Sensory Characteristics and Consumer Acceptance of Mechanically (Canopy-Contact Harvester) Harvested California Black Ripe Olives

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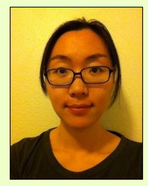


INTRODUCTION

Mechanical harvesting must be developed for successful table olive production in California. Most table olives are hand-picked—a labor intensive and expensive practice which could render table olive production unprofitable. For commercial usage of the technique, the efficiency of harvest removal and collection should be ensured. However and more importantly, the final processed fruit quality needs to be guaranteed first. The objective of this research was to evaluate the sensory quality and acceptability of Californian black ripe olives harvested with a canopy contact harvester (Fig.1) and to re-confirm the findings of Ferguson et al. (2010) from harvest year 2008-09.

METHODS

Experiment 1. Generic Descriptive Analysis

- Panel: 8 trained panelists
- Training sessions
  : Developed 34 terms (Table 2) to describe the 10 olives (Fig. 1, Table 1).
- Actual Evaluation: in triplicate
- Serving: 2 whole olives + 1 olive sliced in half; @ room temp (20˚C); with proper cleansers
- Samples were presented in Randomized complete block design (RCBD)
- Scale: A line scale w/ proper labels at either end of the scale

Experiment 2. Consumer Acceptance test

- Subjects: 109 American black olives likers & users aged 18+
- Sample presentation: 11 olives (primer + 10 treatments) in RCBD
- Serving: 2 whole olives; @ room temp (20 ˚C)
- Examined: Overall degree of liking, appearance liking, flavor liking and texture liking + Exit survey (Usage and demographic SAQs)
- Scale: 9-point hedonic scale

Table 2. Descriptors and references for black olives

	Attribute	Reference		Attribute	Reference
SMELL (AROMA)*	Briny/Salty	Olive brine	APPEARANCE	Size	
	Ocean-like	Seaweed		Shape	Ratio of vertical vs. horizontal
	Sugary/ Sweet smell	Honey, Brown sugar		Glossy	
	Fermented/ Vinegar	Sauerkraut, Apple cider vinegar		Surface roughness	
	Sautéed mushroom	Sautéed mushroom		Degree of discoloration	
	Earthy/Musty	Potting soil		Skin brownness	Dark brown Scale
	Metallic/ Canned	Iron tablet		Gradation (Flesh)	
	Green/Grassy	Parsley		Brightness-Grey/Green (Flesh)	Grey/green Scale
	Floral	Chrysanthemum		Brightness-Grey/Brown (Flesh)	Light brown scale
	Painty/ Solvent-like	Correction fluid		Inner roughness	
	Rancid/ Oxidized	Rancid olive oil	TEXTURE/MOUTHFEEL	Firmness	
TASTE/FLAVOR	Overall flavor			Crunchiness	
	Saltiness	NaCl solution		Chewiness	
	Umami	MSG + brine		Juicy/ Moisture release	Pear, peach
	Bitterness	Caffeine solution		Astringency/ Dryness	Green tea
	Sweetness	Sugar solution		Mouthcoating	
	Buttery*	Melted butter	AFTER-TASTE	Flavor Lasting	

*Mixed with olives

MATERIALS

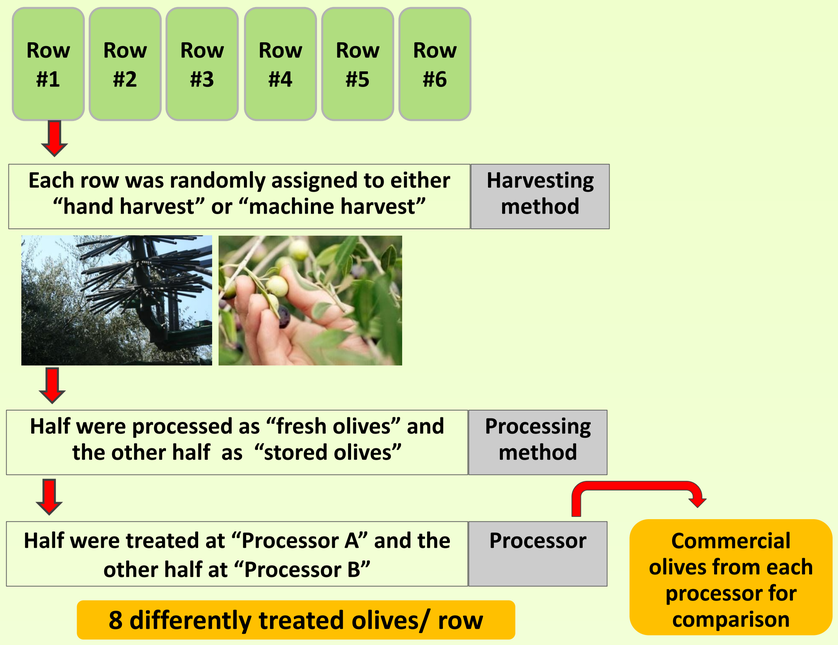


Fig. 1. Diagram explaining how the samples were obtained

Table 1. Californian black olives used in the study[a]

