

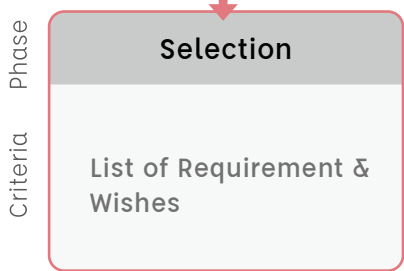
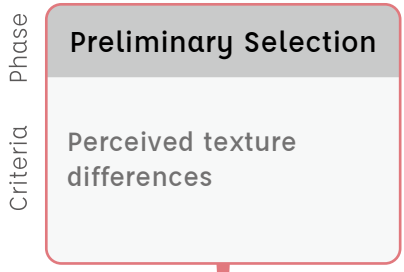
1 / INTRODUCTION

This booklet provides an introduction about the process and result of 4 selected categories of food for the later on design. The aim of this project is to design food that are healthy (satiating) and pleasurable.

Figure 1 shows the process for defining the 4 food categories. Several food products with perceived texture differences on the market are chosen, and a simple analysis is made to derive more understanding about their textures (see Appendix). By combining all the individual analysis, an overview of texture variations and oral exposure time for each food category can be depicted.

The food products were classified based on the groups proposed by Allen and Baines (2002). The food products were sorted into four groups: Meat, Fish & Dairy, Vegetables, and Others. To select the ideal ingredients, comparison within the groups were made.

A list of requirements and wishes are developed to evaluate the ideal food categories (see Chapter 2). At last, Pork, Carrot, Cheese and Chocolate are chosen to have greater potential for texture manipulation (see Chapter 3).



Carrot, Pork & Chocolate

2 / REQUIREMENT & WISHES

A literature research was conducted to define the relevant criteria for evaluating ideal food categories.

Requirement

- | The ideal food category should provide distinct oral exposure time
- | The ideal food category should provide big texture varieties

Wishes

- | The ideal food category should be easy to access in Dutch market, and is common for Dutch consumers
- | The ideal food category should not have strong taste or smell

Oral Exposure Time

Satiation is related with oral exposure time of food, if the food stays longer in the mouth, people tend to feel satiating easily. By manipulating textures of food, it is possible to facilitate a healthy eating experience. The ideal food categories should provide bigger variety of oral exposure time to enable texture manipulation. Thus oral exposure time (duration of time in the mouth before the food is swallowed) of each food product was be measured and compared.

According to Forde et al (2013), oral exposure time is related with number of chews per bite. Therefore, in order to assess the oral exposure time easily in this stage, number of chews per bite is selected as the indicator. Forde et al (2013) indicate that the average number of chews per bite for food is between the number of 10-20, for semi-solid food (such as mashed potatoes), the average number is less than 7 chews per bite.

However, in this exploration, the designer was the only person who measured the oral exposure time, therefore the time can only be considered as indications for evaluation, the average oral exposure time of the selected food categories should be measured in the later on study with users.

Texture Varieties

The ideal food categories should be able to provide wide range of textures characteristics, which indicates more possibilities for texture manipulation. The characteristics of textures can be evaluated by making a texture profile for individual food product.

The definition of texture characteristics (Figure 3) is derived from ISO 5492: 2009, which provides extensive definitions for sensory analysis. ISO 5492 indicates that there are five characteristics related to mechanical aspects of food textures; this classification is also inline with other studies (Szczesniak, 2002; Wilkinson, Dijksterhuis & Minekus, 2000).

I Hardness

Mechanical textural attribute relating to the force required to achieve a given deformation, penetration, or breakage of a product.

I Cohesiveness

Mechanical textural attribute relating to the degree to which a substance can be deformed before it breaks, including the properties of Fracturability, Chewiness and Gumminess.

I Fracturability

Mechanical textural attribute related to cohesiveness and hardness and to the force necessary to break a product into crumbs or pieces.

I Chewiness

Mechanical textural attribute related to the amount of work required to masticate a solid product into a state ready for swallowing.

I Viscosity

Mechanical textural attribute relating to resistance to flow.

I Springiness

Mechanical textural attribute relating to the rapidity of recovery from a deforming force; and the degree to which a deformed material returns to its original condition after the deforming force is removed.

I Adhesiveness

Mechanical textural attribute relating to the force required to remove material that sticks to the mouth or to a substrate.

3 / THE SELECTED FOOD

Three food categories are chosen from each group; namely Pork (Meat), Carrot (Vegetable), and Chocolate (Others) based on list of the requirement and wishes.



MEAT: PORK

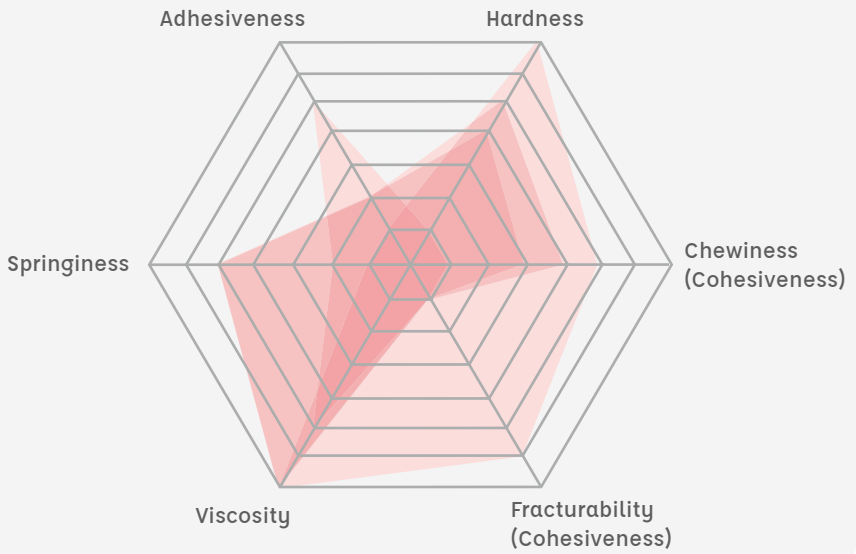
Pork and beef products were compared, and pork was chosen as the selected category for meat. Both beef and pork products are possible to provide distinct oral exposure time. However, pork provides more variety of textures. For instance, with similar oral exposure time, Knabbelspek (high hardness and fracturability) pan-fried pork (higher chewiness and low factorability) demonstrates distinct texture characteristics.

Evaluation

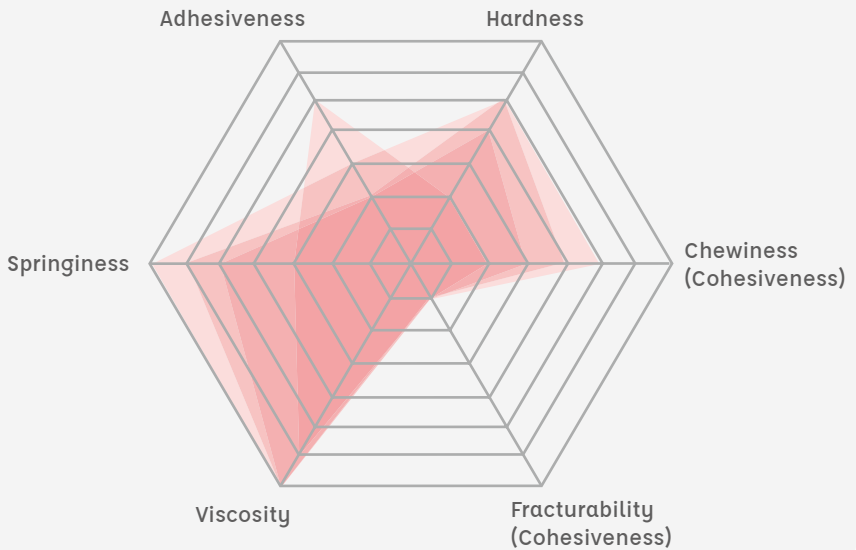
Requirement	Pork	Beef
Distinct Oral Exposure time	<input type="radio"/>	<input type="radio"/>
Texture Variety	<input type="radio"/>	
Wishes		
Easy to access & common for Dutch consumers	<input type="radio"/>	<input type="radio"/>
No strong taste or smell	<input type="radio"/>	<input type="radio"/>

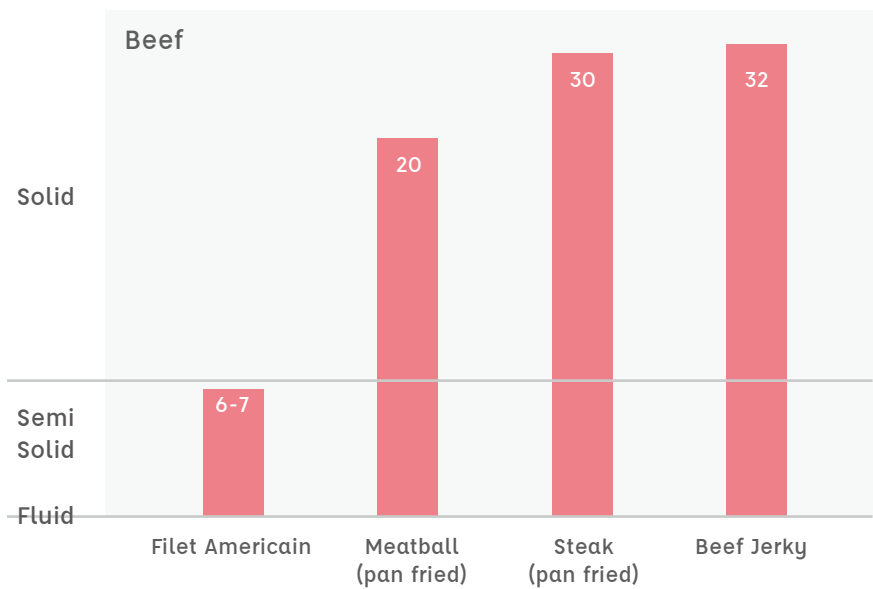
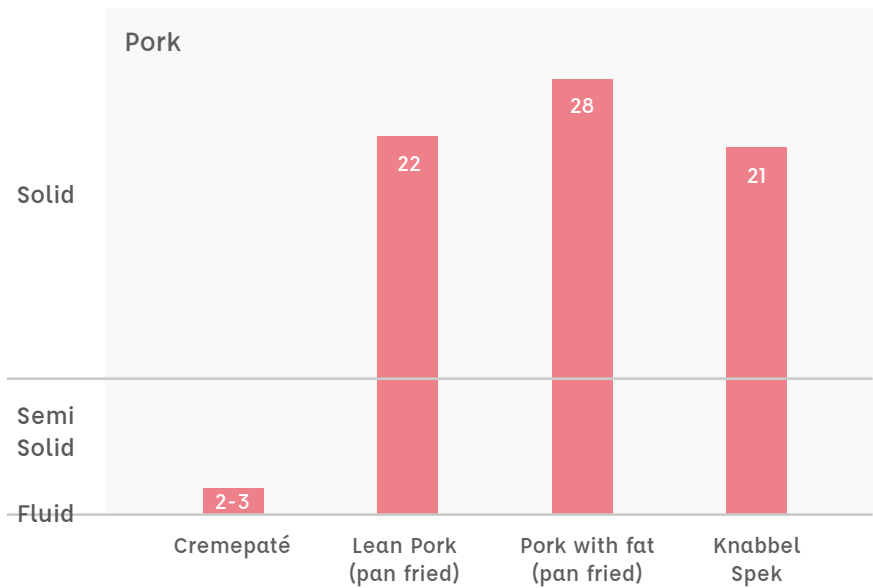
Meat Summary: Texture Characteristics

Pork



Beef







VEGETABLES: CARROT

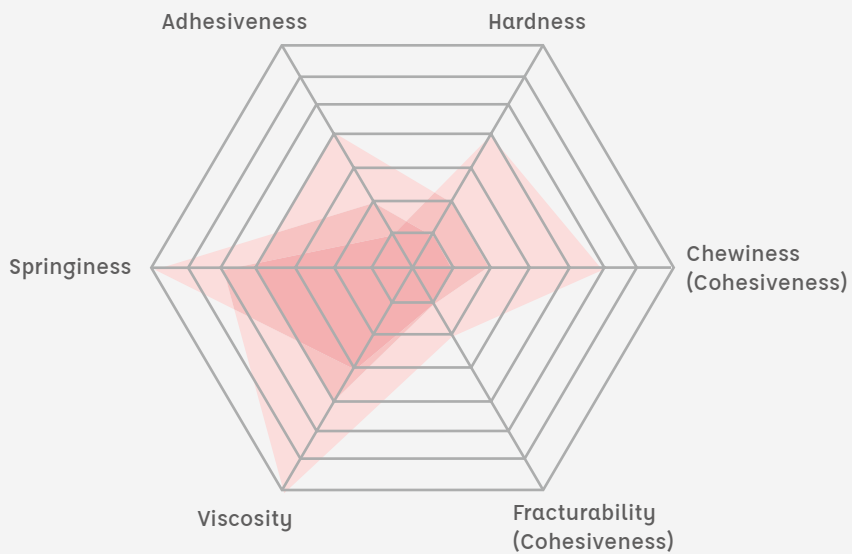
For the group of vegetable, carrot, tomato and cauliflower were compared. Both cauliflower and carrot categories offer more diverse texture characteristics than tomato. Moreover, carrot category provides the most wide range of oral exposure time, carrot juice only stays few second in the mouth, while raw carrot requires around 35 times of chew per bite. Therefore, carrot was chosen as the ideal food category in this group.

Evaluation

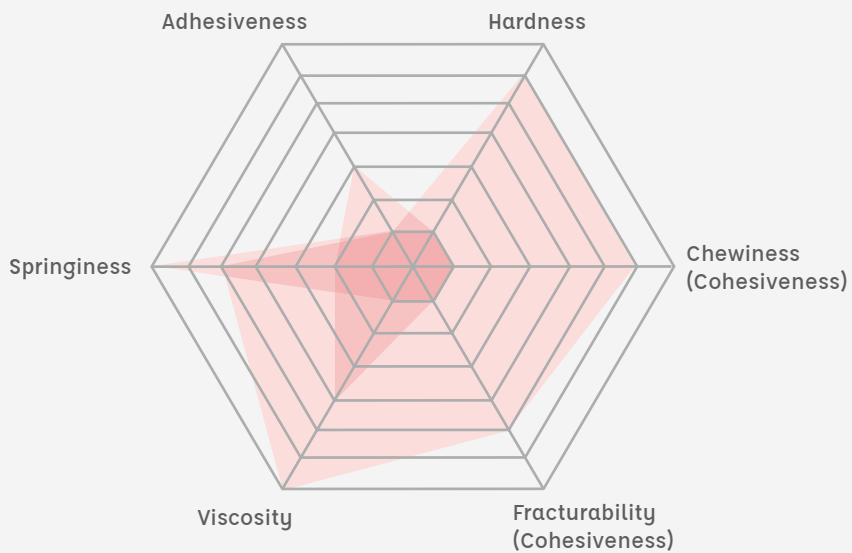
Requirement	Tomato	Carrot	Cauliflower
Distinct Oral Exposure time	<input type="radio"/>	<input type="radio"/>	
Texture Variety		<input type="radio"/>	<input type="radio"/>
Wishes			
Easy to access & common for Dutch consumers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No strong taste or smell	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Summary: Texture Characteristics

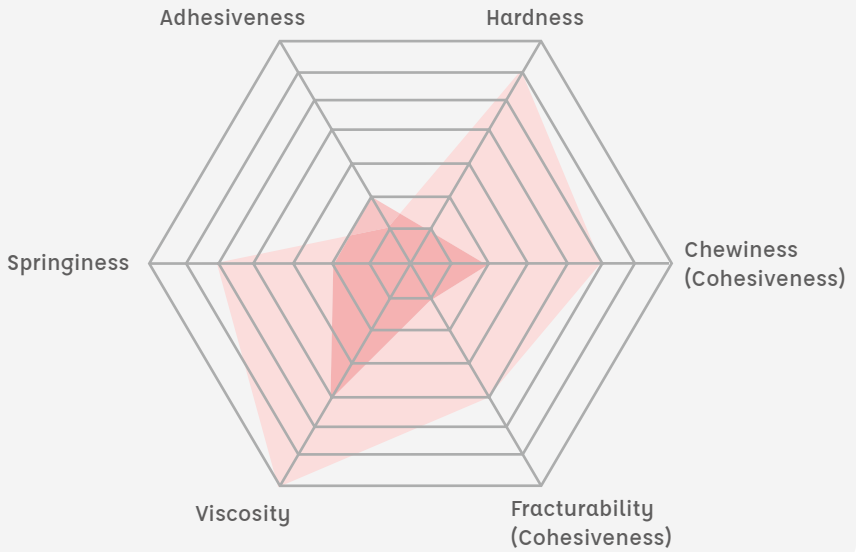
Tomato



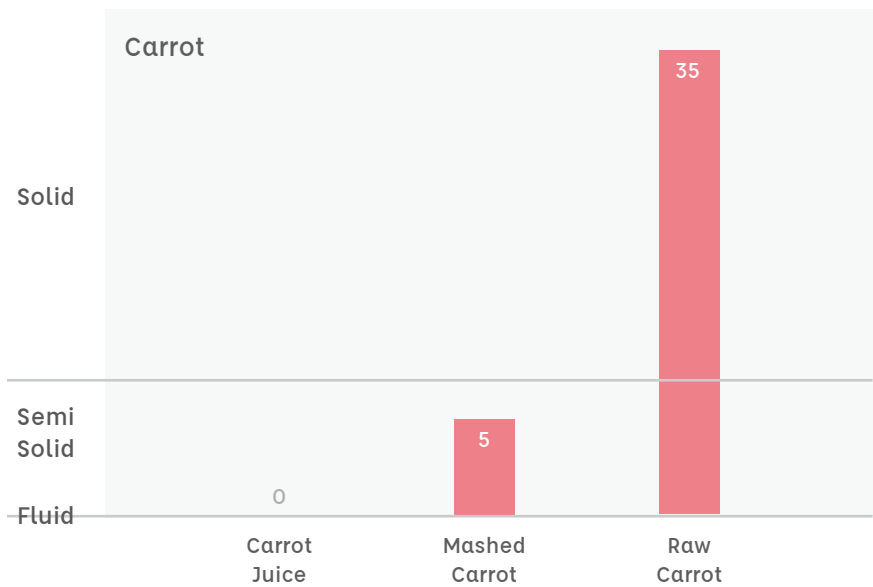
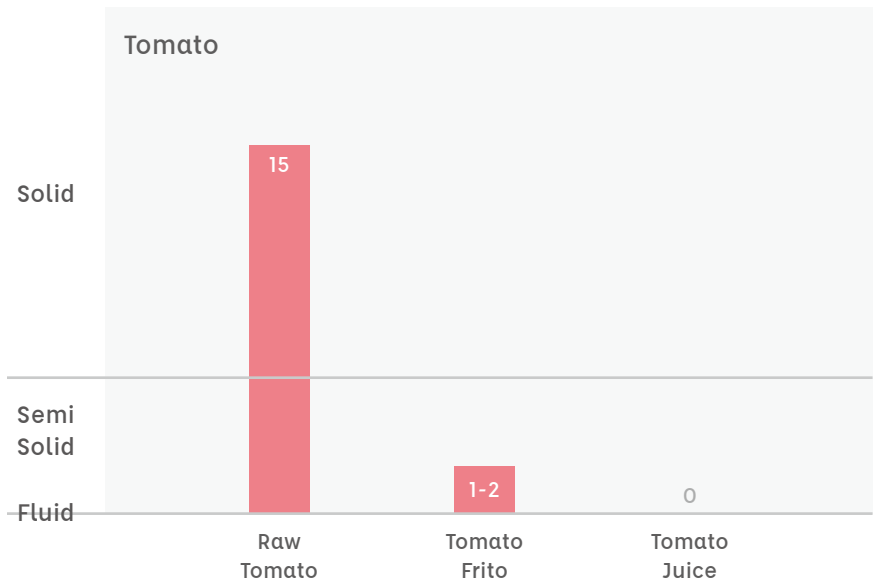
Carrot

