

Consumers expect superior flavor, texture, appearance, culinary quality and nutritional value from produce grown organically, especially when purchased fresh from direct market operations. Sensory evaluation often receives low priority when conducting vegetable variety trials. Taste testing can help identify cultivars with superior flavor, texture and culinary performance, which are important to consumers of fresh market organic produce. In addition to agronomic field evaluations, growers need sensory data to inform them on consumer preferences. Criteria to evaluate may include phenotype (i.e. shape, size, color), flavor, sweetness, texture, acidity, astringency, bitterness, culinary performance and many others depending on the species. Traditional approaches to taste testing using panels of tasters in a laboratory setting are generally time consuming, expensive, and require large numbers of evaluators. The objective of this work is to explore alternate approaches to obtaining useful data on flavor and taste. Two case studies are presented.

Example 1: Northern Organic Vegetable Improvement Collaborative (NOVIC) is an OREI-funded collaborative project among Oregon State University, University of Wisconsin, Cornell University, Organic Seed Alliance, USDA-ARS and over 30 organic farmers in Oregon, Washington, Wisconsin and New York. The original NOVIC was funded 2009-2013; NOVIC II is currently funded 2014-2018. NOVIC conducts extensive variety and breeding line trials of vegetable crops with the goal of finding those well adapted to organic farming systems. One goal for the Oregon group was to find an early Italian sweet pepper that performed well on organic farms and had superior flavor to replace the standard hybrid 'Gypsy'.

Example 2: Integrated Soil and Crop Management for Organic Potato Production (Ospud) was a two-year Western SARE-funded project (2005-2007) focused on improving potato quality and profitability through a participatory learning process and on-farm, farmer-directed research. Ospud farmer collaborators grew a variety of potatoes including reds, yellows and fingerlings. Collaborators articulated several goals for the project, including identifying: (1) cultivars with late blight resistance; (2) high yielding yellow cultivars to replace 'Yukon Gold' and (3) cultivars attractive in appearance and flavor for the fresh market.

Materials and Methods

Evaluation 1: In October 2010 and 2011, in conjunction with a NOVIC sweet pepper trial, a sensory evaluation of nine commercially available cultivars was conducted. Individuals evaluated overall appearance, color, flavor, sweetness, texture and overall liking of raw, sautéed and roasted preparations for each entry. A representative fruit for each variety was displayed raw (whole and halved). Pepper samples for tasting were displayed on plain white dinner plates and labeled with a random, numeric code (Fig. 1). Raw samples were cut evenly into 1/8" strips. Sautéed samples were cut in the same manner then sautéed in a stainless steel pan over medium-high heat with a blended oil (70% canola/30% olive oil) for 5 minutes and sprinkled with sea salt after removed from heat. One tablespoon oil and 1/4 teaspoon salt for every one cup of peppers. Roasted peppers were roasted whole at 215°C for 30 minutes, then peeled, seeded and cut into 1/2" pieces. Evaluators using a 1-9 Hedonic scale (1=Dislike extremely; 9=Like extremely). A comment box was included for additional remarks.

Evaluation 2: In November 2007, a sensory evaluation was conducted across ten commercially available potato cultivars and one breeding line. A representative tuber for each variety was displayed as raw (whole and halved) and cooked (roasted) on a plain white plate and labeled with a random, numeric code. Potatoes were cut evenly into 1" cubes then tossed in extra virgin olive oil and sea salt. One tablespoon oil and one teaspoon salt for every two cups of potato cubes. Potatoes were roasted at 215°C F for 20 minutes. Individuals evaluated color, texture, flavor and overall liking on a 1-9 Hedonic scale (1=Dislike extremely; 9=Like extremely). A comment box was included for additional remarks.

Evaluation 3: In October 2006, a sensory evaluation was conducted across 17 varieties of commercially available potato cultivars and breeding lines. Appearance was evaluated on a 1-9 Hedonic scale (1=Dislike extremely; 9=Like extremely). A representative tuber for each variety was displayed whole and halved on a plain white dinner plate and labeled with a random, numeric code.

Individuals recruited for the pepper evaluations were collaborating farmers and Portland restaurant chefs who frequently bought produce from local farmers' markets. Individuals that participated in the potato evaluations included farmers, Slow Food members, food writers, produce buyers, potato processors and researchers.

Results

NOVIC Example: 'Gatherer's Gold', 'Joelene's Rustic Italian' and 'Stocky Red Roaster' were preferred to 'Gypsy' for overall liking (Fig. 2). These three open-pollinated varieties also outperformed the standard hybrid in the field which had become increasingly difficult to secure a quality seed source. Agronomically, 'Gypsy' was a top performer due to high yield in number of fruits and very low culls due to an above average plant architecture and leaf canopy preventing sun scald on fruits. Comments included on evaluation ballots indicated that evaluators preferred the appearance of 'Stocky Red Roaster' with its rounded shoulders for easier processing in the kitchen (Fig. 5).