Sample abbreviation	Processor	Commercial[b]	Harvesting method	Processing method
Acomm	A	Commercial	-	
AHandF		-	Hand	Fresh olives
AHandS				Stored olives
AMachF			Machine	Fresh olives
AMachS				Stored olives
Bcomm	B	Commercial	-	
BHandF		-	Hand	Fresh olives
BHandS				Stored olives
BMachF			Machine	Fresh olives
BMachS				Stored olives

[a]Olives from different field rows (#1-6) which went through the same treatment were pooled together
[b]The olives were standard products to be compared against mechanically-harvested ones

RESULTS

Sensory characteristics of black table olives

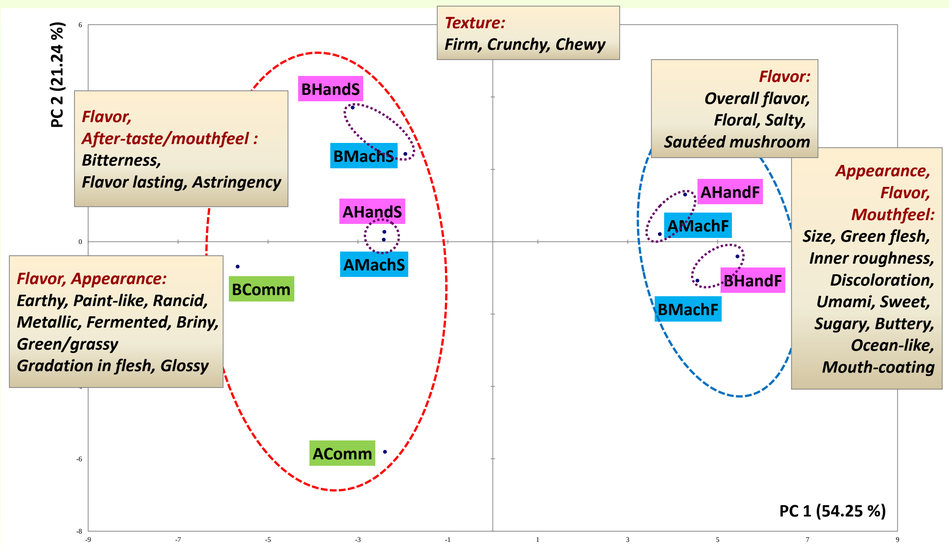
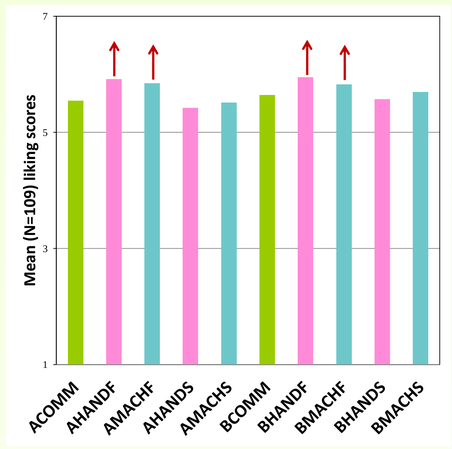


Fig. 2. Sensory map of 10 olives

- The main difference : Processing method (fresh processed vs. non-fresh (i.e. stored and commercial)), along by PC1 (54.3%).
- **Harvesting methods (Hand vs. Machine):** Little difference in sensory characteristics

Consumer acceptability (on average)



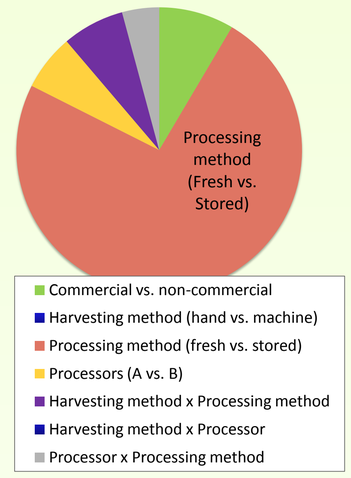


Fig. 3. Mean (N=109) overall liking scores (right); and partitioning of sources of variations for overall liking scores (left)

