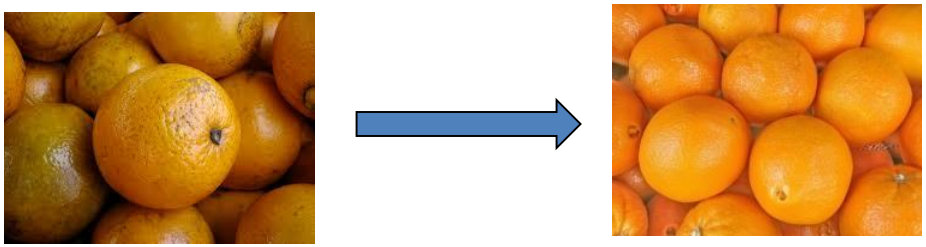
Formulating a natural colorant containing wax for a one-step color-add application for fresh citrus



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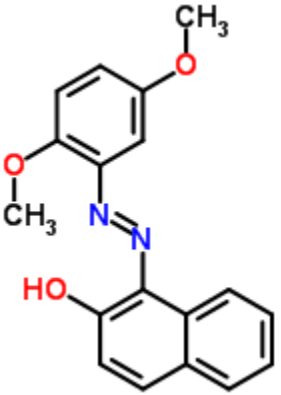
Introduction

- Initiation of the project to search an alternative to Citrus Red Number 2
  - Request from Peter Chairs to Dr. Liz Baldwin, USDA-ARS research leader
  - Basic advises from Dr. Alvin Chen (JBT): water insoluble materials.
  - Dr. Xiuxiu Sun (Postdoc hired by Dr. Mark Ritenour and runs tests in USDA.
  - Dr. Robert Hagenmaier (retired USDA scientist): Technical adviser



CR2

Challenges

1. Solubility

   Soluble in pine oil, however, it is extremely difficult to make an application dilution in water.

