FLAVOR SYNCHRONY™

Using Expert Panels to Identify and Describe Successful Flavor Synergies: A Powerful Tool to Shorten the Development Process

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Background & Objectives

Where it all started…

The initial observation — The past few years have seen increased interest and resurgence in discussions surrounding the concept of food /beverage pairings and its potential application beyond fine dining & the restaurant industry.

The missing piece of the puzzle — While suggestions abound about which wine may complement which type of meat or shellfish, little documentation exists about the reason behind synergistic or antagonistic effects of ingredient combinations in terms of flavor: we know that two ingredients work well together in a recipe, but we don't necessarily know why.

The challenge — As a result, identifying new and unusual successful flavor or fragrance combinations may be a lengthy process and often result in many trial-and-error cycles before success can be achieved.

What if… — Seasoned expert sensory panelists offer a wealth of combined sensory knowledge. Why not leverage their sensory curiosity, descriptive expertise, ability to articulate perception and usage of defined scales to aid in that process? What if creative problem solving and facilitation techniques similar to those used in consumer co-creations provided the structure to extract valuable insights?

Methodology

The Process – In a 2-hour Session



Intro & Ingredient Exploration
- Session and tasks are introduced
- Led by a trained facilitator
- Panelists are divided into groups
- Panelists familiarize themselves with focus and combination ingredients

Create & Test – Single Ingredient

Each group
- Is assigned a category (e.g. "herbs").

Participants:
- Combine flavors, record and taste combinations
- Judge combinations success
- Determine reason for success.

Debrief - Findings and Next Steps

Each group
- Highlights main findings
- Suggests exploration strategies for the next section of the session.

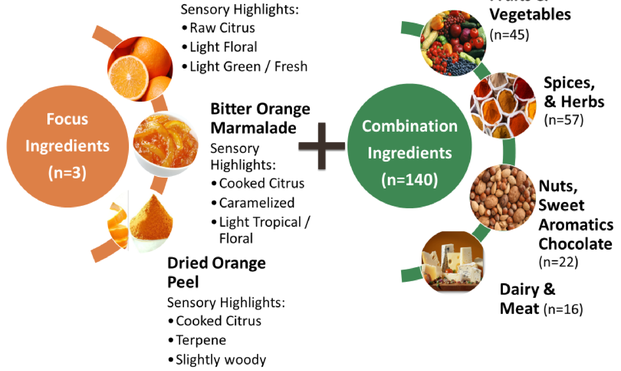
Create & Test – Multi Ingredient

Each group
- Is assigned a new category.
- Combine flavors (multi-ingredient)
- Record and taste combinations based on recommendations from debrief
- Critique combinations.

Debrief – Themes To Explore

Participants:
- Review notes / findings
- Highlight themes and trends
- Suggest possible venues of explorations for product development.

The Stimuli – Over 140 ingredients



The Criteria – Defining successful combinations

	High Success	Moderate Success	Failure
Synergistic Synchrony	High balance and blend. Complementary of aromas Results either in a tightly balanced flavor/fragrance or in a concept emphasizing one of the characters of the focus ingredient	Moderate balance and blend. Aromas complement one another but there is a missing character or the aromas are slightly off balance	Low balance and blend of flavors. Flavors coexist but are discordant with little commonalities among the flavor components
Contrast Synchrony	Flavors combinations create an interesting contrast. Commonalities exist but the contrasting ingredient offer a unique characteristics not present in the focus ingredient	Flavors create a moderate contrast. Some underlying commonalities exist, but a flavor component may be missing to result in success	Flavors contrast but are discordant

Source: Food and beverage pairings: a sensory approach to a culinary phenomenon (Lee, L. Lawless, L, Oftedal, K. Koelliker, Y. and Civille, G.V.; Pangborn Symposium, 2013)

Results and Key Insights

Richness of Information: Two hours later…

Session Highlights

120-min session with 10 expert panelists yield 232 tested combinations

Single vs. Multi-Ingredient Combinations
- 158 combinations = orange + single ingredient (68%)
- 74 combinations = orange + multi-ingredient (32%)

Success
- 116 combinations (50%) = success
- 43 combinations (19%) = moderate
- 73 combinations (31%) = failure



Fresh Navel Orange
- 59 tested combinations
- 61% single ingredient
- 40% success; 35% failure

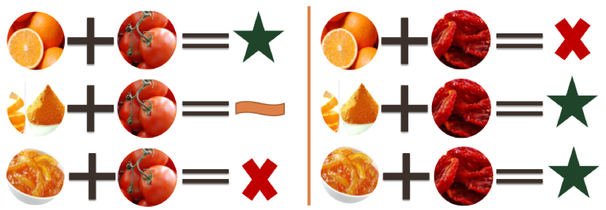


Bitter Orange Marmalade
- 63 tested combination
- 63% single ingredient
- 59% success; 24% failure



Dried Orange Peel
- 110 tested combinations
- 75% single ingredient
- 50% success; 34% failure

Key Insight – The character of the Focus Ingredient is Key



While some flavors successfully blended with fresh orange, they did not pair well with other orange substrates and vice versa. This reinforces the concept that not all orange flavors (or flavor combinations) are created equal. Flavor creations must rely on individual ingredients and their unique sensory experience.

