

The Effect of Color on Odor Perception: Toward More Efficient Ingredient Use

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The color of a food can influence 3 types of food evaluation.

- **1. Odor and taste intensity**
 - Orthonasal odor intensity is increased by color (vs clear) & retronasal odor intensity is decreased or no effect is found
 - Effect of color on taste more varied although quite a bit of evidence that red things taste sweeter
- **2. Flavor identification**
 - If color and flavor are incongruent, subjects often guess a flavor congruent with the color
- **3. Liking for the flavor**
 - If color is incongruent with flavor get decrease in liking for flavor but mostly with flavors that are misidentified. If the color is incongruent but the flavor is correctly identified the flavor is often still liked (green beer on St. Patrick's Day)

Color-induced conditioned odor percepts

- 2 stimuli (in this case color and flavor/odor) paired together repeatedly
- In the case of food, see color before experience flavor/odor
- After a while an association is learned between the color and the flavor/odor
- The color then produces a flavor/odor percept of its own that is similar (but weaker) than that produced by the flavor/odor stimuli

Why do these effects occur?

- **Odor and taste intensity**
 - Through pairing of color & flavor people learn to expect a certain flavor when they see a certain color
 - This might cause a conditioned odor percept which is added to the flavor that is present, enhancing it
- **Flavor identification**
 - The conditioned odor percepts might change the quality of the odor, making it more similar to odors associated with an incongruent color
 - People are notoriously poor at identifying odors. When they see a color they compare the odor they are smelling with odors previously associated with that color (from most to least highly associated) and pick the best one
- **Liking for the flavor**
 - The conditioned flavor percept might change the quality of the flavor of the food to be a combination of the real flavor and the percept caused by the color making it taste “off”
 - Especially true if the flavor is not correctly identified

Can color change the perception of a beverage that is a combination of 2 odors (raspberry & lemon)



Judged intensity of orthonasal and retronasal odor of sparkling water

- 6 Odors:
 - “red” odors – raspberry & strawberry
 - “yellow” odors – lemon & honey
 - “other” odors – orange & grape
- First-judged intensity of orthonasal by smelling
- Second-judged intensity of retronasal by sipping

Effect of color on perception of orthonasal but not retronasal intensity

- Red-colored beverage smelled more “strawberry” than did the yellow-colored or clear
- Yellow-colored beverage smelled more “lemon” than did the red-colored or clear
- No differences between different colored beverages on intensity ratings when sipped

Take-home

- Color of a product can increase orthonasal odor perception but not retronasal perception
- The color can intensify one odor component in a complex product consisting of more than one odor
- Color cannot be used to increase “flavor” intensity of a product but will change expectation, identification, and possibly how much product is liked.

Does the color of the packaging affect odor/flavor perception? A study on expectations and identification.



Does the color of the packaging affect flavor identification?

Crisps of one flavor put in bag of another (different color)

- Misidentify crisps flavor as that of the crisp usually in that color bag
- E.g., Expectation of flavor produced by package causes misidentification consistent with package color
- Only true for people who at that brand of crisps (have unique color-flavor packaging)



Piqueras-Fizman & Spence, 2011

Candy flavor expectations consistent with color of wrapper

Color of wrapper		Candy flavor expectation
Red	95%	Cherry (68%)
Green	95%	Mint (57%) Apple (29%)
Orange	81%	Orange (43%) Caramel (14%) Butterscotch (14%) Chocolate (14%)
Purple/pink	80%	Grape (35%) Raspberry (30%) Chocolate (20%) Berry (10%)

Perceived flavor when tasting candy & expected flavor when looking at candy

Perceived flavor when tasting candy

Vanilla (29%)

Butterscotch (14%)

Expected flavor when looking at candy

Mint (38%)

Vanilla (15%)

Coconut (15%)

Only 4 people consistent with color of wrapper. All orange:

Orange (2)

Pumpkin (1)

Butterscotch (1)

Take-home

- Expectations caused by product color can override or reduce expectations caused by package color. Color of the food matters more than the color of the package.
- Possibly more true when color of the product is a good predictor of the flavor and the packaging is not (e.g., sodas)
- Less true when color of the product is a bad predictor of the flavor and the packaging is a good one (e.g., crisps or chips)

Thank
You