

University of California Cooperative Extension Ventura County

Update on Ventura County Soil Disinfestation Trials



Oleg Daugovish, Anna Howell, Bill Rutan, Steve Koike (UC-ANR), Joji Muramoto and Carol Shennan (UCSC), Tom Gordon (UC-Davis), Ruijun Qin (USDA), Husein Ajwa, J. Gerik , S. Gao (USDA), B. Hansen, UC –Davis)

Anthracnose management guidelines

Anthracnose of Strawberry

Production Guideline by Mark Bolda, Oleg Daugovich & Steven Koike

Issue

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Anthracnose is a disease that occurs wherever strawberries are produced. In California, the disease occurs sporadically and its importance can vary greatly. In some seasons the disease is very destructive, resulting in plants with reduced productivity, unmarketable fruit with lesions, and even plant death. In other years, anthracnose is a minor issue and may be hard to find in the field. Historically the disease is of little concern in California's central coast fruit production fields but may be more damaging to crops in the south coast region. The severity of anthracnose is dependent on the extent to which transplants are contaminated with the pathogen and the amount of overhead irrigation and rain that falls on the planted crop.

Symptoms

The pathogen can infect many different parts of the strawberry plant, though some infections are more common and important than others. Root infections, though not commonly seen, result in rotted, non-functional roots that cause the plant to wilt. On occasion the fungus can also infect the inner tissues of the crown, resulting in an internal red brown discoloration and again plant wilting. Therefore, root and crown anthracnose disease (Table 1) may resemble symptoms caused by soilborne pathogens such as *Phytophthora*.

Strawberry tissue	Symptoms	Orange spore masses?
root	discolored, rotted roots, causing leaves to wilt	no
crown	discolored internal crown, causing leaves to wilt	no
leaf petiole	dark brown, elongated lesions	yes
leaf blade	gray to brown circular spots	yes
runner	dark brown, elongated lesions	yes
flower peduncle (stem)	dark brown, elongated lesions	yes
flower	discolored tissue, causing flower to shrivel	yes
fruit	brown, oval to round, firm, dry sunken spots	yes

On strawberry leaf petioles, runner stolons, and flower peduncles, the anthracnose pathogen causes oval to elongated lesions that range in color from brown to gray to black (Table 1; Figure 1). If conditions are suitable for development of the fungus, the lesions will contain numerous tiny orange masses of spores (Figure 2). Infected leaves can form round, oval, or irregularly shaped brown spots which likewise may produce the orange spore masses.

Strawberry flowers can also become infected, turn brown, and bear the orange spore masses (Figure 3). In some cases, the flower may be killed. Green immature and red ripe fruit show

Colletotrichum acutatum was never recovered from soil, infected runners, or crowns that had been fumigated with methyl bromide-chloropicrin (Gubler et al., 1988).

The California Strawberry Commission Production Guidelines are produced in cooperation with scientists who conduct research related to strawberry production. These guidelines are a tool for growers, providing critical scientific background information on diseases and pests common to strawberry production in California. For copies of this guideline or others in the series, visit www.calstrawberry.com.

Production Guideline by:
Mark Bolda
UC Cooperative Extension
Santa Cruz County
mpbolds@ucanr.edu
p. 831.763.8040

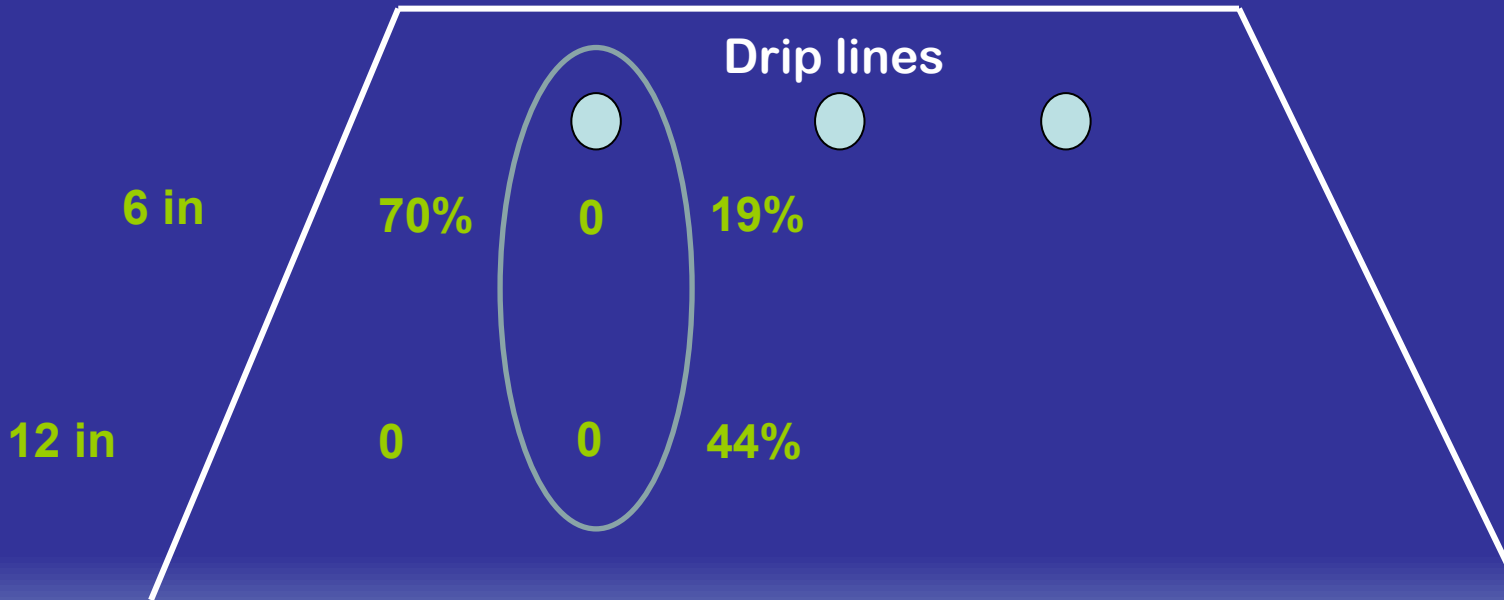
Oleg Daugovich
UC Cooperative Extension
Ventura County
odaugovich@ucanr.edu
p. 805.645.1454

