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NEWSLETTER OF OLIVE OIL PRODUCTION AND EVALUATION

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Fertility Management For Oil Olives

Unlike most fruit trees, olives are not heavy feeders. In fact, very fertile conditions are counterproductive, causing excessive vegetative growth, and lighter bloom and fruit set. Olive trees tend to produce most consistently with nutrition that is minimal but adequate, and not deficient in any critical element.

That said, adequate fertility is important with young trees. Remember that in a new orchard you're not producing fruit, you're producing wood. By meeting all the nutritional needs of a young tree, you will encourage it to grow rapidly, filling its allotted space and coming into full production as rapidly as possible.

The fertilizer rates in this article are for mature trees. To calculate the rates for smaller trees, multiply the fertilizer amount by the percentage of the canopy compared to full-size. For example, a

three-year-old orchard with only 10% full canopy coverage would receive 10% of the fertilizer rate for a mature orchard.

Diagnosing Nutrient Deficiencies

Of the 16 known essential plant nutrients, only nitrogen, potassium and boron are ever likely to require supplementation in California, and potassium and boron deficiencies are relatively rare. Table 1 shows the critical nutrient levels of the primary nutrients in olive tissue analysis.

The two methods of determining the nutrient status of olive trees are tissue analysis and visual inspection; they are best used simultaneously. Soil analysis is not accurate enough to provide useful information about nutrients for olives, but can be useful for determining pH or diagnosing salt problems.

For tissue analysis, gather about 100 fully developed leaves per sample from the middle of non-bearing, current season shoots in July. Check with your local cooperative extension office for a list of reputable labs in your area.

Visual inspection requires that you become familiar with the symptoms of nutrient deficiency on leaves and fruit. Low nitrogen levels cause light green to yellowish leaves and (*cont. on p.2*)

What's That Stuff On My Olive Leaves?

You may have noticed a black deposit on your olive trees recently that looks just like its namesake: soot. It is sooty mold, a fungus that grows on the honeydew produced by certain sucking insects. In the case of olives, the suspect insect is most likely to be black scale.



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Black scale insect adults Photo by Jack Kelly Clark

Black scale populations can usually be kept below damaging levels with a combination of cultural and biological controls. Because the insects are vulnerable to high temperatures, open-pruned canopies can make a big difference in populations. There are also about fifteen different parasitic wasps that target black scale, and a number of insect predators as well.

In cooler areas, the open canopy may be less helpful, however the parasitic wasps may benefit since the scale can have two generations per year and support a more constant population of wasps. Perhaps the relatively moderate temperatures of the past two summers in the North Coast area have given the scale ideal conditions (*cont. on p.4*)

Element	Deficient	Sufficient	Toxic
Nitrogen (%)	1.40	1.50 – 2.00	
Phosphorous (%)		0.10 – 0.30	
Potassium (%)	0.40	Over 0.80	
Calcium (%)		Over 1.00	
Magnesium (%)		Over 0.10	
Manganese (ppm)		Over 20	
Zinc (ppm)		--	
Copper (ppm)		Over 4	
Boron (ppm)	14	19 - 150	185
Sodium (%)			Over 0.20
Chlorine (%)			Over 0.50

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(Managing Fertility, cont. from p.1) poor shoot growth. These symptoms may be more evident in the winter when cold, wet, heavy soils make nitrogen less available to plants, and may disappear when the soil warms up in the spring.

Potassium deficiency first appears as yellowing leaf tips on older leaves. In severe cases, leaves may turn brown and drop, and twigs die back within the tree. Symptoms like these may also indicate other problems, such as poor soil drainage.

Occasionally boron deficiency occurs in Sierra foothill regions or in very sandy soil. Inadequate boron causes misshapen fruit ("monkey facing"), short branch growth, twig dieback, rough bark and leaves with a yellow band between a brown tip and the green leaf base. When applying boron to correct a deficiency, be particularly careful as excessive boron can be toxic to your trees.