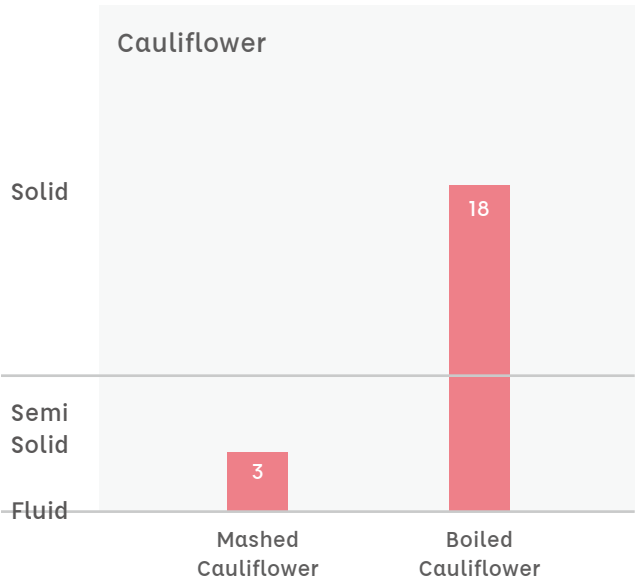


Cauliflower



Summary: Oral Exposure Time







OTHERS: CHOCOLATE

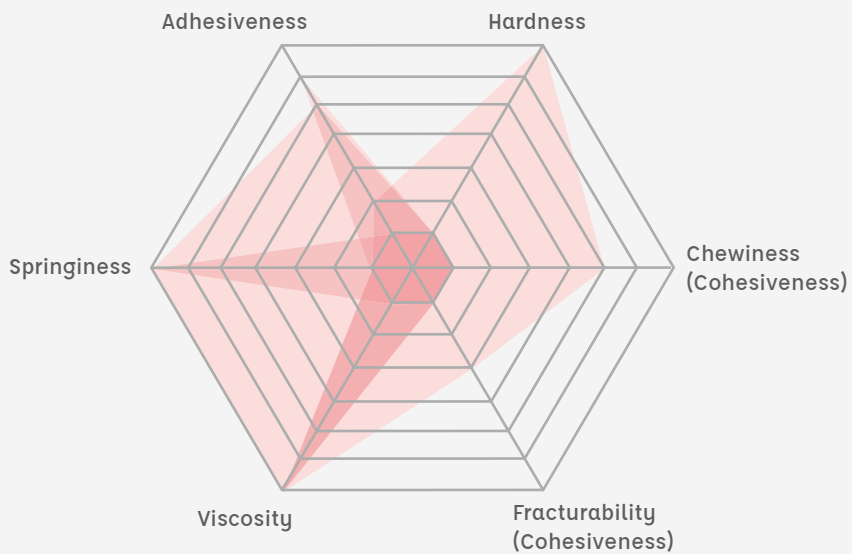
For the other food products, chocolate and soy were chosen to be evaluated. Different chocolate products has distinct oral exposure time, significant differences are shown between chocolate bar (22 chews/bite) and chocomel (0 chew/bite). Chocolate also shows more texture variety than soy products, an interesting example is Chocomel and chocolate custard. Even though both products have similar oral exposure time, Chocolate custard shows significant higher degree of viscosity and adhesiveness than Chocomel. Comparing with soy products, chocolate category was selected due to its diversity.

Evaluation

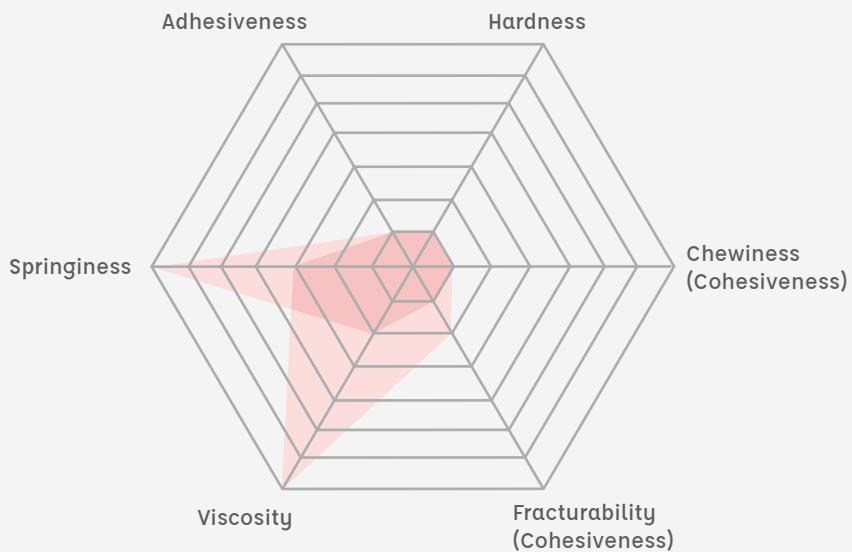
Requirement	Chocolate	Soy
Distinct Oral Exposure time	<input type="radio"/>	
Texture Variety	<input type="radio"/>	
Wishes		
Easy to access & common for Dutch consumers	<input type="radio"/>	
No strong taste or smell	<input type="radio"/>	<input type="radio"/>

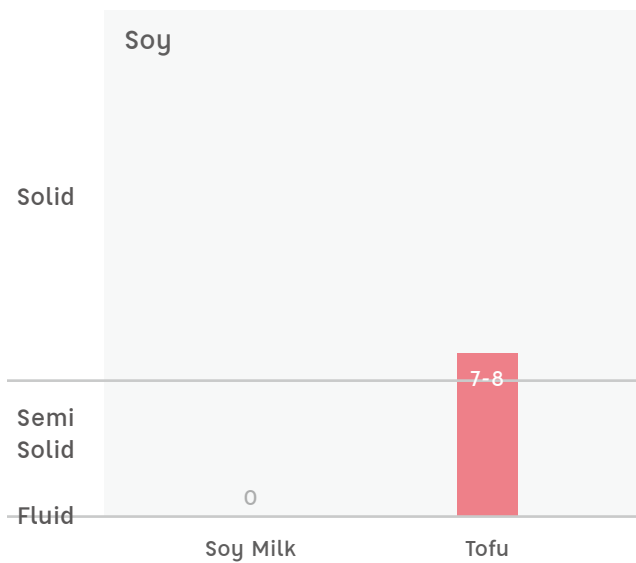
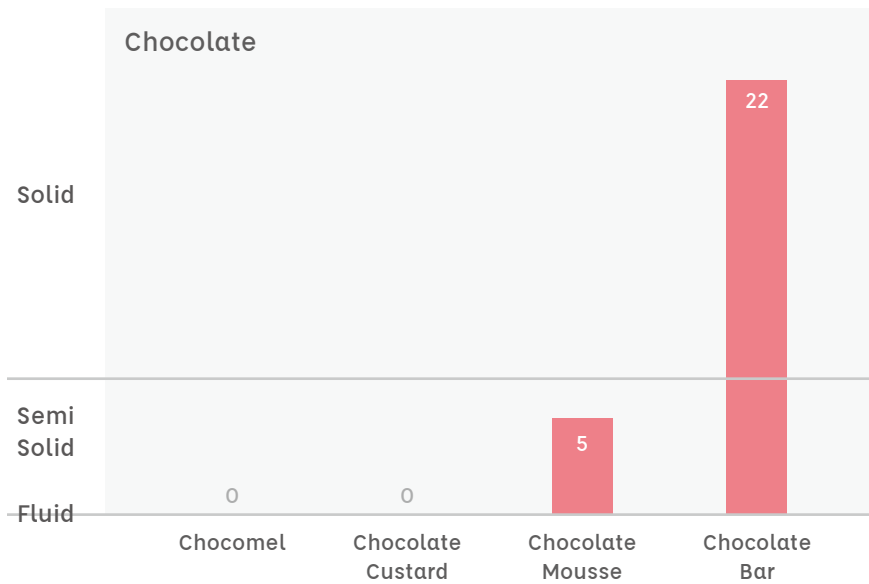
Summary: Texture Characteristics

Chocolate



Soy







Food Category Pork

Product Name Jumbo Speklappen (without fat, pan fried)

Ingredient Contents Pork belly

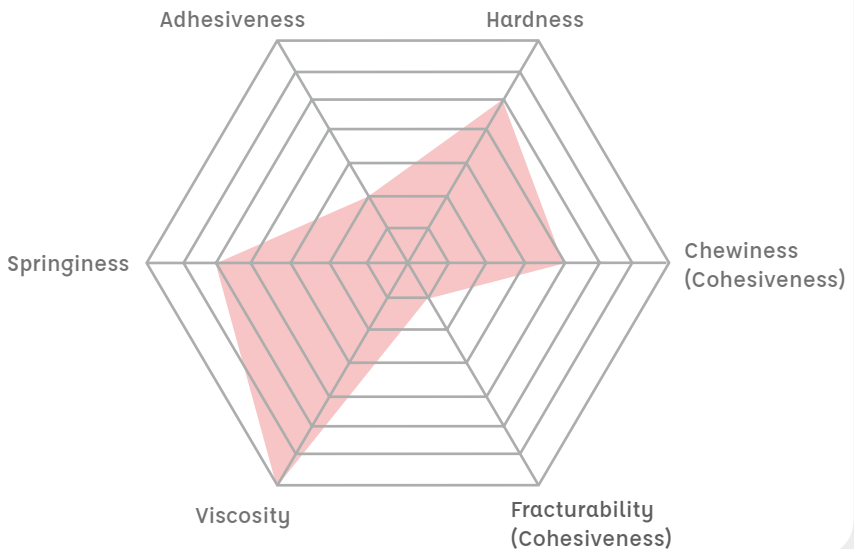
Calories 242.1 kcal/100g

Flavour Salty

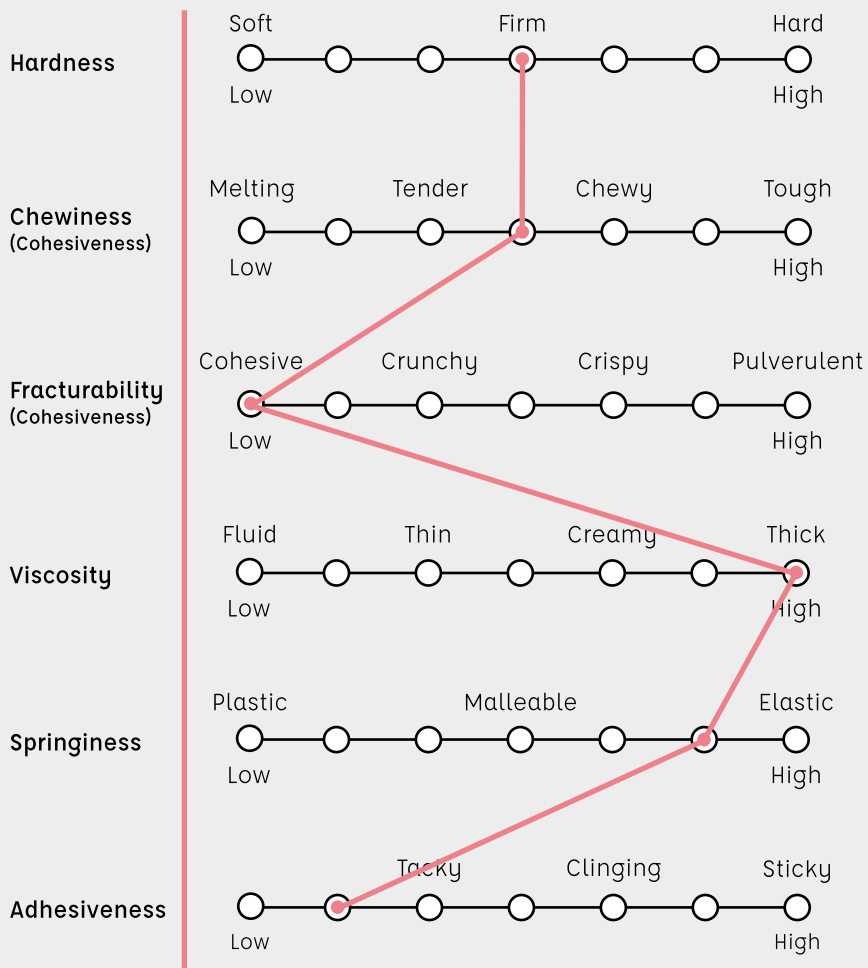
Oral Exposure Time

28 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Pork

Product Name Jumbo Speklappen (with fat, pan fried)

Ingredient Contents Pork belly

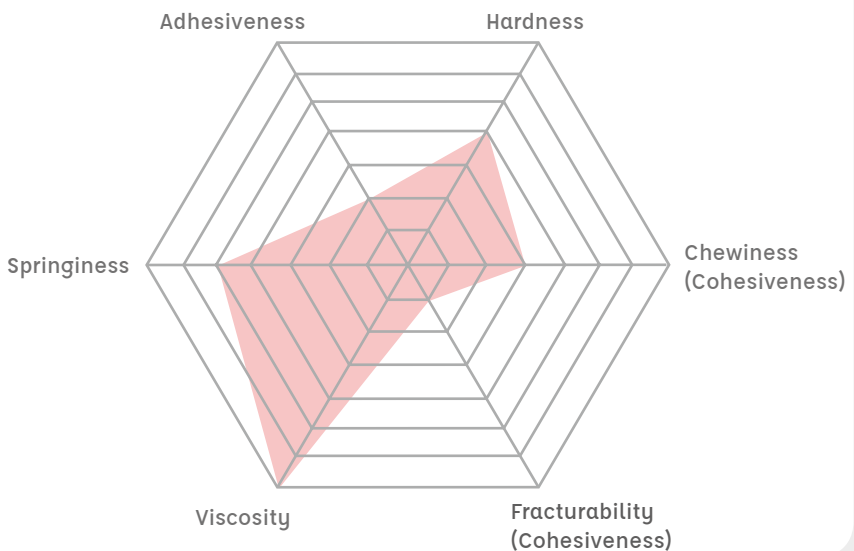
Calories 517.9 kcal/100g

Flavour Salty

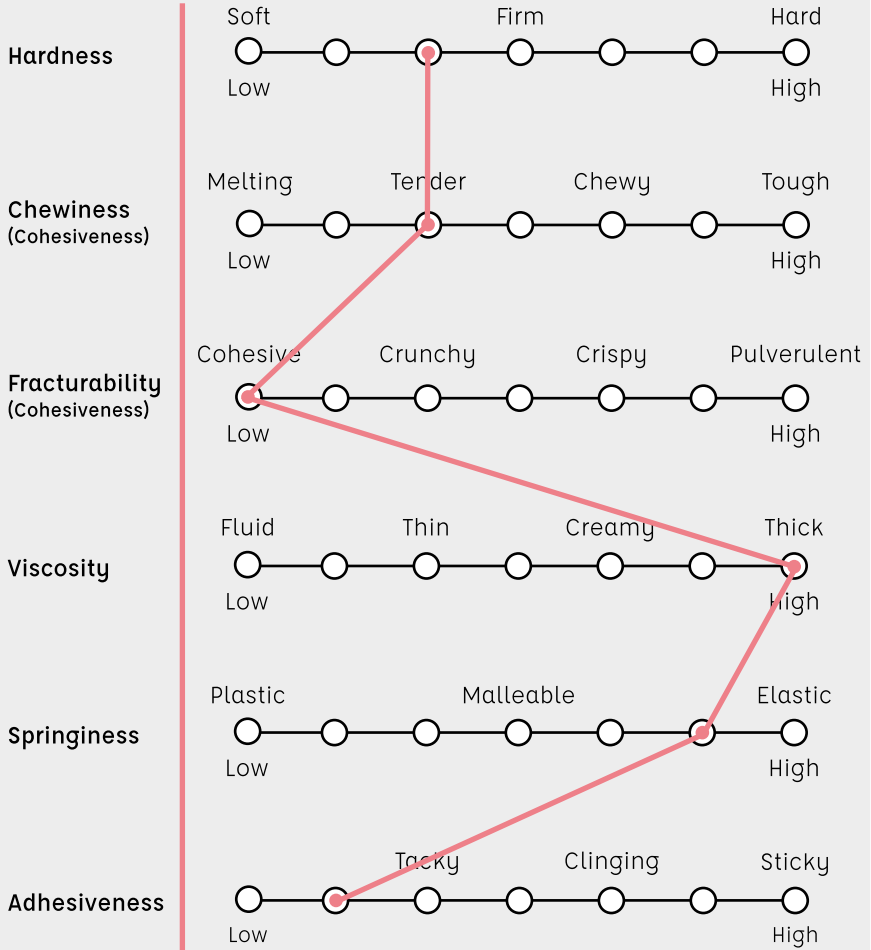
Oral Exposure Time

22 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Pork

Product Name AH Scharrel Cremepaté

Ingredient Contents 33% pig's liver, pig fat, water, starch, tapioca starch, salt, sugar, emulsifier (E472c), spices, shallot powder, preservative (E250).

