Organic Strawberry Production

*In-season nutrient management challenges*

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*San Luis Obispo and Santa Barbara counties*
Strawberry Production

Long standing, well established industry

Basic elements of cropping system

> implications for organic production?
Nitrogen is critical limiting nutrient

• Often primary nutrient limiting plant growth
• Does not accumulate in soil except as organic matter
• Most common form for plants – nitrate - is water soluble
Nitrogen sources

• Organic matter decomposition

• Cycling of N in soil organic fraction, microbial activity
  - dynamic, depends on environmental conditions

• Fertilizers
Organic strawberry fertility management

- Soil organic matter averages 2.5-3% in Watsonville
  - ~1% in Santa Maria Valley
- Low S.O.M creates special problems for organic management
- Rotation cropping cycle feasible?
Nitrogen applied pre-plant followed by fertigation

• Pre-plant applied, incorporated compost, mixed organic blends / pellets, green manure crops

• In-season fertigation
  - plastic mulch, drip, etc
Organic soil fertility

• Soil organic matter > big effect on nutrient availability

• Difficult to increase long-term S.O.M. more than 1%

• Much of applied S.O.M. decomposes quickly;
  - subsequent N availability uncertain

• Complement S.O.M. with pre-plant and in-season fertilization
Strawberry cropping systems

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<th>Transplant</th>
<th>In-season maintenance</th>
<th>Harvest</th>
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- Prepare Fields
- Transplant
- In-season maintenance
- Harvest
Timing of N release?
Nitrogen applied pre-plant

Mineralization from pre-plant compost

Rate of nitrogen release

Time

Week
Nitrogen applied pre-plant VS plant N uptake

Rate of N release or absorption

Mineralization from pre-plant compost

Plant N demand

Time

Week
Strawberry nitrogen uptake
• Little N uptake > October to Feb
• Early-mid March > 1 lb N/acre/day
Pre-plant nitrogen release pattern vs strawberry crop uptake

Rate of N mineralization and crop N uptake

- Pre-plant organic material mineralization
- Compost incorporation
- Prepare beds, apply plastic and drip tape, receive plants from nursery
- Planting (cooler temperatures)
- Planting (warmer temperatures)
- Crop N demand, warmer temperatures
- Crop N demand, cooler temperatures

Weeks

0 1 2 3 4 5 6 7 8 9 10
Timing of N availability - fertigations

- **Mineralization from pre-plant compost**
- **Plant N demand**

- **Southern Districts**
- **Northern Districts**

- **Time**
  - 0 2 4 6 8 10 12 14 16 18 20

- **Rate of N release or absorption**
Nitrogen nutrition?

• Total amount of N
• Timing of N availability
Fertigated N is critical

• Blends of organic sources - fish, soy, feather, etc.
• Finely ground suspensions?
• Fish emulsions with prior enzyme activity
• Low analysis, expensive
Organic liquid fertilizers

Filtered to pass 150 - 200 mesh drip tape

Organic matter + bacteria, fungi, algae

Once mixed, can settle, clump, etc

Usually not soluble – suspended solids?

sedimentation, damage to system?
Field trials with fertigated N

• Multiple seasons, crops, materials
• Rarely see a response to N
• Yields remain 50% of conventional
Rethink the situation?

• Organic strawberries yield 50% of conventional

• Small plants >> “always smaller”

• Lower DU by mid Jan 65%

• Plugging, double the tape!
Other?

Drip system function deteriorates over the season

Plants small with low productivity
Organic fertigation maintenance

Injection not recommended w/o filter

High cost / unit N

In practice, many growers inject below filter
Organic fertigation maintenance

Acid treatment to dissolve Ca / Mg ppts

NOP approved acids: acetic, citric, oxalic, para acetic

Use of chlorine to clean lines; limits on Cl conc.

Natural substances
  - fish, animal, vegetable wastes, proteins

Usually hydrolyzed, ground, enzyme

Interaction between materials / microbes?
Summary - Organic nitrogen management

- Nitrogen is key nutrient for most crops
- Management of organic matter in important part of organic production
- Increasing soil O.M. dependent on regular green manure and O.M. addition
- Amount of N and timing of N both important to crop production
- Crop growth habit, environment, cultural practices may interfere with efficient management of organic N
Organic Strawberry Production

In-season nutrient management challenges

Mark Gaskell, Farm Advisor

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San Luis Obispo and Santa Barbara counties
Title and content layout with chart
Two content layout with table

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Two content layout with smartart

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- Most common form – nitrate is water soluble

Strawberry Production
Long standing, well established industry
Basic elements of cropping system implications for organic production

Organic Strawberry Production
Adapting conventional cropping systems to organic production realities.

Mark Gaskin, Farm Advisor
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San Luis Obispo and Santa Barbara counties

Nitrogen sources
- Preplant applied, incorporated compost, granular organic pellets, green manure crops
- In-season fertilization: plastic mulch, slurry, etc.

Organic soil fertility
- Organic matter ratio affects nutrient availability
- Difficult to increase long-term OM
- Much of applied OM applied to compost or vermicompost
- Subsequent N availability essential

Strawberry cropping systems
Organic soil fertility
- Self-organic matter amendments: 2.5% - 5.0% total
- 1% in San Joaquin Valley
- Low organic matter and special problems for organic management
- Rotation cropping cycle feasible?