Applying Fertilizers

The only nutrient most growers will ever need to apply is nitrogen. Mature olives require in the range of 40 to 100 pounds of actual nitrogen per acre per year. Table 2 lists the nitrogen content of some organic fertilizers. Organic fertilizers have the advantage of slow, continuous release of nutrients

Chicken manure compost	1.0-2.0%
Dairy manure compost	0.5-1.5%
Beef manure compost	0.5-1.0%
Sheep manure compost	0.5-1.0%
Horse manure compost	0.5-1.0%
Compost-fresh grass clippings	1.0-2.0%
Compost-woody material	0.5-1.0%

throughout the year but this also means that they cannot be used to quickly stimulate growth in a heavy crop year. The release rates run about 15-30% the first year, 10-15% the second year and 5-10% the third year. The release continues for up to fifteen years after that, declining with time.

Another organic option for nitrogen is leguminous cover crops. Legumes can fix from 40 to 100 lbs of nitrogen per acre from the air if they are seeded in the fall and tilled into the soil in the spring. If the legume cover crop is mowed and allowed to decompose on the surface, it will likely contribute about 25 or 30 lbs of nitrogen per acre. An excellent resource is the UC SAREP (Sustainable Agriculture Research and Education Program) cover crop page: <http://www.sarep.ucdavis.edu/ccrop/>

Potassium can be found in small amounts in compost and manures, or in higher concentrations in mined mineral fertilizers. To correct a potassium deficiency, potassium sulfate is usually applied in December or January at a rate of 500 to 1,000 lbs/acre. It is important to apply potassium in a concentrated band just inside the drip line of the tree in order to overcome the soil's ability to tie up the potassium and make it unavailable. In drip irrigated orchards the potassium can be applied at 20% of the banded rate directly under the emitters. A severe deficiency can be solved temporarily with a spring foliar spray of 10 lbs potassium nitrate per 100 gal water.

Boron deficiency can be corrected by applying one half to one pound of a 14-20% boron material per tree (25-50 lbs/ac). The material is broadcast on the soil surface within the drip line of

the tree, and a single application will last for several years. A foliar spray of 7 oz boron to 100 gal water can be applied to correct low boron levels. Applied before flowering, this application has sometimes resulted in significantly improved fruit set even in asymptomatic low boron trees.

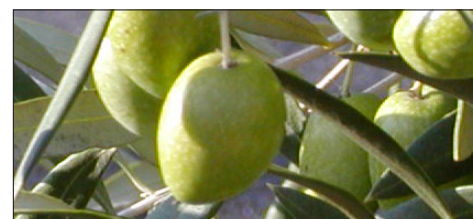
Olive Mill Waste

The waste products of olive oil production can be used like any organic material but it does present environmental hazards if handled incorrectly. The primary concern is the effect of the high level of water soluble organic compounds contained in olive waste products; in surface water, these compounds tie up oxygen as they decompose and can be devastating to the health of an aquatic ecosystem. Every precaution must be taken to prevent run-off into waterways.

By applying olive waste in moderate amounts only during the dry part of the year, the run-off problem can be avoided. Unfortunately, most milling coincides with the rainy season, so the material must be held until the spring or summer. The addition of dry material makes this more feasible. If the material starts to compost, that is fine, but not required.

Olive waste has a carbon:nitrogen ratio of about 30:1 so if composting is the goal, the addition of some high nitrogen material is necessary. Chicken or dairy manure added to the olive pomace at a rate of about 1:3 will promote slow composting. Olive wastewater can be used to moisten compost piles, contributing some useful minerals of its own.

*This piece was adapted from an article authored by Joe Connell and Paul Vossen. The article will appear in its entirety in the upcoming **Organic Olive Production Manual** from ANR Publications.*



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Making Sense of Competition Results

Spring is upon us and with it, the olive oil competition season. A gold medal from a county fair or other competition is a wonderful marketing advantage, and most producers enter their oils in at least some of these events. It can be hugely frustrating when your oil gets a Bronze and your neighbor's gets a Gold. This article attempts to cast some light on the judging process. What makes an oil "Gold" or "Best of Class?" What exactly are these judges looking for?

