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# CONVENTIONALLY OR ORGANICALLY GROWN PEACHES: WHAT A FARMERS MARKET TASTE TEST TELLS US

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## ABSTRACT

Debate surrounds the notion that people can taste a difference between conventionally and organically grown produce. Conventionally and organically grown peaches were sampled in a blind tasting by patrons of a farmers market. The majority of patrons stated they could taste a difference between the conventional and organic peach samples, and of those that tasted a difference, approximately twice as many patrons were able to correctly identify the organic sample over the conventional sample. Future research should study differences in organoleptic quality between conventionally and organically grown produce and how these differences might impact future marketability of organic produce.

## INTRODUCTION

Farmers markets provide patrons an alternative shopping experience where customers can purchase fresh, high quality produce, communicate directly with growers, and socialize with other community members. A survey of shoppers who visited 16 farmers markets throughout Utah and Nevada (n=1488) found the top three produce attributes sought by shoppers were freshness, taste, and quality (Curtis and Gumirakiaz, 2013). These attributes were followed by value, appearance, local production, variety availability, pricing, organic production, familiarity with farmers, and sourcing of specialty items. Utah State University Extension runs a popular farmers market adjacent to the Utah Agriculture Experiment Station (UAES) Kaysville Research Farm. This farm has both conventional and organic fruit tree production plots which provides a unique opportunity to utilize site-grown fruit to conduct blind tastings with farmers' market patrons.

Debate surrounds the notion that people can taste a difference between conventionally and organically grown produce; however, consumers often report that they buy organic produce because it is more nutritious and better tasting than conventional produce (Reganold et al., 2010). Upon review of multiple studies, Theuer (2006) concluded that most studies find no consistent or significant differences between taste and organoleptic quality of conventional and organic produce. A small number of more in-depth studies have shown higher organoleptic quality in organic produce including apples, strawberries, tomatoes, and wine grapes. This may be explained by higher levels of antioxidants and lower average crop yields of organic produce. Benbrook (2005) concluded that environmental factors can impose stress on plants which then triggers a plant's defense mechanisms. Operation of plant defense mechanisms includes the synthesis of antioxidants. Benbrook attributed higher levels of antioxidants in organically grown produce to the scenario that plants not sprayed with pesticides tend to bulk-up natural defenses through increased production of phenols and polyphenols to defend against pest injury. Another study published in the *British Journal of Nutrition* reviewed over 340 peer-reviewed publications and concluded that organic crops had 18 to 69 percent higher concentrations of antioxidant compounds over conventional crops (Baranski et al., 2014). This finding is significant from a human nutrition perspective because higher concentrations of antioxidants amount to the equivalent of 1 to 2 extra portions of fruits and vegetables a day without additional caloric intake. Theuer (2006) concluded that the distinctive flavor of food is often due to higher levels of antioxidants or plant secondary metabolites.

In a study that researched fruit quality of conventional and organic agroecosystems in California grown strawberries, Reganold et al. (2010) found that strawberries produced on organic farms had a longer shelf life and higher levels of antioxidants and phenolic compounds. In the same study, a sensory panel found one variety of organic strawberries to be sweeter and have better flavor than conventionally grown strawberries. Theuer (2006) concluded that the taste of organic food was positively impacted due to lower levels of nitrate and lower crop yields. Organic produce was found to have a better shelf life than conventionally grown produce. In most organic crops, the phenomenon of dilution effect highlights nutritional quality over biomass quantity and describes an inverse relationship between nitrogen applications and phenolic compound concentrations (Benbrook, 2005). In accordance with the dilution effect, crops with ready access to nitrogen grow quickly and large but tend to be lower in vitamins, minerals and antioxidant levels as compared to plants growing under more stressful conditions that concentrate vitamin, mineral, and antioxidant levels in less biomass.

Curtis et al. (2014) found that farmers market patrons in Utah were willing to pay more for conventional products grown in Utah over organic products of unknown origin. They also found that demographic is important; organic produce (of unknown origin) customers tend to be younger, have a higher income, share strong food safety and/or diet and health concerns, be less supportive of local agriculture, and place high importance on purchasing products with low environmental impact. However, this customer demographic does not necessarily reflect the majority of Utah farmers market patrons. This is important to note because one should be cautious to not over-generalize farmers markets customer demographics since demographics vary among countries, states, cities, and neighborhoods.

