# Sensory Comparison of Ciders Produced from Machine- and Hand-harvested 'Brown Snout' Specialty Cider Apple

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## INTRODUCTION

- Machine harvest of 'Brown Snout' specialty cider apple (*Malus × domestica*) has been demonstrated as providing yield and juice quality characteristics similar to hand harvest (Alexander et al., 2016).
- In this study, the sensory perception (color, aroma, flavor, mouthfeel, taste, and aftertaste) of ciders produced from machine-harvested and hand-harvested fruit were compared utilizing a trained panel and electronic tongue (e-tongue), across two seasons.

## MATERIALS AND METHODS

**Harvest**: In 2014 and 2015, a trellis planting of 'Brown Snout' was machine-harvested (over-the-row small fruit, Model OR0012, Littau Harvester, Lynden, WA; Fig. 1) and hand-harvested (Fig. 2).

Figure 1. Machine harvest.

Figure 2. Hand harvest.

- Three boxes of fruit (18 kg per box) from each plot (4 plots per harvest method) were randomly selected for 0, 2, and 4 weeks ambient storage treatment (14 °C). Post-storage, the respective boxes were sorted, marketable fruit milled and pressed, and juice was frozen (0 °C).

**Fermentation:** Juice was fermented with Lallemand DV-10 (*Saccharomyces cerevisiae var. bayanus*), sulfited with potassium metabisulfite, and matured at 13.3 °C for 3 months (Fig. 3).

Figure 3. Cider samples first (left) and last week (right) of fermentation.

**Trained Panel Evaluation:** A panel of seven males and one female, mean age of 38, participated in 10.5 h of sensory training over 7 days. Panelists were trained to recognize sensory attributes (color, aroma, flavor, mouthfeel, taste, and aftertaste) of cider utilizing fresh standards (Fig. 4).

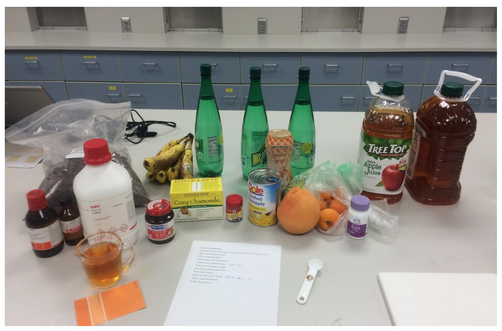

Figure 4. Preparation of fresh standards.


Figure 5. Coded formal samples.

- For formal evaluation, 30 mL of each sample (24 total) was presented at 20 °C in a coded standard glass (Fig. 5). Samples were presented monadically in a randomized, balanced order.

## MATERIALS AND METHODS continued…

**E-Tongue Evaluation:** The α-ASTREE II (Alpha MOS Co., Toulouse, France), with a 48-tray automatic sampler system and seven cross-selective taste sensors (sweetness, sourness, umami, saltiness, bitterness, metallic, and spiciness), was utilized to analyze samples (Fig. 6).

- Six measurements were performed for each of the 24 samples.

## RESULTS AND DISCUSSION

- Trained panelists scored the 2014 samples sourced from machine-harvested fruit as: darker (color), earthier, spicier, and woodier (aromatic and flavor), more astringent, carbonated, and hot (mouthfeel), and more bitter and sour (taste) than the 2014 hand-harvested samples.

  Panelists made no distinctions among the 2015 samples.

- Despite a low discrimination index (DI) for the 2015 samples (DI = -0.5), the e-tongue results were consistent across years with a distinct separation of machine- and hand-harvested ciders. Response to the metallic sensor was more associated with the machine-harvested samples, and response to the bitter, spicy, and umami sensors associated with the hand-harvested samples (Fig. 6).

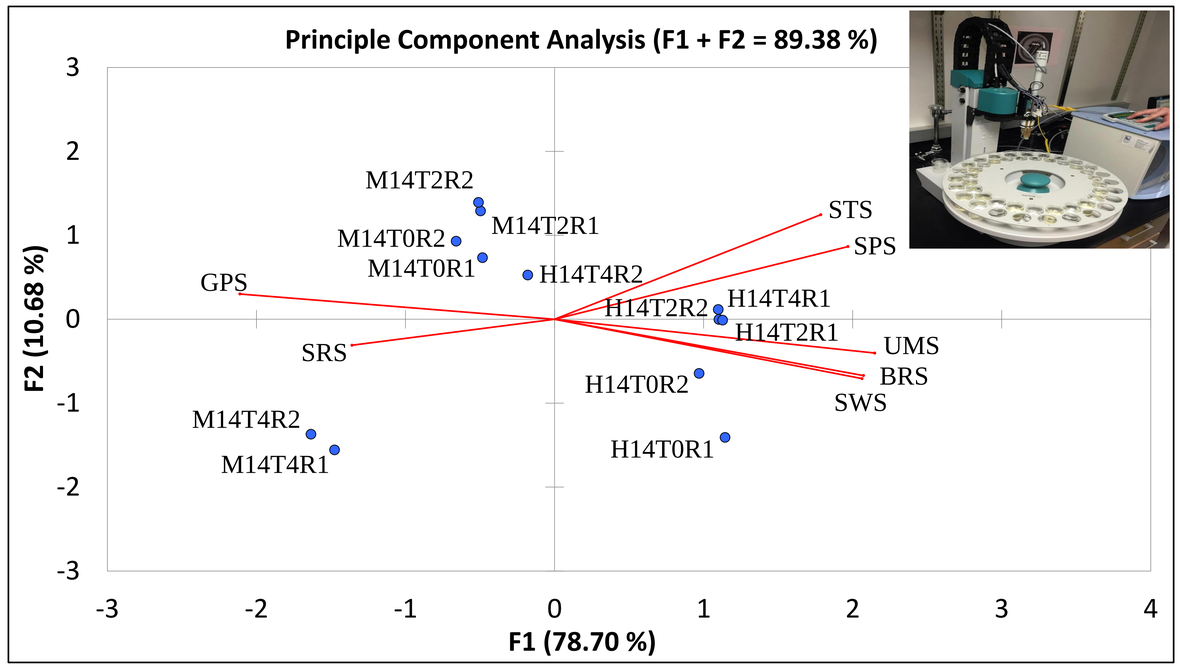


Figure 6. PCA biplot showing e-tongue (top right) separation of 2014 samples (DI = 95).

## CONCLUSIONS

- Panelists' profiling of 'Brown Snout' cider aligned with expert profiling (Zimmerman et al., 2016).
- Contrasting results between the trained panel and e-tongue, the small spread of mean differences, and the significant ($P < 0.0001$) panelist effect indicate a need for further sensory evaluation.
- Future evaluations should include a minimum of three seasons of samples, incorporate a more rigorous training of panelists (> 10.5 h), and use the established standards at lower intensities.

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## LITERATURE CITED

Alexander, T.R., J. King, E. Scheenstra, and C.A. Miles. 2016. Yield, fruit damage, yield loss and juice quality characteristics of machine and hand harvested 'Brown Snout' specialty cider apple stored at ambient conditions in northwest Washington. HortTechnology 26(5):614-619.