

Internal R&D Document: Ice Cream Flavor Development Notes & Formulations

Project: Signature Ice Cream Line Expansion

Date Range: Oct 2023 - Mar 2024 (Compiled Notes & Illustrative Formulations)

Author: R&D Team

Objective: Develop and document formulations for a range of unique and high-quality ice cream flavors.

== Product: 1009 - Madagascar Vanilla Cloud ==

- **Development Notes:**

- **Concept:** Premium classic vanilla with visible bean specks and exceptional creamy texture.
- **Ingredient Trials:**
 - **Vanilla Source:** Compared Tahitian (floral), Mexican (spicy), and Madagascar Bourbon (rich, sweet). Madagascar selected for classic profile. Using Grade A beans.
 - **Bean Specks:** Trial A (extract only) lacked visual appeal. Trial B (extract + ground spent beans) looked better. Trial C (extract + fresh ground bean paste) provided best aroma, visual, and taste. Adopted Trial C method.
 - **Base Mix:** Target 14-16% butterfat. Tested different stabilizer blends (guar, LBG, carrageenan) to achieve target viscosity and smooth melt. Blend #4 gave best 'cloud-like' lightness with good stability.
- **Process Notes:** Need precise overrun control (target 90-100%) during freezing to achieve 'cloud' texture. Pasteurization temp optimized to hydrate stabilizers without damaging vanilla volatiles.
- **Sensory Feedback:** Panel universally praised the rich, authentic vanilla flavor and creamy texture of Trial C / Blend #4. Approved for scale-up.

- **Final Recipe Formulation (Illustrative Example - % by Weight):**

- Heavy Cream (40% BF): 32.0%
- Whole Milk (3.5% BF): 45.3%

- Skim Milk Powder (SMP): 5.0%
- Sucrose: 12.0%
- Glucose Syrup (DE 42): 5.0%
- Stabilizer/Emulsifier Blend: 0.4%
- Madagascar Vanilla Extract (2x): 0.3%
- Ground Madagascar Vanilla Bean Paste: 0.05%
- **Total:** 100.0%
- **Notes:** Target Overrun: 95-100%.

== Product: 1005 - Lavender Honey Haze ==

- **Development Notes:**

- **Concept:** Delicate floral notes balanced with sweet honey in a premium cream base.
- **Ingredient Trials:**
 - **Lavender Source:** Tested culinary grade *Lavandula angustifolia* buds. Compared infusion into milk vs. creating a lavender extract. Direct infusion (Trial 2B) provided cleaner, less 'soapy' flavor than extract (Trial 1). Strain carefully.
 - **Honey Source:** Compared wildflower (complex), clover (mild), and orange blossom honey (citrus notes). Wildflower honey chosen for complexity. Need consistent supplier.
 - **Honey Swirl:** Initial trials had honey sinking or dissolving. Developed stabilized honey ribbon using pectin - holds shape better during freezing (Trial 4). Target 8% swirl by weight.
- **Process Notes:** Balancing infusion time/temp is critical to avoid overpowering floral notes. Color is naturally pale; considered adding trace purple color but decided against to keep it 'natural'.
- **Sensory Feedback:** Panel noted unique aroma. Some found initial trials too floral. Final version (Trial 4) rated well for balance. Need to manage customer expectations for a subtle flavor.

- **Final Recipe Formulation (Illustrative Example - % by Weight):**

- Heavy Cream (40% BF): 30.0%
- Whole Milk (3.5% BF): 46.0%

- Skim Milk Powder (SMP): 4.5%
- Sucrose: 10.0%
- Glucose Syrup (DE 42): 5.0%
- Stabilizer/Emulsifier Blend: 0.4%
- Dried Lavender Buds (for infusion): 0.1% (infused in milk, then strained)
- Stabilized Wildflower Honey Swirl: 8.0%
- **Total:** 100.0% (Base mix adjusted to 92% before swirl addition)
- **Notes:** Calculate base mix ingredients to sum to 100%, then use 92% base + 8% swirl.

== Product: 1010 - Golden Butterscotch Swirl ==

- **Development Notes:**

- **Concept:** Rich, intensely sweet butterscotch ice cream with thick, visible swirls.
- **Ingredient Trials:**
 - Butterscotch Base Flavor: Developed in-house using dark brown sugar, salted butter, heavy cream. Compared adding flavor base directly to ice cream mix vs. using a separate butterscotch flavoring. In-house base (Trial 3) gave much richer, authentic taste.
 - Butterscotch Swirl: Needs to be thick but pumpable/injectable. Recipe refined (Trial 5B) using specific glucose syrup ratio to prevent crystallization and maintain viscosity at freezing temperatures. Target 10% swirl.
- **Process Notes:** Swirl injection technique critical for visual appeal. Need wide nozzle, slow incorporation speed. Base ice cream sweetness needs slight reduction to compensate for sweet swirl.
- **Sensory Feedback:** Panel loved the intense sweetness and buttery notes (Trial 5B). Described as decadent and comforting. Approved.