Robbins (2003) noted that shoppers at farmers markets can be used to provide ratings for sensory attributes of food such as look, feel, taste, or smell of a particular treatment. We conducted a taste test of conventionally and organically grown peaches at a farmers' market. Our hypothesis was that market patrons would not be able to taste a difference between the peaches.

## MATERIALS AND METHODS

In 2013, samples of conventionally and organically grown peaches were sampled in a blind tasting by patrons of the Kaysville farmers market. At the UAES Kaysville farm, conventional and organic research blocks of the 'Starfire' peach variety were grown adjacent to each other in the same soil type and were subjected to the same climatic conditions. Peaches selected for the blind tasting were similar in maturity and appearance and were harvested just prior to the market, cut into slices, and labeled "A" or "B." Unbeknownst to the taste testers, peaches labeled "A" were grown organically and peaches labeled "B" were grown conventionally. Approximately ten organic peaches and ten conventional peaches were sampled over a two-hour period. Taste test participants were asked to taste both "A" and "B" labeled peach samples and fill out a brief paper survey (n=57) to determine if patrons could correctly identify which sample was organic and which sample was conventional (Table 1). The survey also asked the patrons about their purchasing preferences and feelings about using pesticides in their backyard gardens.

**Table 1.** Survey questions.

| Number | Question | Possible Responses |
|---|---|---|
| 1 | Which peach is organically grown? | A.; B.; *or* I am not able to tell a difference. |
| 2 | Do you prefer to purchase organically grown produce over conventionally grown produce when grocery shopping? | Yes.; No.; *or* Sometimes. |
| 4 | Could you tell the difference between the organically grown peaches and the conventionally grown peaches? | A.; B.; *or* Not Sure. |
| 6 | If you answered Yes to question #4, what taste quality caused you to recognize a difference between the organically grown peach and the conventionally grown peach? | Please write in answer. |
| 9 | Are you interested in reducing or eliminating pesticide use in your fruit/vegetable garden? | Yes.; No.; *or* I never use pesticides in my garden. |

## RESULTS AND DISCUSSION

Taste test participants were asked if they could determine which sample was grown organically. Participant responses are presented in Table 2. When patrons were asked if they could determine which sample was grown organically, 37 respondents (65%) chose either 'Sample A' or 'Sample B' while 20 respondents (35%) stated they found no difference in taste between the two samples. Of the 37 participants who selected between 'Sample A' and 'Sample B'; approximately twice as many respondents correctly identified 'Sample A' as organic (25/37=68%) as compared to respondents who picked 'Sample B' as organic (12/37=32%). Although conventional and organic peaches of similar appearance and maturity were selected for the blind tasting, researchers noted as they sliced up the peaches for the tasting, that some of the organic peaches appeared to be slightly riper than the conventional peaches which may have contributed to a slight taste difference between the two samples.

**Table 2.** Participant responses to question #1 (n=57).

| Q #1: Which peach is organically grown? | Number of responses | Percentage of responses |
|---|---|---|
| Answer: Sample A is organic (actually is organic) | 25 | 44% |
| Answer: Sample B is organic | 12 | 21% |
| Answer: No difference in taste | 20 | 35% |

It was not the intent of the researchers to investigate a statistically significant difference in taste between the conventionally and organically grown peaches, but rather to survey patron perceptions and preferences in regard to conventional and organic produce. In fact, our hypothesis was disproven since most respondents did actually chose between 'Sample A' and 'Sample B'. We had predicted that most patrons would respond that they could not tell a difference in taste between the two samples. However, it is interesting to note that if there was no organoleptic difference between 'Sample A' and 'Sample B', the odds of correctly choosing the organically grown sample would be 50%. Patrons were nearly twice as apt to choose either 'Sample A' or 'Sample B' rather than choose 'no difference in taste' and of those that chose between the two samples, they were twice as likely to identify 'Sample A' as organic. The authors acknowledge the small sample size of taste testers (n=57) in this study and recognize it is plausible responses would be closer to a 50/50 split if the sample size were increased.

