your *Lake County* HORTICULTURAL NOTES

MAY 1993

!!! REMINDERS !!!

(Contact us)

HORT NOTES RENEWAL FORMS DUE!!!
(MUST be in by June 1 or no more HORT NOTES!)

May 15	Int'l Pear Symposium - registration due (see April HORT NOTES)
June 23-25	44th Annual Meeting - American Society for Enology & Viticulture Sacramento. Forms from ASEV at (916) 753-3142
July 8	**WINEGRAPE PEST MANAGEMENT WORKSHOP IN SPANISH - Kelseyville** (details in June HORT NOTES)

CURRENT TRENDS IN NITROGEN FERTILIZATION RESEARCH

Nitrogen (N) fertilization of perennial crops has long been thought of as "cheap insurance", returning great benefits at relatively small cost per acre. Adequate levels (generally interpreted from tissue analysis and observed plant growth) are needed for proper vegetative growth/function, yield,and perhaps most importantly, bloom and fruit set. Table 1 (from Weinbaum, Walnut Production Short Course) summarizes factors influencing N fertilization need.

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Table 1. Factors influencing the relative need for fertilizer N application.

Increases Need	Decreases Need
Heavy yield	Light yield
Low tree vigor	Excessive tree vigor
Leaf N concentration < critical level	Leaf N conc. > critical level
Excessive irrigation or rainfall	High nitrate irrigation water
Winter fertilization	Soils with high nitrate levels
Shallow, coarse-textured soils	Deep, fine-textured soils
Failure to incorporate ammoniacal sources of fertilizer N	Split fertilizer applications
	Fertigation (drip irrigation)

Traditionally, research has focused on optimal applied amounts, (i.e. rate-yield response) but less on timing and use efficiency. In recent years, the long-held recommendation to apply N in late fall or winter has been disavowed in favor of spring through late summer applications. It was found that 1) N uptake coincides with leaf activity and 2) dormant-applied N is lost to (among others) leaching, run-off and denitrification. Indeed, most orchards/vineyards - except dryland - are now fertilized ahead of or with irrigations during the growing season (though N use efficiency is STILL low in many cases). Uptake and storage for next season's bloom and set is thus enhanced.

More recent studies are being conducted to 1) learn how N is partitioned among plant parts (i.e. how much is stored/used by wood, roots, vegetation and fruit through the season) and 2) refine application timing for various crops to coincide with the needs of various parts, especially buds and fruit.

These studies are needed because the line between adequate and excessive N is becoming finer. Besides excess vigor (causing shade, poor fruit color and poor bud set), there is increased concern over shortened storage life of fresh fruit and increased susceptibility to certain pests (e.g. leafhoppers, pear psylla, fireblight and certain decay pathogens). A social concern is high nitrate well water levels which have resulted in state programs to increase agricultural N use efficiency.

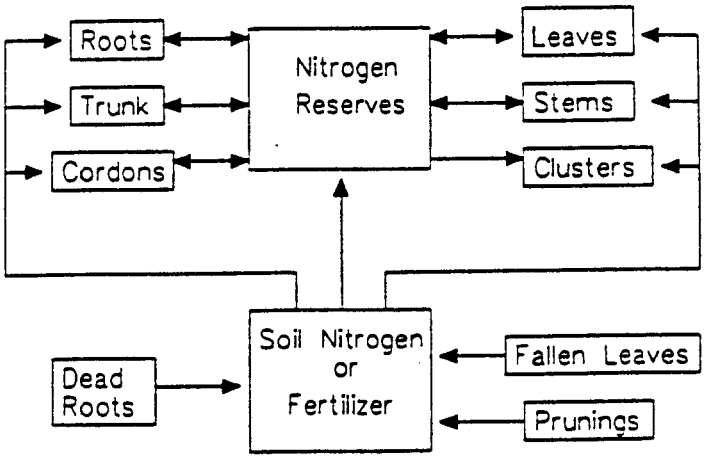
Following are summaries of three research projects aimed at characterizing plant N uptake and use, with the long term goal of optimizing N fertilization. (Adapted by Rachel Elkins from various sources. Please contact me for complete reports).

