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Fruit and Nut Notes

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SACRAMENTO VALLEY REGIONAL
PRUNE NEWSLETTER

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Full color articles and photos are available on our Website: cetehama@ucanr.edu

Nitrogen Management for French Prune

Richard P. Buchner- UC Farm Advisor, Tehama County

The success of a nitrogen fertilizer program for prunes depends upon a complex root/soil and organic material relationship. A mature tree has a system of permanent roots extending throughout the available soil plus many small temporary feeder roots. During growth, the surfaces of these feeder roots absorb water and mineral elements necessary for adequate tree nutrition. Prune nitrogen management is a complex process and is not thoroughly documented by research. Soil fertility, depth, texture, moisture content, temperature, drainage and aeration all influence nutrient availability and uptake.

Nitrogen is a key element for prune production and, economics plus a potential for leaching nitrogen below the root zone necessitates efficient use. For a more thorough review of prune nutrition, the "Nutrition and Fertilization" chapter by Colusa/ Sutter/Yuba Farm Advisor Franz Niederholzer is available in the new *Prune Production Manual*.

Five tools used to manage and monitor orchard nitrogen status include; leaf tissue analysis, soil analysis, nitrogen budget, visual symptoms and irrigation water analysis.

Leaf Analysis

Leaf analysis is a useful tool to quantify nitrogen nutrition. Critical level standards for prunes are based upon non-fruiting spur leaves collected in July. July samples correspond to UC critical nutrient values and represent a time during the season when nutrient concentrations in the leaf tend to stabilize. Leaves are taken from spurs reachable from the ground and selected at random to account for tree to tree variation. One leaf per tree from 100 trees is a reasonable compromise to get a large enough sample and average trees with high and low nitrogen levels. The number of acres per sample depends upon how much variability exists in each orchard. Another way to utilize leaf samples is to sample problem areas and compare values to good areas in the same orchard. Leaf tissue samples have the advantage of integrating soil nutrition and provide a rapid technique to monitor whole orchards and /or problem areas. One concern has been how well critical values represent whole orchards. If a leaf tissue analysis shows an average of 2.2% (low critical value) some trees will be above the critical value and some will be below. So the strategy is to set the target leaf nitrogen level high enough such that all trees are above the 2.2% critical value. For that reason, many orchard managers shoot for leaf nitrogen levels in the 2.6% to 2.8% range. Values above 3.0% would be excessive. Leaf tissue values graphically charted over several years can indicate if leaf levels are increasing, suggesting over application or decreasing suggesting under application of nitrogen.

Soil Analysis

Soil analyses are usually used to diagnose soil quality. Soil characteristics such as texture, pH and salinity dramatically influence tree growth and productivity by influencing nutrient availability, water holding capacity and water penetration. The primary difficulty when using soil samples for tree nutrition is selecting a sample representative of the entire tree root zone. Multiple samples can be used to guarantee a representative sample. A second limitation when using soil analysis for tree nutrition is that critical nutrient levels are not well documented or available.

Nitrogen Budget

Another option for making nitrogen application decisions is to look at nitrogen nutrition as a nitrogen budget and aim to replace nitrogen exported from the orchard each year. Research suggests 100 to 150 pounds of nitrogen per acre for prunes depending primarily on tree age and crop load. The high rate of 150 pounds of nitrogen per acre would be more appropriate for a 4 dry ton crop load, while 100 pounds would be more typical for an "average" yielding prune orchard. Again, tissue samples can be evaluated to follow increasing or decreasing levels of tissue nitrogen.

Visual Symptoms

Visual symptoms are a useful way to identify nitrogen deficiency and can be used in combination with other techniques to improve confidence in an orchard fertility program. Symptoms of nitrogen deficiency include reduced shoot growth and smaller slightly pale green leaves tending toward yellow as deficiency becomes more severe. Leaf tissue values are often used to confirm visual symptoms. One disadvantage is that yield losses could occur if nitrogen deficiency is not quickly diagnosed and corrected.

Irrigation Water Analysis

The final part of nitrogen nutrition is the amount of nitrate-nitrogen in irrigation water. Prune orchard well water analysis done as part of the Integrated Prune Farming Practice (IPFP) project in 1999 showed a range of 0 to 30.2 pounds of nitrogen per acre foot of irrigation water for survey orchards in Tehama, Glenn, Butte ,Sutter and Yuba counties. Nitrogen in irrigation water could be contributing significantly to an orchards nitrogen status. Well water analysis would identify and measure this source of nitrogen. For irrigation water, NO_3-N in ppm or mg/liter times 2.72 = pounds of nitrogen per acre–foot of water. Surface water irrigation sources generally contain very little nitrogen.

