

Working with Commodity Groups, Processors, and Packers to Procure Representative Crop Samples to Assess Harvest Nitrogen Content

Project Summary

2018 Sampling of Harvested Materials with Collaborators

Through the Irrigated Lands Regulatory Program (ILRP), the Central Valley Regional Water Quality Control Board (Water Board) now requires producers to implement management practices that are protective of groundwater quality and to document the effectiveness of those practices by providing, among other things, information on field nitrogen (N) balances. In addition, the Agricultural Expert Panel convened by the State Water Resources Control Board recommended metrics composed of N applied (A) and N removed (R) to gauge program progress in reducing the mass of leachable N (Burt et al., 2014). This approach was adopted by the Water Board. To comply with this new reporting requirement, growers and their water quality coalitions need reliable data about N removed from fields in harvested crop materials. Also, growers can use rates of N removal in crops to help plan nutrient management programs that reasonably minimize N at risk of leaching below the root zone. Geisseler (2016) presents yield-to-N-removed conversion factors from which conversions for at least 31 agronomic, 21 permanent, and 20 vegetable crops can be readily derived. Area covered by these crops represents more than 98 percent of irrigated lands in the Central Valley. However, that report noted that some of these factors are based on small, outdated, or geographically different datasets. We are developing updated conversion factors for about 25 crops. For some, information is coming from existing research projects. For others, we are sampling and analyzing harvested material. By partnering with commodity organizations, growers, processors, and packers, it has been possible to procure hundreds of samples that represent a range of varieties and growing environments for each crop. In most cases, substantial information about source fields, such as age of perennial crops, crop management, variety, yield, quality, and dates of bloom or planting, are acquired and related to results. In this way, some of the factors that affect N content of the harvest can be investigated and explained. These data will be incorporated into updates of Geisseler (2016) as part of this project. The existing Y-to-R calculator (<http://agmpep.com/calc-y2r/>) will be revised to reflect these findings, and the results will be used to update the assessment and planning tools available to growers, grower advisors, and coalitions.

Existing Information and Preliminary Results

Pilot work with a peach producer yielded valuable methodological and N content information. Peach N is mostly in flesh (Fig. 1), tends to be overall higher than reported in the literature (Fig. 2), and declines predictably as the physiological season lengthens (Fig. 3). Results were readily related to information supplied by producers, such as dates of flowering, harvest, and applied N. This work was expanded to 11 other crops in 2018 (Table 1) with support from FREP, harnessing processes each industry already employs to procure representative samples of harvested material (e.g., Fig. 4), often to assess quality related to value of the harvest. Over 500 field-years' harvests will have been sampled by the close of this season.

Figure 1. 2017 work showing N partitioning in peaches.

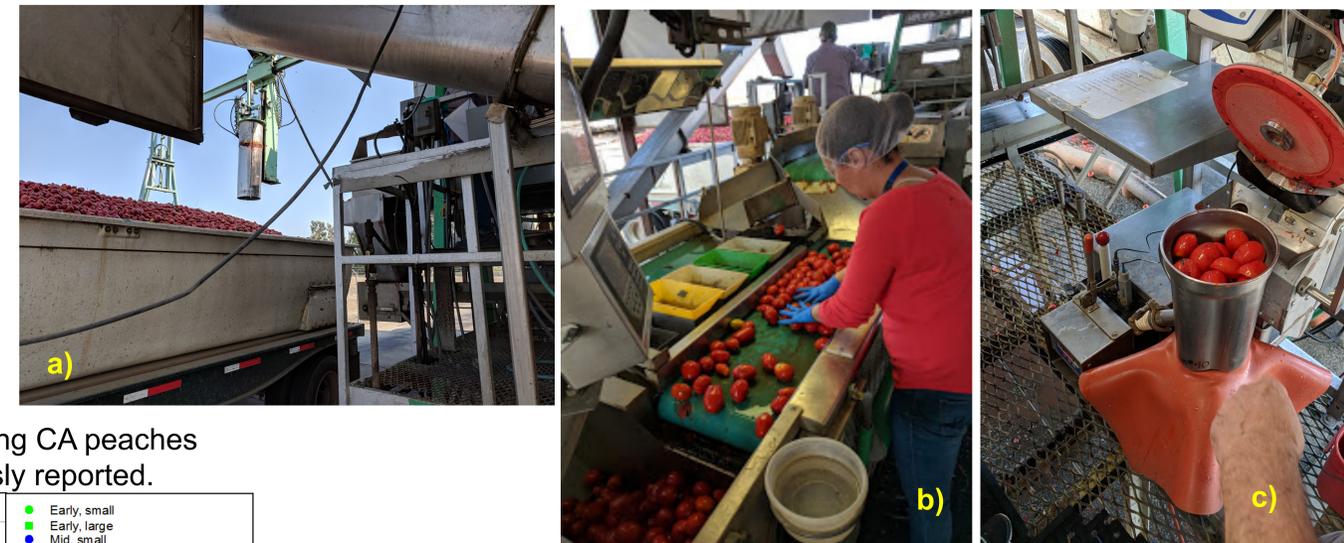
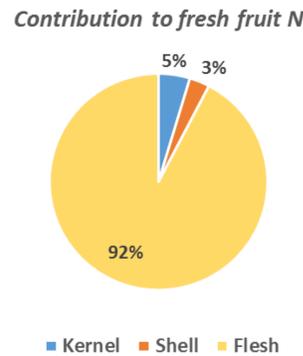


Figure 2. 2017 results showing CA peaches contain more N than previously reported.