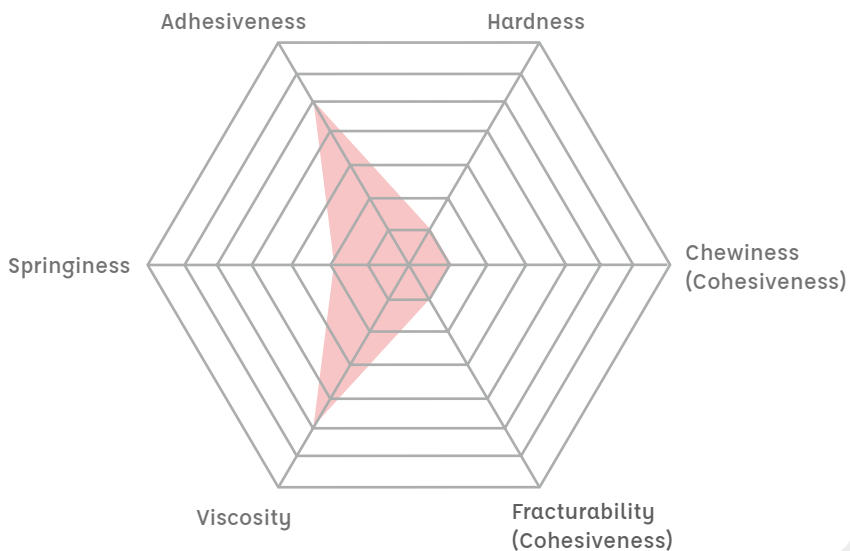
Calories 290 kcal/100g

Flavour Salty

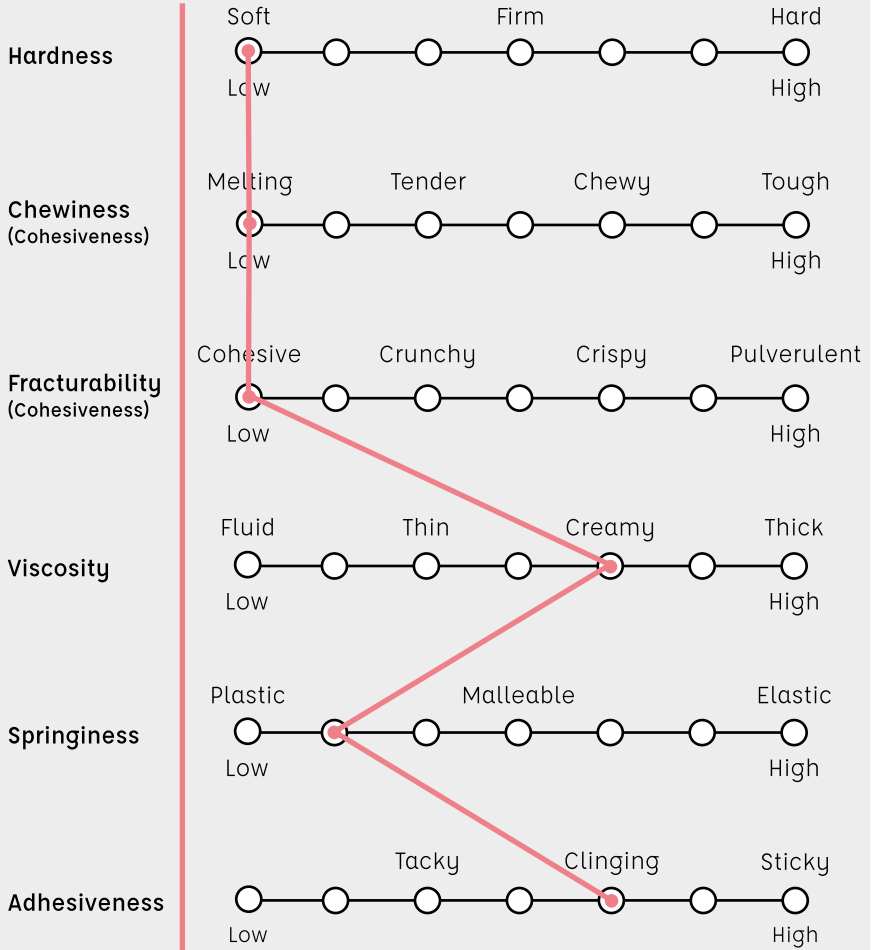
Oral Exposure Time

2-3 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Pork

Product Name AH Knabbelspek

Ingredient Contents 95% pork bacon with rind, salt

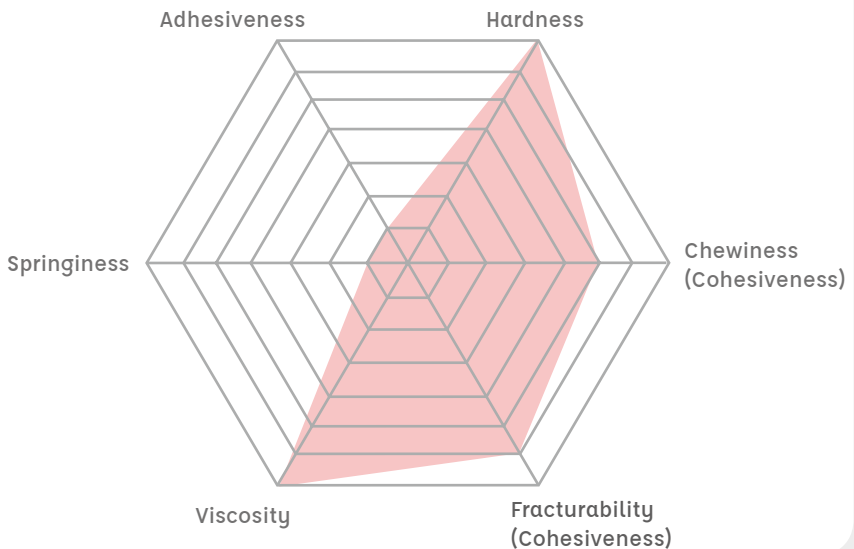
Calories 575 kcal/100g

Flavour Salty

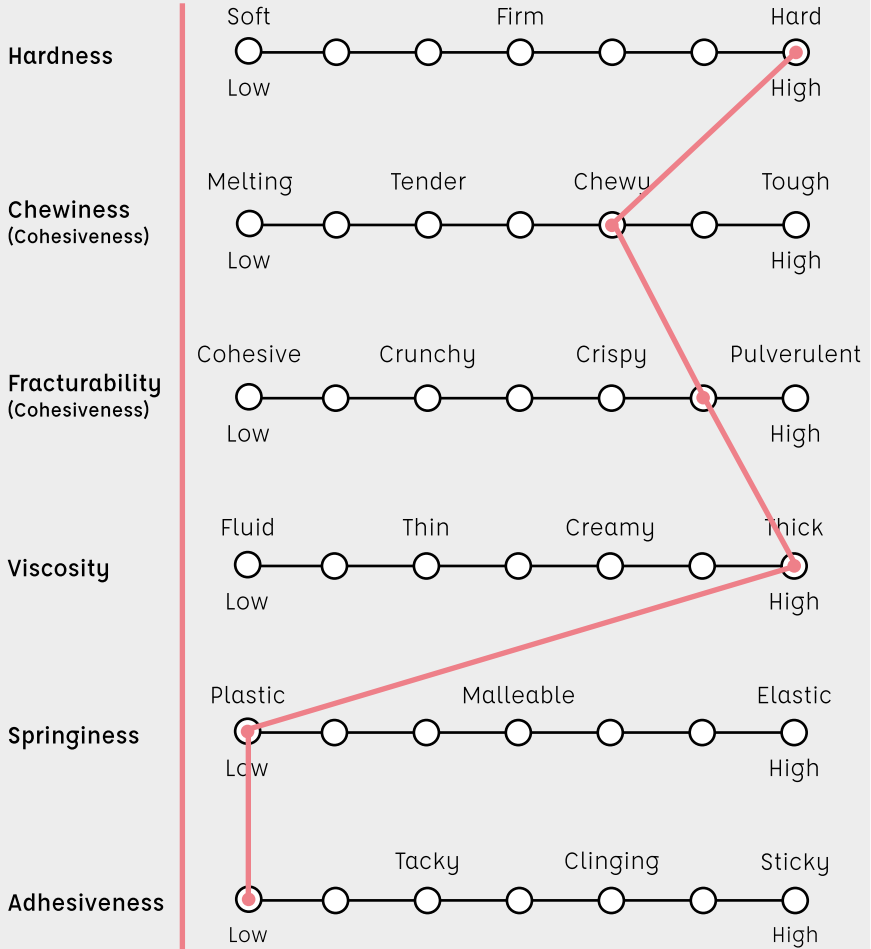
Oral Exposure Time

21 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Beef

Product Name Jumbo Runderribblappen Iers (pan fried)

Ingredient Contents beef

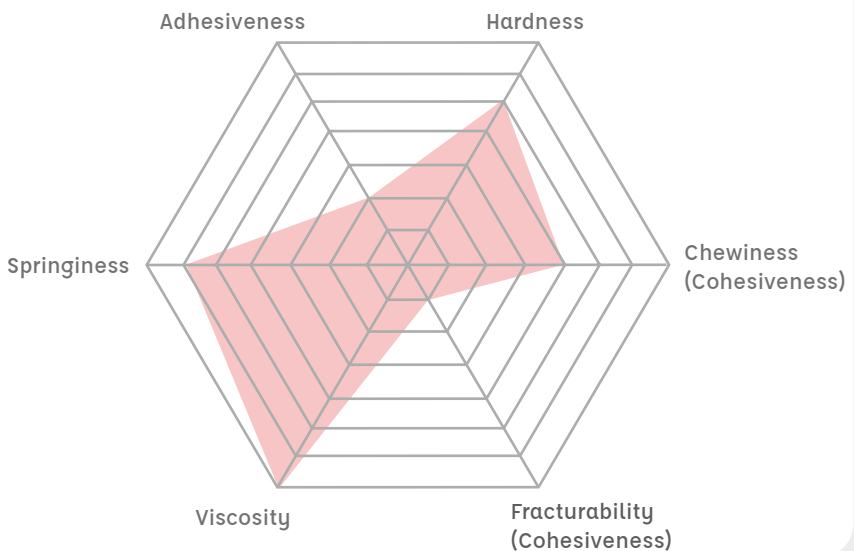
Calories 166 kcal/100g

Flavour Salty

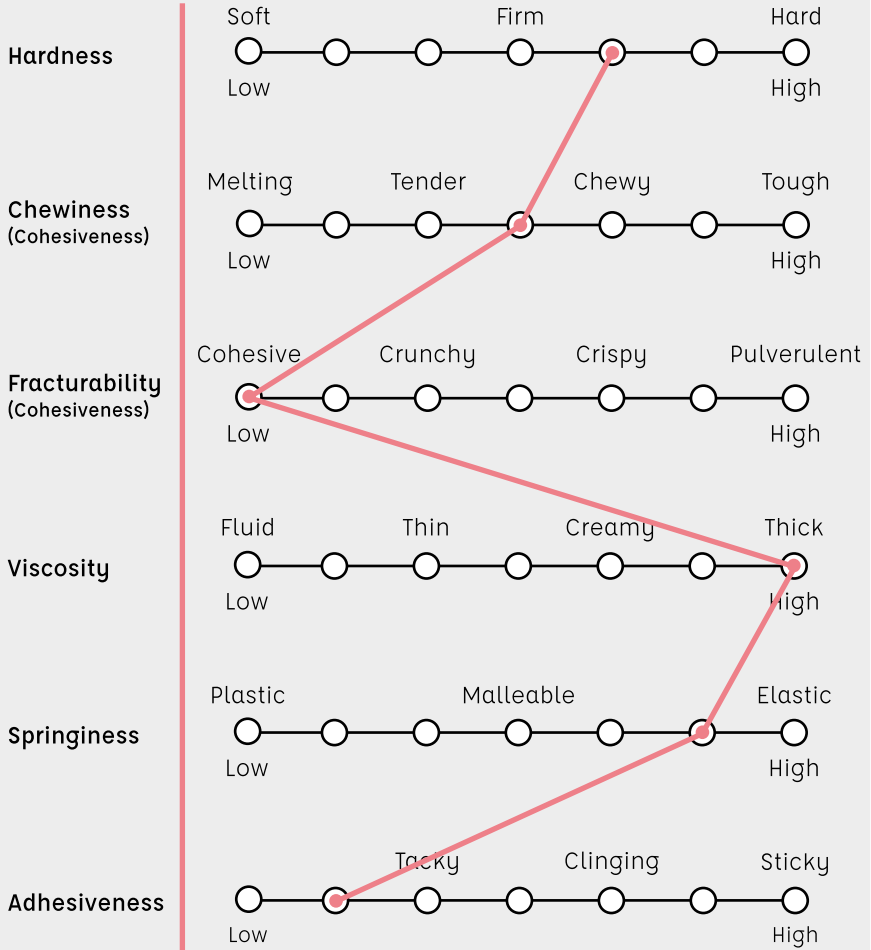
Oral Exposure Time

30 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Beef

Product Name Jumbo Meatball (pan fried)

Ingredient Contents Beef 43.0%, Veal 41.0%, water, breadcrumbs, potato, salt, spices, dextrose, potato, wheat starch, aromas, antioxidants: E301 and E331, acid: E325, preservative: E262, E = by EU approved excipient.

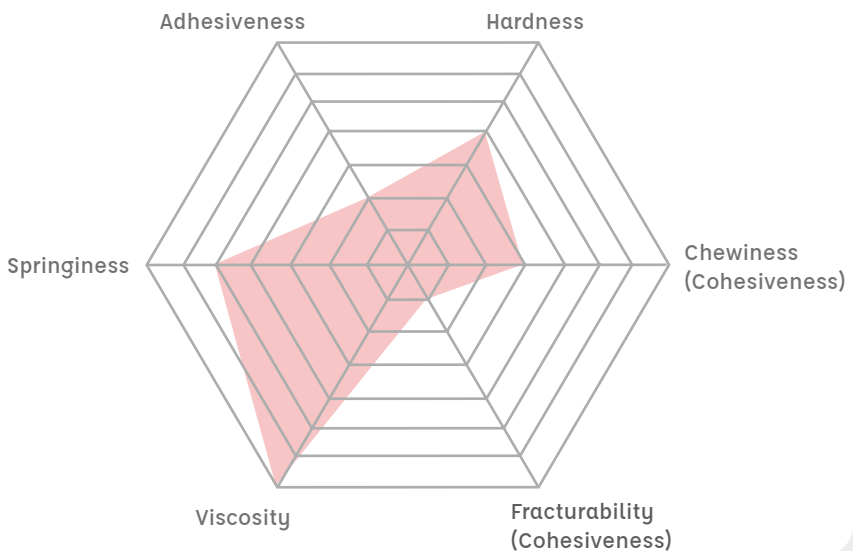
Calories 210 kcal/100g

Flavour Salty

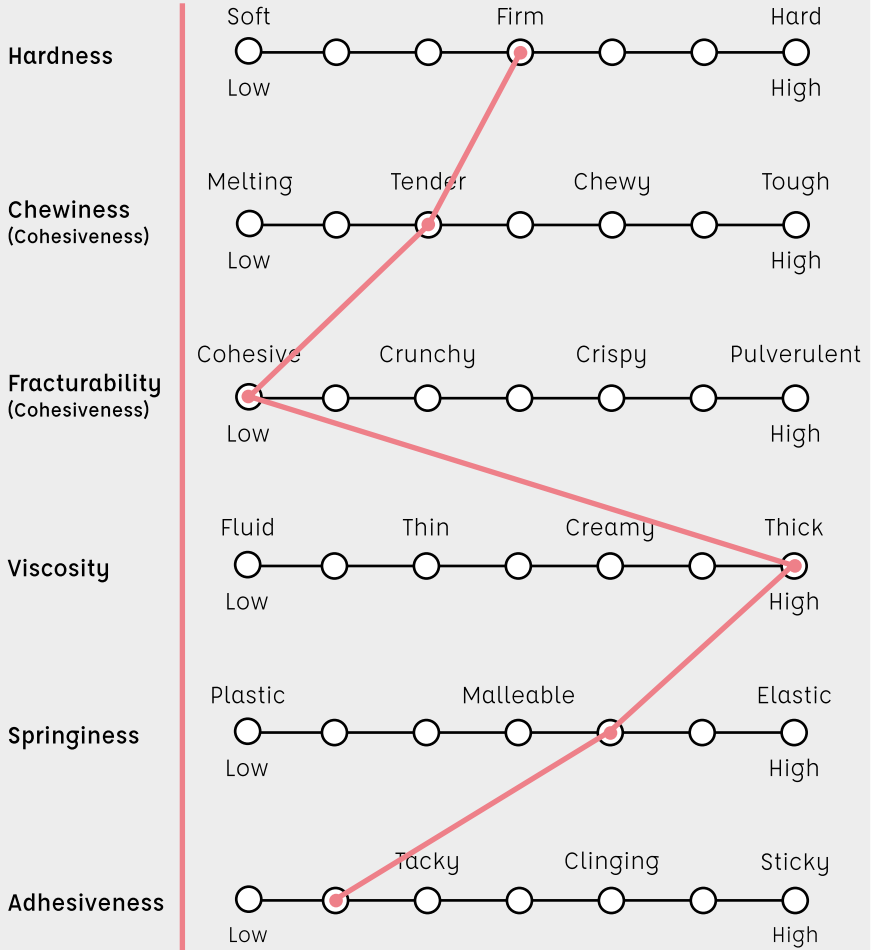
Oral Exposure Time

20 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Beef

Product Name Jacklink's Beef Jerky Original

Ingredient Contents Beef, sugar, salt, soy sauce powder, hydrolyzed corn protein, yeast extract, spices, aroma, nitrite pickling salt, antioxidant: extract of rosemary, acidity regulator: Citric acid, smoke flavoring, 100g

Calories 253 kcal/100g

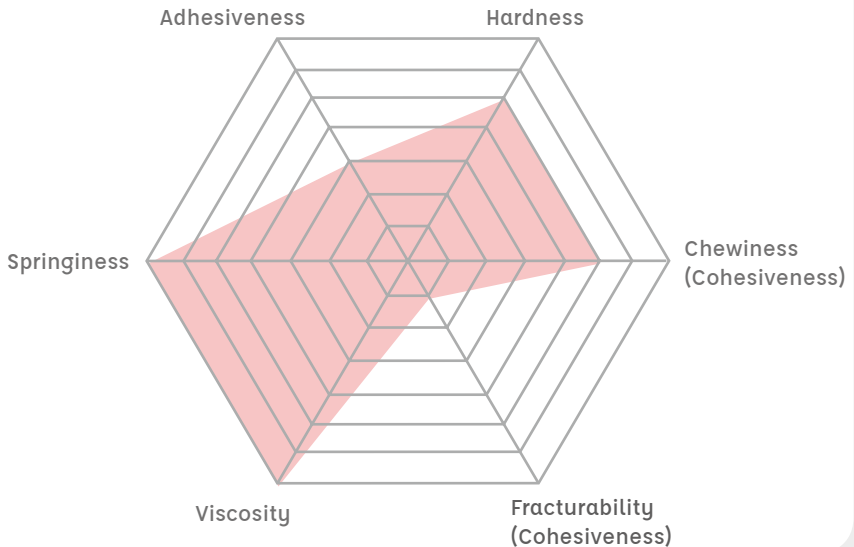
Flavour Salty, sweet

Beef Jerky is made from 201g beef.

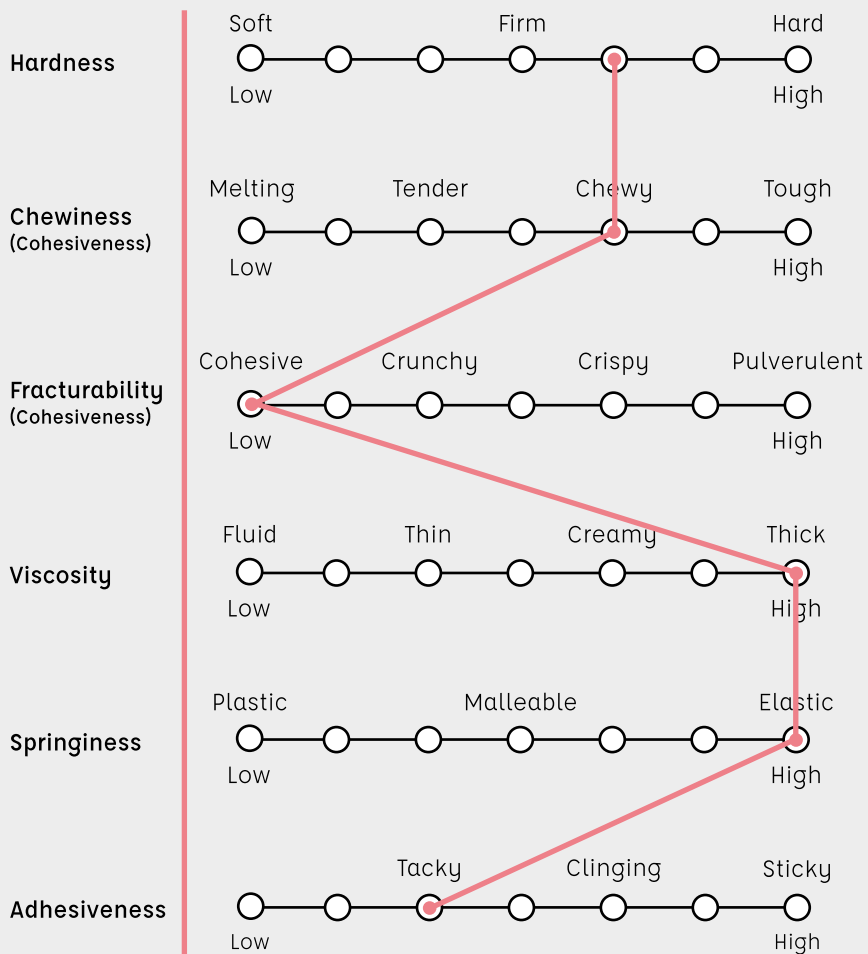
Oral Exposure Time

32 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Beef

Product Name AH Filet Americain

Ingredient Contents 65% meat, sunflower oil, water, salt, free-range egg yolk extract, rice starch, vinegar, spices, tomato, apple