Steven T. Koike
UC Cooperative Extension
Monterey County
stkoike@ucanr.edu
p. 831.759.7350



Macrophomina phaseolina

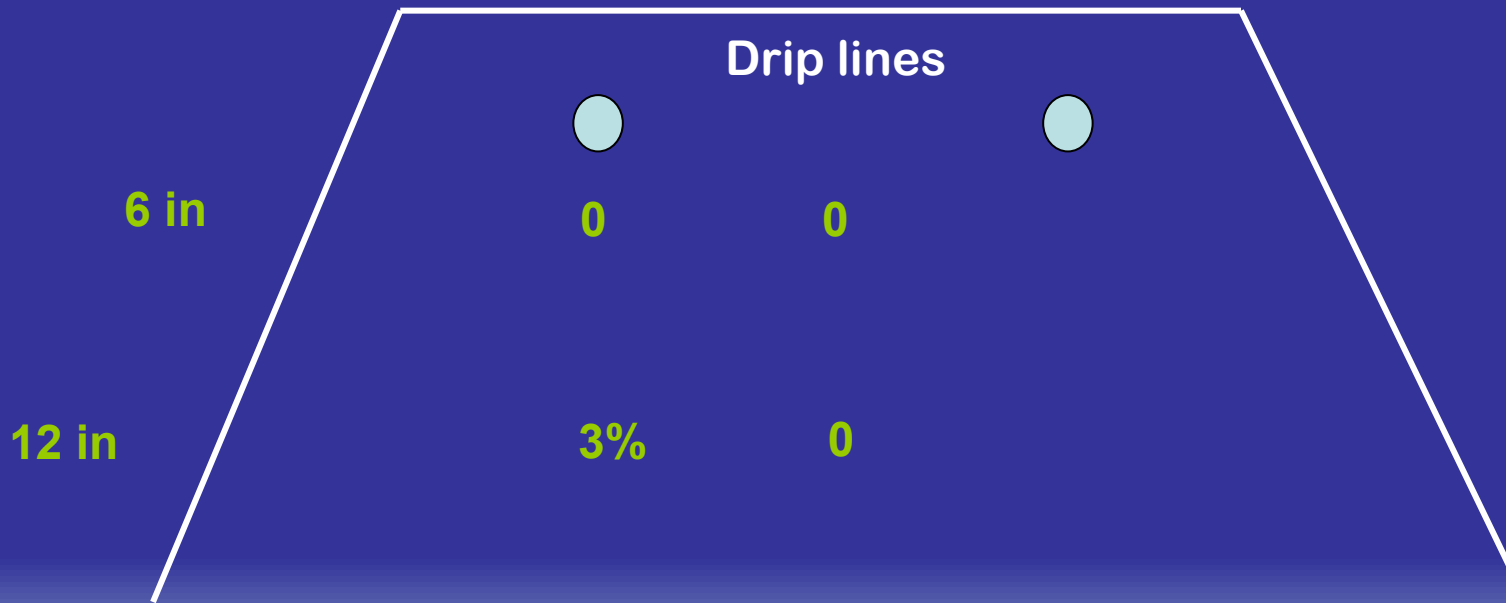
survival in infested crowns after 200 lbs/a InLine



Survival = viable *Macrophomina* sclerotia in crown tissue post fumigation

Colletorichum acutatum

survival in infested crowns after 200 lbs/a Pic



NON-FUMIGATED SOIL

In non-fumigated soil *C. acutatum* was recovered in 80% of the buried crowns after 6 months

