Three food grade colorants identified for citrus

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Oranges treated with annatto extract, paprika extract, and paprika oleoresin show the dark orange color preferred by consumers. These natural colorants could be used as alternatives to Citrus Red #2. Credit: Xiuxiu Sun.

In citrus fruit, the color of the peel is a major factor in consumer

selection; fresh oranges with a dark orange peel are favored. In order to appeal to consumer preferences, citrus that is picked when it hasn't reached peak color is often "degreened", and then may be treated with an emulsion containing Citrus Red No.2 (CR2) to improve peel color. A new study reveals three food grade colorants that are promising natural alternatives to CR2.

"Warm field temperatures can often result in poor peel color, especially early in the harvest season," the study authors said. "Under these conditions, Florida oranges, temples, tangelos, and K-Early citrus fruit are allowed to be treated with Citrus Red No. 2 dye (CR2) to help produce a more acceptable peel color." The problem: CR2 has been listed as a group 2B carcinogen by both the European Union and the International Agency for Research on Cancer. "Although not likely dangerous at levels used on citrus, and on a part of the fruit that is not ingested, there is a negative health perception, and thus a need for natural or food grade alternative colorants to replace CR2 for use on citrus," said Jinhe Bai from the U.S. Horticultural Research Laboratory, Agriculture Research Service, U.S. Department of Agriculture and corresponding author of the research study published in *HortScience*.

Bai said that acceptable alternatives to CR2 must meet several criteria: they must produce an acceptable orange color in treated peels, and not transfer to hands, containers, or packaging. The study evaluated five natural colorants that are commercially available and are approved as food additives: annatto, paprika, β-carotene, carrot oleoresin, and paprika oleoresin. The stability of the natural colorants (along with CR2) was evaluated by applying them on test papers and then on fresh 'Hamlin' oranges.

Carrot oleoresin and β-carotene were removed from further evaluation because they produced colors that were too light and significantly different from industry standards. Annatto, paprika, and paprika

oleoresin produced colors that were considered "dark orange" and therefore were selected for further evaluation in storage and simulated market conditions. Results showed that all treatments were stable under the cold, dark conditions simulating storage, but only annatto extract maintained a stable color when subsequently stored in a simulated market condition. "These experiments suggest that annatto would be the most successful replacement of CR2 for use as a natural colorant on citrus fruit," the authors said.

More information: The complete study and abstract are available on the ASHS *HortScience* electronic journal web site: hortsci.ashspublications.org/c … t/50/9/1353.abstract

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