

**Paul C. and Edna H. Warner Endowment Fund for Sustainable Agriculture
Interdisciplinary Grant Program for On-Farm Research
Report for 2011 Grant**

Project Title: Preparing farmers to meet crop quality goals

Project Leader(s): Natalie Bumgarner (Graduate student) and Matt Kleinhenz (Extension specialist)

Address: 1680 Madison Ave. Phone: 1(330)263-3810 Fax: 1(330)263-3887

City: Wooster State: OH Zip Code: 44691

Email: Kleinhenz.1@osu.edu Bumgarner.169@buckeyemail.osu.edu

Name and Location of Grower Cooperators:

Yoders Acres, Fredricksburg, OH

Blackbird Meadows Farm, Canton, OH

Blue Pike Farm, Cleveland, OH

Cow Towne Farms, Blacklick, OH

Daniel Hershberger, Millersburg, OH

Granville HS Sustainable Ag. Class, Granville, OH

Kinnikinnick Gardens, Chillicothe, OH

Nothing but Nature Farm, Oakwood, OH

Shepard's Corner Ecology Center, Blacklick, OH

Wayward Seed Farm, Marysville, OH

Project start date: June 1st, 2011

Project end date: Feb. 28th, 2012

PROJECT OVERVIEW

Our aim is to help Ohio farmers be more successful, especially in local markets through the use of crop quality assessment and management. In this project, our goal was to help Ohio growers better assess the quality of vegetable crops on their farms and prepare them to achieve higher produce quality as is increasingly expected of them by their buyers. We sought to achieve these goals through a coordinated research and training program. Our long-term goal was to begin a program of data collection with the assistance of cooperating farmers that described aspects of the quality of vegetables from Ohio farms. To our knowledge, data on the status of vegetable crop quality in Ohio has not been previously gathered. This on-farm research was undertaken in conjunction with our goal of training and equipping growers to meet quality targets. Our education and outreach goal was to distribute and demonstrate the use of quality assessment tools while focusing on °Brix as an initial on-farm crop quality indicator. °Brix represents an ideal place to begin on-farm vegetable quality assessment because it can be reliably measured and is recognized throughout the value chain. With such methods of on-farm quality assessment, growers can begin to make informed management decisions to meet crop quality and farm sustainability targets. ***Our research objective was to: 1) document the crop quality status on Ohio farms through novel °Brix data collection. Our training objectives were to: 1) instruct and assist growers in on-farm measures of quality through assessment of soluble solids, and to 2) help growers identify and apply management techniques that optimize quality outcomes.***

Background and Rationale

One of the key benefits of measuring °Brix levels in vegetable tissue is the availability of affordable and relatively precise field measurement devices, which is not the case for many other factors that contribute to crop quality. Sensitive analytical approaches and sensory panels are often recognized as critical in the description of crop quality and consumer appeal, but the level of investment and training needed makes these techniques impractical in many settings. Therefore, on-farm quality assessment and management must utilize tools and techniques that are not prohibitively expensive or technically demanding. Assessing °Brix through handheld refractometers represents one such method. Therefore, appropriate use of °Brix as an indicator of crop quality can be a 'gateway' for farmers allowing quality goals to be targeted in production systems. However, it is clear that such measures are currently underutilized and incompletely understood by Ohio vegetable growers, so those were the critical gaps addressed by both the data collection and grower training goals of this project.

DESCRIPTION OF ACTIVITIES

Recruitment of Grower Cooperators for Crop Quality Assessment Project

Experienced and inexperienced farmers operating on small and large parcels are often interested but ill-equipped to tailor production systems and decisions to crop quality. To address these potential limitations in the grower community, grower-cooperators involved in this project included farms representing a range of experience, geographic location, and operation size and production practices. Cooperators represented primarily organic/sustainable farm operations and/or educational institutions. Data was also collected and analyzed at OARDC from additional farm locations, which did include farms with conventional production practices. Cooperators were initially drawn from participants in a crop quality workshop at the OEFFA 2011 conference that included both growers and marketers. Names of voluntary participants were collected at this February, 2011 workshop and contacted after notification that the grant was funded. Three growers in the project were attendees at this workshop. Three additional cooperators were recruited through the OEFFA email list serve, while the remaining cooperators were recruited through personal contact by the co-PIs.

Grower Training and Project Implementation

Our two central goals were gathering Ohio crop quality data and training and equipping growers to assess vegetable crop quality on their own farms. Addressing both of these goals began in Summer 2011 with cooperator contact and initial education in the area of °Brix and crop quality. The training portion of the project was initiated with grower-cooperator training visits by PI-Bumgarner to assist growers with the use of handheld refractometers and distribute equipment and materials. These on-farm training sessions with each cooperator included a demonstration of methods and techniques and a discussion of crop selection and data collection methods throughout the season. Emphasis was placed on gathering data that represented replicated measures across potential seasonal, variety, farm management and maturity impacts on soluble solid contents in vegetable crops. Visits also included the distribution of a refractometer (if the grower did not already own one), a garlic press to prepare samples, datasheets, and materials to properly clean the refractometer.

Data Collection and Summary

On-farm quality data collection, the central element of our research goal, began on each farm as soon as the training visit occurred and materials were in hand. An interactive web portal was available to grower-cooperators to allow for the real-time uploading and viewing of soluble solids data recorded during the project. Growers were also able to directly send or give data to the CO-PIs, and this seemed to be the simplest, most direct, and generally

preferred method for growers. Data was compiled by farm (in a single-blind method) by the PIs as it was turned in by growers. Additionally, °Brix data was collected on-site at some farms. Data from these locations was recorded by the PIs and also immediately returned to the cooperating farm. In total, data from 24 different crops across 12 locations was gathered from July through November, 2011. All data was compiled at the end of the season for dissemination through reports, presentations and other publications. Below is a synopsis of data from the 2011 project on a several tested vegetable crops.