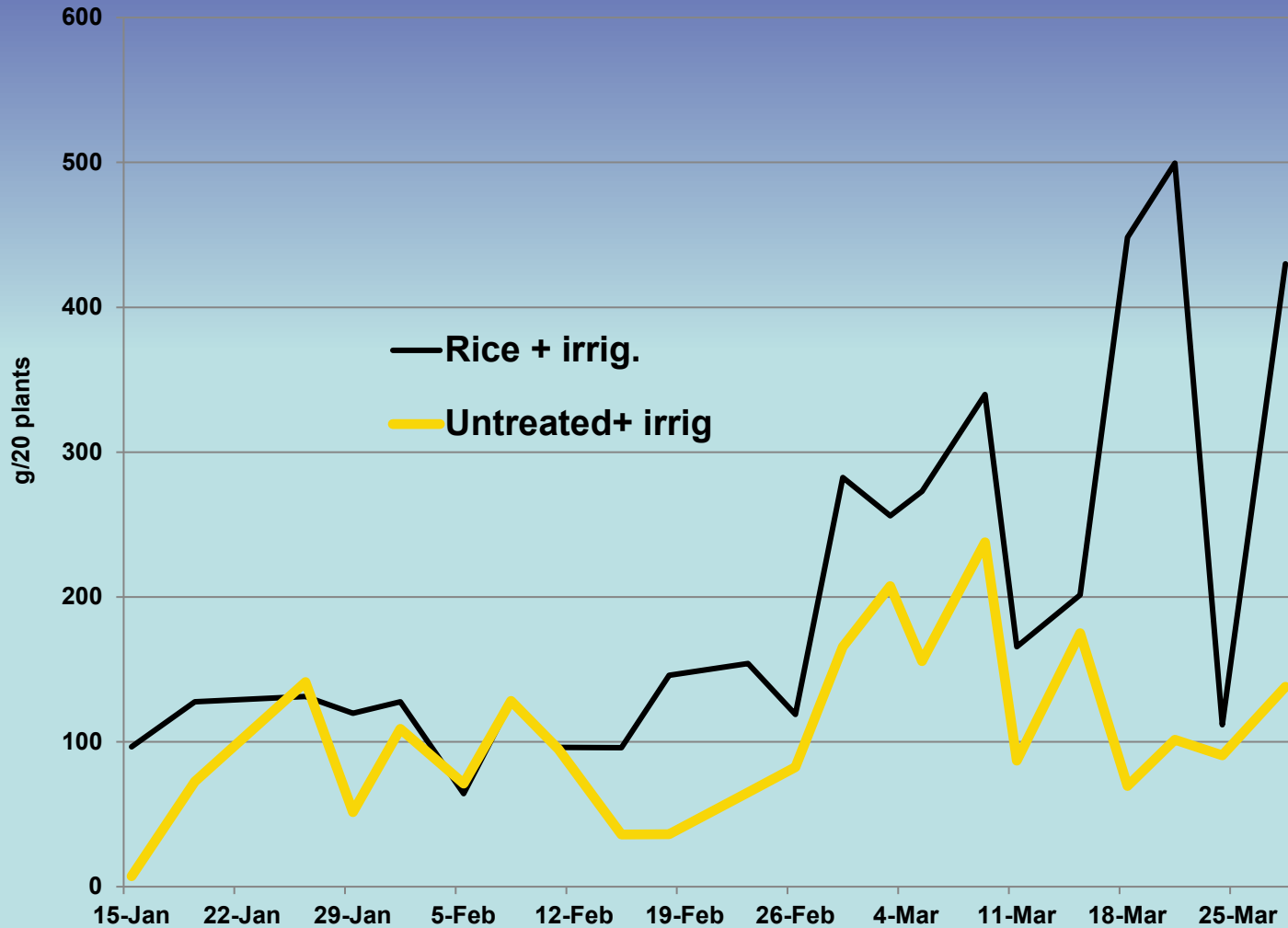
The fungus was able to survive in buried strawberry tissue for 9 months (Eastburn and Gubler, 1990).

What is the probability of new transplant infection from old *C. acutatum* containing residue?

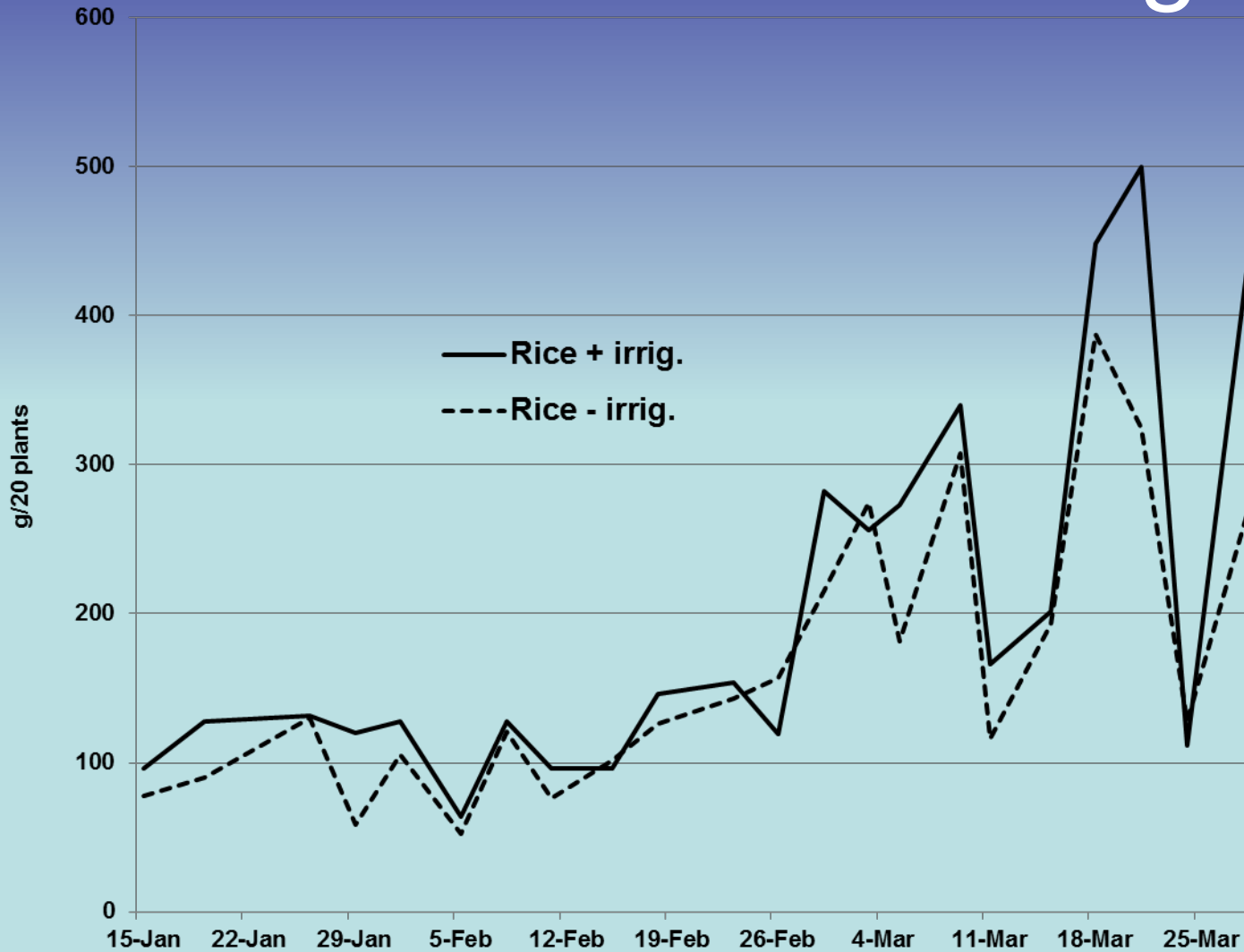
ASD: looking for Rice bran alternatives



Yield: Rice vs Untreated



Yield: Rice with or w/o irrigation



C-sources:

favorable C/N ratio, local, available, cheap

Coffee grounds



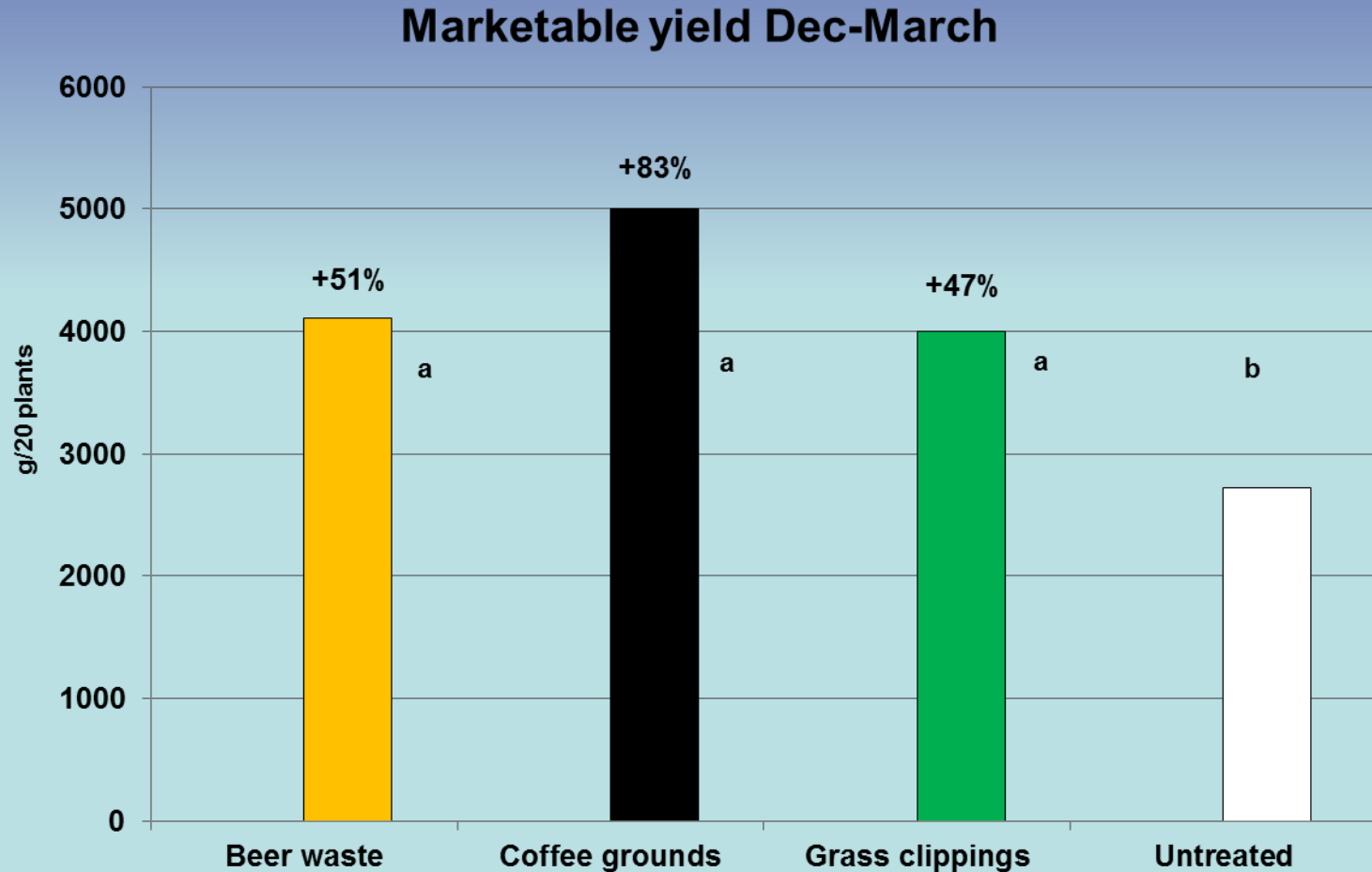
Spent grain



Grass clippings



Marketable yield: Dec-March



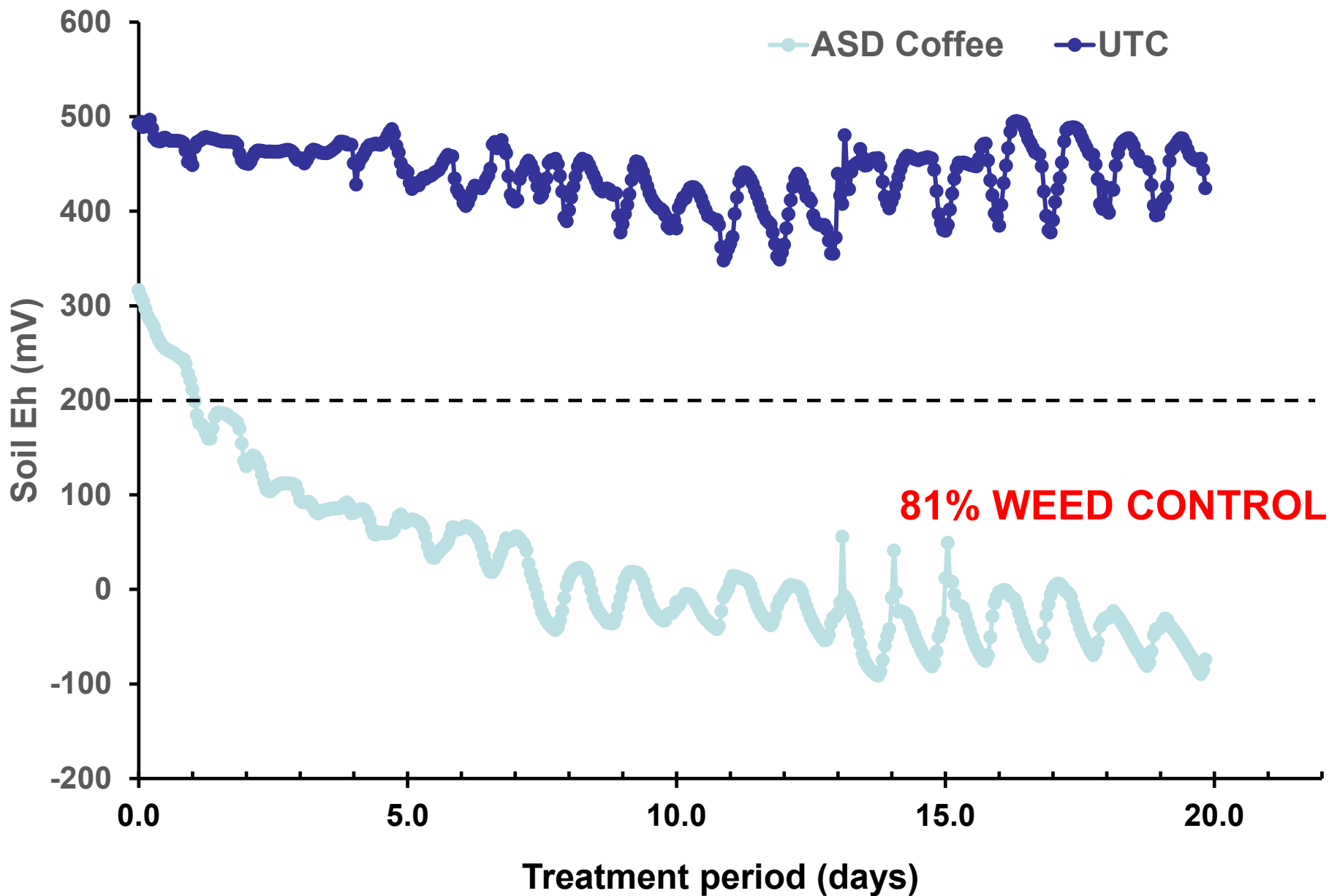


