Sensory characteristics and classification of plain yogurts

Marissa Brown and Delores H Chambers

Sensory Analysis Center, Kansas State University, Manhattan, KS 66506

Research Objectives

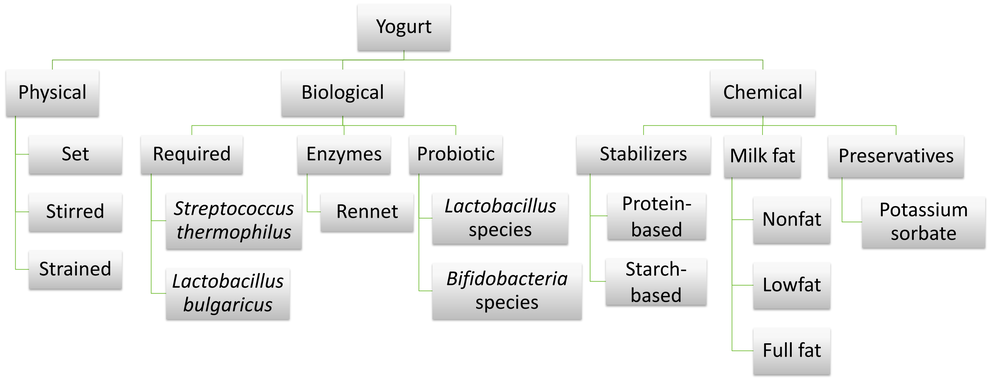
- Develop a more thorough lexicon for plain yogurts that captures the full range of sensory characteristics evident in the category
- By using this language (1) compare the sensory properties of a wide range of commercial plain yogurts and (2) compare three prototypes (one control and two "sustainable" samples) to the commercial plain yogurts

Summary

- This research aimed to determine the sensory characteristics of currently-available plain yogurts and examine how three "more sustainable" prototypes compared
- The prototypes, nonfat set-style yogurts preacidified after pasteurization with lemon juice or citric acid had shorter fermentation times than the control. These reduced fermentation times could result in energy reductions and potentially substantiate a "sustainable" marketing claim, a concept gaining traction among consumers
- Using descriptive sensory analysis, a six-person highly-trained panel scored the intensity of 25 flavor, four texture, three mouthfeel, and three mouthcoating attributes on a 15-point scale
- The samples differed for 19 flavor and all 10 texture attributes. Cluster analysis indicated approximately seven flavor and five texture clusters, resulting in 15 different combinations of flavor and texture

Introduction

- Traditional dairy judging measures quality on a defect-based scorecard system
- Descriptive sensory analysis measures the intensity of specific flavor and texture attributes on an balanced numerical scale
- Previous studies of plain yogurt used ambiguous flavor and texture attributes such as milky, cheesy, sour cream, cream cheese, buttermilk, creamy/creaminess, intensity, and chemical
- Yogurt continuing to increase in popularity
- Recent trends include organic and all-natural
- 70% of consumers (n = 971) claim that "offering products that save energy or natural resources when they are used" is very important to them (Mintel 2010)
- Green qualities more important in food purchases than any other consumer category



Dairy flavors	Off-flavors	Sour flavors	Basic tastes	Textures	Mouthfeels and mouthcoatings
Overall dairy	Animalic*	Sharp/bite*	Sweet	Firmness	Astringent*
Dairy fat	Cardboard*	Overall sour	Salty	Smoothness	Tooth etch*
Buttery	Filler*	Lactic*	Bitter	Thickness*	Fat feel*
Cooked	Goaty*	Acetaldehyde		Degree of dissolving*	Chalky mouthfeel
Processed	Grain-like	Sour			Fatty mouthcoating*
Butyric	Lemon				Chalky mouthcoating
Whey*	Moldy*				
	Oil-like				
	Plastic*				
	Oxidized*				

Attributes indicated by an asterisk were new terms

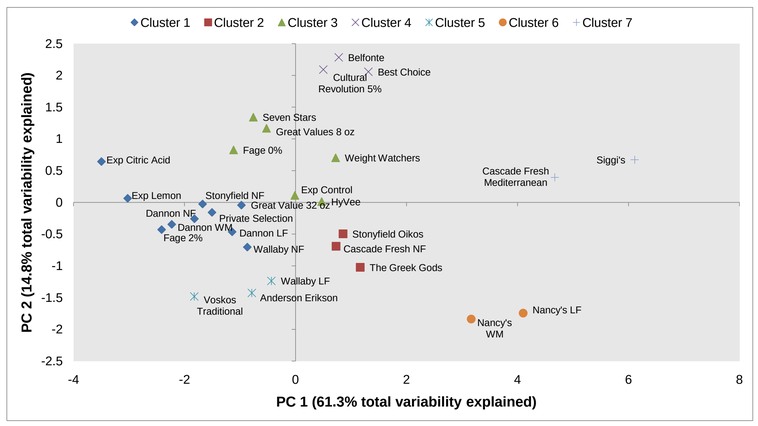


Figure 1: Flavor clusters with respect to the two principal components

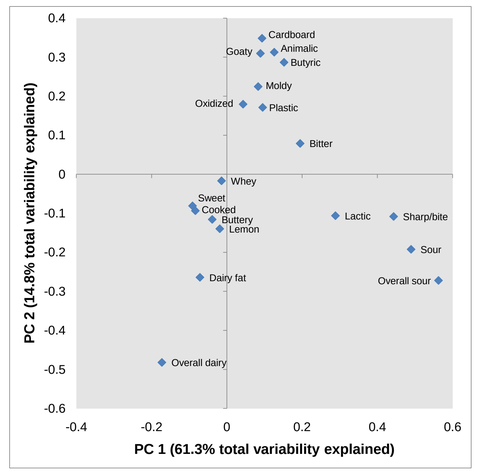


Figure 2: Loadings of the significant flavor attributes onto the two principal components