- "Fresh processed" olives - Liked the MOST.
- Processing method - Main factor differentiating consumer acceptance
- **Harvesting method (H vs. M)**–No significant difference in consumer acceptance

Consumer acceptability (accounting individuals)

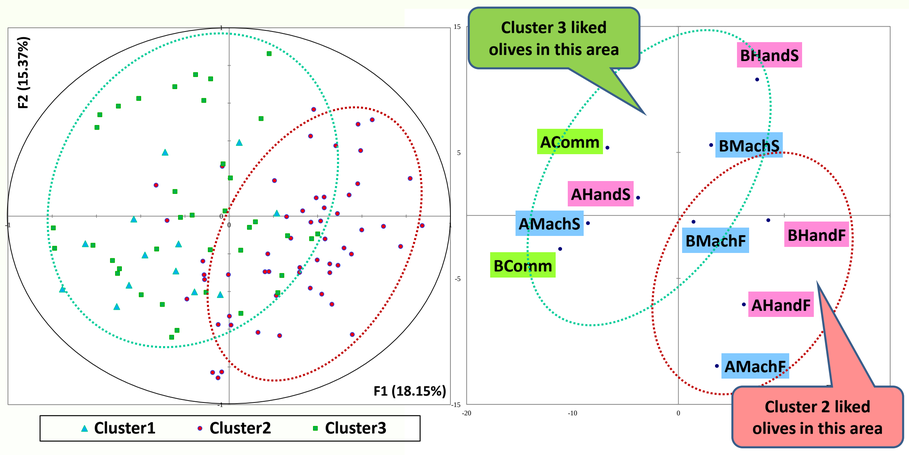


Fig. 4. Internal preference map of 109 individual consumers based on overall degree for liking for 10 and indication of group information (Average-linkage method; C1, N=14; C2, N=57; and C3, N=38) *Each vector (on the left graph) represents individual consumers

- **Three consumer segments** which differ in preference for olives were identified:
  - Cluster 1 (n=14) : Hard to generalize a trend
  - **Cluster 2 (n=57, majority):** Fresh-processed olives
  - Cluster 3 (n=38): Commercial ones and fresh-processed olives from processor B

Identification of drivers of likes and dislikes

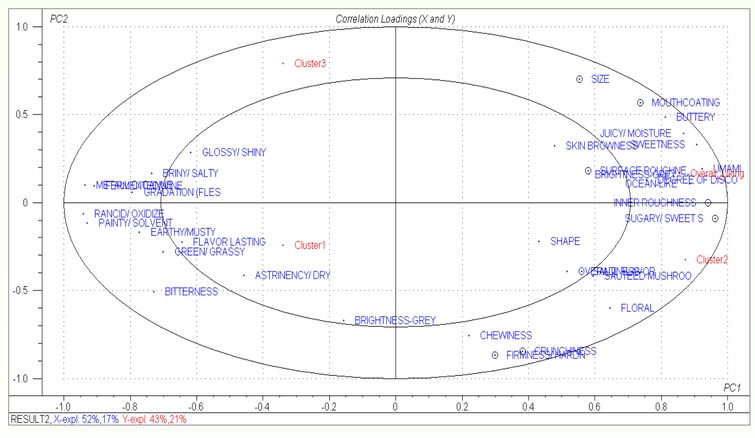


Fig. 5. PLS-Regression of the consumer hedonic ratings onto the sensory attributes from the descriptive analysis

- **Three clusters had different drivers of likes of dislikes**
  - Cluster 1 (N=14): Not well defined in this regression model
  - **Cluster 2 (N=57):** Likes - Buttery, Sweet, Umami, Ocean-like, Sugary, Sautéed mushroom, Floral; Dislikes - Fermented, Green/grassy, Bitter, Earthy/musty, Rancid/oxidized, Metallic, Briny/Salty
  - Cluster 3 (N=38) : Disliked firm, chewy, crunchy textures

CONCLUSION

- **Canopy-contact head mechanical harvesting can produce table olives of similar sensory quality to traditional hand harvesting.**
- **Our research re-confirmed the strong potential for fresh-processed olives in the Californian-olive market.**
- **The findings re-confirmed that canopy contact mechanical harvesting may provide a cheaper alternative to hand harvesting of black table olives.**