Almond Sensory Attribute Training
How to train a group to describe sensory differences among almonds

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Introduction

In this handout we describe a simple way to train a group of interested people to describe the sensory differences among almonds, whether for processing or marketing needs and/or due to consumer complaints.

A series of attributes (Table 1) and reference standards (Table 2) are provided to facilitate the training. These reference standards have two purposes: (i) to make sure that everyone in the training is on the same page relative to each attribute and in agreement with one another; and (ii) to act as a translation device to anyone outside the group that has not gone through the training.

The step-wise training process (A–D) is as follows:

A. Samples and panelists

Choose almonds that fall within the scope of interest. These may be raw, pasteurized, roasted, different varieties, different grades, and/or different ages – whatever needs to be evaluated. Then gather the potential group of panelists. Ideally each individual should fit the following criteria: over 18 years of age, regularly consumes almonds (at least once per week), has no food allergies, and is available at the required meeting times. Panelists should be asked not to eat or drink anything (other than water) 30 minutes prior to each session.

B. Sample preparation

Panelists should assess no more than six almond samples in any one session, to limit palate fatigue and satiety. About 1 hour before assessment, place six whole kernels of each sample in lidded 2-oz plastic soufflé cups labeled with random 3-digit codes. If wanted, more kernels can be used per sample. With more kernels there may be a better representation of the sample aroma in the cup, but it is wasteful if only a limited sample size is available. Ensure consistency in kernel numbers across the different samples.

C. Panel training

Initially, panelists should spend the first session of training to identify and use the attributes. Reference standards can be stored overnight, but fresh ingredients should be refreshed daily (such as the "grassy" standard). Reference standards should be assessed with labels, for identification. Panelists should become familiar with the attributes, particularly the opposite adjectives of some of the texture attributes. Panelists may suggest additional attributes to include, if they are prevalent to the samples being assessed. Reference

standards need to be created for these attributes (food-grade products that adequately represent the attributes, not the almond samples themselves).

In the second session, introduce panelists to the procedure for assessing almond samples (detailed below) and the score sheet, so that they are familiar rating each scale. Before rating the almond samples, panelists should again familiarize themselves with the reference standards. Assess taste and texture standards before aroma standards, to minimize palate carry-over effects. Almond samples should be assessed blind (no identifier, besides the random 3-digit code) and the results are then recorded on the paper score sheets. One score sheet (3 pages) should be used for each sample, with the sample number indicated in the top right corner. Panelists should be given the option to spit out samples after assessment, and cups with water should be provided so that panelists can rinse their mouth between samples. Ideally, all almond samples should be assessed in triplicate, if possible, over 3 separate days, such that no replicates are assessed together in the same session.

D. Almond assessment procedure

Assess each almond sample individually by following these steps in order:

1. Shake cup, then remove lid and assess the aroma of the samples in the cup
2. Assess the uniformity of the color, size, shape and texture of the sample
3. Place 2 kernels in your mouth
4. Bite down and assess taste and texture
5. Swallow or spit out and assess particulate left in mouth
6. Place 2 more kernels in your mouth
7. Hold in mouth for approximately 10 seconds to assess skin flavor*
8. Bite down and assess whole kernel flavor and aftertaste
9. Rinse with water before assessing the next sample

* It may seem backwards to assess taste and texture first. However, assessment of flavor requires the almond to be held in the mouth for ~10 seconds. In doing this first, the texture of the almond changes (it softens and becomes more cohesive), which obscures the actual texture ratings of the sample. Hence, taste and texture are rated first, followed by flavor. Do not rinse between the assessments, only between different almond samples.

Note: If one or more of first three appearance attributes (uniformity of color, size and shape of sample) are rated as less than 2, on average, this indicates variability in the appearance of the sample. If one or more of the last three appearance attributes (chipped/nicked skin, cracks, wrinkly/leathery) are rated as more than 2, on average, this indicates the presence of defects. If rancid aroma or flavor is rated as greater than 2, on average, this indicates oxidation of the sample.

Conclusions

A simple sensory assessment procedure was created for use in industry to assess almond quality. Although the total list of descriptors is fairly large (33 attributes), subsets of descriptors can be used to differentiate almonds by processing type (e.g., skin vs. blanched, raw vs. roasted, young vs. aged, and raw vs. pasteurized).

Acknowledgement

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Table 1. Differentiation of attributes by almond processing method.

Attribute	Includes terms	Important in the listed processing type
Aroma/ flavor		
Overall aroma intensity	Intensity of aroma of almonds in cup after shaking	Roasted, Aged
Overall flavor intensity	Intensity of flavor of the kernels in-mouth	Natural
Floral	Soapy	Natural
Fruity	Orange, citrus, dried apricots	Natural
Dark chocolate	Caramel	Roasted
Marzipan	Sweet nutty, benzaldehyde, vanilla	Natural[*], Roasted
Nutty	Hazelnut, walnut, macadamia, pistachio, peanut	Roasted, Aged
Hay	Old green, stemmy, lentils	Roasted
Grassy	Fresh green, vegetable	Blanched, Natural[*], Aged
Woody	Sawdust, musty, dusty	Natural[*], Roasted, Aged
Toasty	Burnt, smoky, meaty	Roasted
Earthy	Tobacco	Natural[*]
Rancid	Stale, crayon, sweaty, clay	Natural, Roasted, Aged
Taste/ Texture		
Bitter		Roasted, Aged
Sweet		Blanched, Natural[*]
Salty		
Roughness	Low = Smooth	Blanched, Skin, Natural
	Feeling of skin on tongue	
Resilience	Low = Brittle	Roasted
	Force required to break kernel on initial bite; includes tough, firm, spongy	Blanched, Natural[*], Aged
Crunchy	Low = Soft	Blanched, Aged, Roasted
	High	
Chewy	Includes springy	Blanched, Natural[*], Aged
Drying	Low = Moist	Natural[*], Blanched, Roasted, Aged