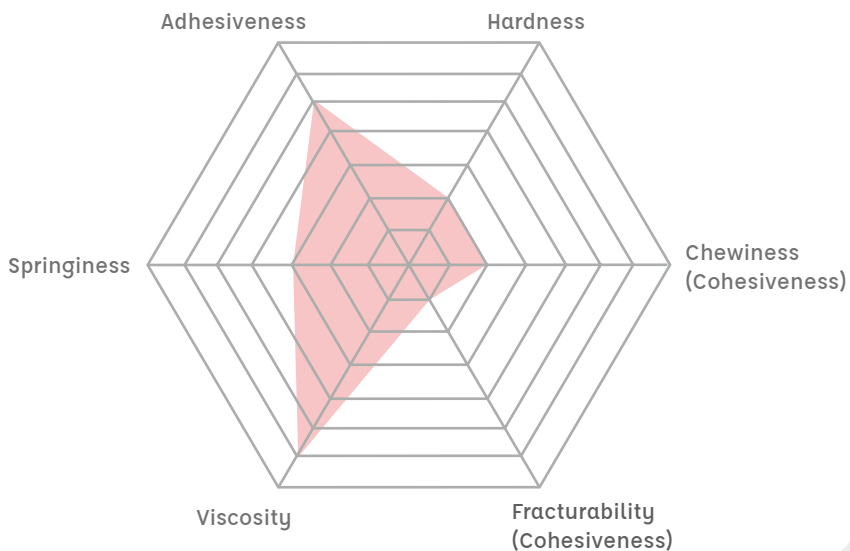
Calories 270 kcal/100g concentrate, sugar, dextrose, milk powder, milk protein, natural flavors,

Flavour Salty yeast extract, antioxidant, preservative, acid, thickeners

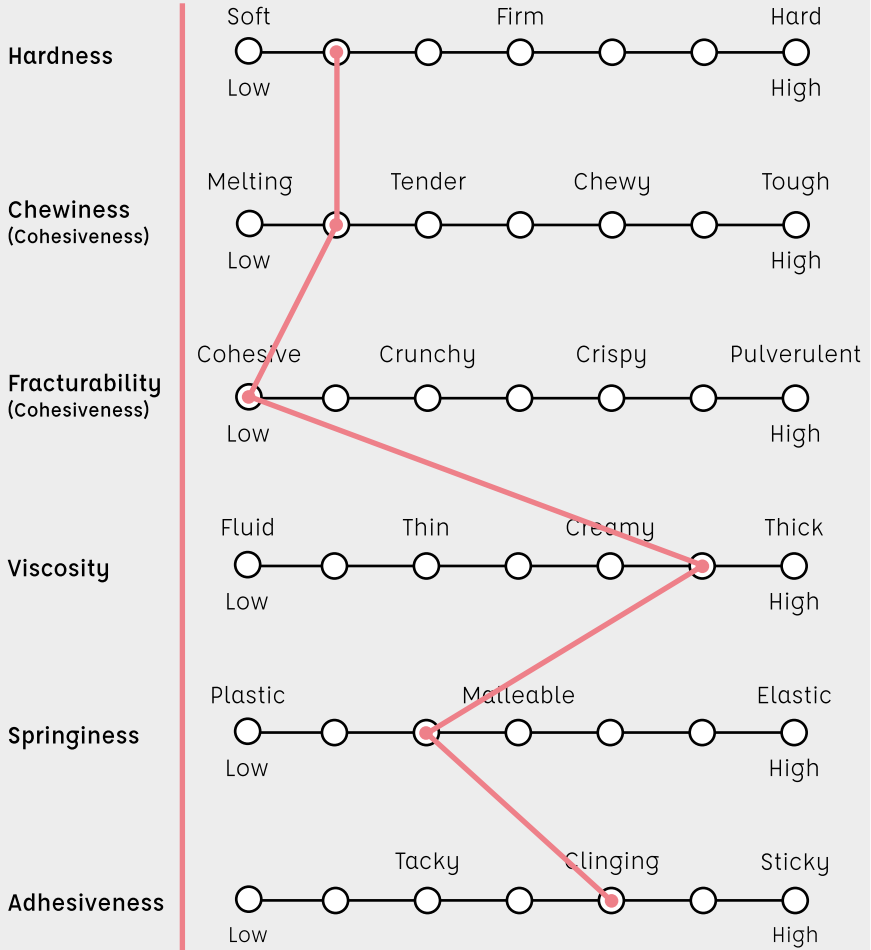
Oral Exposure Time

6-7 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Cheese

Product Name Galbani Ricotta

Ingredient Contents Pasteurized MILK serum, cream of MILK and / or whey (MELK), salt, acidity controllers: dairy acid, citric acids

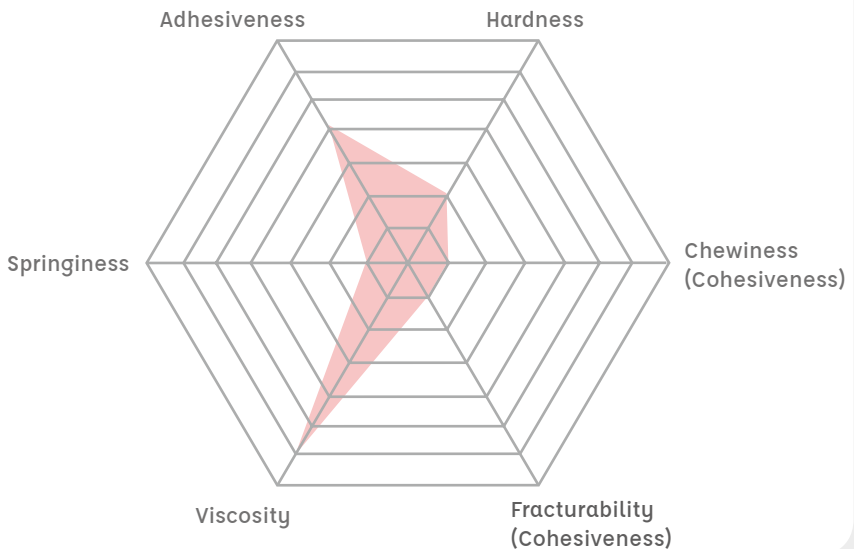
Calories 169 kcal/100g

Flavour

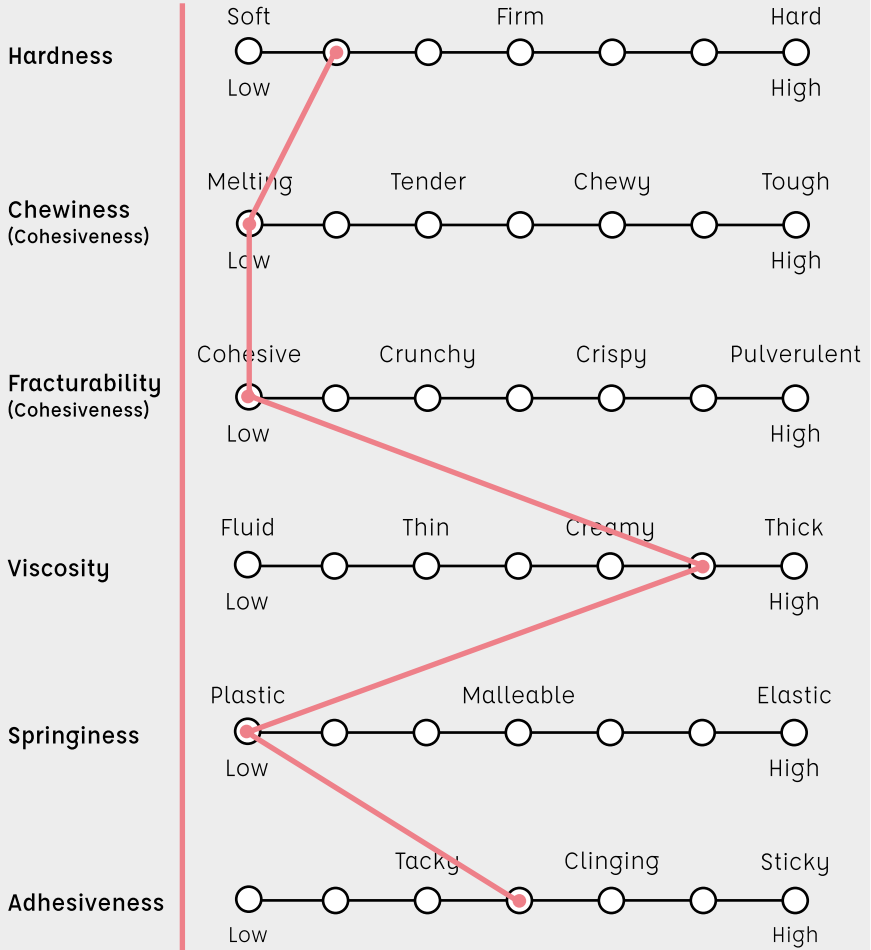
Oral Exposure Time

2 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Cheese

Product Name Goldsteig Mini Mozzarella

Ingredient Contents Pasteurized cow milk, acid: citric acid, lactic acid bacteria, microbial rennet, salt

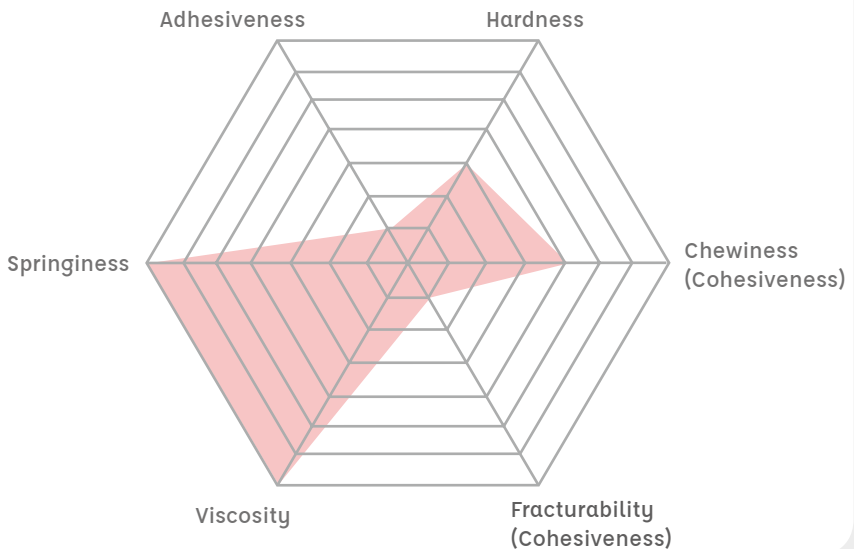
Calories 245 kcal/100g

Flavour

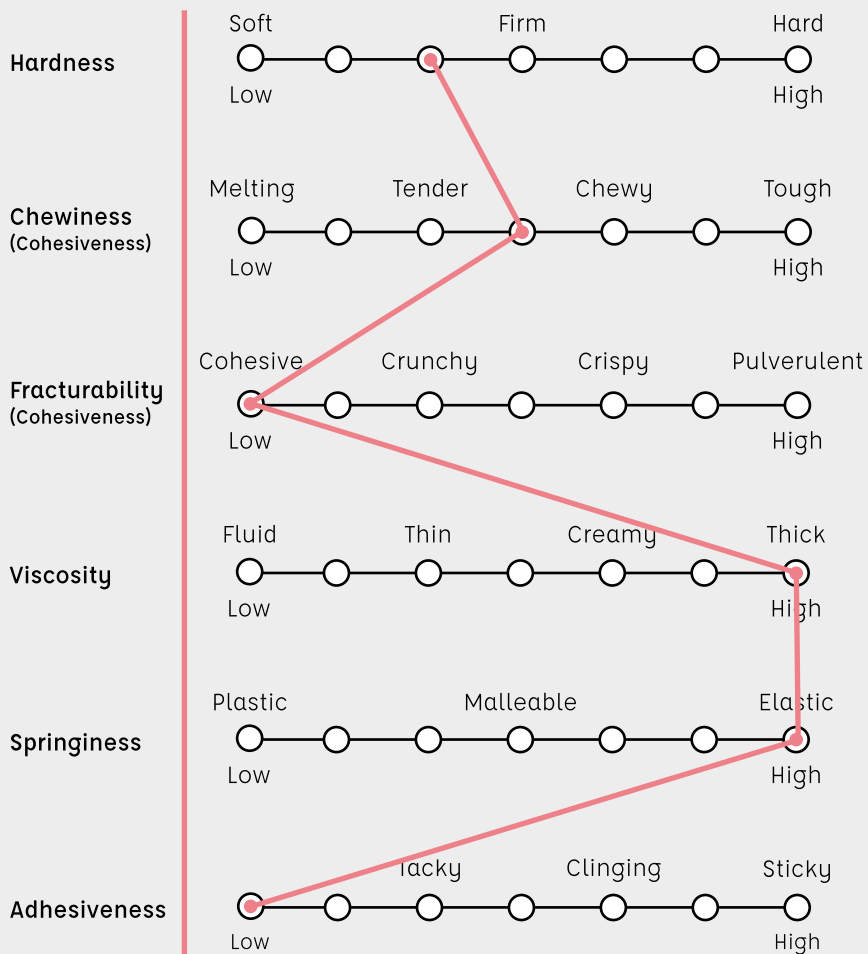
Oral Exposure Time

18 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Cheese

Product Name Philadelphia Cream Cheese

Ingredient Contents whole milk, cream, milk protein preparation, weipermeaatconcentraat (from milk), salt, stabilizer

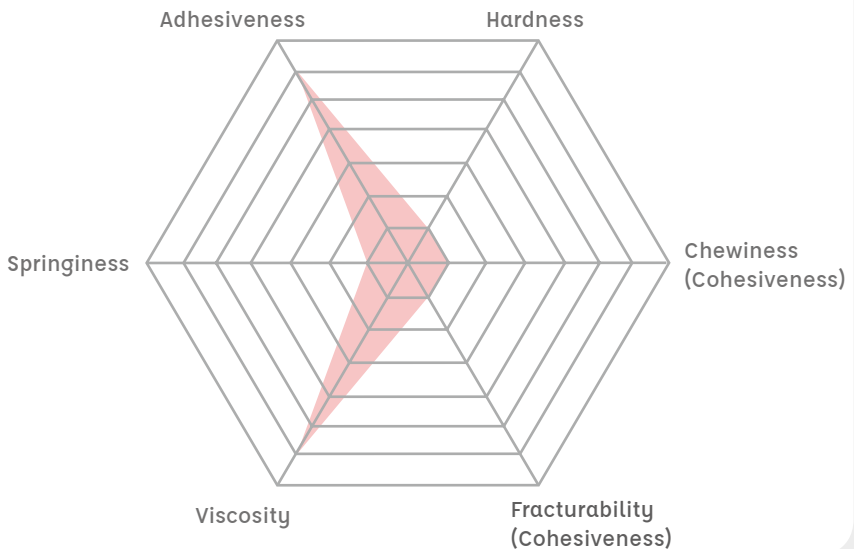
Calories 235 kcal/100g ,acid (citric acid) ,Pasteurized milk.

Flavour

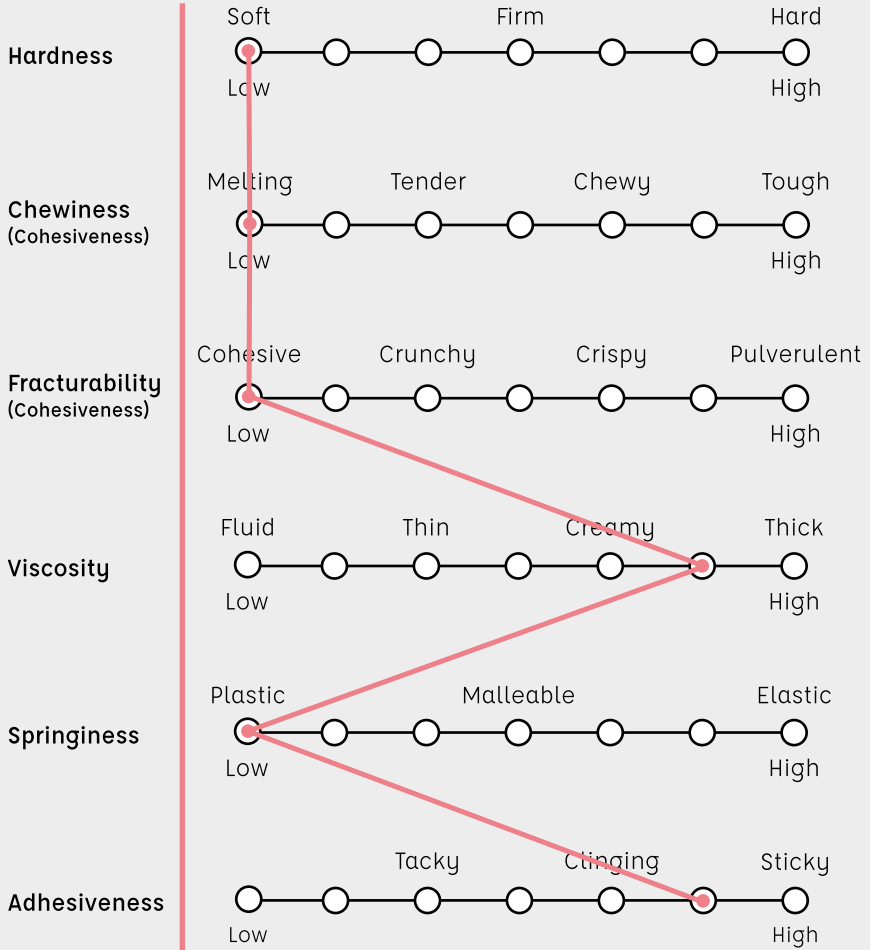
Oral Exposure Time

5 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Cheese

Product Name Jumbo Cheese Cubes

Ingredient Contents Milk, salt, lactic acid, rennet, preservative: E251, Dye: annatto