If we ignore those who were not able to tell a difference, there were 25 correct responses and 12 incorrect responses. A binomial test can be used to test this proportion against a 50/50 guess. In this case, the p-value of 0.0243 is less than 0.05 suggesting that we are unlikely to see these results if people were just guessing or had no basis for their answer. The odds ratio of 2.08 (25/12) is > 2, suggesting a medium-sized effect.

When asked (Q #2) “Do you prefer to purchase organically grown produce?”, 30% of survey participants responded that they preferred to purchase organically grown produce, 40% responded that they sometimes did, and 30% indicated that they do not prefer to purchase organically grown produce.

When asked (Q #4) “Could you tell the difference between the organically grown peaches and the conventionally grown peaches?”, 34% of survey participants responded ‘Yes’, 20% responded ‘No’, and 46% responded ‘Not Sure.’

Of the respondents who answered ‘Yes’, 79% correctly identified ‘Sample A’ as the organic peach sample. Of the respondents who answered ‘No’, 18% correctly identified ‘Sample A’ as the organic peach sample, and of the respondents who answered ‘Not sure,’ 31% correctly identified ‘Sample A’ as the organic peach sample. It is interesting that respondents who stated they could tell a difference were most successful at identifying the correct organic peach sample (Sample A). Participant responses to question 4 are presented in Table 3.

**Table 3.** Participant responses to question #4 (n=30).

| Q #2: Could you tell a difference between organically grown and conventionally grown peaches? | Number of responses that correctly identified organic sample | Number of responses that incorrectly identified organic sample |
|---|---|---|
| Yes | 15 | 4 |
| No | 2 | 9 |

Using a chi-square test of association, the p-value of 0.00121 is less than 0.01, suggesting there is an association between the responses in Table 2. The phi-coefficient of 0.59 indicates a strong association.

Respondents who stated they could tell a difference between ‘Sample A’ and ‘Sample B’ gave the following taste descriptors (Table 4) when answering question #6, “What taste quality caused you to recognize a difference between the organically grown peach and the conventionally grown peach?”

**Table 4.** Participant responses to question #6 (n=19).

| Number of Comments | Taste Descriptors |
|---|---|
| 11 | Sweetness |
| 3 | More flavorful and ripe |
| 2 | Texture |
| 2 | Sour, bitter, more tart |
| 1 | Tasted better, more nutritious, skin appearance, juicer |

Most respondents who provided taste descriptors to question #6 assumed the “sweeter” “juicer” and “tasty” sample was the organically grown peach. Theuer (2006) referred to the “halo effect” in which consumers sometimes increase acceptability of food if they have a preconceived expectation that either organic or conventional food is of higher quality and better taste.

When asked (question #9), “Are you interested in reducing or eliminating pesticide use in your fruit/vegetable garden?”, 62% of survey respondents said ‘Yes,’ 15% said ‘No,’ and 23% responded ‘I never use pesticides in my gardening.’

These findings mirror a larger survey conducted in 2012 and 2013 at the Salt Lake Tribune Home and Garden show (n=732) in Salt Lake City. Findings from that study found that although most respondents used pesticides in their gardens, a large majority (over 70%) were interested in learning about ways to reduce their pesticide use (Wagner and Kuhns, 2013). It is interesting to note that the surveyed participants in that study were home and garden show attendees, not farmers market patrons.

Responses from the participants who answered ‘Yes’ to question #9 showed a fairly even divide of replies to question # 2, “Do you prefer to purchase organically grown produce when shopping?” 30% of survey participants responded ‘Yes,’ 37% responded ‘No,’ and 30% responded ‘Sometimes.’

Raab and Grobe (2005) surveyed Oregonian food shoppers and found customers who are more environmentally conscious “were significantly more likely to purchase organic food frequently.” Curtis & Gumirakiza (2013) found that on average Nevada and Utah farmers market patrons stated they were ‘unsure’ or ‘agreed’ with the statement “I buy products with low environmental impact”. The same respondents ‘agreed’ or ‘strongly agreed’ that their purchasing decisions were influenced by “concern about food safety, concern for diet and health reasons, concern over food origin, desire to support local farmers and feelings of importance to preserve agriculture open space.”