1) **Uptake and distribution of N in Thompson Seedless (TS) grape vines**

Dr. Larry Williams, Dept. of Viticulture & Enology, UC Davis

To learn seasonal N demands, Dr. Williams harvested entire vines periodically through the growing season for two years in the San

Joaquin Valley. Roots, trunk, shoots and fruit were separated and dried and the amount of N measured. He found that at budbreak, roots and trunk contained 30 lbs. per acre N. From budbreak to harvest, levels decreased 18-27 lbs. per acre. This was N redistributed to current season's growth and represented 30-36% of the total seasonal vine N requirement of 60-75 lbs. Most of the remaining N, or 60% (more or less) of the total, was supplied from soil N during the growing season. The balance was from dead leaves, roots and prunings.



Nitrogen Cycling Within a Vineyard

At the Wine Grape Nutrition Seminar in February, Dr. Williams presented a theoretical N "budget" for Lake County. As with TS, about 35% of total seasonal N need for a 4.4 ton/acre vineyard (726 vines/acre) is supplied by roots, cordons and trunk (about 12 lbs.). This should be taken into account when planning an N fertility program (based on vine vigor, yield and bloom petiole levels).

2) **Nitrogen management options for pears**
Dr. Tim Righetti et al., Department of Horticulture, Oregon State University

Starting in 1988, Dr. Righetti and others began studying the uptake and fate of N applied variously in spring, mid-summer, post-harvest, or split between spring and post-harvest. The goal was to insure bud development and set while avoiding excessive vegetative growth and high N fruit. Experiments were done on 5-10 year old Comice trees in Corvallis and Medford. The following general findings were reported in 1992:

1) Flower development and early growth of vegetative tissues is almost entirely dependent on stored N. Soil-applied N in the spring does not affect these tissues.

2) Spring applications of N increase vegetative growth and produce high N fruit. When leaves senesce, N is stored in the aboveground portion of the tree, thus buds receive adequate N.

3) Applications of N before harvest (3 weeks) cause a build up of storage N in both the roots and aerial parts of the tree, but little N is allocated to leaves or fruit. Buds receive adequate N.

4) Applications of N immediately before or after harvest cause a build up of storage N in the roots, but little N is stored in the aerial parts of the tree or is available to developing buds.

5) Postharvest foliar sprays of urea can increase storage N in developing buds, but little or no N is available to other parts of the tree.

In his report to funding agencies, Dr. Righetti noted that the above are principles and that each orchard's unique situation (soil, irrigation, rootstock, variety, etc.) dictates basic tree vigor and fruit quantity/quality. Supplemental N management is thus a grower-controlled tool that can either enhance or hinder crop quality. He gave several strategy examples, e.g. #5 to control excessive vigor, #3 to maintain optimal vigor and production and #2 plus #3 or 4 (split) to increase vigor while avoiding high N fruit.

Older trees apparently partition N similarly. However, since storage reserves are greater but incremental structural growth is less, seasonal changes in tissue levels would decrease **until total seasonal N need approaches the amount removed by the crop** (in the Oregon trial, about 44 lbs. per 15 ton per acre Comice crop). Dr. Righetti feels that post-harvest foliar-applied N may offer a strategy in line with how older trees partition N, AS LONG AS ADEQUATE AMOUNTS CAN BE ECONOMICALLY APPLIED AND TREE VIGOR IS MAINTAINED.

The above results have yet to be tested in California pear orchards. UC Extension Pomologist Dave Ramos and others are currently establishing differential leaf N and irrigation status levels in a mature Bartlett orchard to observe effects on yield and fruit quality. If significant differences occur, the next step will be to refine knowledge of "critical" levels and application strategies.

3) **Walnut N fertilization and usage**
Dr. Steve Weinbaum, Dept. of Pomology, UC Davis

From 1985-1990, N partitioning was followed in Hartley walnuts in the San Joaquin Valley. 80% (or 90 lbs.) of the 110 lbs. N removed by a 2+ ton crop was by the fruit (hulls + shells + kernels). This translates into about 25 lbs. N removed per 1000

lbs. nuts or 50 lbs. per ton. An additional 10 lbs. was removed in prunings and roots. However, the same experiment showed only 30% applied N recovery by the trees, indicating great loss to runoff, leaching, denitrification, volatilization, etc. How common such great inefficiency is in California is unquantified, but signals the need to utilize the most efficient strategies currently available (i.e. application timing/method, formulation). Allowing for 50% inefficiency, current recommendation for walnuts is no more than 100 lbs. actual N per ton dry nuts per acre. Weinbaum also refined the July critical leaf tissue level for walnuts at 2.3%. If levels remain above this, applied amounts may be decreased as long as vigor and yield are maintained.