Ospud Example: Evaluators rated 'Jacqueline Lee' and 'Ama Rosa' comparable with 'Yukon Gold' for overall liking in roasted potatoes and overall appearance in raw potatoes (Fig. 6 and 7). 'Jacqueline Lee' has a similar appearance to 'Yukon Gold' (Fig. 4), was higher yielding overall than 'Yukon Gold' and also exhibited late blight resistance. Although 'Jacqueline Lee' and 'Yukon Gold' were indistinguishable in sensory evaluations, according to one of our farmer collaborators, several chef customers preferred 'Jacqueline Lee'.

Collaborating farmers grew 'Ama Rosa' in a variety trial which yielded adequately. In sensory evaluations, it was very popular due to its unique, striking appearance and flavor (Fig. 3). Its appearance is most comparable to 'All Red' which it outperformed in every category in the field and in sensory evaluations.

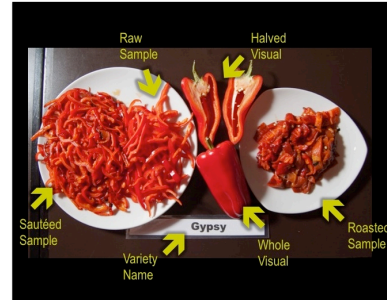


Fig. 1. Example of a pepper sample display. During evaluations a numeric code is used rather than the cultivar name.

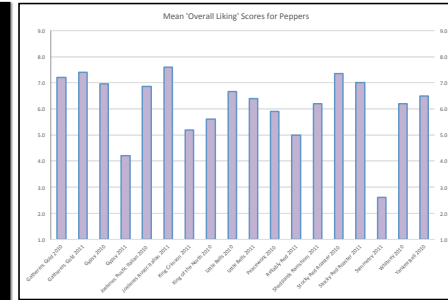


Fig. 2. Mean Overall Liking scores for peppers in 2010 and 2011



Fig. 3. 'Ama Rosa' potato

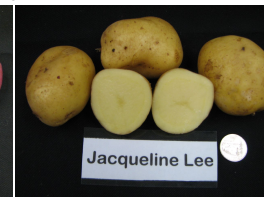


Fig. 4. 'Jacqueline Lee' potato



Fig. 5. Pepper evaluators preferred the appearance of fruits with rounded shoulders like those of 'Stocky Red Roaster' (L)

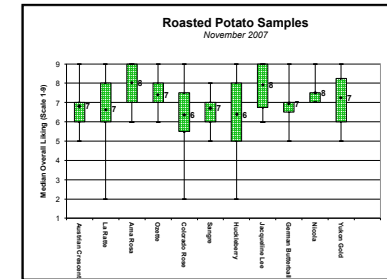


Fig. 6. Median Overall Liking scores for roasted potato

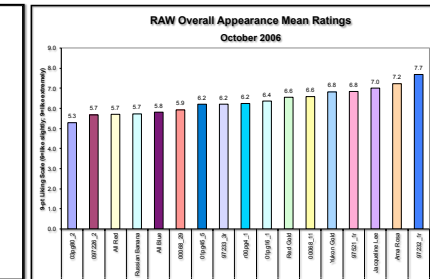


Fig. 7. Mean Overall Appearance scores for raw potato

Summary

NOVIC Example - The 'Stocky Red Roaster' pepper bred by collaborating breeder Frank Morton of Wild Garden Seed was highly ranked by farmers and chefs for appearance and flavor. In conjunction with its outstanding field performance, seed sales for this previously little known sweet roasting pepper have increased 400% for the independent organic seed company and is now offered by several national seed companies.

Ospud Example - The goals described by our collaborating farmers were met. 'Jacqueline Lee', a waxy yellow potato, was identified to have not only late blight resistance and comparable yields but also very good flavor which makes it a good substitute for 'Yukon Gold'. Additionally, 'Ama Rosa', a red fingerling breeding line that has since been released, was also identified to have superior flavor and appearance for the fresh market. Many growers have incorporated these cultivars into their potato plan.

Overall, sensory evaluations provided plant breeders, farmers and researchers with desired, but not widely available, qualitative and quantitative data on sensory preferences in vegetable varieties, some of which they were not previously aware of. Farmers, retailers, and chefs at these events provide valuable feedback on appearance and flavor. Farmers and chefs began to grow and cook with new varieties that were shown to perform well in the field and on the palate.