Roasting facility for Starbucks = coffee grounds

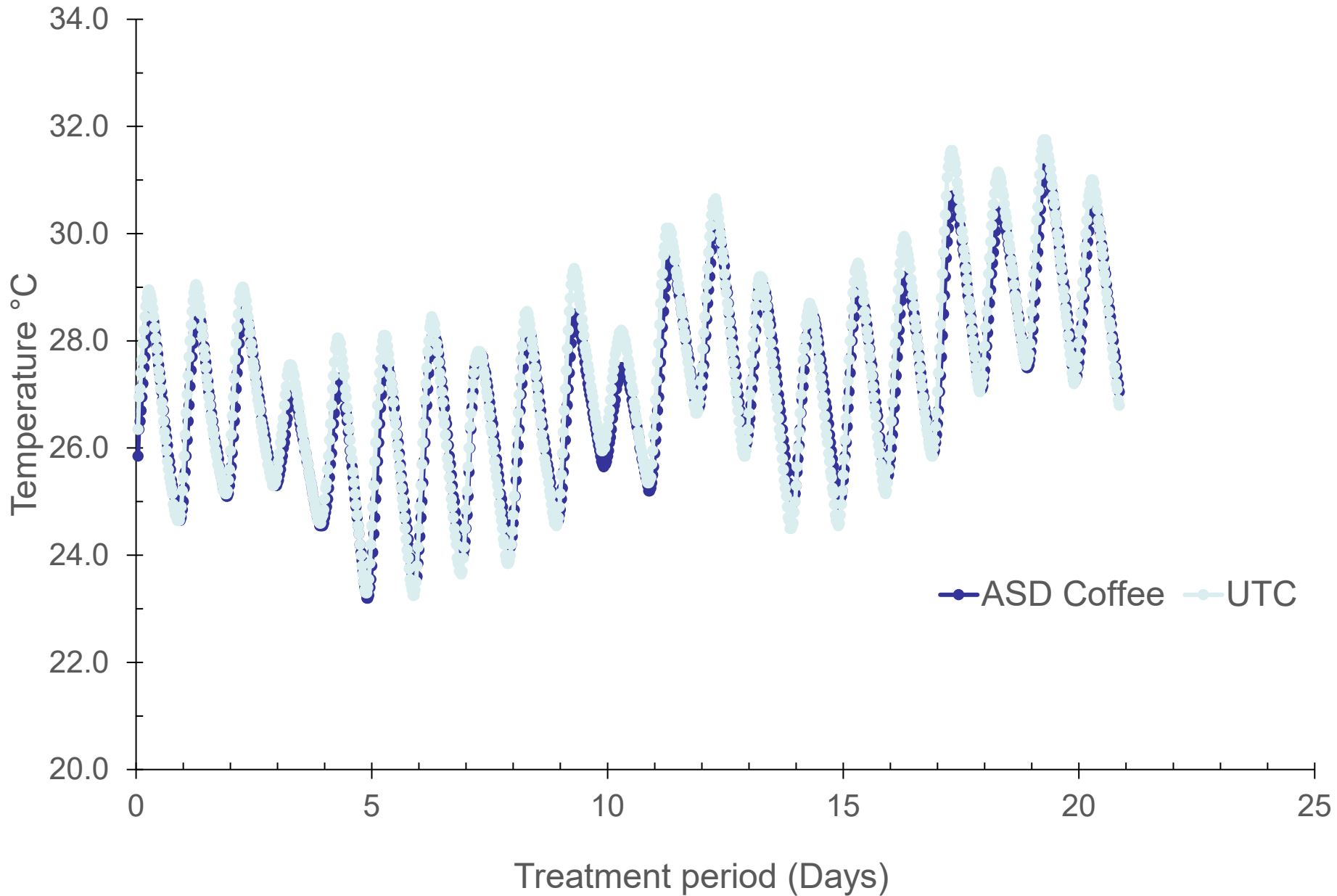
- **< 15 miles from application sites**
- **Free + free delivery**
- **15-20 cu yards available weekly**
- **Can be stored at field site**
- **Easy to apply**