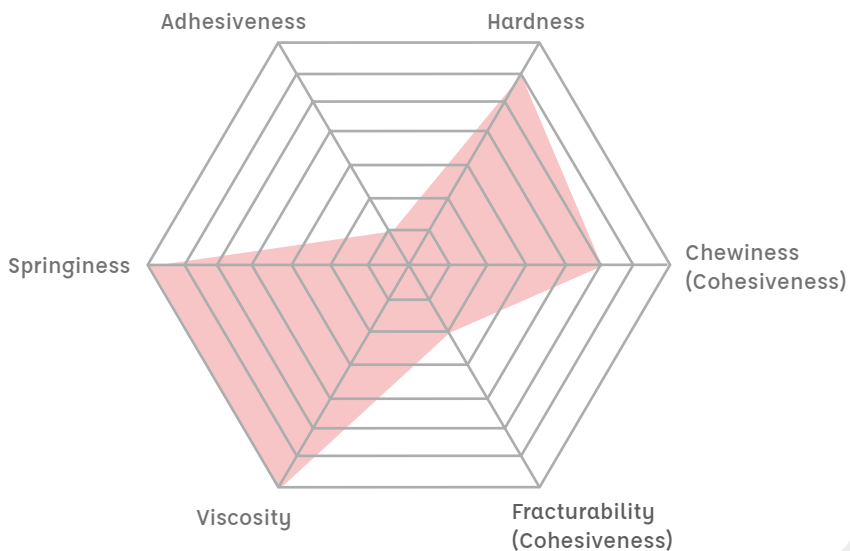
Calories 409 kcal/100g

Flavour Salty

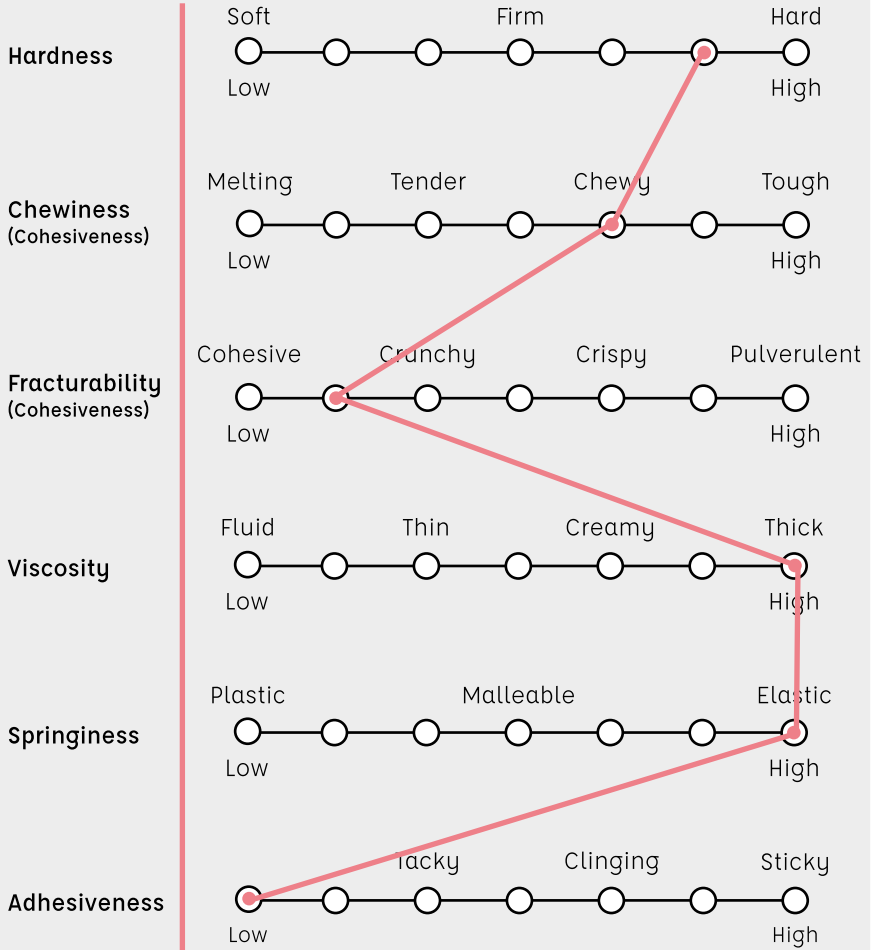
Oral Exposure Time

24 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Yogurt

Product Name Jumbo Yoghurt Mager

Ingredient Contents Milk, milk protein 0.9%, lactic acid bacteria (milk)

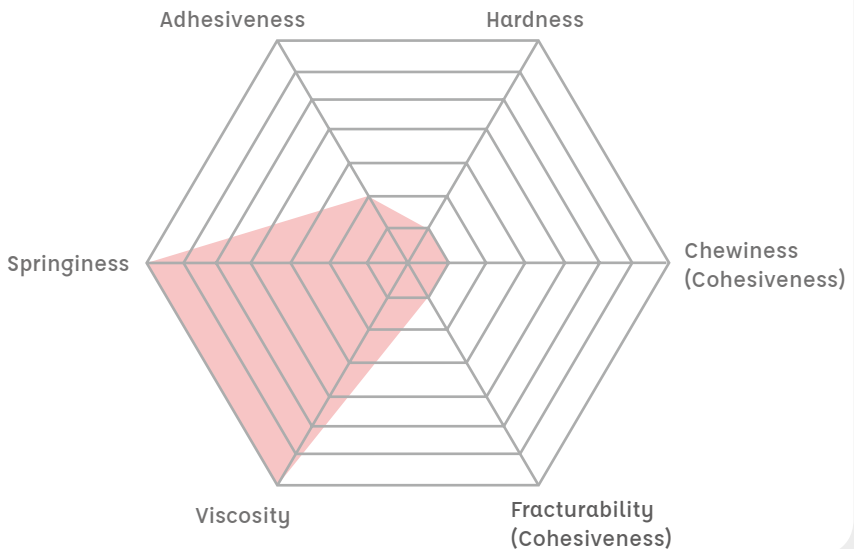
Calories 37 kcal/100g

Flavour Sweet

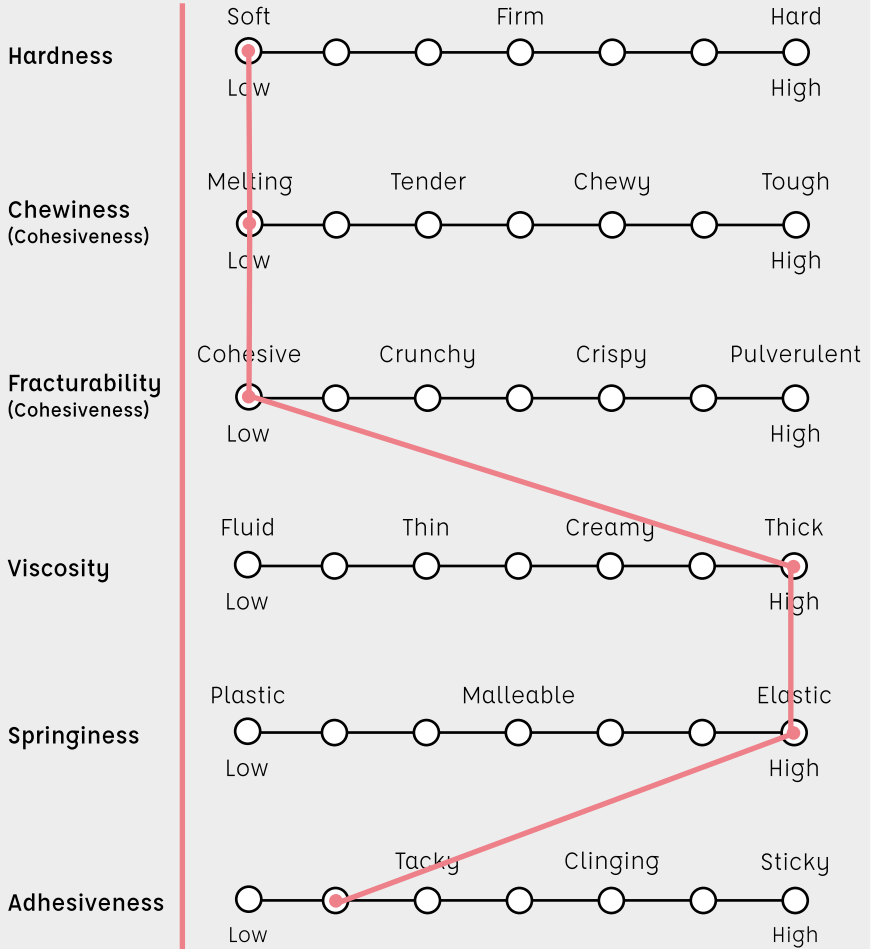
Oral Exposure Time

1-2 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Yogurt

Product Name Jumbo Greek Yoghurt

Ingredient Contents Low-fat yogurt (milk), milk protein 4%

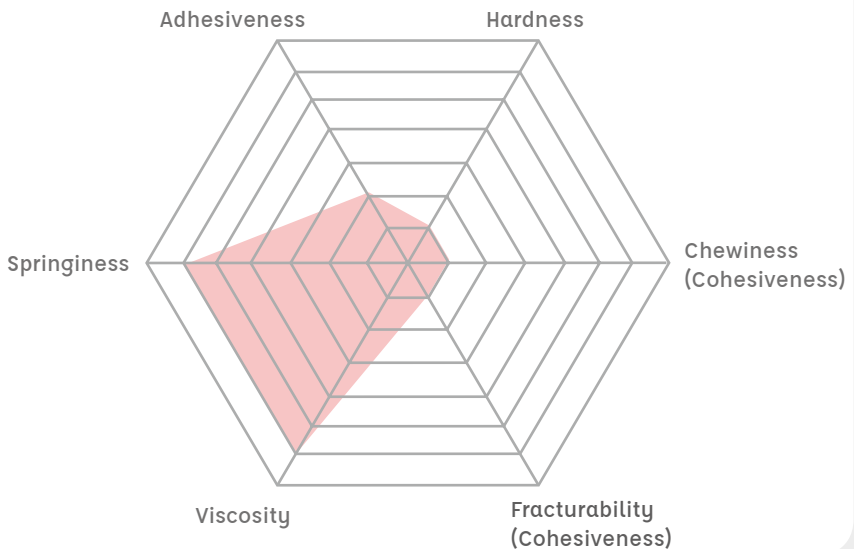
Calories 54 kcal/100g

Flavour Sweet

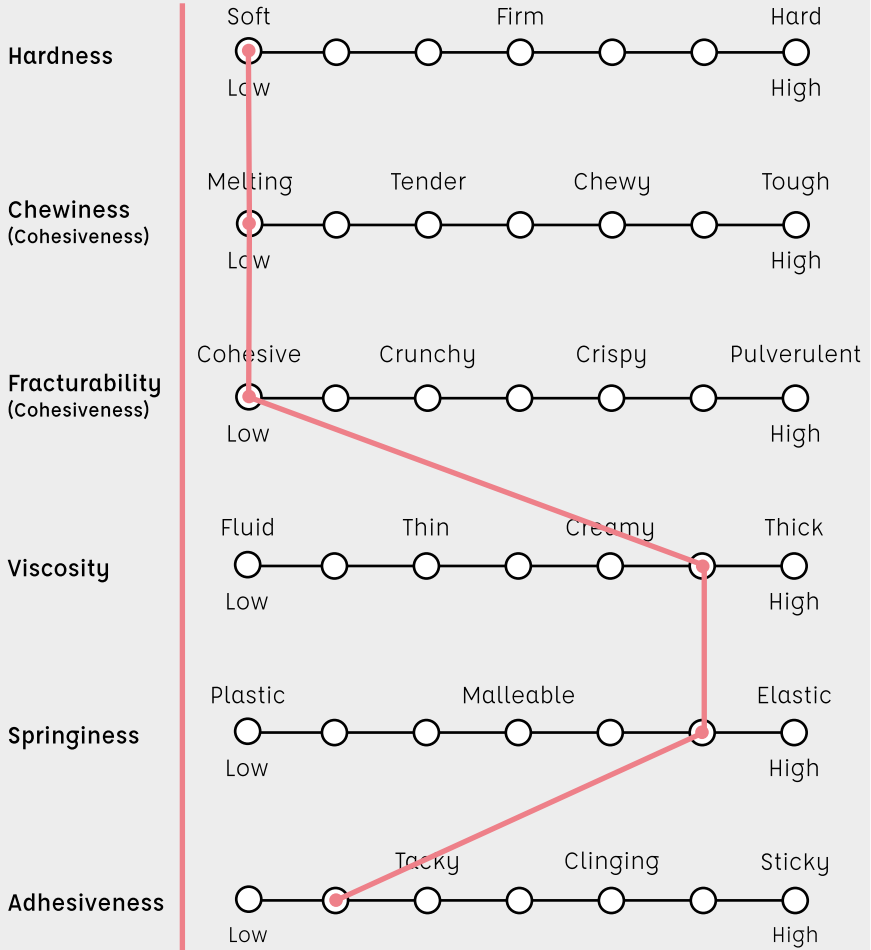
Oral Exposure Time

4 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Milk/ Cream

Product Name Half Volle Milk

Ingredient Contents Milk

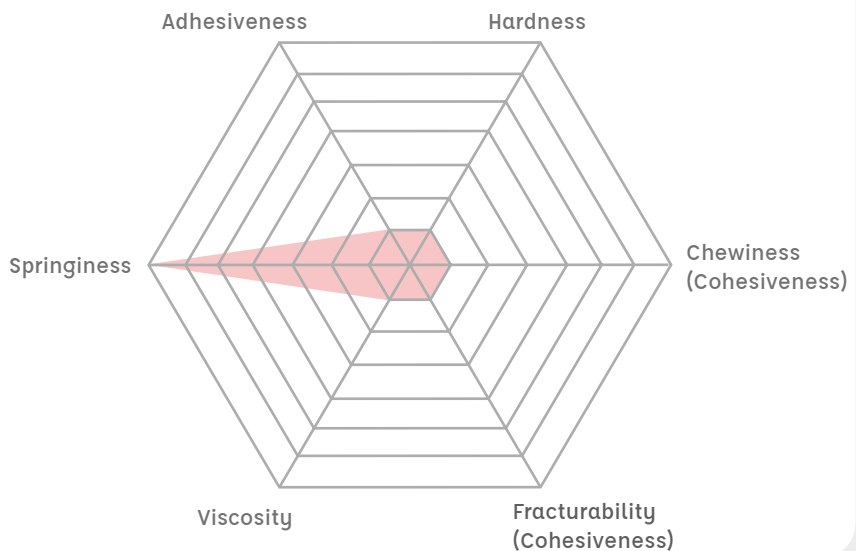
Calories 48 kcal/100g

Flavour

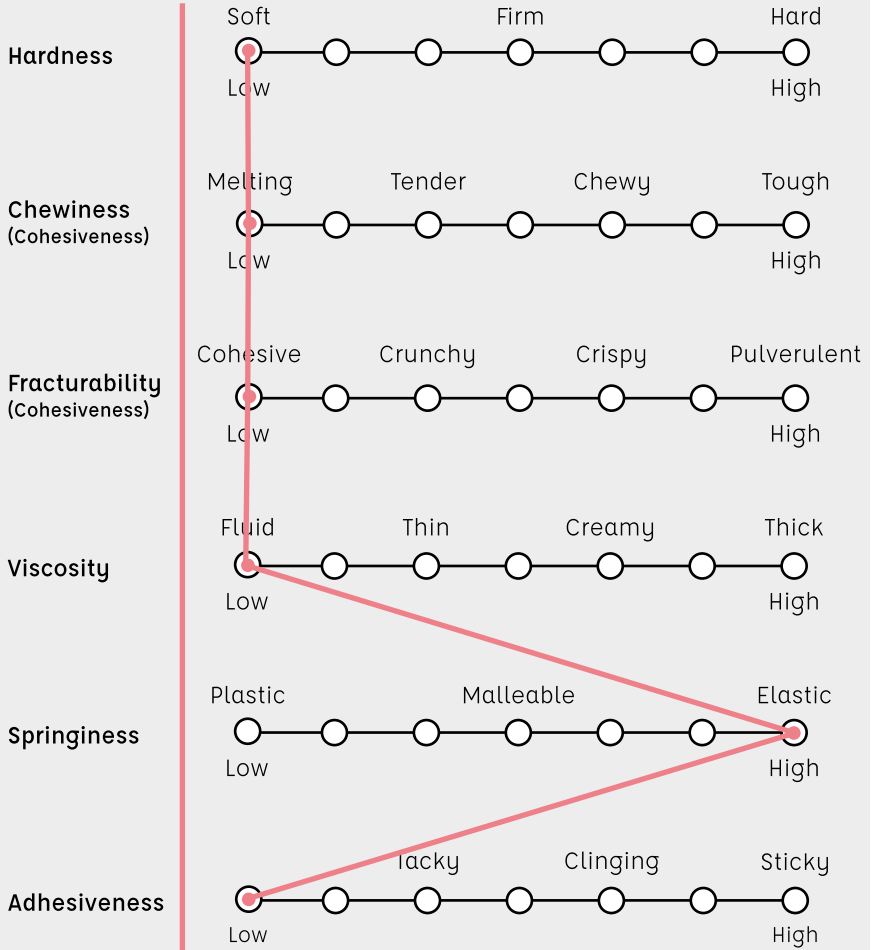
Oral Exposure Time

0 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Milk/Cream

Product Name Verse Slagroom

Ingredient Contents Whipped cream (milk), stabilizer: E407

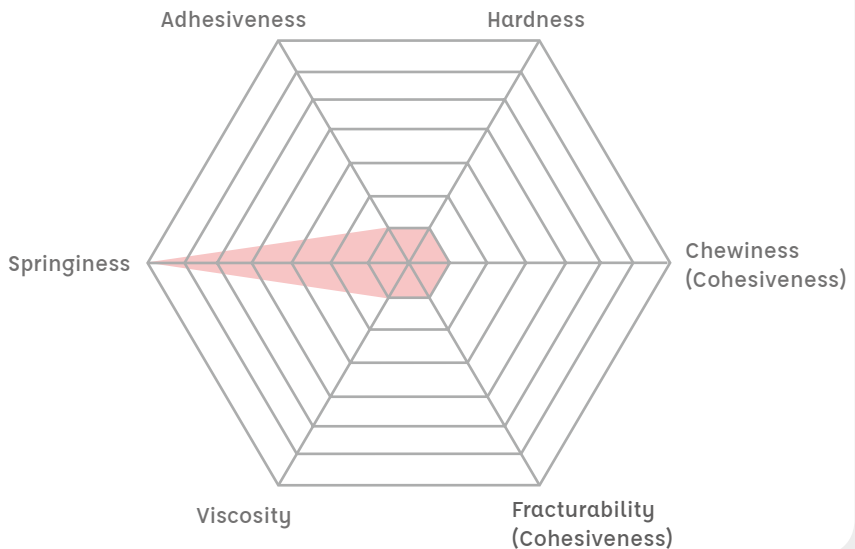
Calories 336 kcal/100g

Flavour

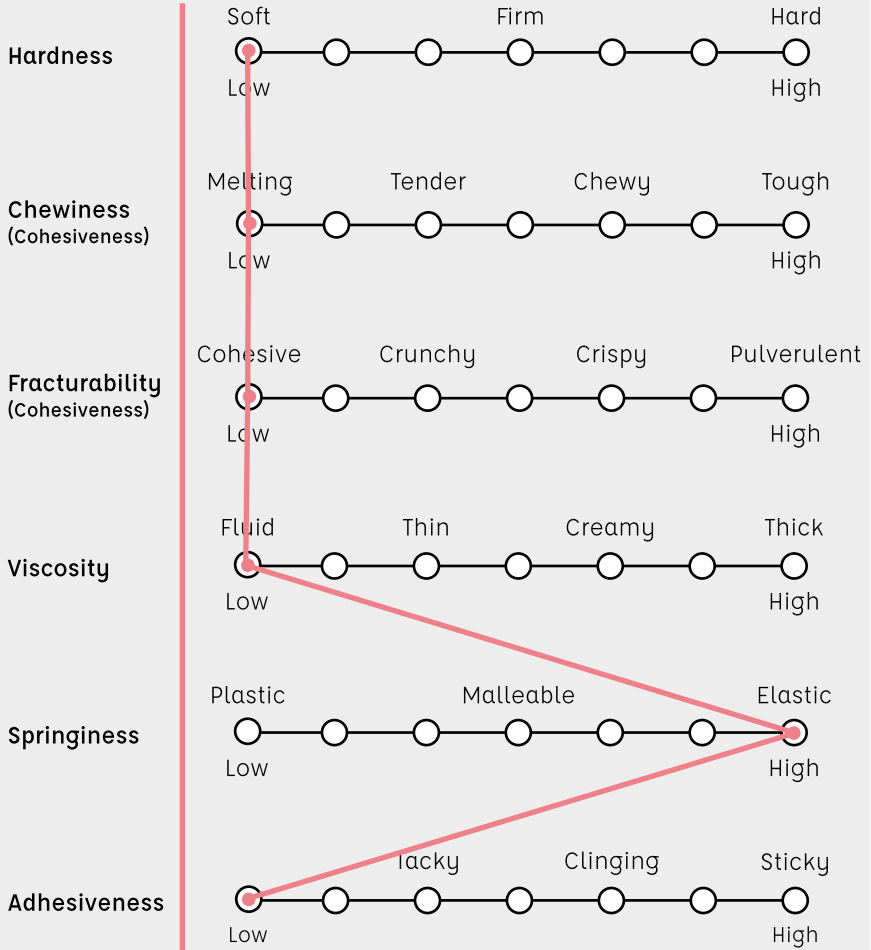
Oral Exposure Time

0 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Tomato

Product Name Cherry tomato (raw)