Fertilizing Mature Prune Trees

Mature, consistently producing prune trees (over 8 years old) typically require from 100 to 150 pounds of nitrogen per acre per year depending upon tree size and crop load. Careful irrigation water management is a crucial part of an efficient nitrogen management program. Soil nitrate-nitrogen can be leached down and out of the root zone with excess irrigation water, resulting in economic loss to the grower and less nitrogen available for the orchard. The primary exporter of nitrogen from the orchard is the crop, so when crop load is low it might be appropriate to reduce applied nitrogen. Likewise, a heavy crop load will require more nitrogen. Prune trees take up nitrogen most efficiently from about early April to about early September when shoot growth terminates. Split applications of nitrogen are suggested for prune production. Apply a larger percentage of the required nitrogen in the spring and a "touchup" in the summer. July leaf tissue samples are used in combination with crop load and visual symptoms to make summer nitrogen application decisions. A nitrogen budget worksheet is available in the IPFP binder published May 2003.

Brown Rot Blossom/Twig Blight and Preventing Fungicide Resistance

Joseph Connell and Richard Buchner, UCCE Farm Advisors – Butte & Tehama Counties
Franz Niederholzer, UCCE Farm Advisor, Colusa/Sutter/Yuba Counties

Brown rot blossom/twig blight is the most important blossom and pre-harvest (fruit) disease of prune in California. Properly timed fungicide treatments can most effectively protect your trees and prevent this disease.

Old brown rot infections are the source of spring brown rot infections. The brown rot fungus produces spores from infected fruit mummies on the orchard floor and from mummified fruit left in the tree, twig cankers on the branches, and on any remnants of infected flower parts. These spores are transported by wind or rain splashes. Good orchard sanitation including removing mummified fruit from trees, pruning out blighted shoots, and cultivating the orchard floor to bury fruit mummies are practices that reduce spore production. These practices reduce the amount of spores in the orchard and the risk of infection. Spraying is still necessary after sanitation, but the risk of a major epidemic in the orchard is reduced.

All prune flower parts are susceptible to brown rot blossom infections from green bud through petal fall. Brown rot fungi grow and reproduce rapidly at temperatures ranging from 60° to 80°F. Infections do not develop below 50°F. Initially infected flowers turn brown, wither and remain attached to fruit spurs. Twig cankers form on the wood at the base of infected blossom spurs. Ultimately, as blossom infections extend into the twigs, shoot death is caused by girdling. Gumming occurs at infection sites, and grey-brown spore masses may be visible under high humidity.

Proper timing of bloom sprays is crucial to effectively control brown rot. The challenge is trying to anticipate or predict severe disease conditions. Orchards with a history of brown rot should be treated. A two-spray program (green bud/white bud and full bloom) aimed at both brown rot (green bud and full bloom) and russet scab (full bloom, only) is a good choice in wet years, especially when the weather is warm (over 60°F). When no rain falls at bloom, research shows that a single bloom spray, applied at 20-30% bloom provides effective control of any infections caused by dew. Fungicide treatments are most effective when applied in time to dry thoroughly before rainfall occurs.

Good spray coverage is essential for effective disease and scab control. Calibrate your sprayer and check coverage before spraying. Spray every row after the green bud spray to ensure complete coverage and the best possible disease control while reducing the risk of fungicide resistance development.

With careful fungicide selection, timing, and application practices, brown rot blossom/twig blight should not be a problem in prune production. See the tables included in this newsletter for details on fungicide efficacy and timing. These tables are from Fungicides, Bactericides, and Biologicals for Deciduous Tree Fruit, Nut, Strawberry and Vine Crops, 2012 published by UC IPM every year and written by Drs. Jim Adaskaveg, Doug Gubler, and Themis Michailides of the University of California. This valuable publication is available free on the web at: http://ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf.

NOTE: Spraying captan or chlorothanil (Bravo, etc.) at full bloom helps control russet scab – a physical condition that damages fruit skin quality when wet conditions exist between full bloom and jacket split and drop.

PRUNE (DRIED PLUM): TREATMENT TIMING

Note: Timings listed are effective but not all may be required for disease control. Timings used will depend upon orchard history of disease, length of bloom, and weather conditions each year.

Disease	Green bud	White bud	Full bloom	May	June	July
Brown rot[1]	+++	+++	+++	----	+	++
Russet scab[2]	----	----	+++	----	----	----
Rust[3]	----	----	----	+	++	+++

Rating: +++ = most effective, ++ = moderately effective, + = least effective, and ---- = ineffective

[1] Flowers are susceptible beginning with the emergence of the sepals (green bud) until the petals fall but are most susceptible when open.
[2] A physiological disorder; no pathogens involved.
[3] More severe when late spring rains occur.

