Developing Nitrogen Management Tools in Strawberry

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Strawberries important to California…

- strawberries planted on more than 30,000 acres in key coastal CA counties
- harvested value in excess of $1.3 billion
- nitrogen (N) management is one of key cultural practices
Nitrogen and salt management are important

- nitrogen (N) - important component of yield and quality
- salinity can markedly limit strawberry production
- manage salinity by leaching of salts – and nitrate?
- can strawberries be grown with little off-site N movement?
N in surface and ground water ...

- excess N leaches or runs off
- need to match N availability to crop need
- N use efficiency
- but the need to leach salts can put EC management at odds with efficient N management?
- manage salts with leaching and nitrate moves
- water use implications?
Strawberries and N management

- limited applicable research base
- strawberry nutrient needs
- interaction with other cultural practices
- common coastal California strawberry fertility programs
- critical determining factors?
Limited applicable research base…

• Florida N fertility work with strawberry indicates response to 150-200 lb N per acre (~2500 crates per acre)

• Florida studies show 75 -80 lb N in the plant and fruit 200 day season, warmer / humid yields are 30 - 50% of CA yields

• 1996 study from So. Calif shows yield of Chandler and Camarosa increasing with increasing N up to 320 lb / A - Camarosa yes / Chandler no
Other factors affect strawberry N needs

- key growing districts South to North
- range of cultivars, planting and harvest dates
  Camarosa, Ventana, Diamante, Albion dominate
  + others, - proprietary
- different nursery transplant growing conditions
  that also affect plant vigor
Role of N in strawberry development and yield …

- annual system – need to develop foliar area early and produce over a long season without gaps
- high yields of good quality fruit depend on detailed critical management regime or plants fail to meet potential
- need to get plant crown branches and foliar area as early as possible >>> then cut back N
  - - but still maintain vigor.
Role of N in strawberry development and yield

- If not enough side branches before flowering, flowering competes with vegetative growth
  > > breaks in production

- Plant may not respond if limited by cool temps, slower in Northern districts.
SHOULD WE HAVE LARSON STUDY EARLY OR AFTER N NEEDS??
Mark Gaskell, 9/28/2008
Interactions with strawberry cultural practices…

- variations in cultivars – growth habit, vigor
  - cultivars respond differently
- nursery management – N regime, location, planting / digging date all affect early vigor and establishment
- soil type, fertility – field to field variation
- heat units in growing areas during fall, winter -- in So. Cal, strawberries respond very quickly to applied N – in North districts, slower
Interactions with strawberry cultural practices…

• in-season climate – rainfall? + rainfall X temp?
• bed height, mulch color orientation, planting density, irrigation management
• fruit growers must integrate N management into this mix of interacting factors - no easy task
• observations of plant growth and vigor also important
Nitrogen and salt management …

- back to balancing plant N need with EC management
- strawberries are sensitive to salts and also specific ion detrimental effects with Cl⁻ that need to be considered
- some data shows that we may lose %30 of yield going from ECe of 1-2 – not uncommon in Santa Maria strawberry fields

- conflict between optimizing N and leaching salts?
need periodic (weekly(?)) N injection
Controlled release fertilizers...

- Industry has gone to more controlled released fertilizers over time for pre-plant fertilization
- Relatively pricey but can be very effective
- Release of N may not always meet needs of strawberry plant – need some flexibility
"Typical” Fertilization Program?

• Some variation among districts – slower in North and less early N or

• Lower N analysis materials in North districts

• Some variations with varieties – vigor?

• Some growers use little or no CR fertilizers with excellent results
  - more careful, intensive fertigation mgmt

• In warmer So., plants more responsive to early N; in North, establish more slowly
Overall Seasonal Strawberry Vegetative Fresh and Dry Weight
Albion - 2008 Season

Above Ground Fresh or Dry Weight (lbs / Acre)

- FrWgt/A
- DWgt/A

Date
Week

% Nitrates Release 20°C

- Polyon 80-110
- Duration 60-90
- Duration 90-110
- Meister 70
- Meister 100
- Multicote
- Trikote (S)

source: T. Hartz, UC-Davis
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Preplant controlled release N?

Crop N demand

Rate of Nitrogen Release

Week

Time
N release from tillage / broadcast N?
Controlled Release VS drip applied N?

- drip-applied N
  - most flexibility and efficiency - management?
- wet years?
  - may be difficult getting into field and applying sufficient N without damaging beds, aggravating other problems - but this would be brief
- improve control over off-site movement?
Strawberries and N management

• time N availability to crop need
  - high preplant application may not allow needed control
  - time-released materials are more costly, less efficient

• manage irrigation for EC and nitrate?
  - more research needed > plant response, variables, timing, conditions, etc.

• can more targeted periodic N injection can avoid off site N movement?
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