- **Once added to water, the solution becomes jelatinous and can harden**

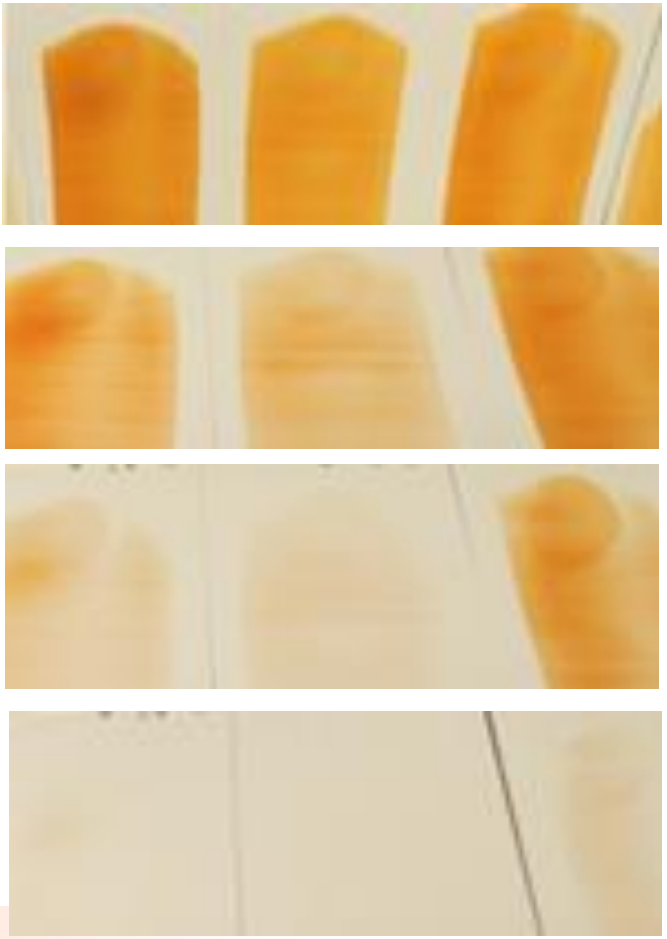
In pine oil

Challenges

2. Color stability

Fading of color when exposed to AIR

- **Oxidation of carotenoids**



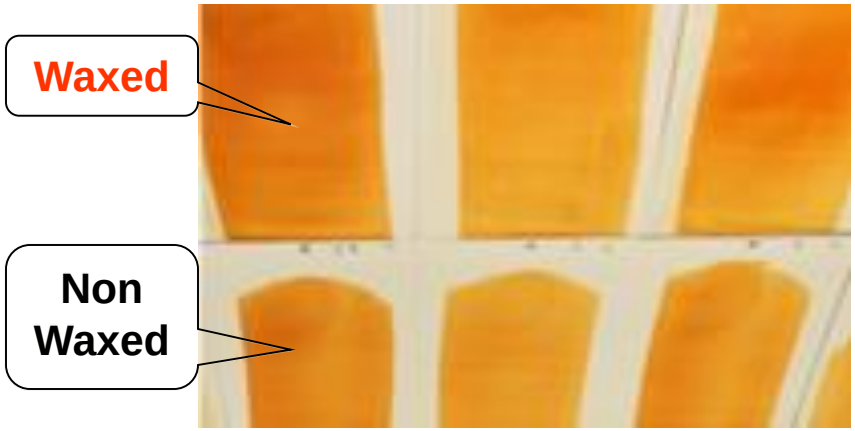
Day 0

Day 1

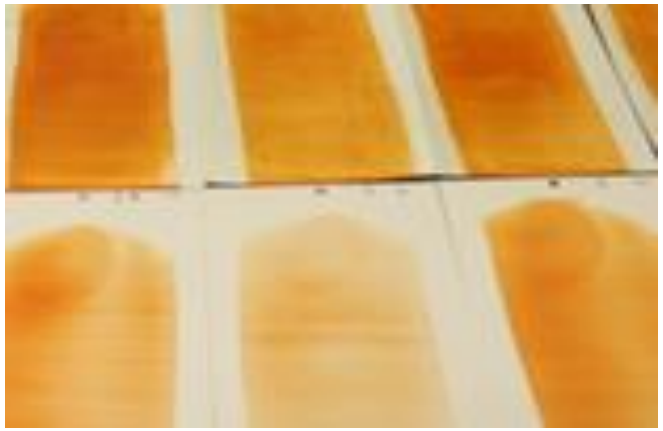
Day 2

Day 7

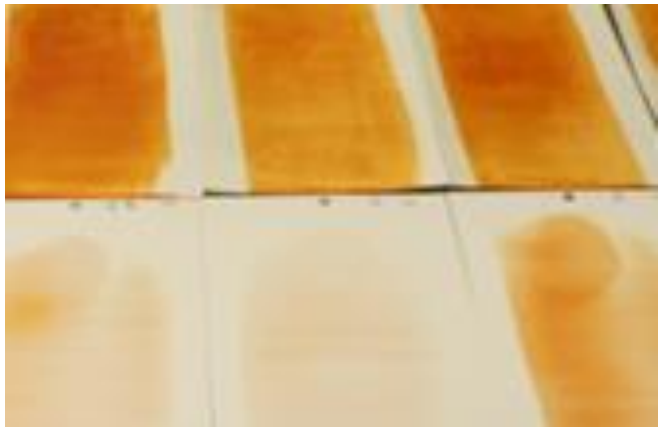
Wax protected color (carotenoids) from fading



