



Development of a Sensory Lexicon for Almonds



Abstract

Although the sensory characteristics of peanuts are well documented, to date, no attempt had been made to qualify and quantify the appearance, aroma, flavor and textural characteristics of almonds. Creation of a standard lexicon provides researchers with a tool to understand the range and importance of each sensory characteristic. The objective of this study was to develop a comprehensive sensory lexicon that encompasses attributes relating to appearance, aroma, flavor and texture of untreated and treated almonds.

Commissioned by the Almond Board of California, Sensory Spectrum evaluated thirty-six samples of raw almonds, representing 20 different almond varieties, procured from sources across California. Nine staff members of Sensory Spectrum, trained and experienced in detailed appearance, flavor and texture analysis, evaluated fifteen randomly selected samples in April 2005 over two sessions.

Lexicons for Appearance, Aroma, Flavor, and Texture attributes of almonds were developed. The terminology and definitions yielded a formal lexicon and evaluation ballot. Six almond samples were selected from the fifteen previously tasted to validate the lexicon. The six samples selected showed differences in perceived appearance, flavor or texture attributes during the initial screening. A total of 14 appearance, 1 aroma, 33 flavor aromatics, 3 basic taste and 2 chemical feeling factor attributes, and 19 texture attributes with corresponding definitions were initially developed. After later evaluation of roasted and pasteurized almonds, additional terms and definitions were added as new characteristics were uncovered. The current almond lexicon as presented contains 15 appearance terms; 9 aroma terms; 36 flavor aromatics, 3 basic taste and 4 chemical feeling factor terms, and 19 textural terms, all with definitions.

Creation of a detailed, working lexicon provides almond researchers, producers, and retailers a better platform to communicate observations in the quality grading of almonds.

Methodology

Thirty six samples of almonds were sent to Sensory Spectrum for evaluation. These samples were representative of 20 different almond varieties. Nine Sensory Spectrum staff members, trained in detailed appearance, aroma, flavor and texture descriptive analysis participated in the evaluations.

Fifteen randomly selected almond samples were chosen for screening. Samples were qualitatively evaluated for appearance, flavor and texture for the purpose of terminology generation. Attributes were discussed and refined, and definitions were generated.

Six of the initial 15 screening samples were selected for lexicon validation based on screening differences for one or more evaluation modality. Samples were presented blindly to the evaluation panel. Samples were evaluated for appearance, aroma, flavor and texture attributes with profiles generated for each sample.

Results

The initial lexicon contained a total of 72 terms with definitions. These included 14 appearance, 1 aroma, 33 flavor aromatics, 3 basic taste, 2 chemical feeling factor and 19 textural terms. Subsequent evaluation of roasted almonds and pasteurized almonds allowed for further development of the lexicon to its present state. The present almond lexicon contains 86 attributes divided as follows: 15 appearance terms; 9 aroma terms; 36 flavor aromatics, 3 basic taste and 4 chemical feeling factor terms; and 19 textural terms and definitions. Lexicon creation is dynamic; as new attributes are uncovered and/or understanding of given terms is expanded (i.e., to be more specific), this lexicon may grow and change.

FLAVOR – AROMATICS	
Total Impact	The total portion of flavor that is perceived by the sense of smell from a substance inside the mouth
Almond Nut Meat	The aromatics associated with the meat of almonds
Raw	The aromatics associated with uncooked beans or legumes
Cooked	The aromatics associated with nuts, beans or legumes which have been gently heated or boiled
Roasted	The aromatics associated with nuts which have been roasted
Dark Roast	The aromatics associated with cocoa beans and/or nuts that have been dark roasted but not burnt
Other Nut Meat	The aromatics associated with nuts other than almond
Walnut	The aromatics associated with walnuts
Coconut/Lactone	The aromatics associated with shredded coconut or coconut milk and dried coconut, including lactones
Sweet Aromatics	The aromatics associated with products which also smell sweet (e.g., maple syrup, brown sugar, and vanilla)
Benzaldehyde	The aromatics associated with benzaldehyde, reminiscent of cherry candy or some almonds
Fruity	The total aromatics associated with fruit
Red Fruit	The total aromatics associated with red berries including the synthesized, raw and cooked notes of berries including strawberries, raspberries, and berries
Brown Fruit	The aromatics associated with the general category of brown fruit including raisins, prunes and figs
Floral	The aromatic character associated with the general category of flowers and fruit blossoms
Woody	The aromatics associated with the general category of wood
Sawdust/ Pencil Shavings	The aromatics associated with sawdust or pencil shavings
Fresh Cut Lumber	The aromatics associated with fresh cut lumber including raw wood, green, and resin notes
Hulls/Skins/Cellulose	The aromatics associated with nutgenuine hulls and skins
Vegetable	The aromatics associated with the general category of vegetables including the general category of winter or summer squash varieties
Squash	The aromatics associated with raw zucchini or other similar summer squash varieties
Zucchini	The aromatics associated with raw pumpkin meat or seeds
Pumpkin	The aromatics associated with uncooked beans (soy beans, green beans, navy beans, etc.)
Raw Bean	The aromatics associated with uncooked soy beans
Soy Beans	The aromatics associated with uncooked green beans
Green Beans	The aromatics associated with beans, grass, leaves and green colorant (e.g., grass - h1p1al, GS-3-hexa-1-ol)
Green	The aromatics associated with dried grass or hay, may be reminiscent of tea leaves
Grassy/Hay	