Responses from the participants who answered ‘No’ to question #9 also showed a fairly even divide of replies to question # 2, “Do you prefer to purchase organically grown produce when shopping?” 26% of survey participants responded ‘Yes,’ 37% responded ‘No,’ and 37% responded ‘Sometimes.’

These findings reflect the Nevada and Utah farmers market patron survey results that although environmental impact of food production was of concern, it was of lower concern than other attitudes and habits of patrons such as concerns over food safety and diet and health concerns.

## CONCLUSION

In a blind taste test, the majority of samplers stated they could taste a difference between the conventional and organic peach sample. Of those who tasted a difference, approximately twice as many samplers were able to correctly identify the organic sample over the conventional sample. Results from this survey mirrored two larger surveys, one of Nevada and Utah farmers market customer priorities and the other of pesticide use preferences of attendees at a home and garden show in Salt Lake City, Utah.

It would be interesting to repeat this study to include a larger sample size and minimize variables such as ripeness differences between samples. Furthermore, more elegantly designed research is needed to comparatively study differences in organoleptic quality between conventionally and organically grown produce. It is somewhat naïve to dismiss the possibility that variances in organoleptic qualities might exist between conventional and organic systems since management practices vary and hence plant responses to local stresses, such as pest pressure, vary as well. Finally, continued research studying antioxidant levels between conventionally and organically grown produce should continue to be thoroughly researched and refined due to a significant human nutritional impact as well as future marketability of organic produce to customers. Extension professionals should continue to collaborate with agricultural and nutritional researchers and utilize public forums, such as farmers markets, to conduct relevant research.

## LITERATURE CITED

**Baranski, M., Srednicka-Tober, D., Volakakis, N., Seal, C., Sanderson, R., Stewart, G.B., Benbrook, C., Biavati, B., Markellou, E., Giotis, C., Gromadzka-Ostrowska, J., Rembialkowska, E., Skwarlo-Sonta, K., Tahvonen, R., Janovska, D., Niggli, R., Nicot, P., and Leifert, C. (2014)**. Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: a systematic literature review and meta-analyses. British Journal of Nutrition, 112(5): 794-811. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4141693/

**Benbrook, C.M. (2005).** Elevating antioxidant levels in food through organic farming and food processing. The Organic Center, Foster, R.I.

**Curtis, K.R., and Gumirakiza, J.D. (2013).** Farmers' market customer priorities. USU Extension. Available at: https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=2018&context=extension_curall

**Curtis, K.R., Gumirakiza, J.D., and Bosworth, R. (2014).** Consumer preferences and willingness to pay for multi-labeled produce at farmers' markets. Journal of Food Distribution Research, 45(1). Available at: https://www.fdrsinc.org/wp-content/uploads/2014/09/JFDR-45-1-3-Curtis.pdf

**Raab, C. and Grobe, D. (2005).** Consumer knowledge and perceptions about organic food. Journal of Extension, 43(4). Available at: https://joe.org/joe/2005august/rb3.php

**Reganold, J.P., Andrews, P.K., Reeve, J.R., Carpenter-Boggs, L., Schadt, C.W., Allredge, J.R., Ross, C.F., Davies, N. M., and Zhou, J. (2010).** Fruit and soil quality of organic and conventional strawberry agroecosystems. PLOS One 5(9). Available at: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0012346

**Robbins, J. (2003).** A simple method to determine consumer preference. Journal of Extension, 41(5). Available at: https://www.joe.org/joe/2003october/tt4.php

**Theuer, R.C. (2006).** Do organic fruits and vegetables taste better than conventional fruits and vegetables? The Organic Center. Available at: https://www.organic-center.org/reportfiles/tastereport.pdg

**Wagner, K. and Kuhns, M. (2013).** Meeting horticulture clientele interests in an urban setting: A needs assessment for reduced pesticide and pollinator education in the greater Salt Lake area. Journal of the National Association of County Agricultural Agents, 6(1). Available at: https://www.nacaa.com/journal/index.php?jid=221


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