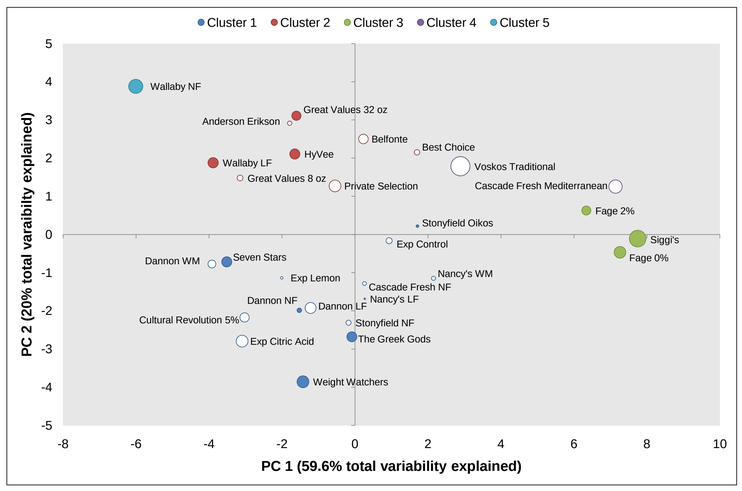


Figure 3: Texture clusters with respect to the three principal components

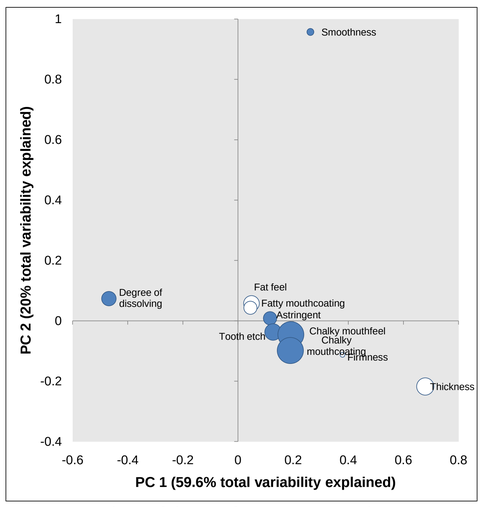


Figure 4: Loadings of the significant texture attributes onto the three principal components

Materials and Methods

- Three prototypes and 26 commercially-available samples were evaluated
- Commercially-available samples varied in physical processing, biological, and chemical composition.
- The three prototypes were developed using novel, more sustainable production methods that reduced necessary fermentation time (Boomgaarden and Schmidt 2009)
- Before evaluation, samples were tempered to 10 °C
- After scraping off the top layer and whey, 2 oz portions placed into 3.25 oz clear, odorless plastic cups labeled with three-digit random codes
- Six-person highly-trained descriptive panel evaluated the samples on 25 flavor, four texture, three mouthfeel, and three mouthcoating attributes
- Four to five samples were evaluated during each 90 minute session
- Panelists individually evaluated samples using a 15-point scale anchored with identified reference samples
- Data was collected using Compusense® five 4.6 and Compusense® Commuter 2.0 (Compusense Inc. , Guelph, Ontario, Canada, 2005)
- Three completely –randomized evaluations were carried out, with all samples tested at least 10 days prior to the end of their shelf-lives
- Analyses of variance , principal component analyses, and cluster analyses were carried out (SAS®, 2008, version 9.2; SAS Institute Inc., Cary, N.C., USA

Results and Discussion

- Samples differed for19 out of 25 flavor attributes and all texture, mouthfeel, and mouthcoating attributes
- The flavor attributes reduced to two principal components (PCs): sharp/sour flavors (61.3% total variability) and dairy and off-flavors (14.8% total variability)
- The samples grouped into seven clusters with respect to the two flavor PCs
- The texture, mouthfeel, and mouthcoating reduced to three principal components (PCs): thickness/firmness (59.6% total variability), smoothness (20.0% total variability), and chalkiness (14.4% total variability)
- The samples grouped into five clusters with respect to the three texture, mouthfeel, mouthcoating PCs

Conclusions

- Plain yogurt flavor was primarily described by sour, dairy, and uncharacteristic off-flavors
- Plain yogurt texture was primarily described by thickness/firmness, smoothness, and chalkiness
- Seven flavor clusters and five texture clusters resulted in 15 unique combinations
- Milk type (conventional or organic) and percent milk fat did not seem to have an effect on flavor and texture
- Added ingredients such as whey protein and potassium sorbate introduced uncharacteristic off-flavors such as cardboard
- Physical processing (set, stirred, or strained) had an effect on texture
- Although no legal definitions exist for "sustainable," the prototypes' sensory characteristics were comparable to those of top-selling yogurts in the category

References

Boomgaarden, T.A., Schmidt, K.A. 2009. Effect of acidulant addition on yogurt fermentation. Kansas State University Dairy Research: Report of Progress 1021.

Mintel: Yogurt– US – November 2009 [Internet]. [Accessed 2010 Feb 17]. Available from: http://academic.mintel.com.

Mintel: Green living– US – February 2010 [Internet]. [Accessed 2010 Mar 31]. Available from: http://academic.mintel.com.

This material is based upon research supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, under Agreement No. 2008-38420-18754. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.