	High = Astringent, squeak on teeth	
Particulate	Includes grainy, mealy, powdery, dusty	Blanched, Natural[*], Aged
Skin cohesiveness	Low = Loose skin	Roasted
	Skin sticks to kernel; High = Tough skin	Natural[*]
Cohesive	Low = Crumbly	Roasted
	Chewed mass sticks to itself	Natural*
Adhesive	Particulate sticks to teeth/mouth; includes sticky, toothpack, fibers between teeth	Blanched, Roasted
Oily residue	Fatty/viscous residue left in mouth after swallowing/spitting	Roasted
Length of flavor/ aftertaste		Natural, Roasted

[*] Includes pasteurized almond samples

Table 2. Attributes, terms included, and reference standards used to assess all almond samples.

Attribute	Includes terms	Reference standard ingredients
Appearance		
Uniform color		
Uniform size		
Uniform shape		
Uniform texture	Appearance of chipped/nicked skin, cracks, wrinkly/weathered (not ridges/veins)	
Aroma/ Flavor		
Overall aroma intensity	Intensity of aroma of the samples in the cup after shaking	
Overall flavor intensity	Intensity of flavor of the kernels in-mouth	
Floral	Soapy	1 tsp perfumed soap, flaked (Mild Soap, Cleans & Freshens, Jergens)
Fruity	Orange, citrus, dried apricots	Fresh orange zest + 1 dried apricot, chopped (Sunsweet)
Dark chocolate	Caramel	1 sq 88% dark chocolate (endangered species Chocolate)
Marzipan	Sweet nutty, benzaldehyde, vanilla	1 drop imitation almond extract (McCormick) + 20 mL filtered water
Nutty	Hazelnut, walnut, macadamia,	2 hazelnuts, halved

		pistachio, peanut
Hay	Old green, stemmy, lentils	Handful alfalfa hay (Nature's Care)
Grassy	Fresh green, vegetable	Handful fresh cut green grass
Woody	Sawdust, musty, dusty	1 tsp French oak shavings (EvOak) + 1 tsp American oak shavings (EvOak) + 1 tsp fresh pine shavings + 1 tsp fresh sawdust
Toasty	Burnt, smoky, meaty	Toasted English muffin + pinch Lapsang Souchong tea (Twinings)
Earthy	Tobacco	Fresh earth + ½ tsp tobacco leaf (Rocky Patel 1992 juniors)
Rancid	Stale, crayon, sweaty, clay	4 dried cranberries (Mariani Premium) + 4 old roasted, salted almonds (Kirkland, exp 2011)
Taste/ Texture		
Roughness	Low = Smooth	Low = 2 whole Redskin Spanish peanuts , salted (Platners)
	Feeling of skin on tongue	High = Triscuit minis (original, Nabisco)
Resilience	Low = Brittle	Low = Dried banana piece
	Force required to break kernel on initial bite; includes tough, firm, spongy	Moderate = 1 cm^2 piece baby carrot
		High = Dried apple piece
Chewy	Low = Crisp	Low = Dried banana piece or ½ potato chip (unsalted, Kettle)
	Includes tough	High = Dried apple piece
Crunchy	Low = Soft	Low = Dried apple piece
		High = 1 cm^2 piece fresh celery or baby carrot
Skin cohesiveness	Low = Loose skin	Low = 2 whole Redskin Spanish peanuts (with skin), salted (Planters)
	Skin sticks to kernel; high = Tough skin	
Particulate	Includes grainy, mealy, powdery, dusty	High = Triscuit minis (original, Nabisco) or Fiber wafer (apple crisp, Metamucil)
Bitter		750 mg/L caffeine (Sigma)*
Sweet		5 g/L fructose (Acros Organics)*

Salty		3 g/L salt (Morton Kosher salt)*
Drying	Low = Moist	Low = 1 cm^2 piece fresh celery or baby carrot
	High = Astringent, squeak on teeth	High = Triscuit minis (original, Nabisco)
Cohesive	Low = Crumbly	Low = Rice cracker (brown rice original, Lundberg)
	Chewed mass sticks to itself	High = 2 whole Redskin Spanish peanuts, salted (Planters)
Adhesive	Particulate sticks to teeth/mouth	High = Fiber wafer (apple crisp, Metamucil)
	Includes sticky, toothpack, fibers between teeth	
Oily residue	Fatty/viscous residue left in mouth after swallowing/spitting	High = 2 whole Redskin Spanish peanuts, salted (Planters) or ½ potato chip (unsalted, Kettle)
Length of flavor/aftertaste		

* Dissolved in filtered water

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