

Participatory Evaluation of Vegetable Flavor and Implications for Developing Varieties for Organic Systems

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Abstract

The growing interest in high quality local foods presents an opportunity for local farmers, and a need to focus on flavor and fresh-market quality in addition to agronomic performance on diversified farms. Often farmers, gardeners and chefs choose to use heirloom vegetable varieties known for their flavor because they have found many modern varieties disappointing in terms of quality. With the industrialization of the food system and consolidation of seed companies, flavor has often not been a priority because of the importance of traits such as shelf life and tolerance to shipping in long-distance food systems. However, in recent years we have seen renewed interest in breeding for organic and local food systems, and in prioritizing flavor in varieties developed for these systems. Flavor is a key trait for direct-market growers, and a trait that is difficult to measure. Trained sensory panels are effective at quantifying different components of flavor, but are expensive and may not provide the most relevant information to farmers or plant breeders. Many plant breeding programs rely exclusively on tasting done by the breeder or their crew, which is effective as a rapid screening method but not easily communicated with others such as farmers, chefs and consumers. There has also been an increase in the number of independent regional seed companies focused on organic systems, which provides a ready outlet for successful varieties developed for these systems.

Methods

We worked with farmers, gardeners, plant breeders and farm-to-table chefs to evaluate selections from heirlooms and new varieties for diversified direct-market farms where flavor and adaptation to organic/low input agriculture are of primary importance. This collaboration presents a unique opportunity to focus on vegetable variety characteristics important to local food systems. Data collected was prioritized by direct market growers and participating seed companies. Farmers used a simple score sheet to rate varieties and describe their marketability and flavor. Based on farmer priorities, we trialed beets, carrots, cucumber, kale, greens, melons, onions, peppers (sweet and hot), winter squash, and tomatoes (high tunnel and field grown).

Varieties were selected for inclusion in the trial based on recommendations from plant breeders at UW-Madison and other universities, seed companies specializing in varieties for market growers, and farmers in the region. The trials take place on organically managed land at the West Madison Agricultural Research Station and on participating farms, using a mother-baby trial design. We collect agronomic performance data including yield, marketability, disease resistance and stress tolerance (heat and cold) at the research station, and farmers contribute qualitative evaluations for a subset of the trials that they plant on their farm. We also include culinary corn and potatoes in sensory evaluations.

We used three different evaluations: one by the field crew, who had undergone a brief training on tasting methods, one by local chefs, and one by members of the public who attended field days. Tasters were asked to rate each variety for color, texture, sweetness, acidity, bitterness, saltiness and intensity of flavor on a scale of 1-5, with 1 being weakest and 5 being strongest. This data was then analyzed using a principle component analysis to examine similarities and differences among varieties based on their flavor profile. Farmers also use a simple score sheet to rate varieties and describe their marketability and flavor.

Results and Conclusion

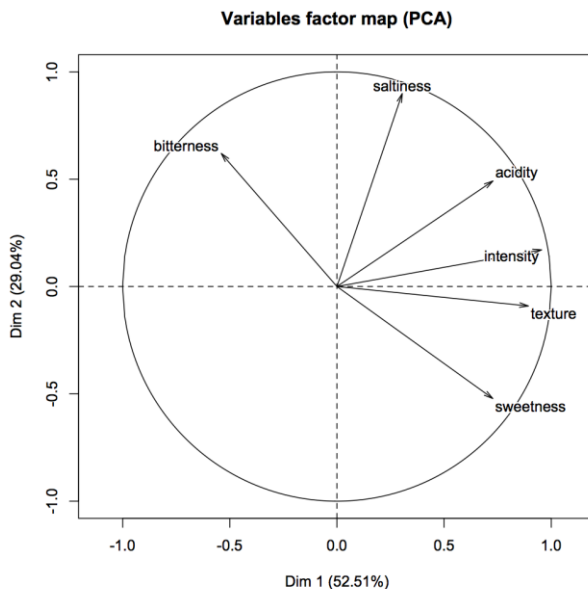
Results from crew tomato flavor evaluation are shown in Figures 1 and 2 in the Appendix. Characteristics are shown in figure 1 and varieties in figure 2. For example, varieties with high scores for intensity of flavor and good texture are found towards the right side, varieties with higher scores for acidity are found in the upper right and those with higher scores for sweetness are found in the lower right. Bland varieties are found more towards the lower left.

Varieties that scored well for intensity or particular flavors, or that were well balanced were given to the chefs for evaluation. Chefs then evaluated varieties based on culinary characteristics and whether they would buy them for their restaurants. Colors in Figure 2 correspond to preference of tasters and preference data not used to construct the principle component axes. The ratings are ranked Blue (preferred) > Green > Yellow > Red (disliked).

Production results, farmer evaluations and chef and crew sensory evaluations are available online at <http://dawson.horticulture.wisc.edu/chef-farmer-plant-breeder-collaboration/>

Appendix

Figure 1: Principle component analysis (PCA) of tasting data:
Relationship of different flavor components



B)

Figure 2: Principle component analysis (PCA) of tasting data:
Relationship of different tomato varieties based on scores for the different flavor components