Most of the world's competitions use the Mario Solinas scale, developed by the International Olive Oil Council for its olive oil competition. On the Solinas sheet, a perfect score is 100, with 65-75 being Bronze, 76-86 Silver and 86-100 being a Gold. Many of the competitions designate 94 and above as a contender for Best of Class.

There are three categories to the evaluation: olfactory, gustatory-retronasal and "final" sensations. Olfactory is worth a maximum of 35 points, gustatory-retronasal 45, and the "final" category is worth up to 20 points.

The profile sheet lists a number of attributes in each category and the number of points awarded for each. It is illuminating to look at the attributes and how much each one is worth. Under gustatory, for example, "olive fruitiness" is worth up to 10 whereas "green" is only worth 2. Bitter and pungent get up to 3 points each. The big money in both olfactory and gustatory is in "harmony;" it is worth a whopping 20 points in each category. That is 40 points out of 100. This "harmony" business is clearly where it's at!

Harmony, also referred to as "balance," describes the relative proportions of the different attributes. The big three are bitterness, pungency and fruitiness, and it is there that the Golds rise above the others. An oil that is excessively pungent or bitter will never be a big winner. That is not to say that you can't have a brilliant oil with high bitterness and pungency, because you

can. But in order to support those high bitter/pungent levels, you better have some *very* intense fruitiness.

The other area that receives a lot of attention is complexity. In the "final" category, complexity is awarded up to 10 points, but it is also present in the other categories. If you think about it, the fact that "other fruit" and "other positive sensations" are listed indicates that the judges are looking for many dimensions in the fruitiness. The two most basic aspects of complexity are green fruit and ripe fruit. A truly great oil will usually show different facets of the fruit, even if it is predominantly green for example; a one-dimensionally green oil will not score very high.

Complexity can also come with different varieties, though this is obviously true only of blends. There are many descriptors for fruit character in the olive oil tasting vocabulary: grassy, herbaceous, artichoke, tomato leaf, nutty, tropical, floral, green apple, almond, and so on. Gold medal oils beg the use of these descriptors to capture the complexity and nuances of their fruit.

The mechanics of judging are pretty simple: all samples are coded and presented to the judges blind in flights that represent a class. In some competitions there are subclasses according to the intensity of the oil. By classifying the oils as light, medium or intense, the competition essentially puts apples in competition with apples instead of with pears. The more delicate oils have traditionally had a harder time in competition when they have been put up against very intense oils in the same class.

The judges are told only the variety or the provenance (in the case of a foreign oil) of the oils in a class, and should be chosen to judge classes that do not present conflict of interest issues.

Competitions of this sort are often referred to as "beauty

contests," in contrast to the sort of dispassionate sensory evaluation that is done for determining extra virgin status. Even though there is more subjectivity by the very nature of the event, judges try to be as objective as possible. Styles and varieties are judged against an ideal of that style or varietal, and a judge needs to recognize a superb example of that particular type of oil even if it is not to their personal taste. Judges at a table will share insights about the oils as part of the evaluation process.

So how do you take home the Gold? Some things you can't control, like the weather, but others you can. Of course, you must always handle fruit carefully and process it promptly. Keep good records of your irrigation and maturity index at harvest. Record your impressions of the oil – good and bad. If you have enough fruit, experiment with different processing methods or harvest maturities. Each year you will learn a little more and be able to adjust your practices accordingly. Hope to see you in the winner's circle soon!

Alexandra Devarenne is a California olive oil taster and competition judge.



