



Does the **COLOR** of Foods and Drinks Affect The Sense of Taste?

Have you ever had **green cherry drink** or **brown strawberry juice**? Some people have! Of course, they were in experiments to see how the color of a drink affects the way the drink tastes. Flavor can be influenced by many factors such as the way a food or drink looks, smells, and feels. Let's look at some studies that have examined how color affects the way foods and drinks taste.



Paper	Methods	Results
<p>1. Philipsen D.H., Consumer age affects response to sensory characteristics of a cherry flavored beverage. <i>Journal of Food Science</i>, 60:364-368, 1995.</p>	<p>Test subjects were divided into two groups: a young adult group (18-22 years old) and an elderly group (60-75 years old). The subjects were given cherry-flavored drinks that differed in sweetness and the amount of red coloring.</p> 	<ol style="list-style-type: none"> 1. Color did not affect the perceived sweetness of the drink and did not affect the drink's ability to quench thirst. 2. Color did affect flavor intensity, especially in the older group. Subjects reported that drinks with more red color tasted stronger. 3. Color did affect flavor quality (how "true" it tested like cherry). 4. Color did affect overall acceptability of the drink (how much people liked the drink). 5. Changes in color made people think the flavor of the drink was different. For example, if the cherry-flavored drink was colored orange or yellow, people thought it was an orange drink or fruit punch drink.
<p>2. Roth, H.A., et al., Psychological relationships</p>	<p>Subjects were between 20-25 years old. Five different sweetness levels and five different colors of</p>	<p>As the color of a drink became more intense, people reported that the drink became more sweet.</p>

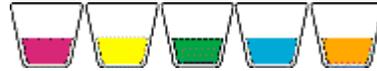
between perceived sweetness and color in lemon- and lime-flavored drinks. *Journal of Food Science*, 53:1116-1119, 1988.

lemon and lime drinks were used.



3. DuBose C.N., Effects of colorants and flavorants on identification, perceived flavor intensity, and hedonic quality of fruit-flavored beverages and cake. *Journal of Food Science*, 45:1393-1399, 1415, 1980.

Subjects tasted grape, lemon-lime, cherry and orange drinks with different colors.



When subjects tasted the drinks and were able to see the "correct" colors of the drinks, they were always able to identify the taste of the drink correctly. However, when they could not see the color of the drink, they made mistakes (see table). For example, 70% of the people who tasted the grape drink, said it was grape. However, 15% of the people thought it was lemon-lime. Only 30% of the people who tasted the cherry drink thought it was cherry. Most people thought the cherry drink was lemon-lime (40%).

What People Said (%)

Real Flavor	GR	LL	CH	OR	OT
Grape	70	15	5	0	10
Lemon-Lime	15	50	5	15	15
Cherry	0	40	30	10	20
Orange	0	50	5	20	25

GR=grape; LL=lemon-lime; CH=cherry; OR=orange; OT=other
(Correct % in **BOLD**).

4. DuBose et al., Effects of

The cherry, lemon-lime and orange drinks and a

1. Flavor Indentification: it was easier for the subjects to identify the correct

colorants and flavorants on identification, perceived flavor intensity, and hedonic quality of fruit-flavored beverages and cake. *Journal of Food Science*, 45:1393-1399, 1415, 1980.

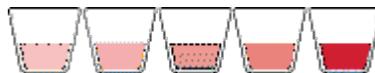
"no-flavor" drink were colored either red, orange, green or given no color. Also, a solid food was tested: a white cake with added yellow coloring and lemon flavor.

flavor when the drink had the expected color. People made errors toward the taste that were expected for a particular color. For example, an orange-colored drink that was really cherry-flavored was often thought to taste like an orange drink; a green colored cherry drink would taste like lime.

2. Acceptability: As the intensity of the color increased, the "acceptability" for the cherry and orange drinks went up. However, if there was too much color, people did not like the drinks.
3. Flavor Intensity: subjects thought that the drinks with more color tasted stronger.
4. If the cake had no added lemon flavoring, the yellow color made the cake more acceptable. People did not like too much yellow color in the cake. Cakes with more yellow coloring were thought to have more lemon flavoring.

5. Johnson, J. and Clydesdale, F.M., Perceived sweetness and redness in colored sucrose solutions. *Journal of Food Science*, 47:747-752, 1982.

Test subjects were between 19-50 years old. Five different sucrose (sugar) solutions and five different intensities of red were used.



Subjects reported that sucrose solutions that were more red tasted sweeter.