ANAEROBIC CONDITIONS

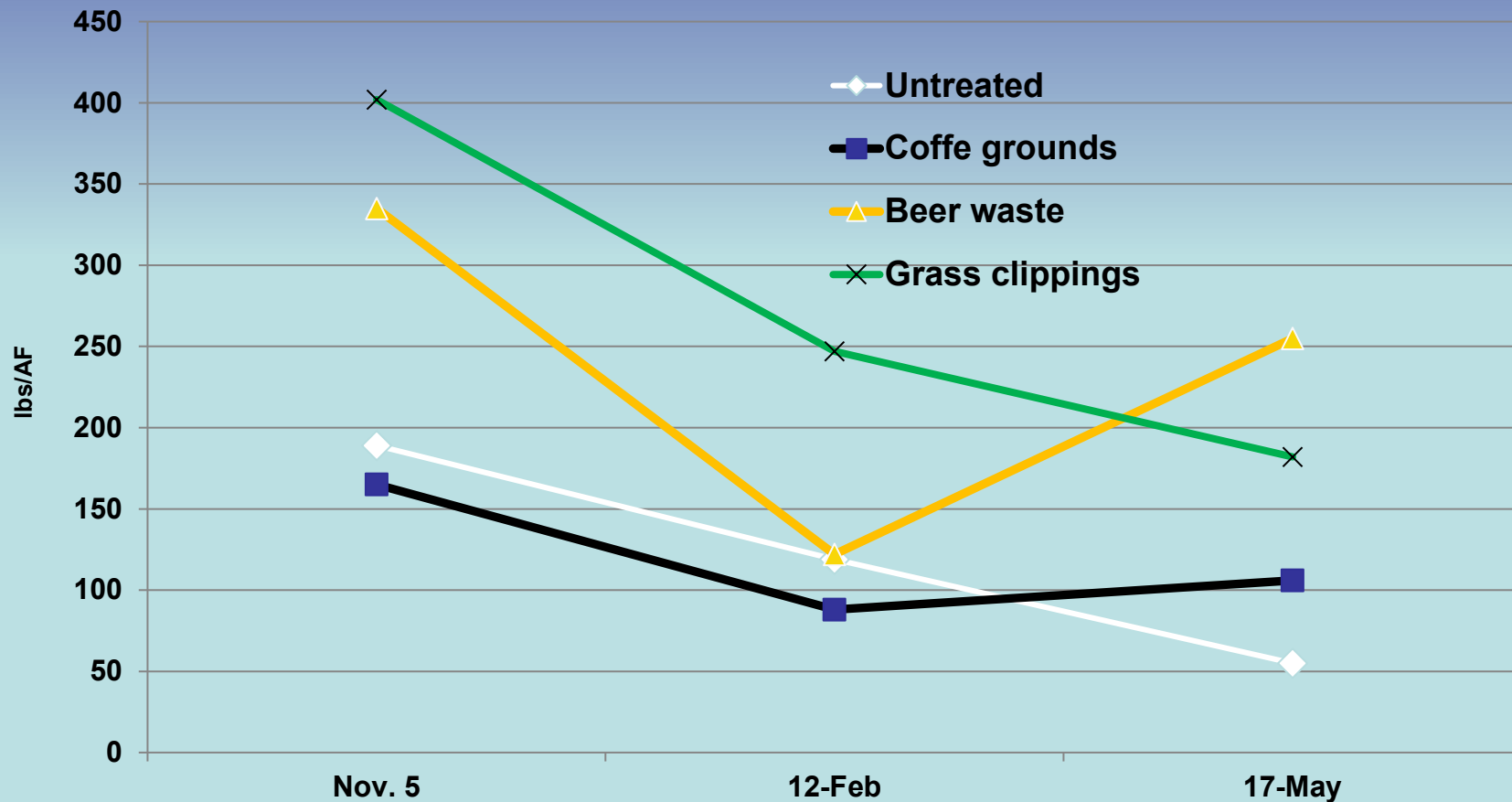
Soil Eh (mV)



Soil Temperature (8" depth)