Day 0

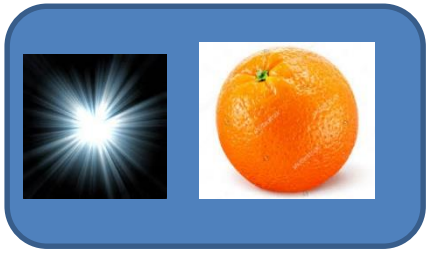


Day 1



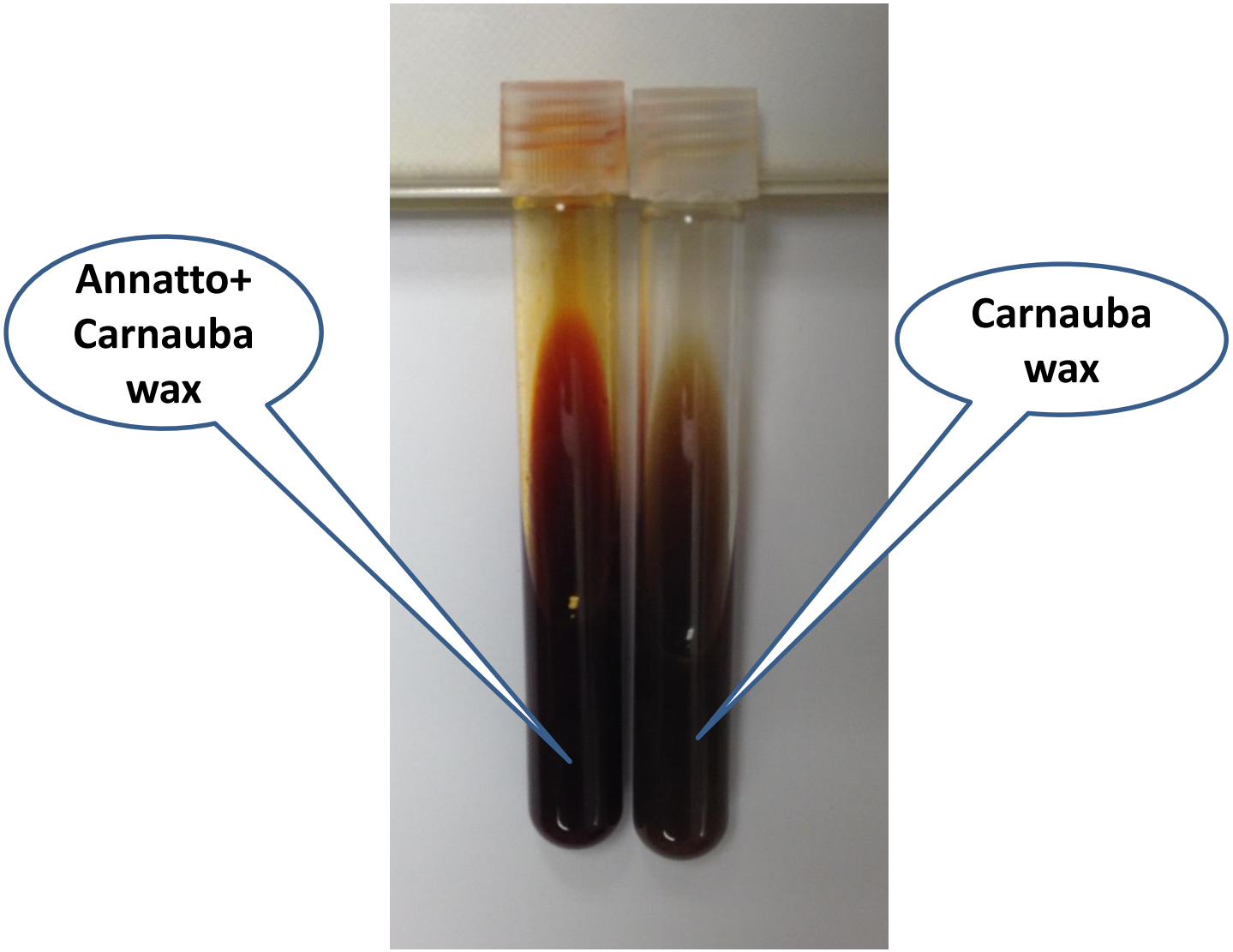
Day 2

Day 7

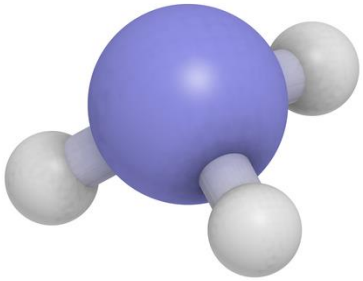


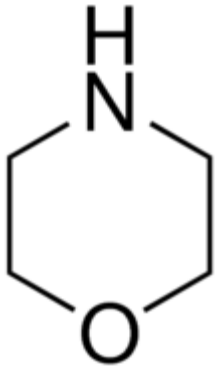
Why not formulate a wax + colorant mixture and change the current two-step process to one?

Colored wax coating



Morpholine is easy to use in the basic formulation, but is now being replaced by ammonia for all formulations





Annatto

Citrus red 2

Comparison between the current two-step CR2 + wax vs. the one-step paprika in wax

Treatment	Day0	Day7 (20 °C)	Day14 (10 °C)
Control (Wax only)			
CR2 then wax			
Paprika in wax			

Where are we?

- Technology: accumulation of colorants/waxes in the valleys of the uneven citrus fruit surface




- Commercialization: we are working with several wax suppliers and packers toward improving the formulation and application in citrus packinghouses.

Acknowledgement

Our team:

Dr. Xiuxiu Sun

Dr. Elizabeth Baldwin

Dr. Mark Ritenour

Dr. Robert Hagenmaier

Advises and supplies:

Dr. Alvin Chen (JBT FoodTech)

Food Ingredient Solutions, LLC ; WILD Flavors Inc

Kalsec

Use controlled-release chlorine dioxide to control diplodia stem-end rot

Chlorine dioxide

Control

Diplodia stem-end rot symptoms (28 days at 50°F+ 7 days at 68°F)

Take home message

- Paprika and annatto are alternatives to Citrus Red No. 2.
- A one-step coloring and waxing technology has been developed.
- Curoxin chlorine dioxide reduces incidence of diplodia stem-end rot in Grapefruit.