- **Final Recipe Formulation (Illustrative Example - % by Weight):**

- Heavy Cream (40% BF): 33.0%
- Whole Milk (3.5% BF): 40.0%
- Skim Milk Powder (SMP): 4.0%

- Sucrose: 9.0%
- Glucose Syrup (DE 42): 6.0%
- In-House Butterscotch Flavor Base: 3.5%
- Stabilizer/Emulsifier Blend: 0.4%
- Thick Butterscotch Swirl (stabilized): 10.0%
- **Total:** 100.0% (Base mix adjusted to 90% before swirl addition)
- *Notes:* Butterscotch base flavor contributes solids/sugars - needs balancing.

== Product: 1002 - Midnight Velvet Chocolate ==

- **Development Notes:**

- **Concept:** Ultra-dark, intense cocoa flavor with a smooth, near-black appearance and slight bitterness.
- **Ingredient Trials:**
 - Cocoa Powder: Tested various high-fat Dutch-processed cocoas and Black cocoa. Blend of 70% Black Cocoa / 30% high-quality Dutch-processed (e.g., Bensdorp) gave target color and flavor intensity without excessive bitterness (Trial 4 Blend).
 - Sweetness/Bitterness Balance: Adjusted sugar levels carefully. Initial trials too bitter. Final version uses a mix of sucrose and glucose syrup to enhance smoothness and balance cocoa notes.
- **Process Notes:** High cocoa solids require excellent emulsification/stabilization to prevent grittiness. Increased homogenisation pressure slightly. Target high overrun (95-105%) for 'velvet' texture. Need careful temperature control during aging and freezing.
- **Sensory Feedback:** Panel confirmed intense chocolate flavor and deep color (Trial 4). Smoothness rated highly. Termed 'sophisticated'. Approved.

- **Final Recipe Formulation (Illustrative Example - % by Weight):**

- Heavy Cream (40% BF): 34.0%
- Whole Milk (3.5% BF): 42.8%
- Skim Milk Powder (SMP): 3.0%

- Sucrose: 13.0%
- Glucose Syrup (DE 42): 5.0%
- Black Cocoa Powder: 4.9% (7% of cocoa blend)
- Dutch-Processed Cocoa Powder (high fat): 2.1% (3% of cocoa blend)
- Stabilizer/Emulsifier Blend: 0.5%
- **Total:** 100.0%
- *Notes:* High cocoa requires robust stabilization. Target Overrun: 100-105%.

== Product: 1011 - Ruby Raspberry Cheesecake ==

- **Development Notes:**

- **Concept:** Tangy cheesecake base with tart raspberry swirl and graham cracker pieces.
- **Ingredient Trials:**
 - Cheesecake Base: Compared using cream cheese directly vs. cream cheese powder vs. natural cheesecake flavoring. Blend of cream cheese powder and natural flavor (Trial 3C) gave best tangy flavor and texture stability without processing issues.
 - Raspberry Swirl: Using high-fruit content (60%) raspberry puree with seeds strained partially. Added lemon juice concentrate to enhance tartness and contrast the sweet base. Stabilized swirl needed (pectin/LBG blend). Target 9% swirl.
 - Graham Cracker Pieces: Tested different sizes. Medium chunk preferred. Need fat-coating (using coconut oil) on pieces (Trial 4) to prevent them from becoming soggy in the ice cream. Target 6% inclusion.
- **Process Notes:** Incorporate graham pieces late in the freezing process to minimize breakage and maintain integrity. Swirl injection needs careful calibration.
- **Sensory Feedback:** Panel enjoyed the authentic cheesecake tang and contrast of textures (Trial 4). Balance of sweet/tart/creamy/crunchy rated highly. Approved.

