Prototype Development of Avocado-Powder based Food Concepts

ICE-CREAM
(FROZEN)

Project number: 111-20

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33.4 Ice Cream

3.4.1 Product Background

The fat content of the powder acts as an optimal fat substitution in ice cream. Both dairy and non-dairy applications benefit greatly by having the powder in the fat base, providing creamy texture, while working as a good fat replacement. A vegan option using coconut milk was developed, but due to the lack of vegan consumers in the focus group, it was removed to avoid any bias.

3.4.2 Prototype Development

Avocado powder was used in combination with anhydrous milk fat between 1%-5% substitution levels. It was incorporated into the melted fat mixture and emulsifiers to ensure complete solubilisation. The base mix was sheared in the Silverson L4RT High Shear Mixer at 7500RPM for 1.5 minutes.

The ratio of anhydrous milk fat to avocado powder of 70:30, was identified as the best combination. Table 1 below shows the composition of ingredients required to produce the prototype. The specific methodology can be found in Appendix D, provided by W. Johnson (personal communication, December 2, 2020).

Table 1. Final ice cream formulation

Ingredients	**Composition (%)**
Anhydrous Milk Fat (AMF)	7.00
OVĀVO Avocado Powder	3.00
Skim Milk Powder (SMP)	11.00
White Sugar	9.00
Glucose Syrup	4.00
Locust Bean Gum	0.20
Guar Gum	0.10
Mono-Diglycerides	0.40
Coffee Flavour, EI8275	0.20
Water	65.2

Table 2. NIP for ice cream

Nutrient	**Reference value (per 100g)**
Energy (kJ)	713.4
Protein (g)	4.8
Total Fats (g) - Saturated fats (g)	8.9 0.8
Carbohydrates (g)	17.5
Sodium (mg)	65.7

3.4.3 Effects of avocado powder on ice cream

There was some skim formed on the base mix after ageing for 24 hours. This phenomenon may be caused by powder oxidation due to air incorporation during the mixing processes. This layer did not impart any undesirable flavours or texture, it dispersed easily once mixed through. After churning, the product appeared to have a dull green colour, increasing with the addition of avocado powder. Beyond 5% avocado, it started to become gritty with a cardboard-like flavour that was unacceptable.

The melting rates of product containing avocado powder were very different from the control sample. They retained shape even after 15 minutes of leaving them out of the freezer, whereas the control started to melt almost immediately. There was some grittiness detected, yet it had a considerably mouth-coating texture. Coffee flavour accentuated product creaminess without imparting any bitter afternotes.

4.0 Focus Group Study

4.1 Objective

The objective of this element of project was to understand how well an avocado powder would be received by consumers by itself and in prepared applications. Prototype products were developed and presented to avocado consumers in focus group discussions to gather a broad range of consumer opinion on the prototypes, as well as further insights into potential avocado powder-containing products.

Twenty-four regular avocado consumers aged 18 to 65 were recruited from the Palmerston North community to participate in focus group discussions (5 to 7 per focus group) for one 90 minute discussion & tasting. This was conducted through FEAST, Massey's sensory professional team.

4.3 Results

4.3.1 Participant avocado consumption habits

Consumption habit discussion summarised in detail in Table 3, which is ordered from left to right of most frequently mentioned to least frequently mentioned. Key themes included highest consumption of avocado during the season "when the price is low", with most participants purchasing from the supermarket. Whilst some participants reported consuming avocado on its own "as a fruit", the majority reported consuming avocado in combination with other foods, which included on toast, in sushi, or "as a smoothie". Participants generally consumed avocado because it is healthy, with many mentioning "healthy fats". Other important reasons were "good taste", "good texture" and "satiating". Another key insight was that purchase of NZ grown avocadoes was appealing to many participants due to the environmental impact of imported avocadoes and avocado plantations in South America.