Ingredient Contents Cherry tomato

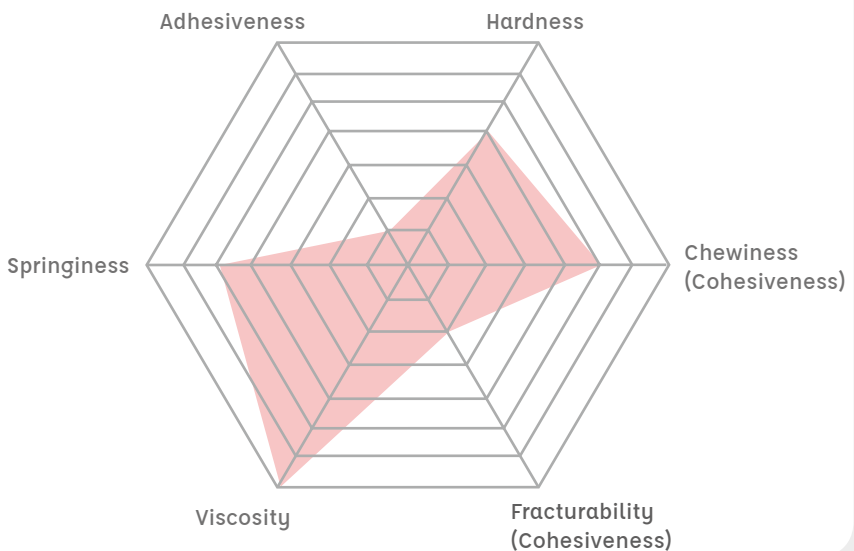
Calories 18 kcal/100g

Flavour

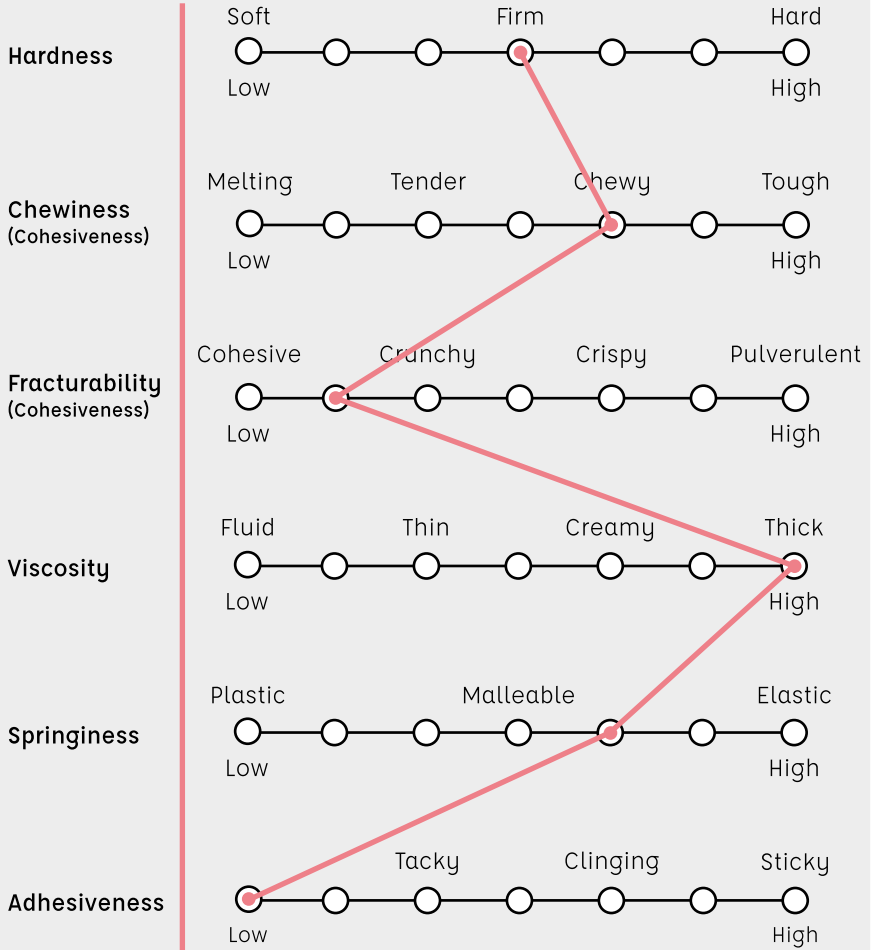
Oral Exposure Time

15 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Tomato

Product Name Heinz Tomato Frito

Ingredient Contents Tomatoes (160g per 100g tomato frito), sunflower oil (fried with onion and garlic), sugar, salt, modified starch

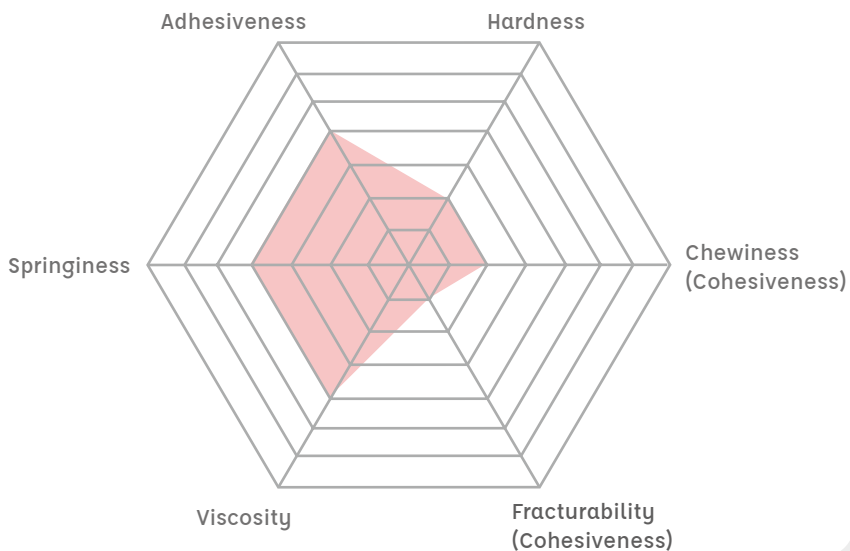
Calories 73 kcal/100g

Flavour

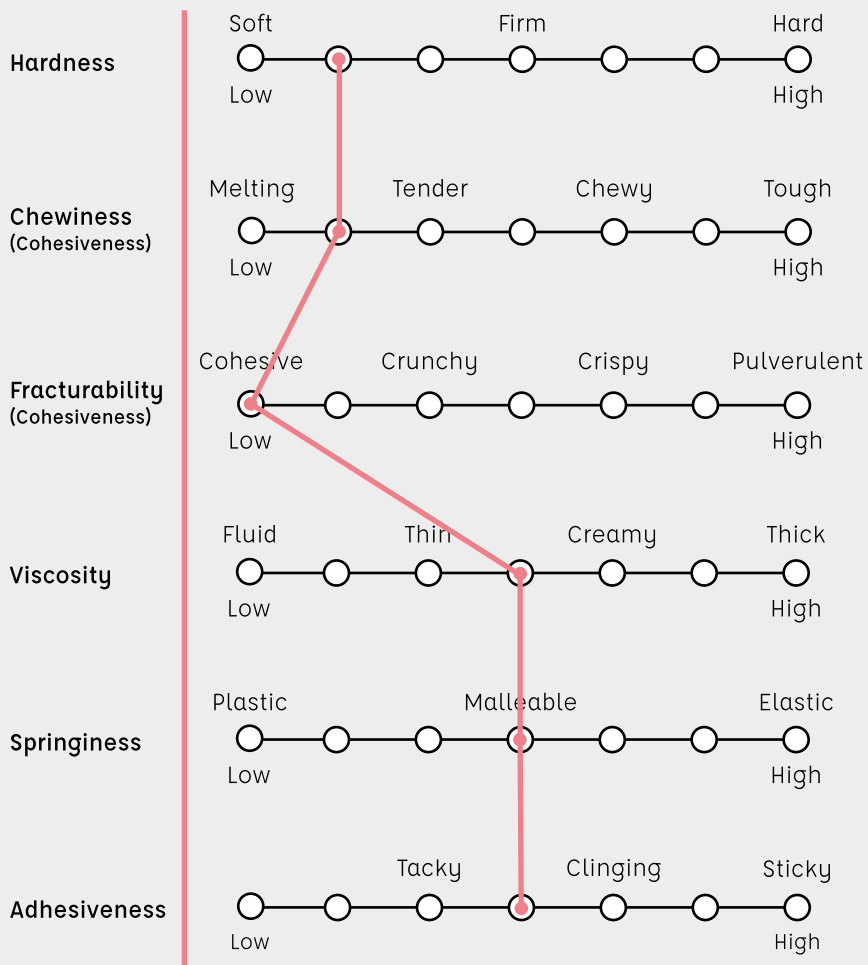
Oral Exposure Time

1-2 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)

Food Category Tomato

Product Name Tomato Juice

Ingredient Contents

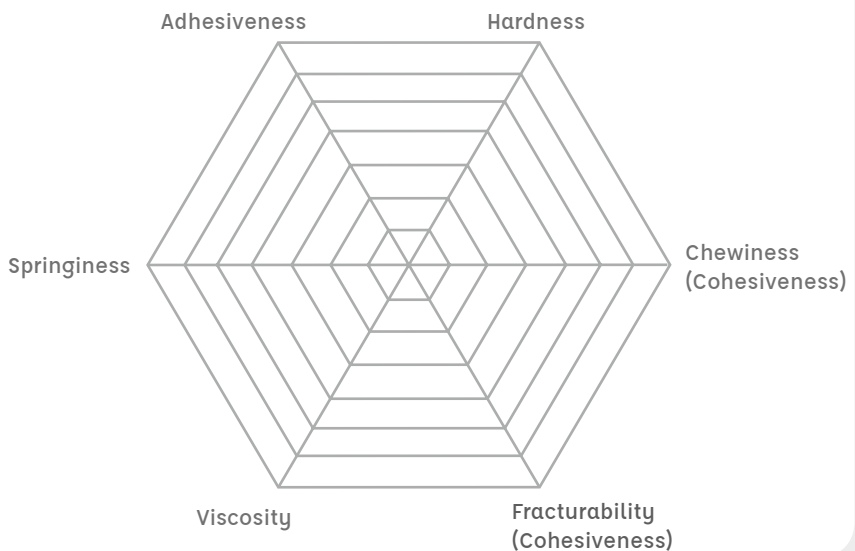
Calories 49 kcal/100g

Flavour

Oral Exposure Time

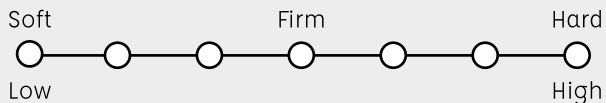
0 chews/bite

Texture Characteristics

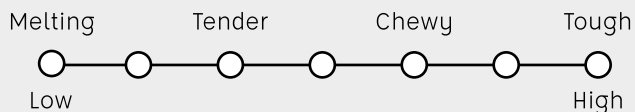


Texture Profile

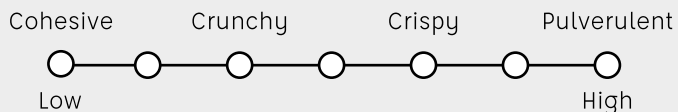
Hardness



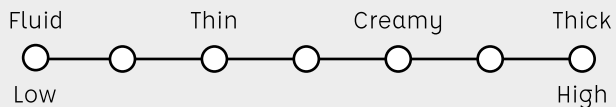
**Chewiness
(Cohesiveness)**



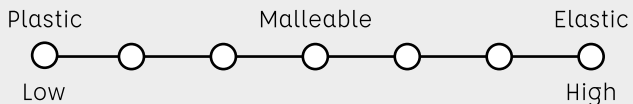
**Fracturability
(Cohesiveness)**



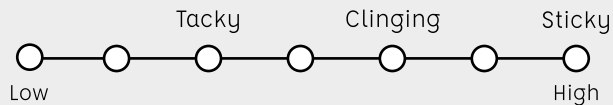
Viscosity



Springiness



Adhesiveness



(Definition from ISO5492:2009)



Food Category Carrot

Product Name Carrot (raw)

Ingredient Contents Carrot

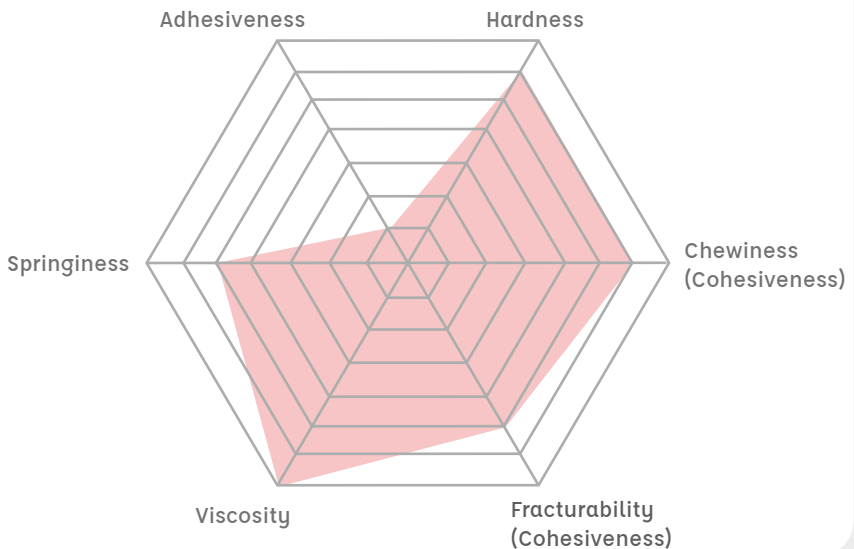
Calories 33 kcal/100g

Flavour

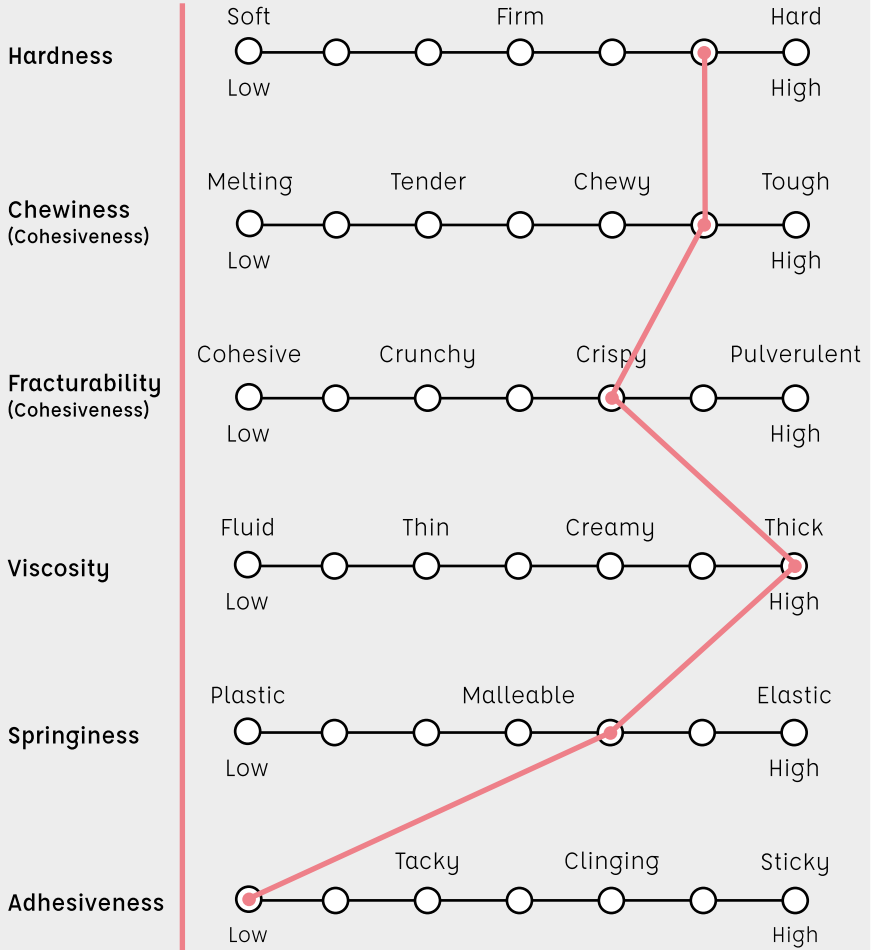
Oral Exposure Time

35 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Carrot

Product Name Jumbo Mashed carrot (for 4+ months)

Ingredient Contents Carrot 80%, water

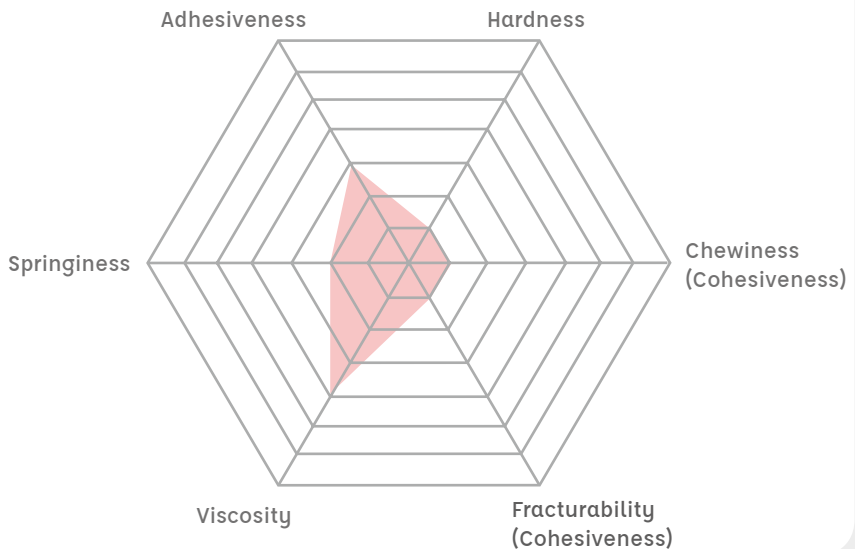
Calories 32 kcal/100g

Flavour

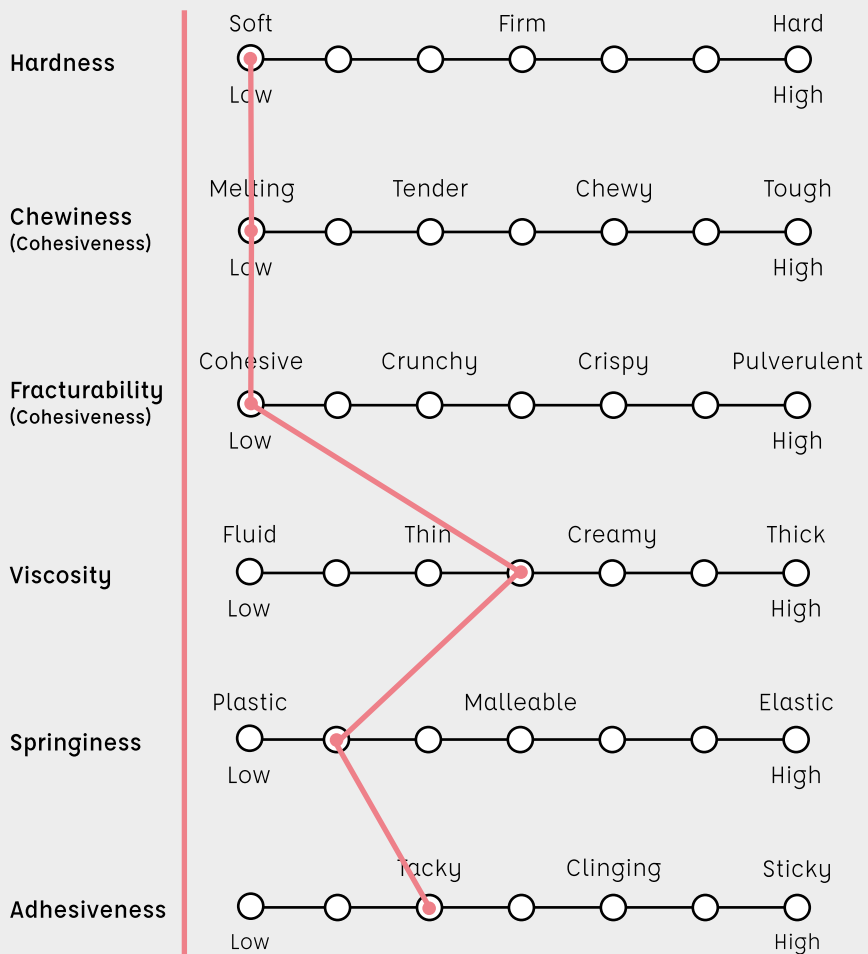
Oral Exposure Time

5 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)