Single Ingredient Findings – What works ? What does not? Why?



Bitter Orange Marmalade + Fruits and Vegetables

+ Most ripe floral fresh fruit (pear, mango…) → **SYNERGY:** fresh floral fruity notes complement citrus

+ Most red dried fruit/veggies (tomatoes, red peppers, cherries) → **SYNERGY**: complementary notes (sweet caramelized notes + fruity)

- Fruits with green notes (e.g., kiwi, cucumber, avocado) and sweet mildly flavored fruit and veggies (dried blueberries, carrots) → **ASYNCHRONY**: Marmalade flavor overshadows the fruit / vegetable flavor



Bitter Orange Marmalade + Spices, Herbs & Seasonings

+ Spices with enhanced feeling factors (black pepper, ginger, mustard) → **CONTRAST:** Provide dimensionality by creating an unusual contrast

+ Most brown spices & spices with sweet citrus notes (e.g., coriander, ginger) → **SYNERGY:** Emphasize citrus / floral and light woody notes

- Red spices (paprika) and black seeds (poppy, black sesame) → **ASYNCHRONY:** Emphasize dark woody/terpene notes too heavily

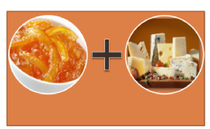


Bitter Orange Marmalade + Sweet Aromatics, Nuts and Chocolate

+ Sweet nuts, chocolate → **SYNERGY:** Complement sweet, soften with nutty/buttery notes

- Most SWA → **ASYNCHRONY:** Aroma is too sweet and syrupy

- Woody nuts (walnuts/pecan), extra dark chocolate → **ASYNCHRONY:** Too woody



Bitter Orange Marmalade + Dairy and Meat

+ Ham / heavy cream → **SYNERGY:** The sweet aromatics of the ham and cream complement those of the orange, without enhancing the bitterness

- Most other dairy and meat → **ASYNCHRONY**: Too sour, increase the bitterness of the orange

Similar outputs are also generated for the two other orange types

Multi Ingredient Combinations – Areas to Explore Further

Findings for Dried Orange Peel



Most Successful Synchronies
- **Sweet & Cured Meat–**
  - Maple syrup + ham
  - Coconut + bacon
  - Maple syrup + bacon + roasted almond
- **Cream & Sweet –**
  - Heavy cream + molasses
  - Sour cream + molasses + graham crackers
  - Heavy cream + red Thai curry
- **Spice and Nuts**
  - Chai tea + pecan
  - Spicy mustard + cashew nut
  - Ginger + garam masala

Most Successful Synchronies (cont.)
- **Pineapple & more**
  - White chocolate, dried pineapple & fresh mint
  - Dried pineapple, parm
  - Mango & pineapple
  - Lemongrass paste & dried pineapple
- **Sundried veggies**
  - Sundried tomato + celery seed
  - Sundried red pepper + celery seed

Asynchronies
- Dried blueberry & dark chocolate
- Salami, cinnamon

Findings for Bitter Orange Marmalade



Most Successful Synchronies
- **Fruit & Cheese–**
  - White cheddar cheese + mandarin orange
  - Feta + cucumber
  - Cheddar + Strawberry
  - Parmesan (fruity) + almond
- **Cooked Orange Veggies / Dried red veggies**
  - Sundried pepper + sundried tomatoes
  - Cooked pumpkin + cooked carrots (SWT – candy-like)
- **Spices and Green Herbs**
  - Ginger & fresh basil

Most Successful Synchronies (cont.)
- **Spice and Nuts**
  - Almond + ginger
  - Macadamia + ginger
- **Sweet & Heavy Cream –**
  - Sour cream + honey + mandarin orange
  - Sour cream + honey + Golden mustard
  - Heavy Cream + maple syrup + bacon

Asynchronies
- Parsley & cilantro

Conclusions and Applications

Conclusions
- Expert panels shorten the process of identifying successful flavor synchronies and document the reasons for this success.
- In this project, **three orange substrates** (fresh orange, dried orange, and orange marmalade) were combined with **140 ingredients** to identify single and multi-component flavor combinations by **10 Spectrum-trained panelists.**
- One **2-hour session** yielded over **230 flavor combinations**, ranging from "mainstream" combinations to unique sensory experiences.
- Panel expertise is leveraged to document characteristics of successful and unsuccessful pairings, using descriptive terminology/lexicon.
- Two varieties of successful ingredient combinations were identified
  - **Synergistic synchronies** offer high balance and/or blend. Within that group, one flavor component may be enhanced and supported by complementary flavor characteristics (enhancement)
  - **Contrast synchronies** offer interesting contrast in flavors and / or feeling factors by adding flavor constructs not initially present in the original focus ingredient

Applications
- The breadth and depth of the sensory experience and expertise of a well-trained panel is combined with creative problem solving tools and process often used in consumer co-creation to yield great insight in a short amount of time.
- The use of a rigorous, systematic and scientific process offers potential for early identification of successful flavor synchronies, resulting in the ability to create innovative products, while significantly shortening the development process.
- The use of experienced Spectrum-trained panelists for quick and high yield results can be applied to numerous product and ingredient screening projects.