6. Chan, M.M. and Kane-Martinelli, C., The effect of color on

Young adults (20-35 years old) and elderly adults (60-90 years old) were used as test subjects. Chicken bouillon (three yellow color

1. The young adults perceived the standard color of bouillon to have a better overall flavor than either the bouillon with no color or high color. They also liked appearance of the

perceived flavor intensity and acceptance of foods by young adults and elderly adults. *Journal of the American Dietetic Assn.*, 97:657-659, 1997.

intensities) and chocolate pudding (three brown color intensities) were tested. The bouillon was tested for overall flavor, chicken flavor, saltiness and appearance; the pudding was tested for overall flavor, chocolate flavor, sweetness and appearance.

standard and high color bouillon and pudding more than the no color samples.

2. Changes in bouillon color made no difference to the elderly subjects.
3. Color had no effect on the perceived intensity of chocolate or chicken flavor or on sweetness or saltiness.

7. Christensen, C.M., Effects of color on aroma, flavor and texture judgments of food. *Journal of Food Science*, 48:787-790, 1983.

Test subjects were between 18-35 years old. Subjects were given normally colored margarine, raspberry gelatin, soy bacon, orange drink and American cheese OR uncolored samples of these foods or blue American cheese.



1. Odor intensity: all of the foods (except the bacon) were judged to have a stronger odor when they had color compared with when they had no color. The biggest odor intensity difference was for margarine.
2. Aroma quality: all foods were judged to have a better smell when they had color compared with when they had no color.
3. Flavor intensity: all foods were judged to have a stronger flavor when they had color.
4. Flavor quality: all foods (except the gelatin) were judged to have a better flavor when they had color.
5. Color had no effect on the texture quality of food.

8. Christensen C.M., Effect of color on judgments of food aroma and flavour intensity in young and elderly adults. *Perception*, 14:755-762, 1985.

Test subjects were divided into two groups: young adults (21-40 years old) and elderly adults (65-85 years old). Test foods were processed cheese and grape-flavored jelly, each with three different color and flavor levels. Subjects were given paired food samples and asked which one had a

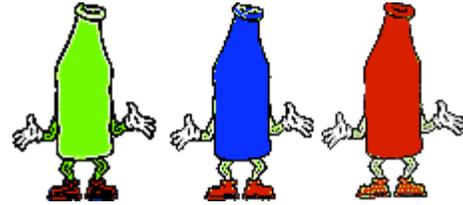
There was no difference between young and elderly adults in their ability to discriminate odor or flavors. Color failed to change the perception of aroma and flavor strength.

more intense flavor and odor.

9. Oram, N.,
The influence of
flavor and color
on drink
identification
by children and
adults. *Dev.
Psychobiology*,
28:239-46,
1995.

Test subjects were divided into five groups: ages 2-7 years old; 8-9 years old; 10-11 years old; 12-18 years old; 19 years old and older. Subjects were given drinks flavored with chocolate, orange, pineapple or strawberry. The drinks were colored either brown, orange, yellow or red. After tasting each drink, the subjects had to choose whether the drink was chocolate, orange, pineapple or strawberry.

Younger subjects made more color-associated errors. In other words, they relied on the color of the drink more than the older subjects to make a decision about its taste.



10. King, B.M.
and Duineveld,
C.A., Factors
affecting the
perception of
naturalness and
flavor strength
in citrus drinks.
*Ann. NY Acad.
Sci.*,
855:847-853,
1998.

Test subjects were "middle-aged" women. Subjects were given an orange drink that varied in aroma, bitterness, sweetness and color (red).

1. Orange drinks that were more red were perceived to be more sweet and have more aroma. However, natural orange flavor was reduced when red was added.
2. Orange drinks with the least amounts of red color were thought to be the most natural. The most red drink was perceived to be the least natural.

11. Stillman,
J.A., Color
influences flavor
identification in
fruit-flavored
beverages.
*Journal of Food
Science*,
58:810-812,
1993.

Subjects were at least 15 years old. Uncolored, red, yellow-orange and green colors were used to test the ability of subjects to identify raspberry-flavored and orange-flavored drinks.

The ability to identify raspberry and orange flavors correctly was reduced in uncolored and "odd-colored" drink samples.

So What?

So, color may influence the taste of food. Why is this important? These experiments are important to scientists who are studying how vision interacts with taste and odor. It is apparent that color can affect the perception of foods and drinks. It is likely that people learn and become familiar with specific combinations of colors and tastes. These learned associations may alter our perceptions and create expectations about how a food should smell and taste. The mechanisms that underlie these interactions are not known.



Food and drink companies are also very interested in the results of these experiments. It is important for companies to know how their products are perceived by consumers. Companies work very hard to make their foods and drinks the most desirable so they can sell more product. Companies are always looking for ways to make their products more appealing to consumers. If changing the color of a food or drink can sell more product, you can be sure that the company will make the change.



Try to change the flavor of a drink or jellybean by altering its color with [these experiments](#).

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