Food Category Carrot

Product Name Carrot Juice

Ingredient Contents Carrot juice

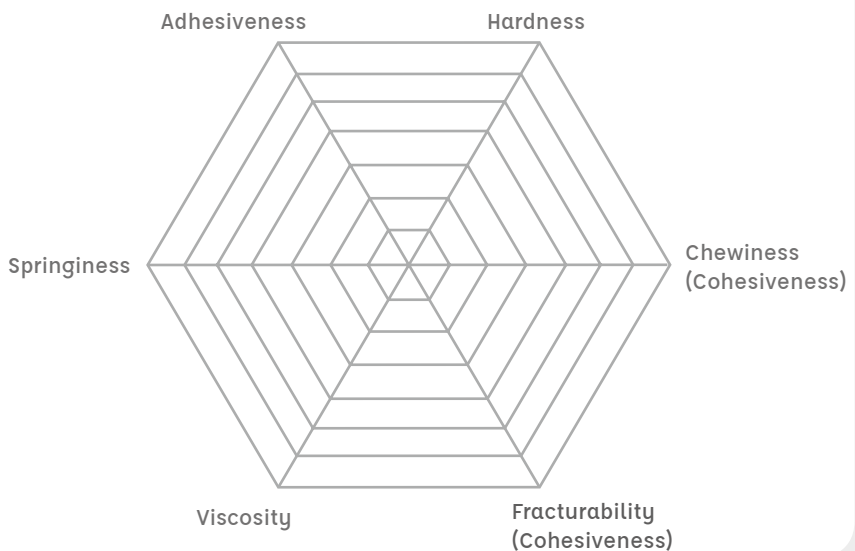
Calories 32 kcal/100g

Flavour

Oral Exposure Time

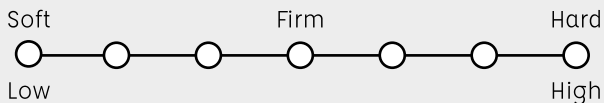
0 chews/bite

Texture Characteristics

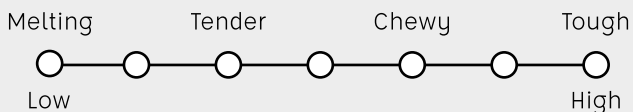


Texture Profile

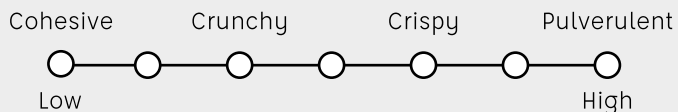
Hardness



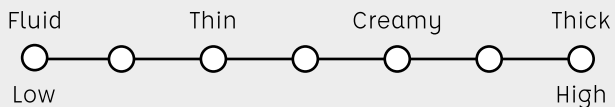
**Chewiness
(Cohesiveness)**



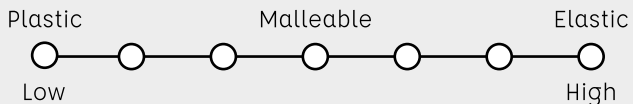
**Fracturability
(Cohesiveness)**



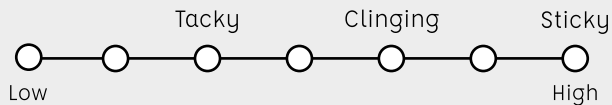
Viscosity



Springiness



Adhesiveness



(Definition from ISO5492:2009)

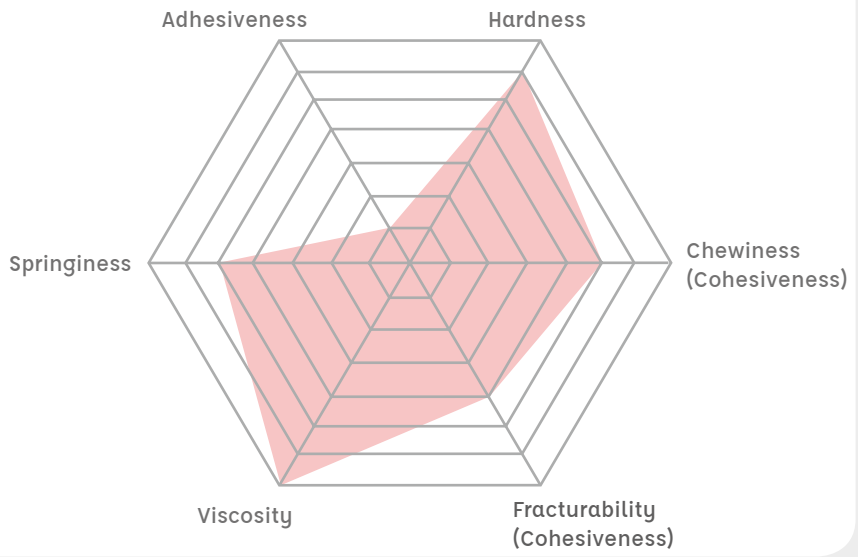


Food Category Cauliflower
Product Name Cauliflower (boiled)
Ingredient Contents Cauliflower
Calories 29.4 kcal/100g
Flavour

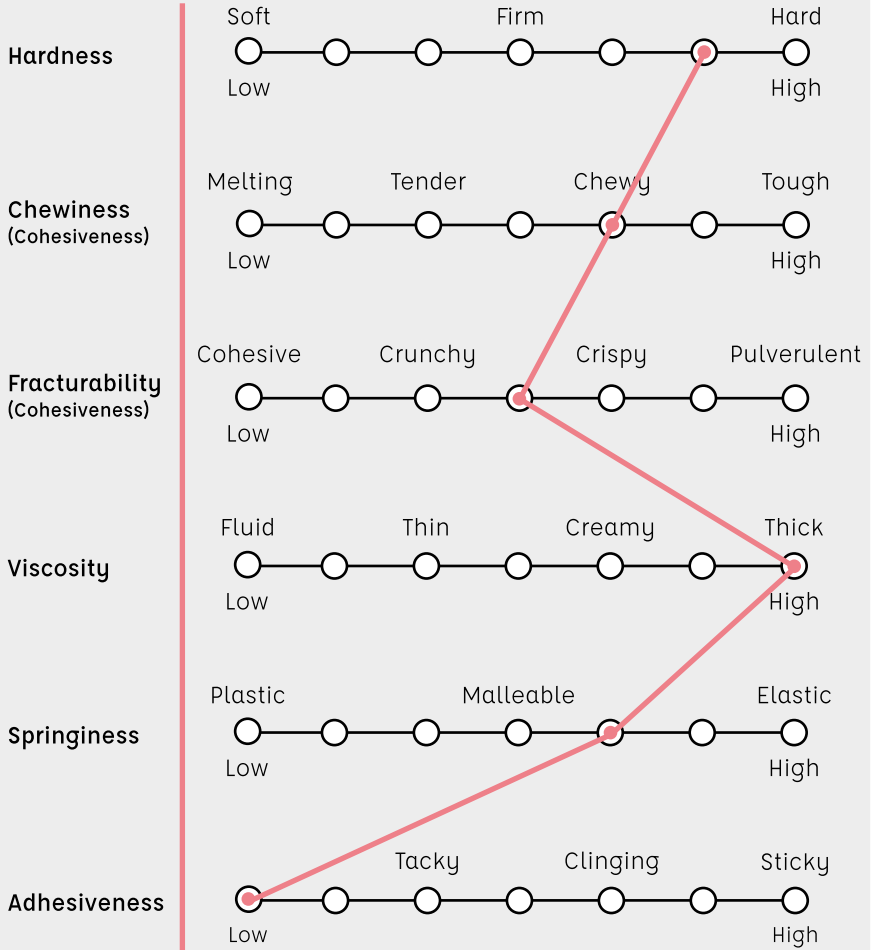
Oral Exposure Time

18 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Cauliflower

Product Name Olvarit Bloemkoolschote (for 8 months)

Ingredient Contents 36% cauliflower, 24.6% water (necessary for preparation), 20.8% skimmed milk, 8% cheese (milk),

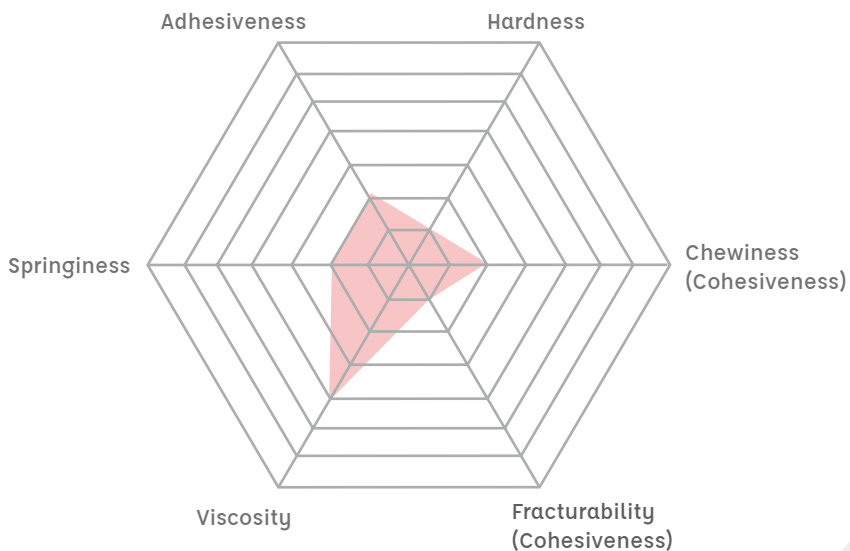
Calories 63 kcal/100g 7.6% rice, 2.5% corn starch, parsley

Flavour

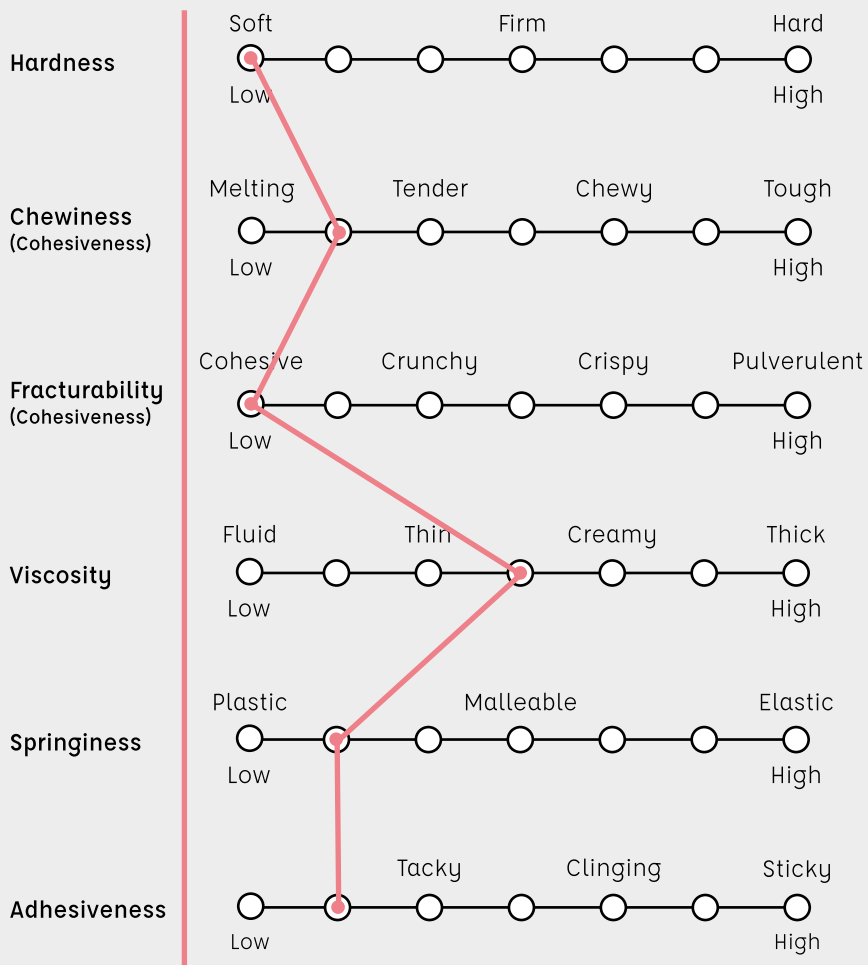
Oral Exposure Time

3 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Chocolate

Product Name Verkade 75% Dark Chocolate Bar

Ingredient Contents cocoa mass, sugar, cocoa butter, emulsifier: soy lecithin, coffee, **Cocoa Ingredients: at least 75%**

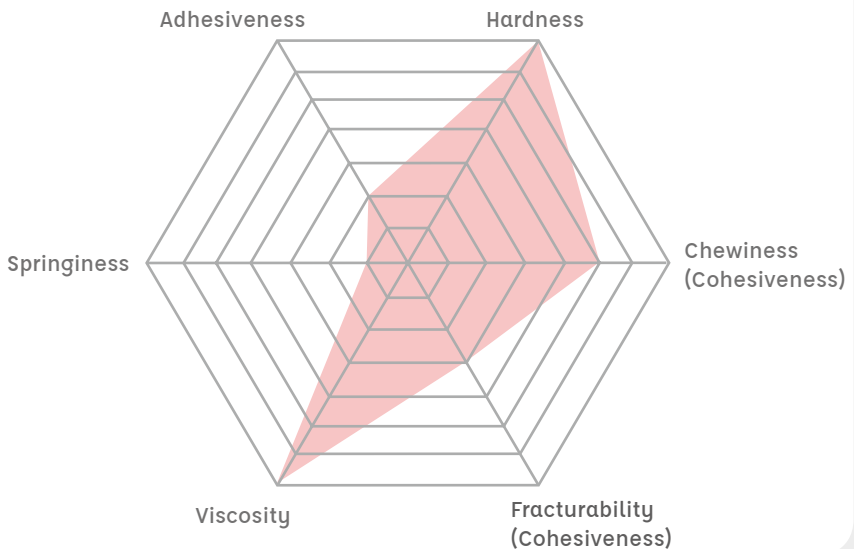
Calories 574 kcal/100g

Flavour Sweet, bitter

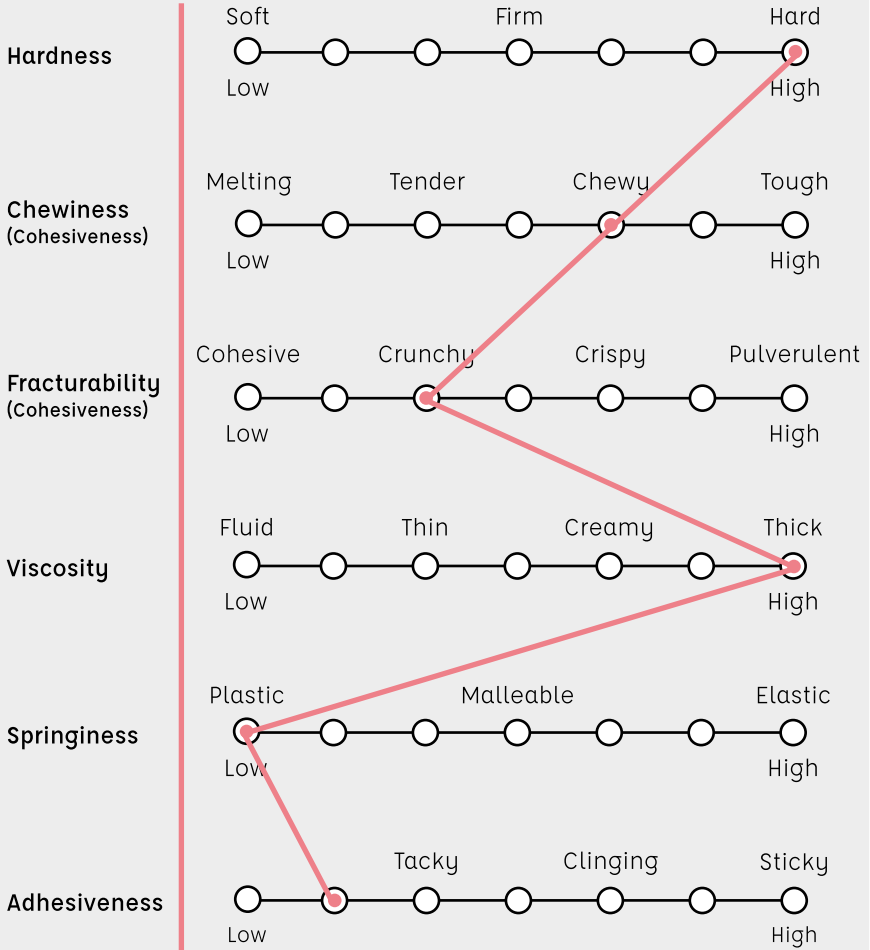
Oral Exposure Time

22 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Chocolate

Product Name Chocomel

Ingredient Contents Partly skimmed milk, sugar, cocoa (1.7%), stabilizer: carrageenan

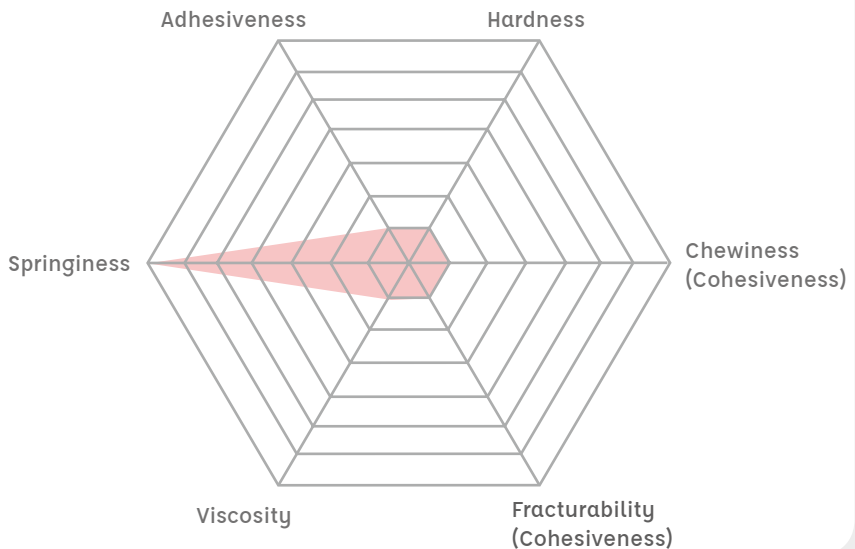
Calories 86 kcal/100g

Flavour Sweet

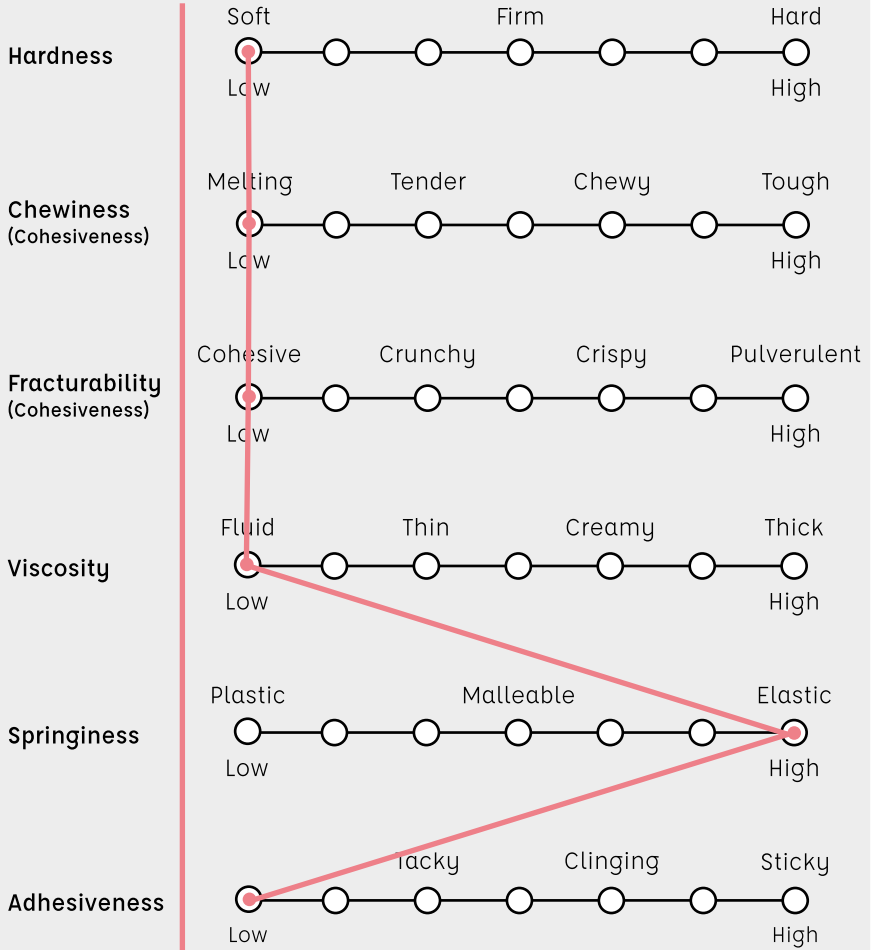
Oral Exposure Time

0 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Chocolate

Product Name Campina Chocolate Custard

Ingredient Contents Milk, liquid milk constituents, sugar, modified corn starch, 1.5% fat cocoa, thickener: carrageenan, aroma

