceptible to high levels of water stress

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Managing Heat & Water Stress in Vines

- Soil moisture monitoring is critical - at least weekly
- Consider investing in soil moisture monitoring tools
- Check the closest local weather (T°, RH, wind) daily
- Get a weather station that downloads to your phone
- If you have significant wind, consider windbreaks
- Vines are adaptable, but long-lasting heat waves or high temperatures can permanently affect yield & vine physiology

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Soil & Vineyard Floor Practices to Reduce Vine Stress

- Increase soil organic matter (OM)
  - Improves water and nutrient-holding capacity
  - Moderates temperature & soil moisture fluctuations => reduces vine stress
  - Promotes soil microbial populations for healthier, more resilient vines
  - Helps suppress disease and insect pests
  - Improve health and productivity of vines

- Cover crops or natural vegetation in row middles
- Vine row mulch

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Vine Row Mulching

- Reduces weed growth and herbicide use
- Reduces water loss, moderates wet/dry cycles
- Increases organic matter and microbial populations
- Provides micronutrients
- Warms soil in winter (3-8º)
- Reduces vine stress:
  - Small amount of stress = good for fruit quality
  - Too much diminishes fruit quality & resistance to pests
- Mulch moderates temperature fluctuations in the bunch zone in high summer heat

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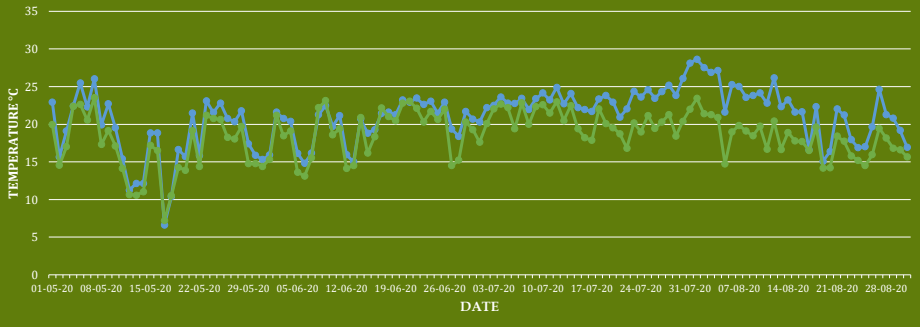
Canopy Temperature with Mulch

Canopy Temperature Control vs Mulch
May-August 2020



Vine Row Mulching

- Mulch materials: pomace, compost, wood chips, shredded prunings (not diseased), composted manure
- Wood chips or combination remains ~1 year
- Mulch 2-4" deep, 4" for weed control
- Leave 2" around trunk to avoid vole cover
- Always apply mulch to moist soil
- Apply in early spring
- Apply manure 4-6 months before harvest

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Irrigation management

- Base irrigation management decisions (interval, set time)on:
- Weather: temperature, wind, relative humidity
- Soil type (DG, clay) and soil depth
- Vine vigor and trellis type
- Don't start irrigating April 15 if soil is wet
- Avoid wet/dry cycles
- Manage irrigation to reduce stress (and dust)

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Irrigation management

- Schedule irrigation effectively
- Monitor winter soil moisture, irrigate as needed
- Monitor soil moisture throughout the growing season, adjust weekly
- Do not turn off the water in fall; reduce the amount or lengthen the intervals
- Monitoring tools:
  - Soil moisture-by-feel at 6-12”
  - Matrix blocks are accurate, low maintenance and easy-to use
  - GDots are excellent tools to know exactly when to irrigate

Tensiometers

GDots

Matrix blocks

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Pest Management

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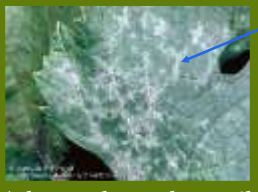
Powdery Mildew Essentials

Fungus: *Uncinula necator*

Initial symptoms of powdery mildew



Advanced powdery mildew

- PM overwinters in buds or spore structures
- Spores are released 7 -10 days after spring rainfall - coming soon to your vineyard!!
- Spore releases continue from **70° to 85°F**
- Initial symptoms are yellow spots on upper leaf surface; brown patches on leaf underside
- **Visible** white mycelium is NOT an early sign - look for symptoms before this happens!
- One day of 95 ° heat may slow it a bit, but it will continue to grow on cooler days…
- Monitor for PM weekly all season!

https://www2.ipm.ucanr.edu/agriculture/grape/

Powdery Mildew Management

PM control depends on reducing early-season inoculum and subsequent infection…

- **1st spray at budbreak = sulfur**
- Until shoots are 8-10", sprays should be sulfur
- Protectants (e.g. sulfur) must be applied ***before*** disease is established
- Free water and/or temperatures >95° stop growth
- Berries are susceptible to PM from cap fall to pea-sized berries

Cane scarring from Powdery mildew

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Organic Fungicide Options

Oils – eradicants!

- Organic JMS Stylet, Natur'l, Neem, etc.