IOOC MARIO SOLINAS COMPETITION – TASTING PROFILE SHEET	
Division Code #	Points
Olfactory sensations: (maximum 35 points)	
Olive fruitiness (0-7)	
Other fruit (0-3)	
Green (0-2)	
Other positive sensations (0-3)	
Harmony* (0-20)	
SUBTOTAL olfactory	
Gustatory-retronasal sensations: (maximum 45 points)	
Olive fruitiness (0-10)	
Sweet (0-4)	
Bitter (0-3)	
Pungent (0-3)	
Green (0-2)	
Other positive sensations (0-3)	
Harmony* (0-20)	
SUBTOTAL gustatory-retronasal	
Final olfactory-gustatory sensations: (maximum 20 points)	
Complexity** (0-10)	
Persistence (0-10)	
SUBTOTAL final olfactory-gustatory	
TOTAL SCORE	
65-75 points = Bronze Medal 76-86 points = Silver Medal 86-100 points = Gold Medal	
(*) Harmony increases when the attributes are balanced	
(**) Complexity increases with the number and intensity of aromas and flavors	

UPCOMING EDUCATIONAL EVENTS

Olive Oil Processing Master Miller Course—Offered by UC Davis Extension. Dates will be either Oct. 20–21 or Dec. 1–2, 2006. Location TBD.

Final dates and location in our next newsletter.

For info or to register: www.extension.ucdavis.edu or call 800-752-0881

(Scale, cont. from p. 1) for growth and reproduction. There is also a possibility that olive fly control measures may be impacting the parasitic wasp population. More research into the effects of fruit fly bait on parasitic and predatory insects is needed.

Whatever the reason, black scale is looking bad these days on the N. Coast. While scouting, monitoring and assessing olive groves for our various research projects, we are seeing many trees heavily infested with black scale. The build-up of sooty mold is so severe in some cases that the photosynthetic ability of the tree is being compromised (starvation!). Add to that the stress caused by the constant feeding of the insects and you are looking at a truly miserable olive tree.

The presence of sooty mold is often the first sign of black scale that people notice. The insects themselves are not that small, but they are inconspicuously colored and don't attract attention by moving around. Another clue to the presence of scale is Argentine ants in the foliage of your trees. Argentines "farm" the scale for the honeydew they produce. A better term might be "shepherd" the scale, since the problem caused by the ants is due to their vigilant guarding of the scale insects from their natural enemies. Since parasitic wasps are an important biological control for scale, an energetic group of ants chasing the wasps away is very disruptive to biological control.

Adult black scale are about 0.2 inches in diameter and range in color from

brown to black. They are slightly oblong, and domed, with a very distinctive H-shaped ridge on the back. The first stage juveniles (called crawlers) are orange to yellow, and it is only during this stage of their lives that the scale can be observed moving around. The crawlers are very small and it usually requires a hand lens to see them.



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Black scale crawlers

Photo by Jack Kelly Clark

Check trees in April and October for honeydew build-up, and sample for adult scale in May. Detailed monitoring guidelines can be found at <http://www.ipm.ucdavis.edu/PMG/r583300511.html>. The UC Pest Management Guidelines (PMG) will help you establish whether your infestation ranks as light, moderate or severe.

Proper pruning, controlling ants around your olives and preserving your natural enemy population is going to be adequate for many situations. But if the problem is advanced, a spray program may also be warranted.

For light and moderate infestations, horticultural oils are the recommended chemical treatment. In the event of a


severe infestation, insecticides can be added. The treatment options are clearly laid out in the UC PMG.

As always with pest management decisions, be sure to consider the impact on your beneficial insect population; black scale is a perfect example of an insect pest that is successfully managed most of the time without sprays. Always implement preventative cultural practices in addition to any chemical treatments. Once you bring your scale population down, the natural enemies and climate may take care of the problem after that. Just remember to continue monitoring so you can catch population increases before they get out of hand.

And just in case you need another reason to get out there and get serious about the black scale, how about this: the sooty mold

could affect the flavor of your oil. The fungus doesn't wash off easily, so a heavy build up could be a problem. In a recent blind tasting of oil made with sooty mold-coated olives, a majority of the tasters characterized it as tasting dusty or musty. More research is clearly needed to confirm the relationship between the sooty mold fungus and oil quality. In the meantime, however, it can't hurt to monitor for scale and consider some low-impact treatment if it's warranted. Ignoring a black scale infestation could compromise the health of your trees and also your olive yield and oil quality.

—Alexandra Devarenne

Special thanks to Lucia Varela, University of California North Coast IPM Advisor 



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