UNIVERSITY of CALIFORNIA

Cooperative Extension • Monterey County

Crop Notes

March/April, 2008

In This Issue:

University of California, U.S. Department of Agriculture, and County of Monterey cooperating

1432 Abbott Street • Salinas, CA 93901

phone 831.759.7350
fax 831.758.3018

http://cemonterey.ucdavis.edu

ADJUSTMENT OF SEASONAL FERTILIZER APPLICATION AND ITS EFFECT ON TISSUE NUTRIENT LEVELS, FRUIT YIELD AND QUALITY

Mark Bolda, UCCE Santa Cruz County

Introduction: Many raspberry growers currently, in the early spring, apply nitrogen in the form of a soluble solid fertilizer such as urea as a top or side dress to the plant row, which is then washed down deeper into the soil by a following rain or irrigation. These amounts, often several tens of pounds of actual nitrogen per acre, are quite large compared to the rest of the season, and while the plant uptake of nitrogen is higher during this early period of growth, the plant's capacity to absorb nitrogen can easily be exceeded.

Later applications of nitrogen and fertilizers are done through the drip irrigation system. These applications are often less than a few pounds of actual nitrogen per acre and take place from once a week to once a month. These applications of nitrogen fertilizer should continue through the growing season, including through flowering and fruiting. While it is a commonly held belief that nitrogen application during fruiting causes soft, reduced quality fruit, recent research suggests this belief might be unfounded. Other factors, such as irrigation practices and disease management may have a larger effect on fruit quality than limited nitrogen use during flowering and fruiting.

It is hypothesized that California growers can achieve better caneberry yields and more fertilizer efficiency by significant adjustment to their fertility practices. Indeed, recent research in caneberries in Oregon suggests that large reductions in early season fertilizer use coupled with increases in in-season fertilizer rates result in more and higher quality caneberries.

This study is designed to investigate large adjustments to early and in-season fertilizer rates on fruit yields and quality as well as test the consequences of these adjustments on plant tissue and soil mineral contents. This information will be important to the caneberry industry since it reduces the environmentally harmful use of large amounts of nitrogen in the early winter season, while potentially offering enhanced plant productivity from more effectively timed fertilizer applications.

Materials and Methods:

A test plot consisting of 4 treatments of four replicates was set up in a well functioning field of Heritage red raspberry. Rates of applied nitrogen consisted of a grower standard, and modifications of both the early and in-season supplemental nitrogen applications (see Table 1 below). Fertilizer was applied as per grower procedure, i.e. as a top dress in the early season, and later as an irrigation drip tape applied liquid supplement.

Harvest and Fruit Evaluation: Measurement of fruit yield was done by an established procedure counting flowers and weighing fruit for a yield estimate. Fruit quality measurements was performed twice times during the harvest season in August and September by taking 15 fruit from each treatment replicate, holding for five days at 38°F, holding at room temperature for one day and then evaluating quality of the fruit by grading it good or unmarketable.

Table 1: Fertilizer application scheme, expressed in lbs of nitrogen (N) per acre.

	Nitrogen Fertilizer Regimen*
1.	Grower standard early season, grower standard in-season (43 lbs + 8 lbs = 51 lbs mineral N)
2.	½ grower standard early season, twice grower standard in-season (21.5.5 lbs + 16 lbs = 37.5 lbs mineral N)
3.	No grower standard early season, twice grower standard in-season (0 lbs + 16 lbs = 16 lbs mineral N)
4.	Grower standard early season, no grower standard in-season (86 lbs + 0 lbs =86 lbs mineral N)

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Table 2: Actual amounts of fertilizer applied, expressed in lbs of nitrogen per acre.

Date	Fertilizer Type	Grower Standard (lb N/A) GS	½ Grower Standard (lb N/A) ½ GS	0 grower standard (lb N/A) 0 GS	Twice grower standard (lb N/A) 2 GS
2/6/07	15.5-0-0-19	15	7.5	0	30
2/23/07	15.5-0-0-19	9	4.5	0	18
3/7/07	15.5-0-0-19	10	5	0	20
3/27/07	15.5-0-0-19	9	4.5	0	18
6/14/07	15.5-0-0-19	2	4	4	0
7/2/07	15.5-0-0-19	2	4	4	0
7/20/07	15.5-0-0-19	2	4	4	0
8/1/07	15.5-0-0-19	2	4	4	0
Total (lb/A)	-	**51**	**37.5**	**16**	**86**

Tissue Sampling: Plant tissue samples were taken at four critical points in the development of the raspberry plant, namely; initial vegetative growth, flowering, green fruit and harvest. Replicate samples were a composite of 12 leaves. The total number of composite samples per event was 16, for a total of 64 leaf samples for the entire study.
To overcome the subjectivity posed by sampling the "youngest mature leaf", leaves from 4 to 7 nodes from the tip were sampled.

Amount of total carbohydrate in raspberry canes has been related to fruitfulness. Total and type of carbohydrates were evaluated to determine resource allocation of canes in the various fertilizer treatments once during the growing season. A cane was removed from each treatment replicate plot on 10/18/2007, and a section from 0.9 m to 1.2 m cut out, dried and sent to the UC ANR Analytical Laboratory for analysis.