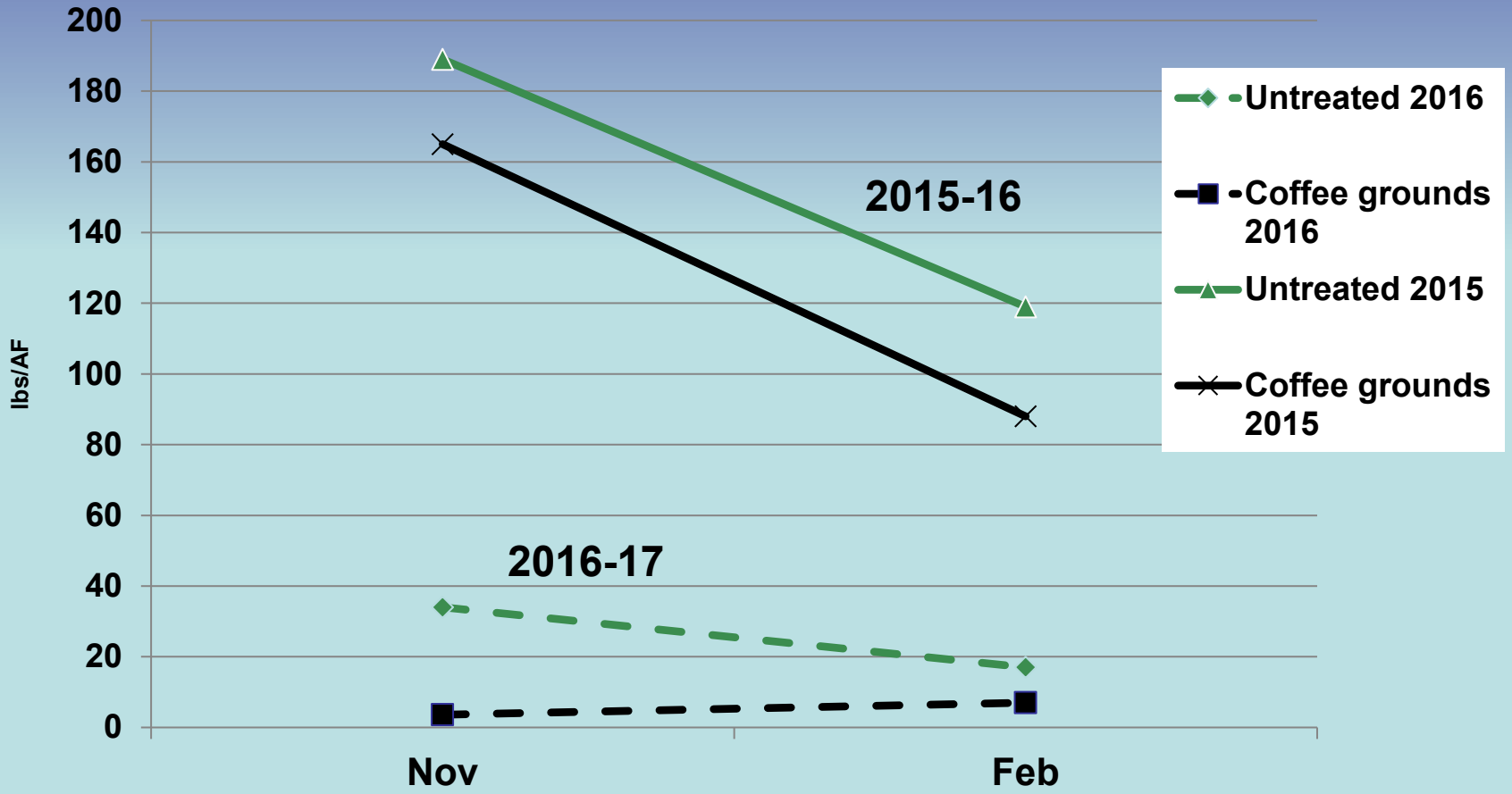


2015-16: NO₃-N at 0 -12"