- **Final Recipe Formulation (Illustrative Example - % by Weight):**

- Heavy Cream (40% BF): 28.0%
- Whole Milk (3.5% BF): 40.8%
- Skim Milk Powder (SMP): 3.5%
- Cream Cheese Powder: 2.5%
- Sucrose: 11.0%
- Glucose Syrup (DE 42): 5.0%
- Natural Cheesecake Flavor: 0.5%
- Stabilizer/Emulsifier Blend: 0.4%
- Stabilized Raspberry Swirl (seedless): 9.0%
- Fat-Coated Graham Cracker Pieces: 6.0%
- **Total:** 100.0% (Base mix adjusted to 85% before inclusions)
- *Notes:* Cheesecake powder adds solids/protein. Inclusions added last.

== Product: 1008 - Orchard Peach Crumble ==

- **Development Notes:**

- **Concept:** Sweet peach ice cream with discernible fruit pieces and buttery cinnamon crumble.
- **Ingredient Trials:**
 - Peach Source: Compared peach puree vs. diced peach pieces in syrup. Combination worked best (Trial 3): Puree for base flavor, diced pieces (IQF preferred) for texture/visuals. Using yellow cling peaches for firmness. Target 12% total fruit.
 - Crumble Inclusion: Developed crumble recipe (butter, flour, brown sugar, oats, cinnamon). Tested baking methods. Need crumble to be fully baked and cooled before incorporation. Fat-coating tested (Trial 4) helps maintain crispness – adopted. Target 7% crumble.
- **Process Notes:** Add crumble pieces late in freezing using a fruit feeder. Need gentle handling to avoid breaking crumble into dust. Base flavor needs careful balancing with cinnamon notes from crumble.
- **Sensory Feedback:** Panel liked the 'homemade pie' feel (Trial 4). Peach flavor comes through well. Crumble texture contrast is key. Approved.

- **Final Recipe Formulation (Illustrative Example - % by Weight):**

- Heavy Cream (40% BF): 29.0%
- Whole Milk (3.5% BF): 39.9%
- Skim Milk Powder (SMP): 4.0%
- Peach Puree: 8.0%
- Sucrose: 10.0%
- Glucose Syrup (DE 42): 5.0%
- Stabilizer/Emulsifier Blend: 0.4%
- Diced Peaches (IQF): 7.0%
- Fat-Coated Cinnamon Crumble Pieces: 7.0%
- **Total:** 100.0% (Base mix adjusted to 86% before inclusions)
- *Notes:* Fruit puree adds water/sugar/solids. Crumble/peach pieces added via feeder.

== Product: 1004 - Pistachio River Ripple ==

- **Development Notes:**

- **Concept:** Delicate, authentic pistachio flavor with visible, intense pistachio paste swirls.
- **Ingredient Trials:**
 - Pistachio Base Flavor: Tested natural pistachio flavoring vs. using ground pistachio paste in the base mix. Ground paste (100% Sicilian pistachios) provided superior, authentic flavor despite higher cost (Trial 3). Target 5% paste in base.
 - Pistachio Swirl: Need a more intense swirl. Using concentrated pistachio paste (higher nut content, slightly sweetened) for the ripple. Stabilized slightly to maintain definition. Target 8% swirl.
 - Color: Natural color is pale green. Initial trials seemed underwhelming visually. Added minimal natural color blend (spirulina/safflower extract) to enhance green hue without looking artificial (Trial 4).
- **Process Notes:** Swirl viscosity matching between base and ripple is key for good definition. Requires careful temperature control during injection. Potential for nut allergens requires strict cross-contamination controls.

- **Sensory Feedback:** Panel approved authenticity of flavor (Trial 4). Visual appeal significantly improved with color enhancement and defined swirl. Texture smooth. Approved.
- **Final Recipe Formulation (Illustrative Example - % by Weight):**
 - Heavy Cream (40% BF): 31.0%
 - Whole Milk (3.5% BF): 42.7%
 - Skim Milk Powder (SMP): 4.0%
 - Sucrose: 10.5%
 - Glucose Syrup (DE 42): 5.0%
 - Pistachio Paste (100% Sicilian): 5.0%
 - Stabilizer/Emulsifier Blend: 0.4%
 - Natural Color (Spirulina/Safflower): 0.05%
 - Intense Pistachio Swirl (stabilized): 8.0%
 - **Total:** 100.0% (Base mix adjusted to 92% before swirl addition)
 - *Notes:* Pistachio paste contributes fat/solids. Ensure allergen controls.