From: Fungicides, Bactericides, and Biologicals for Deciduous Tree Fruit, Nut, Strawberry and Vine Crops, 2012 published by UC IPM. Authors are Drs. Jim Adaskaveg, Doug Gubler, and Themis Michailides of the University of California.

Managing disease resistance to fungicides:

There is no guarantee that an effective fungicide will work forever, especially the new "single-site" fungicides being registered. They are particularly at risk for resistance development, because they only target one chemical pathway in the disease, a "single-site". If a mutation occurs and the disease develops a way around the blocked pathway, then the fungicide may not work on the population that contains the mutation. With that in mind, ask yourself where would I be if propiconazole (Bumper/Tilt/Orbit/etc.) no longer controlled brown rot in my orchard? That will happen if the disease becomes resistant to that important, effective, and inexpensive fungicide. In a few orchards in the Sacramento Valley, brown rot is resistant to cyprodinil (Vangard®). You can help preserve fungicide choices and provide effective disease control by practicing good disease resistance management. Here are some steps to consider:

- *Alternate fungicide classes*. For example, if you sprayed Vangard (FRAC 9) at green bud, then don't use Scala (FRAC 9) at full bloom. Use Indar or Orbit (FRAC 3) or Rovral (FRAC 2) or another effective material not containing FRAC 9 material listed on the chart above.
- *Use full label rates*. Sub-lethal treatments increase the chance for resistant *Brown Rot* to survive.
- *Don't over use a fungicide*. Limit the number of times you use the same fungicide active ingredient to once or maybe twice per year. Change chemistry, not just pesticide trade names. For example, propiconazole is registered as Bumper, Tilt, Orbit, and other names, so any combination of those fungicides should be used only once or maybe twice per year to limit the risk of brown rot resistance to the chemical developing ..
- *Deliver excellent spray coverage*. Solid sprays providing good, uniform canopy coverage are essential for good disease control. When poor spray coverage (read every-other-row spraying) results in a sub-lethal dose, resistant strains of the disease are favored.
- *Watch for trouble*. Identify orchards with suspected resistance. If you suspect brown rot resistance, contact your local farm advisor so samples can be collected and analyzed.

PRUNE (DRIED PLUM): FUNGICIDE EFFICACY

Fungicide	Resistance risk (FRAC#)[1]	Brown rot Blossom	Brown rot Fruit[2]	Russet scab	Rust
Adament[2,7]	medium (3/11)	++++	++++	----	+++
Bumper/Tilt[2]	**high (3)**	++++	++++	----	+++
Distinguish**	medium (9/11)	++++	++	----	++
Elite/Tebuzol[2,7]**	**high (3)**	++++	++++	----	+++
Indar[2]	high (3)	++++	++++	----	+++
Inspire Super	**high (3/9)**	++++	++++	----	+++
Luna Sensation*[2]	medium (7/11)[4]	++++	++++	ND	ND
Pristine[2]	**medium (7/11)[4]**	++++	++++	ND	ND
Quash [2]	high (3)	++++	++++	----	+++
Luna Experience*	**medium (3/11)[4]**	++++	++++	ND	++++
Quadris Top[2]	medium (3/11)[4]	++++	++++	ND	++++
Quilt Xcel[2]	**medium (3/11)[4]**	++++	++++	ND	++++
Rovral + oil[2,5]	low (2)	++++	NR	----	NR
Scala[6]	**high (9)[3,4]**	++++	+++[6]	----	ND
Topsin-M /T-Methyl/Incognito+ oil[2,4]	high (1)[4]	++++	++++	----	----
Vangard[6]	**high (9)[3,4]**	++++	+++[6]	----	ND
Fontelis	high (3)	++++	+++	----	+++
Elevate[2,7]	high (17)[4]	+++	+++	ND	----
Rovral/Iprodione /Nevado[2]	low (2)	+++	NR	----	NR
Topsin-M/T-Methyl/Incognito [2,3]	**high (1)[4]**	+++	+/-	----	----
Abound	high (11)[4]	++	+	----	+++
Botran	**medium (14)**	++	++	ND	ND
Bravo/Chlorothalonil/Echo/Equus[8,9,10]	low (M5)	++	++	++	----[9]
Captan[7,8,10]	**low (M4)**	++	++	+++	----
Gem[7]	high (11)[4]	++	+	----	+++
Rally[2]	**high (3)**	++	++	----	----
Sulfur[10]	low (M2)	+/-	+/-	----	++