To summarize, all the above studies stress timely and efficient application of moderate amounts of N. Regardless of the crop, ideal uptake occurs during the growing season and application should be made with the goals of:

1) optimizing bud development and set
   fruit quality
   vegetative vigor

2) avoiding excessive vigor and resulting poor set
   high N/poor storing/poor color fruit
   N loss due to runoff/leaching (nitrates)
   volatilization (urea and ammonia sources)
   denitrification (nitrates)

In June Hort Notes, critical nutrient values will be discussed. Growers should plan NOW to sample for nutrient status if a baseline is needed or there is suspicion of deficiency or excess.

Wine grape growers will sample bloom petiole levels in June, while pears and walnuts are leaf sampled in July.

Contact me for any assistance on your N (or other) fertilization programs.

NITROGEN FERTILIZATION OF YOUNG TREES

Yolo-Solano Farm Advisor Wilbur Reil suggests applying 1 oz. actual N per year of tree growth (below). He says some growers in his area apply this amount at each irrigation to keep trees growing vigorously all summer. In Lake County, it is important, however, to cease in time to promote hardening off, since fall frost can cause considerable damage to young trees.

TREE AGE (years)	ACTUAL N PER SEASON (split into spring plus summer applications)
1	3 oz. (1.5 oz. each spring and summer)
2	4 oz. (2 oz. per application)
3	6.5 oz. (3.25 oz. per application)
4	9 oz. (4.5 oz. per application)
5	same as mature trees

TRAINING YOUNG PEAR TREES

Dave Burkhart, OSU Extension Agent, Hood River (Emeritus)
from Mid-Columbia Hort News, April 1990

As we move to higher density plantings, it has become more important to develop a definite training system early in the life of the tree. We need to select a plan and stick with it! I have never felt that one system is necessarily better than another. They all have advantages and disadvantages!

Because we do not have good growth control rootstocks, we really need to fruit the trees as soon as possible if we are in a close planting. Fruiting is one of the best aids to training and to growth control.

Each year I see orchards that, with some early pruning and training, could have avoided later corrective cuts and delayed fruiting. Some thoughts on training and pruning.

1. Get into spreading the first summer after planting. Poor crotches can often times be improved with clothespins or toothpicks.

2. Removal of strong, upright competing limbs on central leader or main branches can be accomplished easily when they are 4" to 5" long. This will allow better angled limbs to develop lower on the tree or branch.

3. If trees have not grown well the first year, sometimes you can prune back radically to 8" to 10" above the ground and the tree will take off.

4. Remember, with a pear tree, its always easy to grow a top but not easy to grow lower limbs. Don't let the top "get away" before the lower limbs develop.

5. The thicker of 2 branches that are identical in all respects will always grow more vigorously than a thinner branch.

6. Bending can change the crotch angle and help shape the tree, but spreading too flat can alter longitudinal growth.

7. Notching (making a cut above a dormant bud) will often help stimulate a bud to grow in an area where a limb is needed.

8. Don't over prune a young tree, except to eliminate poor crotches and problem limbs, as it retards tree growth.

(Note from Rachel - trees should be trained to match their growing conditions. For example, trees on the clay or clay loams of Big Valley may need to be pruned harder than those in the alluvial loams or sandy loams of Scotts Valley and Upper Lake. Thus, early crop will be sacrificed somewhat in favor of structural growth.)

GRAPE POWDERY MILDEW - A PROBLEM YEAR?

If cool, humid weather continues, mildew (PM) may be a chronic problem in some vineyards, especially those with all elements of the "disease triangle" - pathogen + host + environment.

Pathogen - The fungus overwinters in 1) bark as sexually-produced ascospores arising from small, hard black spore sacs called cleistothecia and 2) buds as fungal mats called mycelia which produce asecual spores called conidia. Infection coincides with spring rains and may be seen 7-10 days after a wet period. Vineyard inoculum levels will certainly determine the extent of a new infection. If PM was a problem last year and went uneradicated, expect even greater problems in 1993.

Host - Degree of susceptibility varies with variety. Cabernet Sauvignon, Chardonnay, Chenin blanc are worse while Sauvignon blanc, Semillion, White Riesling and Zinfandel are less affected. In a 'PM year' all varieties should receive at least a budbreak to 2 inch sulfur treatment plus one or two more 7-10 days apart. Again, a previous history will mean more treatments, regardless of variety. An open canopy will promote dry conditions and expose mildew to heat and fungicides. This is especially important for susceptible varieties and will help reduce the number of treatments in any case.

