“Laser Labeling for Citrus; Approved by FDA”

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Labeling with low energy Carbon dioxide laser beam
- Permanent label
- Labeling information changed quickly
- Clean
- No storage Needed
- Traceback (must be human readable)

FDA interested in the effect of laser labeling on Citrus fruit quality and safety during storage
- SEM
- SLM

Label based on a shallow scratch on the waxy cuticle

Three part study:
I. Optimization
II. Decay studies
III. Safety studies
1. Optimizing laser energy for minimum tissue exposure to reduce water loss and preserve aesthetics

II. Natural Decay

Storage at 45°F and 80%, 94% RH
Challenged Decay

*Penicillium* spores on unwaxed labeled area, incubated under above conditions

*Penicillium* did not penetrate label

III. Food Safety (main FDA concern)

- FDA main concern: “does natural-light labeling change the colonization, infiltration and survival of pathogens on the surface of produce?”

- Evaluate the potential for *Salmonella* to internalize into citrus fruits following natural-light labeling

Oranges: Valencia oranges

Laser: Etched for 35 μs with
Juice Results

No Salmonella isolated in juice samples of sound fruit for all treatments, controls and storage temperatures.

Peel Results: 10°C

There were no significant differences (P<0.05) between populations of Salmonella on laser labeled or unlabeled oranges, regardless of wax application, stored at 10, or 26°C.

Laser labeling did not facilitate Salmonella infiltration into orange juice.

Peel Results: 26°C

There were no significant differences (P<0.05) between populations of Salmonella on laser labeled or unlabeled oranges, regardless of wax application, stored at 10, or 26°C.

Laser labeling did not facilitate Salmonella infiltration into orange juice.

Conclusions

Laser labeling does not adversely affect the citrus surface with respect to decay organisms, pathogen survival or infiltration, and offers industry a permanent, safe alternative to traditional adhesive labeling.