

How does seasonal variation affect flavor profile?

A case study with black walnuts.

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INTRODUCTION

Although we often consider the cultivar or variety of a raw ingredient, some processors pay less attention to the effects seasonal variation can have on a product. Research has been done on the flavor of black walnut cultivars, however, the research did not account for seasonal variation, which may change the flavor profile of the black walnut cultivars.

OBJECTIVES

The objective of this study was to determine how seasonal (year of production) variation impacts the flavor profile of agricultural products, specifically black walnuts.

METHODOLOGY

Samples: Seven black walnut cultivars (Table 1) were obtained from a walnut orchard near Joplin, MO in 2011 and 2013. The black walnut samples were kept under frozen conditions ($-26^{\circ}\text{C} \pm 1^{\circ}\text{C}$) until evaluation (less than 6 weeks each year).

Table 1. Black walnut cultivars

Cultivars			
Brown Nugget	Davidson	Emma K	Football
Sparks 127	Sparrow	Tomboy	

Evaluation: The black walnut cultivars were evaluated using descriptive analysis with the same panel in 2011 and 2013. Each sample was evaluated, in triplicate, by a highly trained descriptive panel with more than 2,000 hours of testing experience. Samples were served using a modified Latin Square design and evaluated using a 0-15 point scale with 0.5 increments. Panelists developed a lexicon for the black walnuts and rated the intensity of 22 flavor attributes (Table 2) on the scale. Panelists and flavor attributes were the same both years.

Table 2. Black walnut flavor attributes evaluated

Flavor Attributes			
Black Walnut ID	Caramelized	Musty/Dusty	Astringent
Overall Nutty	Acrid	Musty/Earthy	Bitter
Nutty-Woody	Burnt	Woody	Sour
Nutty-Grain-Like	Floral/Fruity	Overall Sweet	Sweet
Nutty-Buttery	Fruity-dark	Oily	
Brown	Piney	Rancid	

Data analysis: Results from the 2011 growing season were compared to the results from the 2013 growing season (data were averaged across panelist and replication). Data was analyzed with SAS 9.3, using a mixed linear model.

RESULTS & DISCUSSION

Results originally showed that there was an interaction effect between year and cultivar for 11 of the 22 flavor attributes. However, about half of these interactions were caused by a single sample from 2011, that most likely was non-representative of the cultivar due to late harvesting or hulling. This cultivar, Emma K, was removed from the analysis. After removing Emma K, six attributes showed a main effect of year (see Figure 1). These results show that overall, cultivars from 2011 had some stronger flavor notes than cultivars from 2013. There were no main effects of cultivar found.

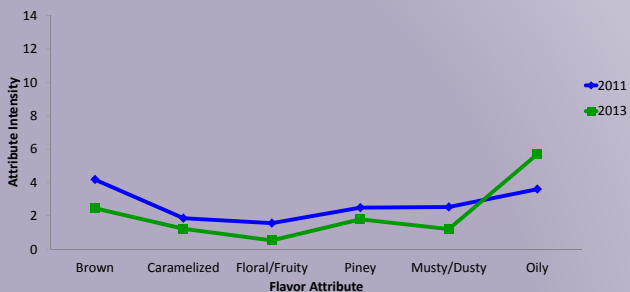


Figure 1. Main effect of year on black walnut flavor attributes (effect is across 6 cultivars)

Four flavor attributes had an interaction effect of year and cultivar (see Figures 2-5). Flavor attributes like black walnut ID and overall nutty, main flavor attributes of black walnuts, varied depending on year and cultivar, further supporting the idea that growing season influences flavor profile.

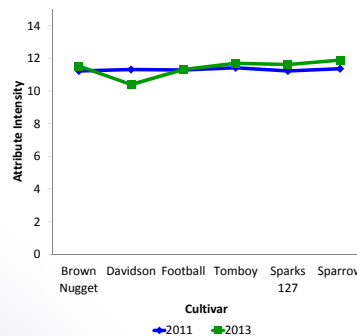


Figure 2. Interaction effect of black walnut flavor and year

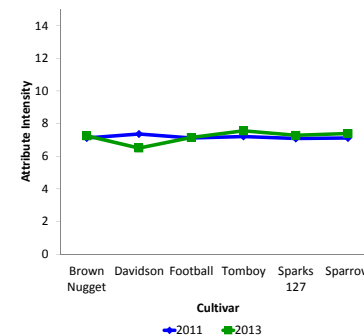


Figure 3. Interaction effect of overall nutty flavor and year

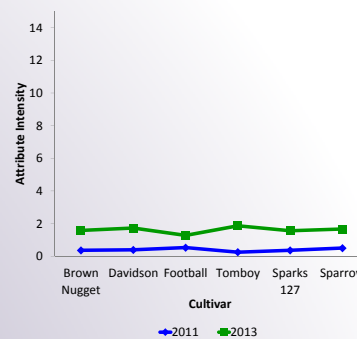


Figure 4. Interaction effect of fruity-dark flavor and year

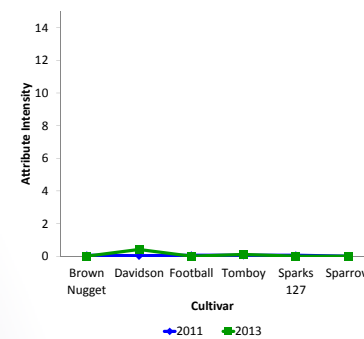


Figure 5. Interaction effect of rancid flavor and year

CONCLUSIONS AND COMMENTS:

- Seasonal variation may influence flavor profile more than cultivar for black walnuts.
- Seasonal variation (in this case growth year) is a critical factor to consider when determining flavor profile of agricultural products and highlights the importance of having representative samples for testing.
- Using samples from only one growing season may not provide adequate information for the long term when testing agricultural products.

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References

Miller A.E. and Chambers D.H. 2013. Descriptive Analysis of Flavor Characteristics for Black Walnut Cultivars. J. Food Sci. 78, S887 – S893.