== Product: 1006 - Espresso Caramel Crunch ==

- **Development Notes:**
 - **Concept:** Bold coffee ice cream with caramel swirl and crunchy toffee pieces.
 - **Ingredient Trials:**
 - Coffee Flavor: Compared cold brew concentrate vs. espresso powder vs. natural coffee extract. High-quality natural espresso extract provided best balance of strong flavor, low acidity, and processing ease (Trial 3).
 - Caramel Swirl: Developed a slightly darker, less sweet caramel compared to butterscotch swirl to complement coffee. Target 9% swirl.
 - Crunch Inclusion: Tested almond brittle vs. plain toffee pieces. Toffee preferred. Pieces need to be fat-coated (Trial 4) to prevent moisture absorption and maintain crunch. Size optimization: medium dice (~5mm) offers best mouthfeel. Target 6% inclusion.

- **Process Notes:** Add toffee pieces late via ingredient feeder. Ensure even distribution. Balance coffee bitterness with caramel sweetness.
- **Sensory Feedback:** Panel loved the strong coffee hit balanced by the caramel and crunch (Trial 4). Texture contrast highly rated. Approved.
- **Final Recipe Formulation (Illustrative Example - % by Weight):**
 - Heavy Cream (40% BF): 30.0%
 - Whole Milk (3.5% BF): 43.8%
 - Skim Milk Powder (SMP): 4.0%
 - Sucrose: 10.0%
 - Glucose Syrup (DE 42): 5.0%
 - Natural Espresso Extract: 1.0%
 - Stabilizer/Emulsifier Blend: 0.4%
 - Dark Caramel Swirl (stabilized): 9.0%
 - Fat-Coated Toffee Pieces: 6.0%
 - **Total:** 100.0% (Base mix adjusted to 85% before inclusions)
 - **Notes:** Adjust extract % based on strength. Toffee pieces added via feeder.

== Product: 1001 - Alpine Strawberry Dream ==

- **Development Notes:**
 - **Concept:** Intense, authentic wild strawberry flavor with visible seeds, balancing sweet and tart.
 - **Ingredient Trials:**
 - **Strawberry Source:** Confirmed wild alpine strawberry puree (*Fragaria vesca* type) provides significantly more intense, aromatic flavor than standard varieties (Trial 2). Higher cost accepted. Target 25% fruit puree.
 - **Sweet/Tart Balance:** Natural tartness is high. Adjusted sugar blend (sucrose/dextrose mix) and added small amount of citric acid to enhance brightness (Trial 4).
 - **Color:** Puree provides vibrant natural color. Small amount of beet concentrate added (Trial 3) for batch-to-batch consistency.

- Texture: High fruit content can lead to iciness. Optimized stabilizer blend (LBG/guar/pectin) critical for smooth texture.
- **Process Notes:** Keep seeds for authenticity, ensure they don't clog equipment. Monitor pH for stability.
- **Sensory Feedback:** Panel rated intensity and authenticity very high (Trial 4). Vibrant color and balance of sweet/tart approved.
- **Final Recipe Formulation (Illustrative Example - % by Weight):**
 - Heavy Cream (40% BF): 25.0%
 - Whole Milk (3.5% BF): 35.0%
 - Skim Milk Powder (SMP): 3.5%
 - Alpine Strawberry Puree (seed-in): 25.0%
 - Sucrose: 8.0%
 - Dextrose: 2.5%
 - Stabilizer Blend (pectin included): 0.5%
 - Citric Acid: 0.1%
 - Beet Concentrate (for color consistency): 0.05%
 - **Total:** 100.0%
 - Notes: High fruit content requires careful stabilization for texture. Adjust acidity based on puree batch.

== Product: 1003 - Tropical Sunrise Sorbet ==

- **Development Notes:**
 - **Concept:** Refreshing, intensely fruity dairy-free sorbet with mango, passionfruit, and pineapple.
 - **Ingredient Trials:**
 - Fruit Blend: Finalized ratio 50% Mango (Alphonso puree) / 25% Passionfruit (seeded puree strained) / 25% Pineapple (MD2 variety juice concentrate). Provides mango forwardness with passionfruit aroma/tartness and pineapple sweetness.
 - Stabilizers (Dairy-Free): Confirmed blend of Guar, LBG, and Pectin (Trial 4 from initial dev) gives best scoopability, melt resistance, and prevents large ice crystal formation. Total stabilizer level ~0.3%.

