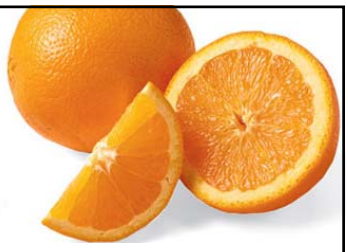
Potential New Food Safety Tools for the Packing Line



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Folta's Research Program

Connecting genes to function in strawberry

Understanding how light can improve plant product quality

Identifying the genetic elements that are required for light signaling.

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A Solution, Before the Problem

Assurances about use of groundwater

Enhancing product safety

- **Can we devise a non-chemical, non-consumable, strategy to enhance current protocols?**
- **What about using light treatments to ensure ultimately 'clean' fruit?**

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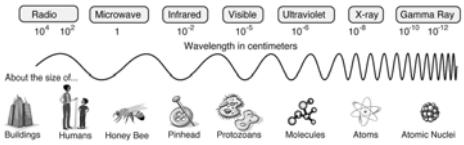
A Solution, Before the Problem

Ultraviolet light can be used as a germicidal agent



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A Solution, Before the Problem

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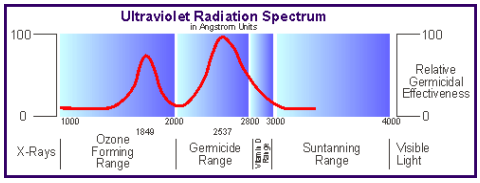

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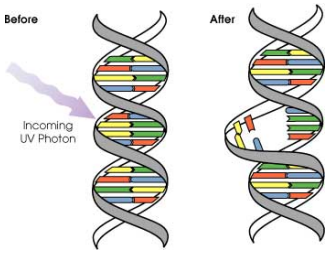
A Solution, Before the Problem



Ultraviolet light, especially at 260 nm, is absorbed by the bases of DNA, causing physical changes that disrupt DNA replication and gene expression.

Also damages proteins.

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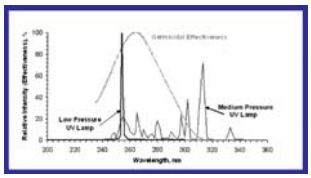
A Solution, Before the Problem

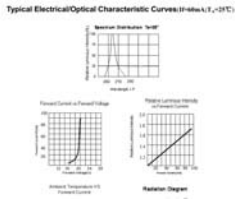
Current methods of germicidal UV delivery are not compatible with the food packing environment.

UV-Generating Bulbs

- Decay with time
- Glass
- Mercury
- Energy

A Practical Safeguard



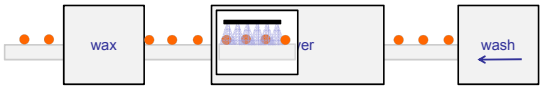


A Practical Safeguard

Light Emitting Diodes (LED)

Strengths
Low cost
One installation
Lower power consumption
Precise wavelength
No special regulation

Limitations
Not cheap for UV 260 nm (price ↓)
Dangerous wavelengths



Lab Scale Prototype

If it works, why don't we use it?

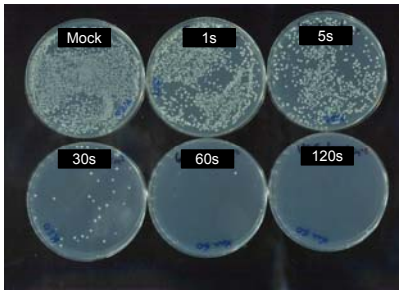
Lab Scale Prototype

Thanks to:

IFAS Citrus Initiative LBR
Light Emitting Computers (Victoria, BC)

Lab Scale Prototype

First Test - Can I kill bacteria on a plate?



1 mW/cm^2

Lab Scale Prototype

Next Test - Can I Clear an Orange of a Surrogate Pathogen?

Surface sterilize fruits with bleach, add known amount of bacteria in a known area.

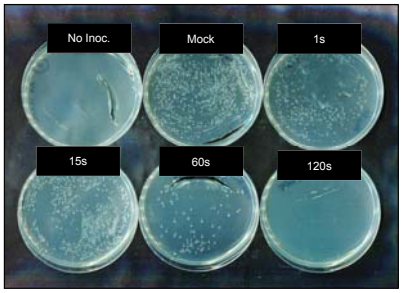
Surface sterilize fruits with bleach, add known amount of bacteria in a specific area.

Treat with UV.

Remove inoculated area, culture, measure.

Lab Scale Prototype

Results



1 mW/cm^2

Lab Scale Prototype

Results

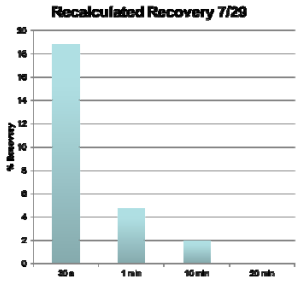
Observations

Valencia oranges come out “cleaner” even in controls.

Navel oranges seem to be better for these experiments, as they do not have inherent anti-microbial properties.

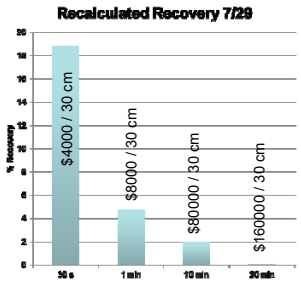
Lab Scale Prototype

Results



Jaynee Hart & Kevin Folta (in prep)

What does it cost to get the gain?



Assuming that the fruit is rolling at 1 m 5 s, and that the whole fruit is being exposed, to achieve each standard we’re looking at:

Jaynee Hart & Kevin Folta (in prep)

Good news – it can work

Bad news – cost is prohibitive

What we don’t know-

Can lower-cost suppliers be sourced?

What is the future cost projected?

Are there other ways to use more lower-output emitters to make this work?

Jaynee Hart & Kevin Folta (in prep)

Lab Scale Prototype

Conclusions

- The UV can be germicidal at practical levels for LED use
- UV can substantially decrease inoculated bacterial populations on fruit
- We are in an economic argument at this point… can we source cheaper materials?

Additional Capacities

Can UV-B generate coloration?

Next Steps

How much energy can be applied before affecting fruit?

Does the UV affect the rollers/mechanisms/dryer?

Repeat trials using better surrogates at CREC, actual safety evaluations.

Identify how timing/power/etc practically fit with the actual packing lines

Test ability to clear additional microbes (plant pathogens?)

Install on packing line at CREC, USDA Indian River

Thanks to:

Jaynee Hart UF undergrad

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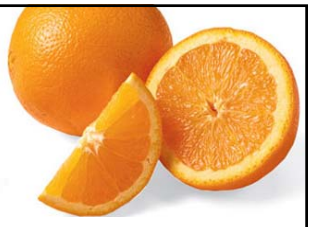
Light Emitting Computers, Victoria BC

Dr. Michelle Danlyuk, UF/IFAS CREC

Dr. Jose Chaparro, UF/IFAS Gainesville

Dr. Mark Ritenour, UF/IFAS IRREC

Thank you for the opportunity to participate in citrus research



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