New ANR Publication: Organic Strawberry Production Manual

http://anrcatalog.ucdavis.edu
Mark Bolda and Steven Koike; 2012

National Organic Standards

- National Organic Standards – definitions + authority USDA
- National Organic Standards Board – advisory to Sec of Ag
  http://www.ams.usda.gov/nop/indexIE.htm
- National Organic Program– certification + enforcement USDA / AMS
- California Organic Products Act 2003 – CDFA and DHS
  http://www.cdfa.ca.gov/is/fveqc/organic.htm

Key Provisions for Organic Produce

- NOP defines “organic”
  An ecological production management system
  - Biodiversity
  - Biological cycles
  - Soil biological activity
  - Enhance ecological harmony
- National Organic Standards Board sets
  Allowable, Restricted, Prohibited
- Prohibits irradiation, sewage sludge, GMO
- Allows use of ‘raw’ manure (Restricted)
  - or composted materials (Process documentation)
  - or validated thermal treatment (Process documentation)
- Allows use of synthetic materials (Restricted)
“in protest”....

Alternatives to USDA Organic Certification have been organized

credit: Dog Mountain Farm

Key Components of Compliance with National Organic Standards

- Organic integrity -- audit trail + labeling
- Certification – recognized auditor
  - Provisions for audits of certifiers
  - Provisions for dispute resolution
  - De-certify auditors
- Prevention/ Control of commingling
- Barriers to contamination
  - Packaging
  - Other physical or spatial separation

Prohibited Packing and Packaging Materials

- Packing and packaging materials impregnated with US FDA approved but non-organic fungicide or bactericide is prohibited
- Organic integrity obstacles in using Post Consumer Production of recycled packaging
  - Clamshells & Lids
  - Films
Regulatory View of Organic: What it is and is not

- Organic is a production claim
  - Organic is about how food is produced and handled.
  - Organic is not a judgment about quality of a product

- Organic is not a content claim
  - It does not represent that a product is “free” of something
  - Allowable residues; Allowable GMO

- Organic is not a food safety claim
  - Organic is not a judgment about the safety of any product
  - Organic does not mean a product is necessarily superior, safer, or more healthy than conventionally produced food

Challenges of Comparing Sensory and Nutritional Benefits of Organic Produce

- Standardizing cultivar across study
  - Conventional vs Organic from retail
- Matching preharvest conditions
  - Soil type, microenvironment, fertility management, irrigation, etc.
- Tree Fruit and Tree Nut challenges
  - Orchard age, rootstock, canopy position
- Matching harvest conditions
  - Maturity, time of day, postharvest handling
  - ....and more
A few examples of preharvest management

Acceptance Criteria:

- Fecal coliforms Negative or < DL per gram
- Salmonella: Negative or < DL (<1/30 grams)
- E. coli O157:H7: Negative or < DL (<1/30 grams)

Minimum temperature: 300°F (150°C) for 60 minutes

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Fertilizers containing animal manure must be heat treated or processed by other equivalent methods

Chicken and Sheep Manure Pellets
Manure Teas and Compost Teas

Recognized benefits in
• plant fertility
• pest management
• foliar pathogen control

Common Compost Tea Additives to Promote Microbial Growth

- Molasses
- Proprietary microbial nutrients
- Yeast extract & Whey blends
- Kelp Meal
- Blood Meal
- Bone and Feather Meal
- Cottonseed meal
- Fish Emulsion
- Humic Acids

Compost Tea Risk and Fecal Pathogens

US Compost Tea Task Force recommendations –
Test teas for E. coli IF
(1) tea contains nutrient additives
(2) are to be used > 1 hr after tea extract production
AND are to be used on
(3) food crops harvested <90d after application
A description of the management practices and physical barriers established to prevent commingling of organic and non-organic products...and to prevent contact with prohibited substances;

and any additional information deemed necessary by the certifying agent to evaluate compliance with the regulations.
NOSB Postharvest Processing Criteria

A SYNTHETIC PROCESSING AIDE OR ADJUVANT may be used if;

An equivalent substance cannot be produced from a natural source and has no substitutes that are organic ingredients.

2006 Revision:
Ethylene Generators—now allowed for postharvest ripening of tropical fruit and flower induction of pineapple

Is ethylene generation allowed for tomato de-greening?

Organic Materials Review Institute:
Postharvest List by Product Name and Generic Category

https://www.omri.org/
Examples of OMRI Approved Postharvest Materials

- Anti-Browning – NatureSeal As-5 & PS-10
- CA/MA Systems – Tectrol; CO2 Active Pad; Genesis ACO2
- DeFoamers – Foam Blast ORG / Suppressor 3642
- Disinfectants – Peracetic acid (Tsunami, VigorOx, StorOx, SaniDate)
- Ethylene Control – EC Power Pellets / CJS Sachets and Bulk Pellets
- Fruit Coatings – Natralife BC / Decco Natur 575
- Wax – Decco Natur 550 / Natural Shine 565-OR

OMRI – Organic Materials Review Institute

NOP § 205.601 Synthetic substances allowed for use in organic crop production (Restricted Use)