Soil Sampling: Soil samples were taken at the same time as leaf tissue samples above. Soil sampling was done in a standard pattern, taking 8" deep samples from the base of the raspberry hedgerow. Replicate samples were composite of 5 cores and had KCl extracts taken from them. In addition to the replicated samples beginning in March, a non-replicated sample from each treatment was taken in February prior to commencement of fertilizer placement.

Rust Evaluation: The literature reports a positive correlation of rust incidence with higher nitrogen use. To test this, an evaluation of rust was done on June 13, and September 20, 2007. Fifteen leaves on each side of each treatment replicate approximately at 2.5 feet from ground level were evaluated and observed rust given as a percentage of leaf coverage.

Cane Diameter: Cane diameter is often strongly correlated with cane fruiting potential, so one measurement of cane diameter was made after the season was over, on December 13, 2007. Measurements were made at the very base of eight fruited canes per treatment replicate.

Results:

Tissue nitrogen measured in leaf blades (Table 1) was significantly higher in March in the grower standard and twice grower standard plots than other treatments, and tissue nitrogen remained higher in the twice grower standard plots than other plots through June.

As evidenced by the accompanying charts (Table 2), use of twice the grower standard rate of nitrogen resulted in significantly higher levels of soil nitrate in April and March. Interestingly, significantly higher levels of nitrate were again available in September in the twice grower standard treatment although no additional fertilizer applications to that treatment had been made after March.

While it is a commonly held belief that nitrogen application during fruiting causes soft, reduced quality fruit, recent research suggests this belief might be unfounded.

Amount of total carbohydrate in raspberry canes has been related to fruitfulness.

ONLINE RESOURCES OFFERED TO THE PUBLIC BY THE UC ANR

Carbon calculator helps Californians understand, reduce their climate impact

A new WEb-based portal developed at the University of California, Berkeley, provides consumers with specific, personalized informationthey need to reduce their emissions of greenhouse gases.This new portal, found at http://www.CoolCalifornia.org, is the only "carbon footprint calculator" that can be used to evaluate both direct and indirect emissions of greenhouse gases related to individual lifestyle choices. It provides localized emissions estimates for transportation, housing, food, goods and services, as well as resources that can help users make more climate-friendly choices.

Advice to grow by

More than 40 California counties have a University of California (UC) Cooperative Extension Master Gardener Program staffed by UC-trained volunteer master gardeners who answer public inquiries and provide UC research-based information on all areas of plant health and garening practices. This free service provides horticultural assistance to the public vaia telephone, plant clinics, demonstrations, talks, web sites, and the mass media covering vegetable gardening, trees, pesticides, recycling, soils, lawns, disease, insects, house plants, and related topics. Samples of insects, weeds and diseased plants may often be taken to the county office for diagnosis. The UC Statewide Master Gardener Program's Website includes links to county program Web sites. Log on to http://camastergardeners.ucdavis.edu and click on "Find Your Local Master Gardener," then select the name of your county to find: directions to the office; the hot-line phone number; news about invasive pests, pertinent information about gardening classes and clinics; newsletters; demonstration gardens, and more information specific to your locale.

Entomology news online

to inform and educatie the public on various activities and research projects, the Department of Entomology at the University of California, Davis, maintains a new section at http://entomology.ucdavis.edu/news/index.html. Some of the offerins include a collection high resolution photos of bees taken in 2008 and 2008; photos taken in a queen bee insemination class taught by bee breeder-geneticist Susan Cobey at http://entomology.ucdavis.edu/news/beephotos.html; and a PowerPoint from the Harry H. Laidlaw Jr. Honey Bee Research Facility.

As a result of four new herbicides registered in 2007 for use on onions growers have additional tools for managing key weeds in onions.

DRY BULB ONION WEED CONTROL STRATEGIES

University of California Cooperative Extension, Monterey County

Richard Smith, Vegetable Crops and Weed Science Farm Advisor

2007 was an interesting year for weed control in onions. There were four new herbicide uses registered for this crop: 1) Goal Tender at the first true leaf stage; 2) Prowl H2O for use at the loop stage; and 3) Outlook at the second true leaf stage. The fourth material, Nortron for pre and postemergence use, was registered late in the year and not in time for the 2007 growing season. As a result of these registrations, onions growers have additional tools for managing common broadleaf weeds; in addition, Outlook will be useful for controlling yellow nutsedge.

The registration of Goal Tender for use at the first true leaf stage allows for control of weeds earlier in the production cycle. Depending on weather conditions, the first true leaf stage occurs 28 to 35 days after the first germination water. Catching weeds at this stage increases the possibility of killing them more effectively than waiting an additional 7-10 days for the second true leaf stage and spraying with Goal 2XL (Table 1). From the table it is clear that Goal 2XL is also effective applied at the first true leaf stage, but it is more damaging to the yield of onions if used at this early stage.

Prowl H2O was registered for use at the "loop" stage of onions (i.e. when the flag leaf is emerging but the tip of the leaf is still in the soil thereby forming a loop). Prowl is not safe for use on onions as a preemergence application, however, once the onions have germinated and emerged the material can be safely applied. The timing of this application is typically 14-16 days following the first germination water. Prowl has no postemergence activity and applications made 2 weeks following the germination water do not control emerged weeds. Therefore applications of Prowl at the loop stage is not a stand alone treatment, but must be followed by post emergence treatments. In both 2006 and 2007, Prowl H2O applied at the loop stage and followed by Goal Tender at the first true leaf stage provided excellent weed control and excellent safety to the yield of onions (see Table 2 for 2007 results).

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