Rating: ++++= excellent and consistent, +++= good and reliable, ++= moderate and variable, += limited and erratic, +/- = often ineffective, ---- = ineffective, ? = insufficient data or unknown, NR=not registered after bloom, and ND=no data

*** Registration pending in California.**

****Not registered, label withdrawn or inactive**

[1] Group numbers are assigned by the Fungicide Resistance Action Committee (FRAC) according to different modes of actions (for more information, see http://www.frac.info/). Fungicides with a different group number are suitable to alternate in a resistance management program. In California, make no more than one application of fungicides with mode of action Group numbers 1, 4, 9, 11, or 17 before rotating to a fungicide with a different mode of action Group number; for fungicides with other Group numbers, make no more than two consecutive applications before rotating to fungicide with a different mode of action Group number..

[2] Fruit brown rot treatments for fungicides in FRAC Groups 1,2, 3, 17, 7/11 are improved with the addition of 2% light summer oil. The oil is "light" summer oil (1-2% vol/vol). If applied in summer, fruit will loose their waxy bloom and look red. They will dry to normal color.

[3] Strains of *Monilinia fructicola* and *M. laxa* resistant to Topsin-M and T-Methyl have been reported in some California prune orchards. No more than two applications of Topsin-M or T-Methyl should be made each year. Resistant strains of the jacket rot fungus, *Botrytis cinerea*, and powdery mildew fungi have been reported in California on crops other than almond and stone fruits and may have the potential to develop in prune with overuse of fungicides with similar chemistry. Subpopulations of both *Monilinia* spp. have been shown to be resistant to AP (FRAC 9) fungicides on prune in CA.

[4] To reduce the risk of resistance development start treatments with a fungicide with a multi-site mode of action; rotate or mix fungicides with different mode of action FRAC numbers for subsequent applications, use labeled rates (preferably the upper range), and limit the total number of applications/season.

[5] Blossom blight only; not registered for use after petal fall.

[6] High summer temperatures and relative humidity reduce efficacy.

[7] Registered for use on fresh prunes only.

[8] Do not use in combination with or shortly before or after oil treatment.

[9] Do not use after jacket (shuck) split.

[10] Do not use sulfur, captan, or chlorothalonil in combination with or shortly before or after oil treatment.

[11] Quash, Elite, Tebuzol, Gem, Scala and Pristine are registered for plums and prunes (dried plum) in California.

New 2012 Prune Cost Study for the Sacramento Valley

Joe Connell - UCCE Farm Advisor, Butte County, and
Carolyn DeBuse— UCCE Farm Advisor, Solano & Yolo Counties

A new 2012 study on Sample Costs to Establish a Prune Orchard and Produce Prunes in the Sacramento Valley under low-volume irrigation has been published by the UC Davis Dept. Agricultural and Resource Economics. This is a great resource and guide if you are thinking about evaluating practices in your current orchards, or wish to further estimate potential costs and returns. This cost study assumes a hypothetical farm of 105 acres with 100 acres planted to prunes. In the first pages, the study goes over the farm's layout, orchard establishment and cultural practices assumed for the study which try to capture the current practices used to grow prunes. The second part of the study is made up of tables which look at the average current cost of all these practices for the years of orchard establishment and for a mature orchard. Each table finishes with estimated total cash costs and returns per acre grown.

This cost study is a great tool but should only be used as an estimate of current costs and returns. One way to use the cost study is to use it as an outline and create similar tables using your actual costs. Another way to use the study is to use it to estimate what practices, machinery, custom hired work, and materials should be planned for and when during the year those operations occur; a calendar of operations so to speak. A portion of Table 4 showing monthly operating costs per acre to produce prunes over the season is shown below.

This cost study can be found at http://coststudies.ucdavis.edu/files/2012/PruneSV2012.pdf

All current and past UC cost studies can be found at http://coststudies.ucdavis.edu

UC COOPERATIVE EXTENSION
Sacramento Valley 2012
Table 4. MONTHLY CASH COSTS PER ACRE TO PRODUCE PRUNES