Table 3. Participant avocado consumption habits based on all focus groups

Section	Individual terms used by participants
Frequency	1-2 times a week, when in season, once in 2 weeks, once a month,

Purchase Location	Supermarket, Fruit and vegetable shop, farmers market, own garden
Usage occasion	Guacamole, toast with eggs, bacon, tomatoes, on its own, with honey/sugar/salt/soy sauce/vinegar/wasabi/sesame oil, in salad, as a smoothie, kebab, sushi, avocado oil
Reasons for consumption	Healthy, healthy fats, tasty, satiating, mild flavour, locally produced, substitute for dairy/butter, in sandwich, good protein, neutralises strong flavours
When	Breakfast, Snack, Lunch, Dinner

4.3.2.6 Ice cream

The ice cream premix with avocado powder, that was made based on Section 3.4.2, was sent for coliform testing before further work was done. Once the results came back negative, the ice cream mix was churned in an automatic cycle in the Magimix Gelato Expert (**Error! Reference source not found.**). Serving sizes of 30g each were scooped out into plastic containers, labelled and frozen at -18°C, before serving.

Participants evaluated the appearance as similar to a premium 'Kapiti' ice cream, and they had expected green colour due to the avocado powder inclusion. In terms of texture, participants reported the creamy and melt-in-mouth texture to be appealing, which they would pay more for. In terms of flavour, they reported maple syrup like flavours and some earthy afternotes. Participants suggested different flavours such as caramel, pistachio or chocolate would be good additions with avocado. Coffee flavour at 0.2% accentuated the creamy profile.

5.0 Recommendations

5.4 Ice Cream

The powder should be mixed with melted AMF after the mono-diglycerides are mixed, at 90°C. Shearing the mixture using the Silverson L4RT High Shear Mixer at 7500RPM for 1.5 minutes is recommended after pasteurisation, to stabilise fat globules in the ice cream mix.

Further development and consumer testing with a vegan option could be completed as the powder acts as an optimal alternative fat base that provides creaminess similar to a dairy ice cream. Partial substitution with coconut fat can be a point of experimentation. Use of the avocado powder as a flavour contributor would require more sweeteners and colour manipulation, which can be achieved via clean label natural plant extracts.

Methodology of Development for Ice Cream

Table 4. Ingredient List for ice cream

Ingredients	Composition (%)
Anhydrous Milk Fat (AMF)	7.0
OVĀVO Avocado Powder	3.0
Skim Milk Powder (SMP)	11.0
White Sugar	9.0
Glucose Syrup	4.0
Locust Bean Gum	0.2
Guar Gum	0.1
Mono-Diglycerides	0.4
Coffee Flavour, EI8275	0.20
Water	65.2

Table 5. Recipe for Ice Cream

1.	Boil and measure out required water, ensuring the temperature does not go below 80°C.
2.	Set up and immerse stirrer rod into water, and start at approximately 500RPM, or until a vortex is created in the water
3.	Carefully add measured out skim milk powder into vortex, in small doses to avoid fish eyes. *Add it close to the surface of the water
4.	Measure out sugar and gums. Dry blend them well and add it to the wet mix, continuously stirring using the stirrer rod.
5.	Add glucose syrup carefully, on the side of the mixture surface. *Adding directly into the vortex may cause glucose to stick to the stirrer.
6.	Melt AMF in a pot, and hold at 90°C. While the AMF is hot, add the mono-diglycerides and mix well until dissolved. Then mix in avocado powder. (Doing this first avoids cooling the SMP mix too much)
7.	Add the fat mixture into SMP mixture and stir for 30 seconds or until the mixture is fully solubilised.
8.	Ensure temperature is approximately 55°C
9.	Transfer the mixture into a heatproof bowl. Slowly heat some water in a pot and place the mixture on top, creating a double boil.
10.	Constantly stir the mixture and monitor the temperature. Pastuerise the mix 85°C, for 15 seconds.
11.	Once pastuerised, homogenise in Silverson High Shear Mixer, using the emulsor screen, at 7500RPM for 1.5 mins. Do not transfer the already pastuerised mixture into a different container

12.	Chill mixture in an ice bath until below 15°C
13.	Cover the mixture in a container and age for minimum 4 hours
14.	Once aged, add coffee flavour, then freeze the mixture at -20°C.