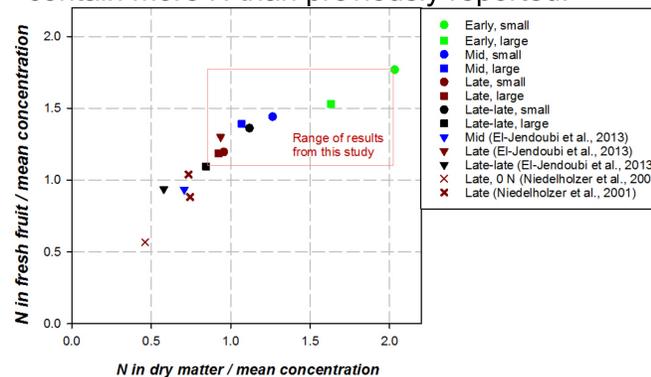


Figure 3. 2017 work relating growing degree hours (GDH) to peach N content.

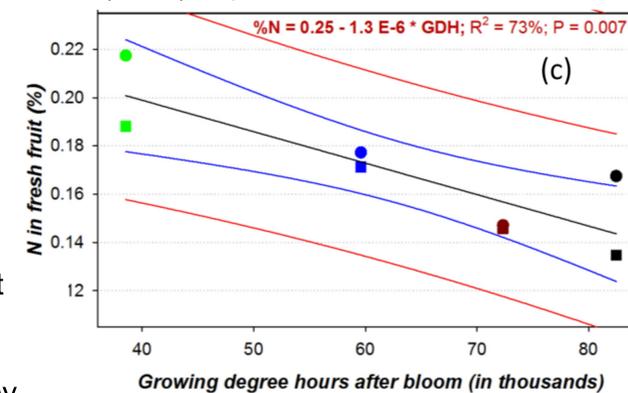


Figure 4. Representative sampling by Processing Tomato Advisory Board collaborators: a) core samples from gondolas and b) grading 50-lb subsample from which a sub-subsample is drawn & blended (c).

Table 1. Late 2018 status of sample acquisition with collaborators.

Crop	Industry Group	Part	Cooperators	Crop-years	Field-years	Procured (%)
Pistachio	CA Pistachio Research Board	Annual	2	1	99	90%
Pomegranate	Pomegranate Council	Annual	2	1	40	0%
Peach	CA Fresh Fruit Association	Annual	1	2	39	100%
Plum	CA Fresh Fruit Association	Annual	1	1	8	100%
Raisins	California Raisins	Annual	1	2	90	0%
Tomato	Processing Tomato Advisory Brd	Annual	3	1	88	100%
Carrots	CA Fresh Carrot Advisory Board	Annual	2	1	66	9%
Corn	CA Alfalfa & Forage Association	Annual	1	1	10	0%
Sorghum	CA Alfalfa & Forage Association	Annual	1	1	10	0%
Safflower	California Safflower Growers Ass'n	Annual	2	1	45	100%
Sunflower	National Sunflower Association	Annual	2	1	0	0%
Cotton	CA Cotton Ginners & Growers Ass'n	Annual	1	1	10	0%
Total for 12 crops			19	14	505	54%

Practical Implications

- Agricultural grower/packer/shippers often have rigorous sampling programs that can be leveraged to assess characteristics of harvested material.
- Large numbers of samples from actual production settings better represent actual harvests than a few samples drawn from research settings.
- Cooperators often will provide contextual agronomic parameters, such as variety, planting date, and N rate that are useful for interpreting results.
- N conversions are being refined & expanded based on results of this & similar work.

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Collaborators: See Table 1.
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References

- Geisseler, Daniel. 2016. Nitrogen Concentrations in Harvested Plant Parts – A Literature Overview. UC Davis.
- Burt, C., R. Hutmacher, T. Angermann, B. Brush, D. Munk, J. duBois, M. McKean, and L. Zelinski. 2014. Conclusions of the Agricultural Expert Panel: Recommendations to the State Water Resources Control Board pertaining to the Irrigated Lands Regulatory Program in fulfillment of SBX 2 1 of the California Legislature. Irrigation Training & Research Center, California Polytechnic State University.



Buena Vista Coalition
 Cawelo Water District Coalition
 Kaweah Basin Water Quality Association
 Kern River Watershed Coalition Authority
 Kings River Watershed Coalition Authority
 Tule Basin Water Quality Coalition
 Westside Water Quality Coalition

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 The SSJV MPEP Committee was awarded \$2 million from the USDA NRCS Conservation Innovation Grant program to increase the use of management practices that reduce nitrate leaching. Growers' and cooperators' contributions will match or exceed this funding.

Contacts

Donald Ikemiya
 Technical Coordinator
 SSJV MPEP Committee
 (559) 636-1166

John Dickey
 Technical Program Manager
 PlanTierra, LLC
 916-517-2481