Environment - Conidia germinate over a wide temperature range (43°F - 90°F). Conidial growth is rapid from 70°F - 86°F; new conidia may be produced in five days. Ascospores germinate and grow in a narrower but compatible temperature range with conidia.

Once germination occurs, free moisture is unnecessary for secondary disease development; temperature plays the key role. Though the fungus is killed above 91°F, they may be protected by clusters and canopy and survive hot spells. Though water is sometimes used to wash off colonies, it may also lower canopy temperatures and actually enhance survival. Berries will be vulnerable until 12-13° Brix.

PM Control - Aim For Eradication And Avoid Resistance

- Apply wettable sulfur at budbreak to 2 inches to prevent infection from overwintering inoculum.

- Follow up with 1-3 sulfur treatments 7-10 days apart, especially if it is cool and humid. Reapply after rain.

- If treatment must continue beyond 4-6" shoot growth or wineries request sulfur use be halted, a systemic sterol inhibitor (DMI) fungicide may be used (e.g. Bayleton, Rubigan, Rally). Extension Plant Pathologist Doug Gubler suggests starting at 10-12" shoot growth. To avoid DMI resistance, alternate or tank mix with sulfur. FOLLOW LABEL - EACH PRODUCT DIFFERS AND GET GOOD COVERAGE.

- Wettable sulfur combined with a wetting agent will wash off and hence eradicate mildew. DMI's are protectants ONLY; already existing infections will be unaffected.

As mentioned in past newsletters, Lake County is fortunate to have low PM inoculum and a favorable control climate. With vigilant attention to canopy management and judicious use of early-season sulfur, future problems should be minimal.

For more detailed information, consult me or (contact us):

Grape Pest Management, DANR Publication #3343

UCIPM Grape Pest Management Guidelines (May 1992)

WALNUT MEETING HANDOUTS

Over 40 walnut growers attended both indoor and field sessions. Topics covered were marketing, industry research trends, walnut blight, navel orangeworm, frosted scale, varietal and planting trends, young tree planting/care grafting and cover crops. Contact us for:

- California Walnut Commission hat/patch (order form)
- Walnut Hedgerow Planting on Marginal Soils
- UC Davis Cultivar and Selection Harvest Evaluations - 1992 (3 tables)
- IPM for Walnuts and Walnut Pest Management Guidelines (order forms)
- Walnut blight management guidelines
- Shredding Mummy Nuts (to destroy navel orangeworm)

MAY CHECKLIST (contact me about any of the following):

Young Trees and Vines

* WEED CONTROL!!! (but watch herbicide phytotoxicity)

* Remember, young plants need more frequent, lighter irrigations than established trees, but watch excess moisture which reduces vital oxygen in the root zone (especially true this year).

* A little fertilizer to push growth should be applied after growth begins (pages 5-6).

* Begin to train the leader in competing 1-year-old walnuts; stake up wind of tree to avoid rubbing trunk and limbs. Pinch back competing laterals.

* Remove suckers when about 6-12" long; tear out or spray shears with Galltrol between cuts to prevent crown gall infection

* Vertebrates can kill young plants in a hurry! (Heavy rains should help out this year.)

Nutritional Problems

* EXPECT TO SEE SYMPTOMS RELATED TO COLD, WET SOIL WHICH DELAYS ROOT GROWTH AND UPTAKE OF NUTRIENTS.

* Plan for bloom-time petiole analysis in grapes. If needed, foliar zinc should be applied before bloom.

* Spring is ideal to apply foliar zinc to pear and walnut.

  - Walnut - 1 lb. 36% $ZnSO_4$/100 gal. water
    apply just as leaves turn green
    repeat 1-2 times at 2-3 week intervals if severe

  - Pear - 4-5 lbs. 50% basic $ZnSO_4$/100 gal. water
    2-4 weeks after bloom

* N uptake is optimal during the growing season - but avoid too much.

Pear trees "woke up" slowly this spring, but the crop looks fairly full (hopefully, leaves will catch up to feed young fruit soon!). To grape and walnut growers - have a great season!

Sincerely,

Rachel B. Elkins

Rachel Elkins
Farm Advisor