- Sweetness/Acidity: Target Brix 29 +/- 1. Primarily sweetened with sucrose/glucose syrup. Acidity adjusted slightly with citric acid based on fruit batch variation.
- **Process Notes:** Requires high shear mixing to activate stabilizers properly. Careful monitoring of Brix and pH is crucial for consistency. Avoid excessive overrun to maintain dense sorbet texture (target 30-35%).
- **Sensory Feedback:** Panel praised the intense fruitiness and refreshing quality (Trial 4). Smooth texture for a sorbet. Dairy-free nature seen as a plus. Approved.
- **Final Recipe Formulation (Illustrative Example - % by Weight):**
 - Water: 25.2%
 - Mango Puree (Alphonso): 25.0% (50% of fruit)
 - Passionfruit Puree (strained): 12.5% (25% of fruit)
 - Pineapple Juice Concentrate (6x): 4.2% (equiv. to 25% single strength juice)
 - Sucrose: 22.0%
 - Glucose Syrup (DE 42): 10.0%
 - Stabilizer Blend (Guar/LBG/Pectin): 0.4%
 - Citric Acid: 0.2% (adjust based on fruit acidity)
 - **Total:** 100.0%
 - *Notes:* Dairy-free. Target Brix: 29 +/- 1. Target Overrun: 30-35%.

== Product: 1007 - Polar Mint Stracciatella ==

- **Development Notes:**
 - **Concept:** Crisp, cool peppermint flavor with fine flakes of dark chocolate throughout.
 - **Ingredient Trials:**
 - Mint Flavor: Compared natural peppermint oil vs. extract. High-quality, triple-distilled peppermint oil (*Mentha piperita*) gave cleanest, brightest, coolest flavor (Trial 3). Dosage is critical - easy to overpower. Target 0.05%.

- Chocolate: Tested different % cacao dark chocolates. 60-70% cacao range provided best contrast to mint without being too bitter. Tempering quality important.
 - Stracciatella Technique: Molten chocolate drizzled slowly into freezing ice cream stream creates fine, brittle flakes. Compared different chocolate temperatures and flow rates. Optimal conditions found in Trial 4 for desired flake size/distribution.
- **Process Notes:** Peppermint oil added late in mixing to minimize volatilization. Chocolate stream temperature and flow rate need precise control during stracciatella process. Base color should remain white - no added color.
- **Sensory Feedback:** Panel enjoyed the refreshing coolness and texture of the fine chocolate flakes (Trial 4). Clean mint flavor approved. Classic appeal.
- **Final Recipe Formulation (Illustrative Example - % by Weight):**
 - Heavy Cream (40% BF): 31.5%
 - Whole Milk (3.5% BF): 48.5%
 - Skim Milk Powder (SMP): 5.0%
 - Sucrose: 12.0%
 - Glucose Syrup (DE 42): 4.0%
 - Stabilizer/Emulsifier Blend: 0.4%
 - Peppermint Oil (Triple Distilled): 0.05%
 - Dark Chocolate (65% Cacao - for stracciatella): 5.0%
 - **Total:** 100.0% (Base mix adjusted to 95% before chocolate drizzle)
 - *Notes:* Add peppermint oil late. Chocolate % refers to amount added during freezing process.

== Product: 1012 - Forest Berry Fusion ==

- **Development Notes:**
 - **Concept:** Creamy ice cream base blended with a mix of blueberry, blackberry, and raspberry purees.
 - **Ingredient Trials:**

- **Berry Blend:** Tested various ratios. Final blend: 40% Raspberry / 30% Blueberry / 30% Blackberry puree provides good balance of tartness (raspberry), depth (blackberry), and sweetness/color (blueberry). Seedless or partially strained purees preferred (Trial 3). Target 20% total fruit puree.
 - **Base Mix:** Standard premium dairy base (14% BF). Ensure base is not too sweet to allow berry flavors to dominate.
 - **Color:** Blend naturally produces a deep purple/red hue. No added color needed. Monitor for batch variation based on berry ripeness.
 - **Process Notes:** Puree blend incorporated directly into the mix before pasteurization. Ensure thorough mixing. Stabilizer level adjusted slightly to account for fruit acidity.
 - **Sensory Feedback:** Panel liked the complex berry flavor profile (Trial 3). Creamy texture complements the fruit well. Color seen as appealing. Approved.
 - **Final Recipe Formulation (Illustrative Example - % by Weight):**
 - Heavy Cream (40% BF): 28.0%
 - Whole Milk (3.5% BF): 38.9%
 - Skim Milk Powder (SMP): 4.0%
 - Raspberry Puree (seedless): 8.0% (40% of berry blend)
 - Blueberry Puree: 6.0% (30% of berry blend)
 - Blackberry Puree (strained): 6.0% (30% of berry blend)
 - Sucrose: 10.0%
 - Glucose Syrup (DE 42): 5.0%
 - Stabilizer/Emulsifier Blend: 0.4%
 - **Total:** 100.0%
 - *Notes:* Total fruit puree 20%. Adjust sugars based on puree sweetness.
-