FLAVOR – AROMATICS	
Fruity Fermented	The aromatics associated with fermented fruits, reminiscent of ethanol and rotting vegetation such as corn husks
Plastic/Waxy	The general term used to describe the aromatics of plastics or wax
Cardboard/Paper	The aromatics associated with a combination of wet paper and wet cardboard boxes
Painty	The aromatics associated with lined or oil based paint
Earthy/Dry Dirt	The aromatics associated with clean dry earth or potting soil
Ham	The aromatics associated with cured meat such as ham
Tea/Tobacco	The aromatics associated with dried tobacco and tea leaves
Solvent	The flavor aromatics associated with a solvent or flavor carrier, reminiscent of ethyl alcohol or vodka
TEXTURE SURFACE	
Powdery/Fuzzy	The amount of small fine particles detected by running the sample gently over the lips, with particles feeling reminiscent of velvet
Macro-roughness	The amount of irregular structure in the surface evaluated by rubbing the sample over the lips. These may be small (grainy) or large (lumpy)
Loose Particles	The amount of loose particles on the surface evaluated by rubbing the sample over the lips
Moistness	The amount of moistness on the surface of the sample evaluated by rubbing the sample over the lips
FIRST CHEW	
Hardness to Split/Crack	The force required to bite into and crack the sample using the molars
Hardness to Grind Pieces	The force required to bite through the fractured pieces of the sample after the first chew using the molars to crack
Crunch/Snap	The force with which the sample breaks or fractures (either than deforms) when placing the nuts between the molars and chewing down at an even rate
Cohesiveness of Chew	The amount the sample deforms either before or after the first chew with molars (Toughness)
Moistness at 3 Chews	The amount of wetness/oiliness/moisture in the mass after 3 chews
Number of Pieces	The number of pieces the almond fractures into after first chew (Fracturability)
Persistence of Crunch	The number of chews that the sample still has a crunchiness sound
CHEW/DOWN	
Number of Chews to Bolus	The number of chews required to form a mass
Moistness of Mass	The amount of wetness/oiliness/moisture in the chewed mass
Cohesiveness of Mass	The degree to which the mass holds together in the mouth
Particulate Mass	The amount of particles in the mass
Fibers Between Teeth	The amount of fibers or fibrous material to grind between the molars after 10 chews
RESIDUAL	
Footprint	The amount of product left in the teeth
Loose Particles	The amount of chafed/grain particles remaining in the mouth after expectoration
Fatty/Oily Film	The amount of fat/oily residue felt by the tongue when moved over the surface of the mouth

APPEARANCE	
Color Hue	The actual color name, such as red, blue, etc. (see-brown)
Color Intensity	The intensity or strength of the color from light to dark
Chroma	The brightness or purity of the color from dull/muted to pure/bright
Visual Roughness	The amount of hills and valleys visible on the surface of the sample
Evenness of Color Within a Sample	The degree to which the sample color is the same throughout the product
Evenness of Color Within a Seed	The degree to which the sample color is the same across each seed, not blotchy
Size of Almond * Thickness	The visual height of the nut from end to end.
Width	The visual width of the product from side to side
Roundness	The degree to which the nut is rounded in shape and not flat
Uniformity of Nuts (within a sample)	The degree to which the nut size and shape are uniform throughout the sample
Macro Roughness	The amount of hills and valleys visible on the surface of the sample
Micro Roughness	The amount of small cracks and crevices visible on the surface of the sample, which includes perceivable particulates (grits and grains)
Wholeness	The degree to which the nuts are whole and not broken into pieces
Skin Lifting	The incidence of almonds in a sample, in which the skin has adhered to the nut meat in an uneven, wrinkled and lifted fashion

AROMA	
Total Aroma Impact	Total intensity of all odors of a product when its volatiles enter the nasal passages and are perceived by the olfactory system
Almond Nut Meat	The aromatics associated with the meat of almonds
Dark Roast	The aroma compounds associated with cocoa beans and/or nuts that have been dark roasted but not burnt with the general category of wood and/or dried tea leaves with fermented fruit character
Woody/leaf/fruit	The aroma compounds of fresh vegetable oil, uncooked beans or squash
Vegetable Oil/Bean/Squash	The aroma compounds associated with products that also smell sweet and which was an aromatic or browned sugar
Sweet Aromatic/ Caramelized	The aroma compounds associated with partially oxidized oil; it is reminiscent color of cardboard boxes
Cardboard	The aroma compounds associated with benzaldehyde; is reminiscent of cherry candy or almonds
Benzaldehyde	The aroma compounds associated with dried red fruits, specifically cranberries
Dried Red Fruit (Cranberry)	

FLAVOR – BASIC TASTES	
Sweet	The taste on the tongue stimulated by sucrose and other sugars, such as fructose, glucose, etc., and by other substances, such as Aspartame, Aspartame, and Asulfame-K
Sour	The taste on the tongue stimulated by acid, such as citric, malic, phosphoric, etc.
Bitter	The taste on the tongue associated with caffeine and other bitter substances, such as quinine and hop biters
FLAVOR – CHEMICAL FEELING FACTORS	
Astringent	The feeling or puckering of the tongue surface caused by substances such as tannins or alum
Tongue Burn	The chemical feel in the oral cavity and on the lips associated with alcohol, strong salt, or sweet products
Metallic	The chemical feeling factor on the surface of the tongue stimulated by metal ions from iron, copper, and zinc
Soury	The chemical feeling factor on the surface of the tongue associated with eating soap