Crop	°Brix average of all observations	Range of °Brix values	# Observations in average	# Farms reporting
Beet	7.8	2.8 - 13.6	27	4
Bean	6.9	2.9 - 15.7	57	3
Swiss chard	4.6	2.6 - 6.5	15	2
Cucumber	3.3	2.2 - 5.4	60	4
Summer squash	4.3	3.5 - 5.3	43	4
Sweet corn	16.2	9.5 - 26.5	66	2
Cherry tomato	7.5	4.5 - 11.7	102	6
Tomato	4.6	2.3 - 8.2	434	10
Turnip	6.0	4.5 - 6.9	20	3
Watermelon	10.8	9.0 - 12.8	66	4
Zucchini	4.0	2.4 - 6.0	71	5

Dissemination of Project Results to Grower Communities

Dissemination of results at the conclusion of the project was the second approach used to reach our training and equipping goal. These broader educational activities followed our in-person training visits to grower cooperators completed earlier in the project. These training and educational approaches were designed to reach growers through a combination of in-person presentations and demonstrations, group workshops, and widely accessible print and digital educational materials.

In September of 2011, a °Brix demonstration and presentation of the project was given at the Ohio Food and Farm Educational Research Program annual field day. This project and accompanying activities and data were also presented by PI-Bumgarner to the Great Lakes Vegetable Working Group at their annual meeting and drew

interest and comment from vegetable production faculty and extension personnel from across the Midwest region. In February of 2012, a 2-hr training and demonstration workshop was held at the OARDC to share and expand upon knowledge and practices emphasized throughout the project. A similar workshop was also presented at the 2012 Ohio Ecological Food and Farming Association conference in February. In total, approximately 70 Ohio vegetable producers and educators were in attendance at these two workshops. In both workshops, information of the background and utilization of °Brix measurements to describe vegetable crop quality was discussed, and a demonstration of proper methods in gathering °Brix data and proper use of refractometers was presented. This overview and demonstration was followed by discussions of the impact of production practices on soluble solids content and overall crop quality. Data from the study was used to illustrate key points that could assist growers in the optimum utilization of °Brix measurements. Additionally, a sensory evaluation was carried out to allow growers to better understand human evaluations of crop taste and quality and both the utility and limitations of soluble solid measures.

Evaluations were conducted at both of the February workshops. Results from both workshops combined showed a 37% increase in knowledge of what °Brix is, a 43% increase in knowledge of °Brix measurement, a 38% increase in knowledge of °Brix as an indicator of quality, and a 35% increase in knowledge of the use of °Brix in the farm business. The evaluations also indicated that 96% of participants would recommend the program to others while 94% answered that the workshop would influence their use of °Brix. On the question of whether the workshop would help them be more successful in measuring and using °Brix, 83% indicated it would. A final important indicator of usefulness was that 62% of respondents indicated that they would do something different in their operation as a result of something they learned in the workshop. These evaluations indicated that the workshops were well received and that attendees felt they took valuable information away from the workshop. Open-ended questions in the evaluation also indicated that areas remain to be explored and that more specifics about on-farm crop management remain for future projects.

To further facilitate dissemination of the information gained in this project, a °Brix guide (approximately 25 pages) has already been prepared. This guide will proceed through internal review and will be published as soon as possible as an OSU Extension publication. This publication focuses on four critical areas of °Brix assessment for farmers including: 1) The background and use of °Brix, 2) Discussion and pictorial guide to °Brix measurement, 3) Farm management decisions that can impact °Brix levels in crops, and 4) Using °Brix in farm management. Attendees at the two workshops were given a handout that represented a shortened version of the larger °Brix guide. We also plan to divide the larger guide into sections that will address specific aspects of soluble solids measurement. These smaller versions of the guide will be available at The OSU Vegetable Production Systems Laboratory (VPSL) website (<http://hcs.osu.edu/vpslab/>).

In addition to the °Brix guide extension publication, two educational video segments have been prepared. A 5-min video entitled “What is °Brix?” as well as a 10-min demonstration video of °Brix sampling methods are currently available at the VPSL facebook page (<http://www.facebook.com/osuvpslab>). To date (3/20/2012), that Facebook page reports that 211 people have been reached by the combination of these two videos. Both the guide and the demonstration videos will magnify the educational impact of the project by reaching a larger number of growers across a wider geographical area than would be possible with only workshops and presentations.

In addition to the workshops and materials already completed and available, we are currently planning and preparing for other outreach opportunities. Two requests for additional °Brix workshops similar to those presented at OARDC and OEFFA have been made from both northeastern and northwestern Ohio growers. We do plan to present workshops in those and potentially other locations in the near future. Additional educational materials are also being developed in response to the strong grower interest in vegetable crop quality assessment and management. We look forward to continued research and outreach in this area.

Project Contributions

This project has contributed to current knowledge and benefits Ohio producers in several ways:

- °Brix data was collected on many crops, both leafy and fruit, throughout the growing season to contribute to the formation of a novel Ohio crop quality database.
- Ohio growers were given necessary tools and training to carry out on-farm crop quality assessment, which will allow future farm management decisions to be connected to quality outcomes.
- Information on quality data and assessment techniques were disseminated to the Ohio grower community to assist producers in better understanding and achieving crop quality goals.

Project findings have been/and or will be presented and discussed ...

- During annual field days, farm tours, and stakeholder meetings,
- During annual conferences and meetings (e.g., as organized by OEFFA, GLVWG and others),
- During workshops and training programs hosted by OSUE,
- In project reports available at our website,
- In Extension handouts, publications, and video segments, and
- On the OSU Vegetable Production System Laboratory facebook page and website.