Protectants:

- Wettable Sulfur (not dust!): Avoid above 95° or w/in 2 weeks of oil
- Potassium bicarbonate
  - Kaligreen, Milstop

=>Frequent applications: 7-14 days

- Lime Sulfur
  - Dormant application, reduces PM
  - Drench cordons and fruiting wood

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Longer-lasting Materials

- Protectants, must be applied before mildew is established
- Must alternate to avoid resistance
- Restrictions on amount used per year
- Sterol inhibitors (DMI/SI): e.g. Mettle, Rhyme
  - Effective, absorbed by plant tissue
  - Begin at 8-10" of growth
  - 10 to 21-day intervals
- Strobilurins: e.g. Flint, Sovran
  - Different chemistry, derived from fungus
  - Begin at 8-10" of growth
  - 14 to 21-day intervals
- Quinolines – Quintec

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Eutypa Dieback

Leaf tatter

- Fungal disease
- Starts in young vines; infections symptoms appear ~5-7 years
- Infection thru pruning wounds
- Fungus survives in diseased wood
- Spores discharged after rainfall
- Early dormant season = wounds are susceptible much longer

- Symptoms
  - Delayed shoot emergence
  - Chlorosis, stunting, tattering of leaves
  - Dark, wedge-shaped cankers in branch/cordon

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Managing Eutypa

- Manage Eutypa & other trunk diseases:
  1. Delay pruning, prune directly after a rain, if you can
  2. Double prune to promote rapid healing of wounds
  3. Apply pruning-wound protectants: 5% boric acid and paint (Tech-Gro B-Lock) or an essential oil (Safecoat VitiSeal) (Save fungicides for powdery mildew)
- Prune out dead wood in summer:
  - Remove infected grape, stone fruit, or other host wood
  - Cut out and remove dead arms and cordons
  - Remove all cankers, prune below the canker until no dark canker tissue remains

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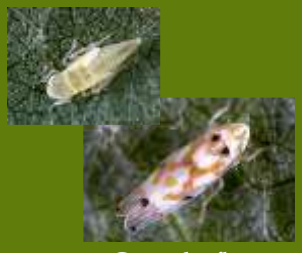
https://www2.ipm.ucanr.edu/agriculture/grape/

Grape Leafhoppers



Grape leafhopper

- Piercing-sucking mouthparts => leaf stippling
- Fly up when disturbed, often mistaken for white flies
- Adults lay eggs on basal leaves in spring
- Whitish nymphs hatch out, feed on lower leaves
- Many natural enemies prey on leafhoppers

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Leafhopper Natural Enemies

Anagrus wasp

Green lacewing larva

Minute pirate bug

Predatory mite w/ nymph

Wasps

- Egg parasites *Anagrus spp.*
- Find near alternate hosts: plum, almond, riparian species
- Parasitized egg is red

General predators

- Green lacewings
- Minute pirate bugs
- Lady beetles
- Predaceous mites & spiders

Leafhopper Cultural Controls

Mowing/weeding

- Remove weeds in and around vineyards before vines push
- Flail mow before budbreak to control overwintering adults
- Mow during early morning hours when it's still cool

Leaf removal

- Remove basal leaves during berry set to 2 weeks after– reduces populations by 30 to 50%
- Do not remove too many leaves => sunburned fruit!
- Use lab analyses to determine N => prevent excess growth

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Monitoring & Treatment Decisions

- Monitor from nymph hatch to 4 weeks after budbreak
- Look for parasitized (red) leafhopper eggs – leave them!
- Remove basal leaves to reduce population
- Large populations = nuisance at harvest
- If needed, treat every other row just before harvest
- Options
- Imidacloprid: Admire pro: soil/foliar: do not use foliar around bees
- Flupyradifurone: Sivanto: soil/foliar
- Clothianidin: Belay: soil/foliar: do not use around bees
- Organic: insecticidal soap, Azadiractin (Debug Turbo), narrow range oil

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Bird Pests

- Robins, crows, starlings, finches, scrub jays
- Birds start on grapes at veraison; most feed in early AM
- Multiple deterrents are needed; mix them up weekly
- Habitat modification:
  - Eliminate brush, piles of pipes, boxes, where they may nest or perch
  - Consider removing roosting trees on vineyard perimeters
- Netting is the most effective, but expensive
- Falconry is also effective, but $$
- Scare tactics: mylar, balloons, cannons, electronic noise
- Shooting noise in the vineyard may deter birds
- Shooting starlings is allowed; others need depredation permit

Trapping works for small birds (finches, starlings, sparrows)

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Gophers

- Crescent-shaped mound with plugged burrow
- Need experience to find active burrows for trapping or baiting. See UCIPM instructions.
- Effective measures
  - **Trapping:** labor intensive. Gophinator trap is most effective.
  - **Baiting:** Multi-dose anticoagulants and single-dose acute baits may require a permit. Serious concern for pets and predatory wildlife.
  - **Fumigants:** aluminum phosphide only effective material
  - Pressurized exhaust is available, but very expensive
  - Repellents, gas explosive and frightening devices have not been shown to be effective

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Good Cultural Practices…

- Vegetated row middles
- Mulched vine rows
- Fertilizer program specific to vine and soil needs
- Irrigation management to reduce stress
- Monitor soil moisture winter & summer
- Use good cultural practices to reduce pests

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Vineyard Checklist

- Delayed or double pruning in February or March
- Apply pruning-wound protectants after pruning
- Carry out dormant-season sanitation
- Destroy infested prunings to reduce pest sources
- Before budbreak: control weeds, mow tall cover crops
- Flag vines with poor budbreak for assessment of disease or abiotic stresses (nutrients, dry or wet soil, etc.)
- Apply sulfur at budbreak for Powdery mildew
- Trap gophers, ground squirrels, etc.

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The Information Source UC IPM…

https://ipm.ucanr.edu

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