- Algicides, disinfectants, and sanitizers
  1. Alcohols
     i. Ethanol
     ii. Isopropanol
  2. Chlorine materials –
     i. Calcium hypochlorite
     ii. Chlorine dioxide (SDWA limit 0.8 ppm)
     iii. Sodium hypochlorite
  3. Hydrogen peroxide
  4. Soap-based algicide/demisters

Residual chlorine levels in the water shall not exceed the maximum residual disinfectant limit under the Safe Drinking Water Act (4ppm)
Cooling Organic Produce

- Dedicated cooling equipment and cold rooms
- Hydrocool, Spray-Vacuum cooling at the beginning of the day after cleaning and complete water exchange
  - Overnight cold room storage
  - May use ozonation to mitigate pesticide residues

After Daily Clean Out

Organic products are cooled first

Certification Requires Approved SSOP

Sanitary Standard Operating Procedure

Define - Validate - Document
Special Postharvest Treatments

- **Waxes**: may not contain synthetic substances; carnauba and other natural waxes acceptable; waxed products must be labeled
- **Ethylene removal**: KMnO₄ air filtration systems allowed - strict separation from product; UV light-ozone destruction system
- **X-ray irradiation**: for metal detection for packaged products is permitted

The Issue with Fruit Waxes

- Microemulsions cannot contain morpholine or triethanolamine
- Formulations cannot contain ammonia or amines
- New formulations under review by OMRI
  - Organic Materials Review Institute

http://deccous.com/products
Carnauba wax, beeswax, and wood rosin
Apply one gallon to:
8,000 lbs of small or 10,000 lbs of large
• cleaned, dry fruit on a brush bed.

Exporters should review organic regulations in target market (e.g. EU and Japan)

International Organic Inspectors Association
http://www.ioia.net/standards.html

Water Disinfection Options

Chlorine remains the predominant treatment
• Must allow for municipal treated water
• Must allow for decay control and safety
• Typically 20-75 ppm in make-up water
• 4 ppm HOCL maximum residual downstream

Flotation aids: lignin sulfonates YES
sodium silicates NO
Minimize chlorine dose by implementing automated injection system and maximizing contact by agitation within practical residence time.

Unexpected Sources of Organic Load

Compost teas

- Potential source of chlorine demand
- Potential for chloramine formation
- Disinfection-by-products
Allowed Non-Chlorine Antimicrobials

<table>
<thead>
<tr>
<th>Class</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic acids</td>
<td>Acetic Acid, Benzoic, Lactic acid</td>
</tr>
<tr>
<td>Spice extracts</td>
<td>Thymol, Clove, Cinnamon</td>
</tr>
<tr>
<td>Thiosulfonates</td>
<td>Allicin</td>
</tr>
<tr>
<td>Metals</td>
<td>Copper ions</td>
</tr>
</tbody>
</table>

Organic Acids

- Acetic acid
- Propionic acid
- Lactic acid (Most effective; $$$$
- Succininc acid
- 2 - 4% alone
- 1% as combination

Postharvest antimicrobials are often based on essential oils
Why wouldn’t ozonation be a sensible treatment in this system?

1. Too much fruit
2. Too hot
3. Too high nozzle pressure

Ozone Gas

205.601(a)(5)
Final October 31, 2003
(68 Federal Register 61992)
Re-affirmed November 2007
Allowed with the annotation:
As cleaning agent for irrigation lines only

205.605 Allows broad O₃ use in postharvest

Ozone treatment during overnight storage may:
- Reduce ethylene
- Reduce airborne microbes
- Disinfect surfaces

Longer-term ozone use also helps:
- Prevent sporulation
- Reduce pesticide residues
- Works best in pack to order or repack
Evaluation of the postharvest use of continuous, low ozone concentration atmospheres during the cold storage of table grapes

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Continuous low dose ozone
- Ozone gas is constantly present
- Concentration is usually low, typically 100 to 300 parts per billion (0.1 to 0.3 parts per million)

Botrytis inoculated
Not treated
Botrytis inoculated
Ozone 800 ppm*hr

7 days after treatment at 15°C
Influence of ozone, M. albus mycofumigation, SO₂ fumigation, and SO₂ generators on gray mold among Thompson Seedless grapes during 30 days storage at 1°C. Results from two package types (RPC clamshell & EPS polybags) combined.

Transportation and Distribution
Maintain Organic Integrity

Prevent transfer of any Prohibited Substances
- Prohibited pesticides
- Oil and grease
- Heavy metals
- Soil and debris
- Prohibited cleaners
Mixed use of cartons, pallets, bins, etc is prohibited/restricted

Separation and Maintenance of Organic Integrity in Cold Storage

Palletize Organics Above Conventional Produce
- Dry loads above wet loads
- Barriers to prevent contamination
Maintain Organic Integrity in Retail Display

Do retailers need to be certified under the National Organic Standards?

NOP rule 7 CFR Section 205

Retailers are not required to be certified.
- prevent commingling with non-organic certified
- prevent contamination with prohibited substances
- keep records of integrity through delivery to customer

Organic produce should be stored separate from or above conventional produce
Resources for more information

http://www.ams.usda.gov/AMSv1.0/nop

Organic Trade Association

http://www.ota.com/index.html

http://www.theorganicpages.com/topo/index.html
Summary

Organic Postharvest Principles are the same – tools are modified or limited but philosophical and market commitment has allowed substantial innovation, adaptation, and growth.