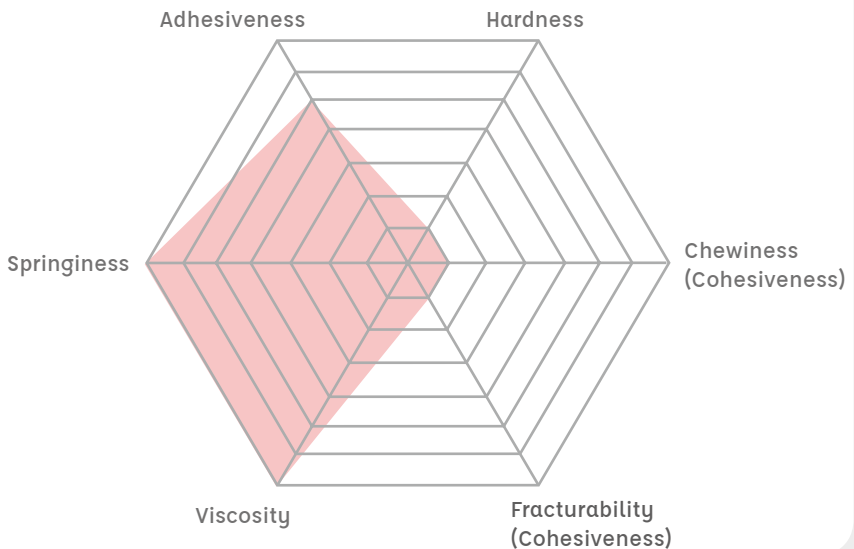
Calories 97 kcal/100g

Flavour Sweet

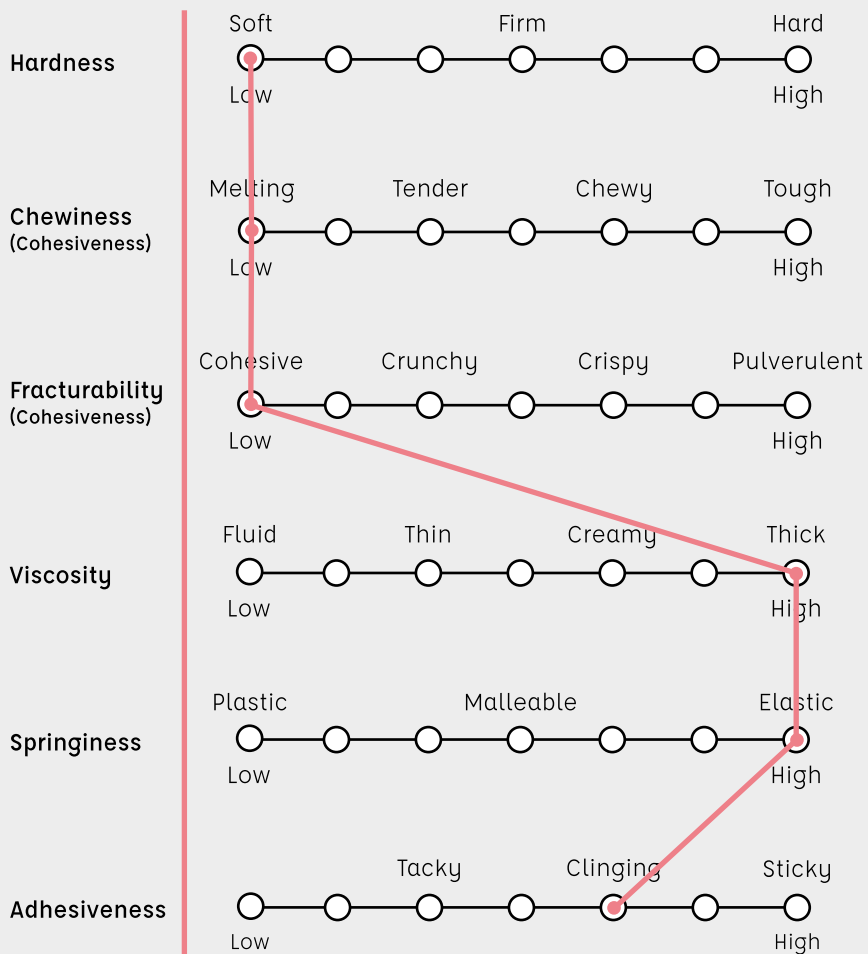
Oral Exposure Time

0 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Chocolate

Product Name Jumbo Chocolate Mousse

Ingredient Contents Whipped cream (milk), 25% chocolate (cocoa mass, sugar, emulsifier: soy lecithin, natural vanilla flavor),

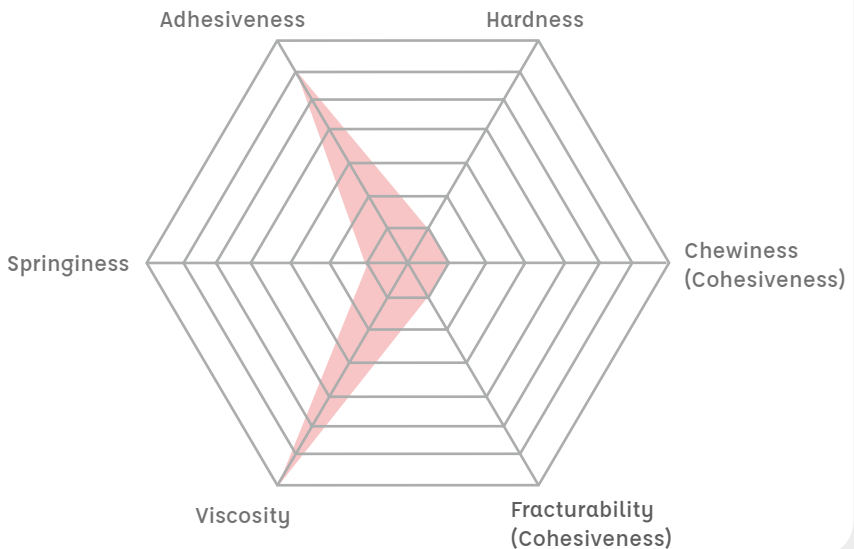
Calories 319 kcal/100g pasteurized free-range egg, white icing sugar, modified wheat starch

Flavour Sweet

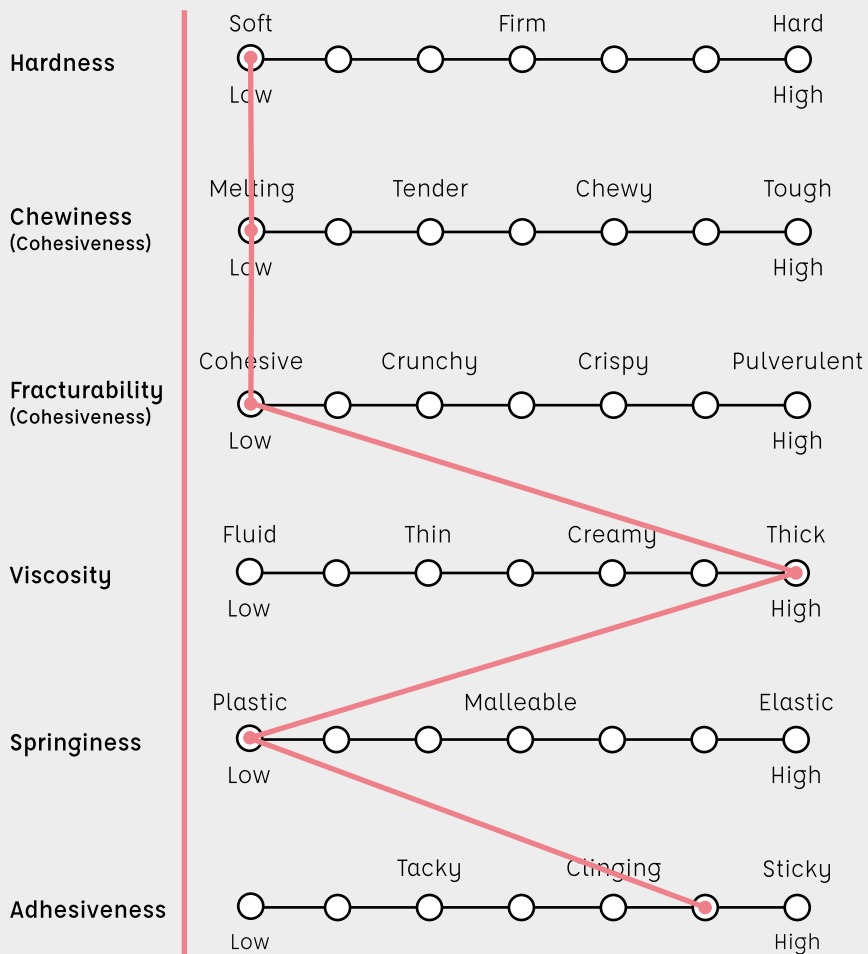
Oral Exposure Time

0 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Soy

Product Name Alpro Cuisine Soya

Ingredient Contents Water, hulled soya beans (4%), sunflower oil, thickening agent (modified tapioca starch), sugar, stabilizers

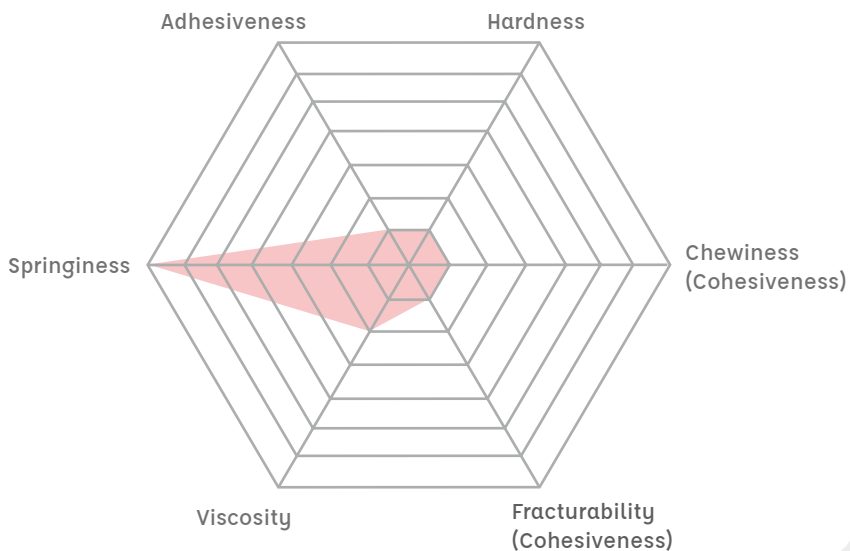
Calories 62 kcal/100g (xanthan gum, carrageenan), emulsifier (sucrose fatty acid esters), aroma, sea salt

Flavour

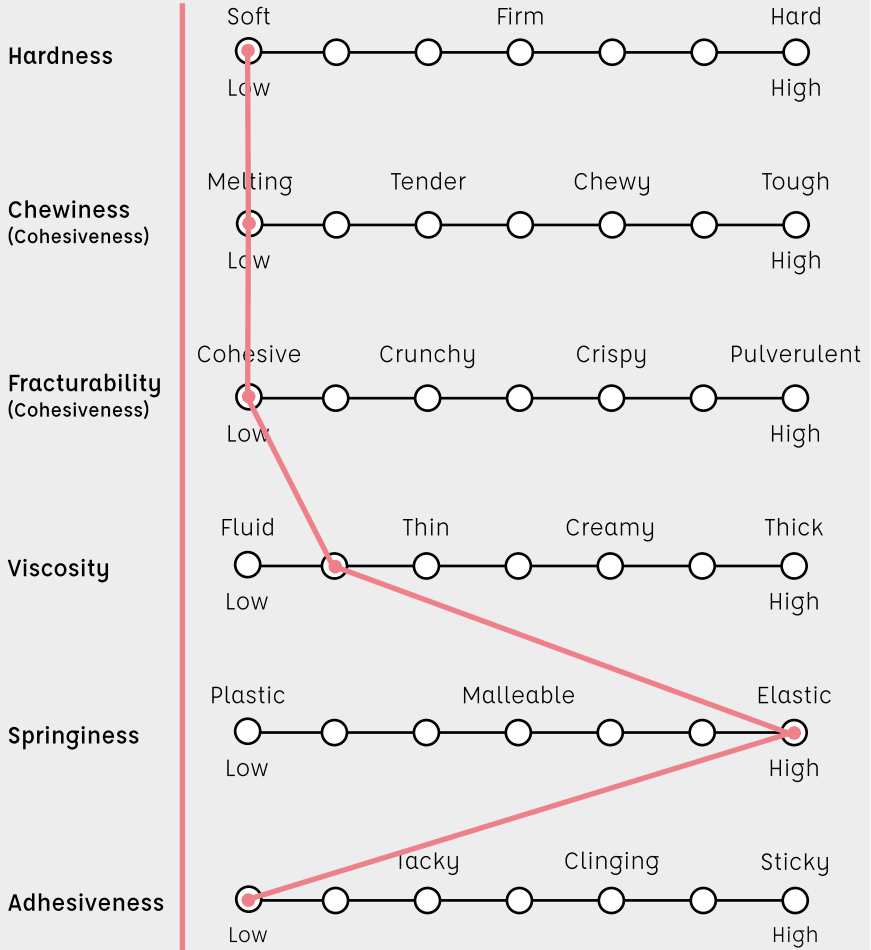
Oral Exposure Time

5 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)



Food Category Soy

Product Name Tofu

Ingredient Contents Water, soya beans 47%, thickener: E511

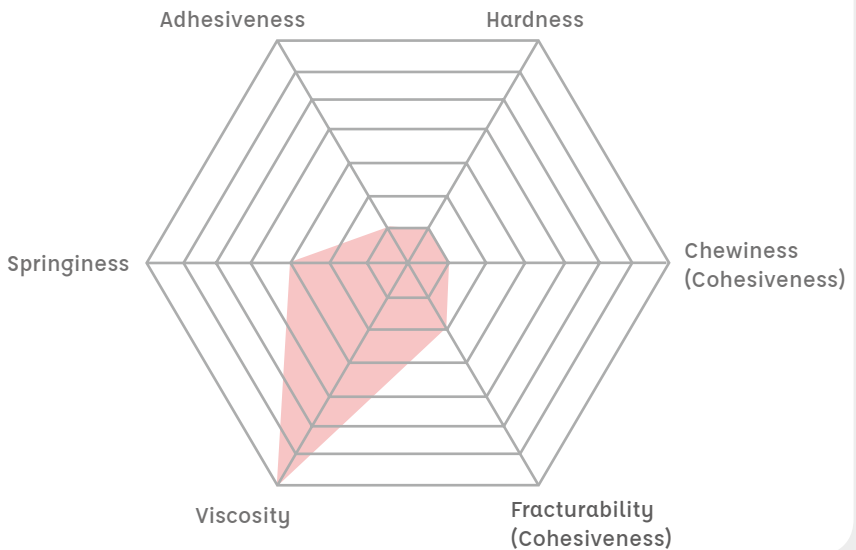
Calories 101 kcal/100g

Flavour

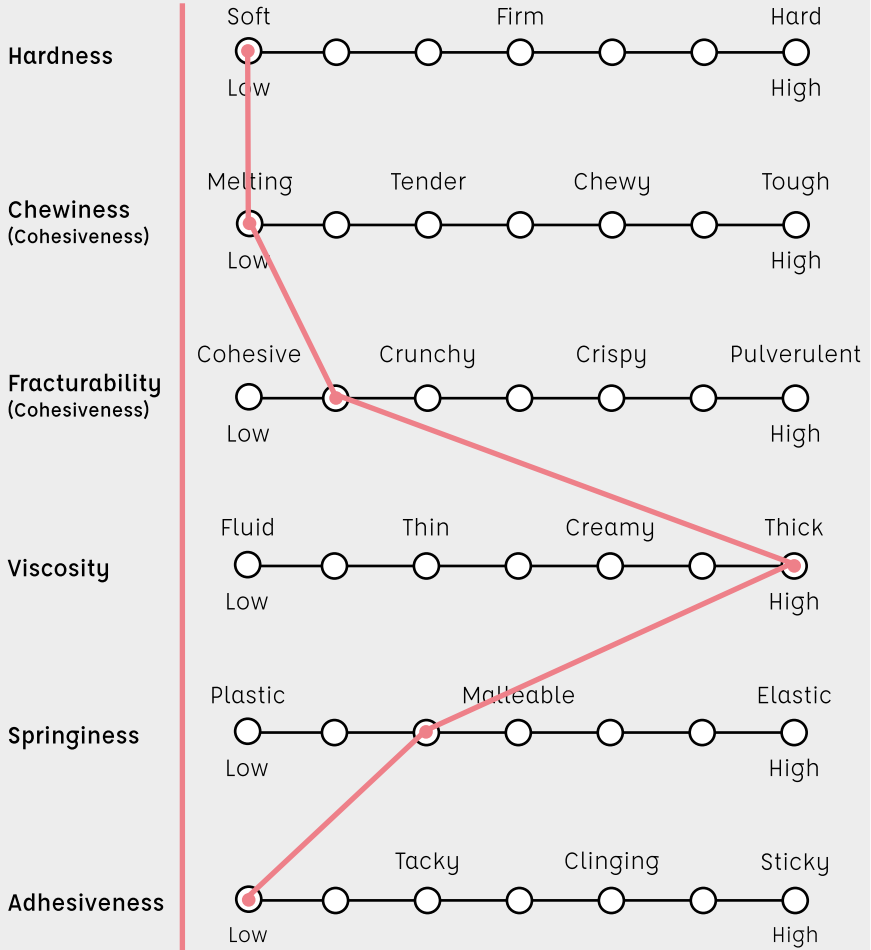
Oral Exposure Time

7-8 chews/bite

Texture Characteristics



Texture Profile



(Definition from ISO5492:2009)