Beginning 01-12 Ending 12-12	JAN 12	FEB 12	MAR 12	APR 12	MAY 12	JUN 12	JUL 12	AUG 12	SEP 12	OCT 12	NOV 12	DEC 12	TOTAL
Cultural:													
Prune: Prune & Sucker	381												381
Prune: Top. Alt Yrs	18												18
Prune: Shred Brush	8												8
Insect: Dormant. Scale, mites, PTB (Oil Asana) Alt Yrs	22												22
Disease: Greentip Brown rot, scab, PTB (Vangard, Dipel*)			50										50
Disease: Bloom. Brown rot, scab, PTB (Bravo, Orbit, Dipel*)			61										61
Pollinate: Hives			15										15
Vertebrate: Gophers (bait)			3										3
Fertilize: Nitrogen (UN32)				32	32	32							95
Fertilize: Potassium (potassium sulfate)				42	42	42							126
Irrigate: (water & labor)				12	19	26	29	25	18				128
Weed: Mow centers - 5X				8	8	8	8	8					38
Thin Fruit: Shake Trees. Alt Yrs					33								33
Vertebrate: Squirrel (bait)					1	1			1	1			3
Weed: Summer strip spray (Roundup)					15								15
Disease: Rust (Sulfur)					26								26
Insect: Mite (EpiMek) Alt Yrs						19							19
Leaf Samples 1/25 acre							1						1
Disease: Fruit rot (Orbit, Oil) 1X/5Yr								9					9
Weed: Dormant strip (Surflan Goal Roundup)											78		78
Insect: Aphid (Asana) Alt Yrs											13		13
Pickup Truck Use	3	3	3	3	3	3	3	3	3	3	3	3	31
ATV Use	3	3	3	3	3	3	3	3	3	3	3	3	42
Consultant/PCA Service	3	3	3	3	3	3	3	3	3	3	3		30
TOTAL Cultural COSTS	437	9	137	102	184	135	47	50	27	10	100	6	1,243
Harvest:													
Harvest & Size								318					318
Haul To Dryer								144					144
Dry Fruit								1,320					1,320
California Prune Board Assessment								101					101
TOTAL Harvest COSTS								1,883					1,883
Interest on Operating Capital (5.75%)	2	2	3	3	4	5	5	14	-1	-1	-1	0	37
TOTAL OPERATING COSTS/ACRE	439	11	140	106	188	140	52	1,947	27	9	99	6	3,163

Heat at Bloom Update

Franz Niederholzer, UC Farm Advisor, Colusa/Sutter/Yuba Counties
Richard Buchner, UC Farm Advisor, Tehama County

Excessive heat – sustained temperatures above 80°F -- at bloom can cause virtual crop failure in prunes. How bad can it be? In Sutter County, average prune yield per acre is in the range of 2.5 dry tons per acre over the last decade – in good crop years. In 2004, 2005, and 2007, when temperatures reached above 80°F at bloom, the Sutter County crop was 0.5, 0.7, and 0.6 dry ton per acre, respectively. Losses like this cost growers dearly in several ways. First, there is the obvious loss of income in those years. Second and longer lasting, catastrophic losses force local and international packers to find other sources of prunes, fruit not grown in California, to fill their orders. Recovering that market share can be difficult, even with a high quality product such as California prunes.

What hot temperatures and weather patterns are most damaging to prune fruit set? In the three years of crop disasters in Sutter County, the bloom weather has been similar:

- Early to normal bloom timing (March 10-15) with no rain from first flower to full bloom.
- Warm temperatures (70+°F daily maximum) begin early, even before any flowers open, and continue as bloom begins. These conditions help make a short, compact bloom period that can be more vulnerable to a spike in temperatures at the wrong time.
- Excessive heat (83+°F) occurs around full bloom and is sustained for at least two days. Extreme heat (85-87°F max) right around full bloom seems to have a big role in damaging the crop set. Appearance of extreme heat early in bloom followed by cooler temperatures doesn't appear to harm the crop as much as heat at full bloom or closely after.

What can growers do if these conditions appear as bloom approaches? Run water. Even though running water has not dropped orchard temperatures dramatically in recent research, it does provide some small relief, usually just a degree (°F) or two lower temperatures, and may have some benefits we have not been able to measure in our recent research. Just the orchard surface foot of soil needs to be wet, so deep watering is not necessary. Anything else? Not that research has shown to date. We will continue to look at possible spray options at bloom.

SAVE the DATES

Tehama Prune Day

February 8, 2013 8am-1pm — Red Bluff Elks Lodge

For more information call the UC Cooperative Extension Office 527-3101

Almond Institute & Walnut Day

February 22, 2013 8am-5pm — Chico Elks Lodge

For more information call the Butte Co UC Cooperative Extension Office 538-7201

FRUIT & NUT NOTES

SACRAMENTO VALLEY REGIONAL PRUNE NEWSLETTER

The "SACARAMENTO VALLEY REGIONAL PRUNE NEWSLETTER" is a collaborative effort of prune research specialists working together to provide Sacramento Valley growers and industry leaders the latest research and information effecting walnut production in today's changing environment. This newsletter will be published quarterly, be sure to look for upcoming issues!

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