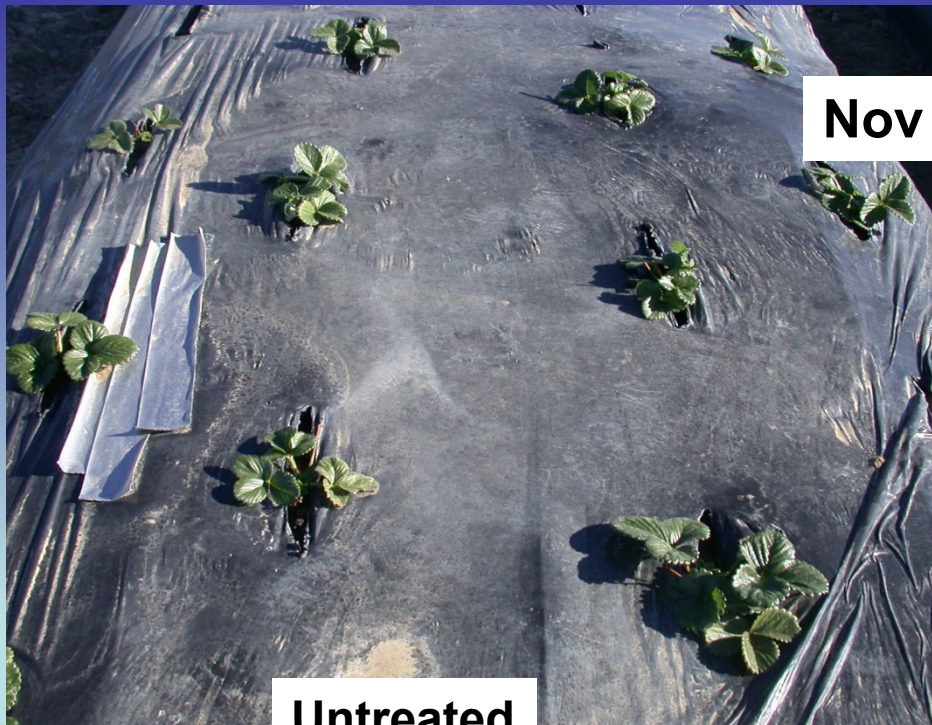


Untreated check beds received 500 lbs/A of 18-6-8 pre-plant

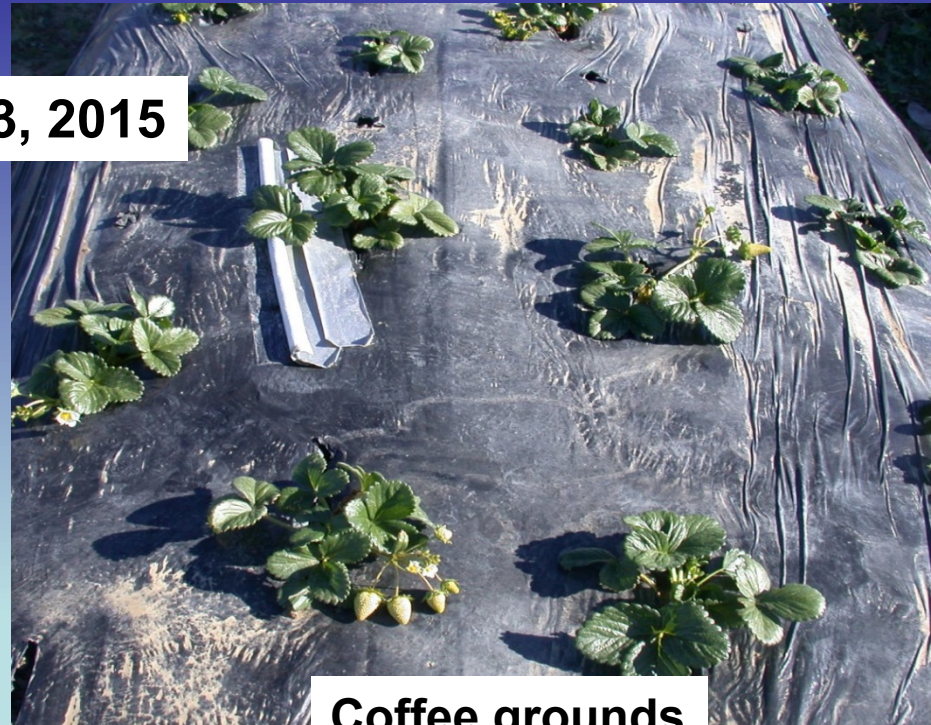
NO₃-N at 0 -12"



Untreated check beds in 2015 received 500 lbs/A of 18-6-8 pre-plant



Untreated



Coffee grounds



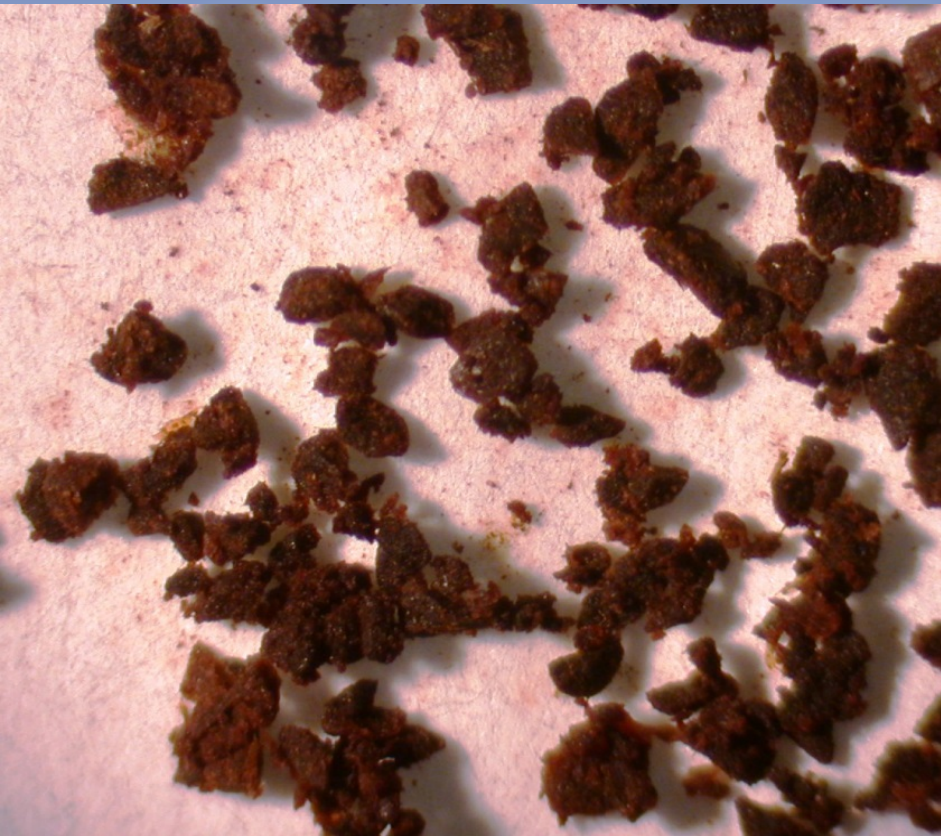
Nov 13, 2016



Coffee grounds (as applied)

	Peet's	Starbucks
Total N, %	2.4	0.9
Total C, %	54.1	22
C:N ratio	22:1	24:1
Total P₂O₅, %	0.1	0.1
Total K₂O, %	0.26	0.23
EC, dS/m	3.5	3.1
pH	6.1	5.6
Ash %	2.5	8.4
Moisture%	63	24

Pete's



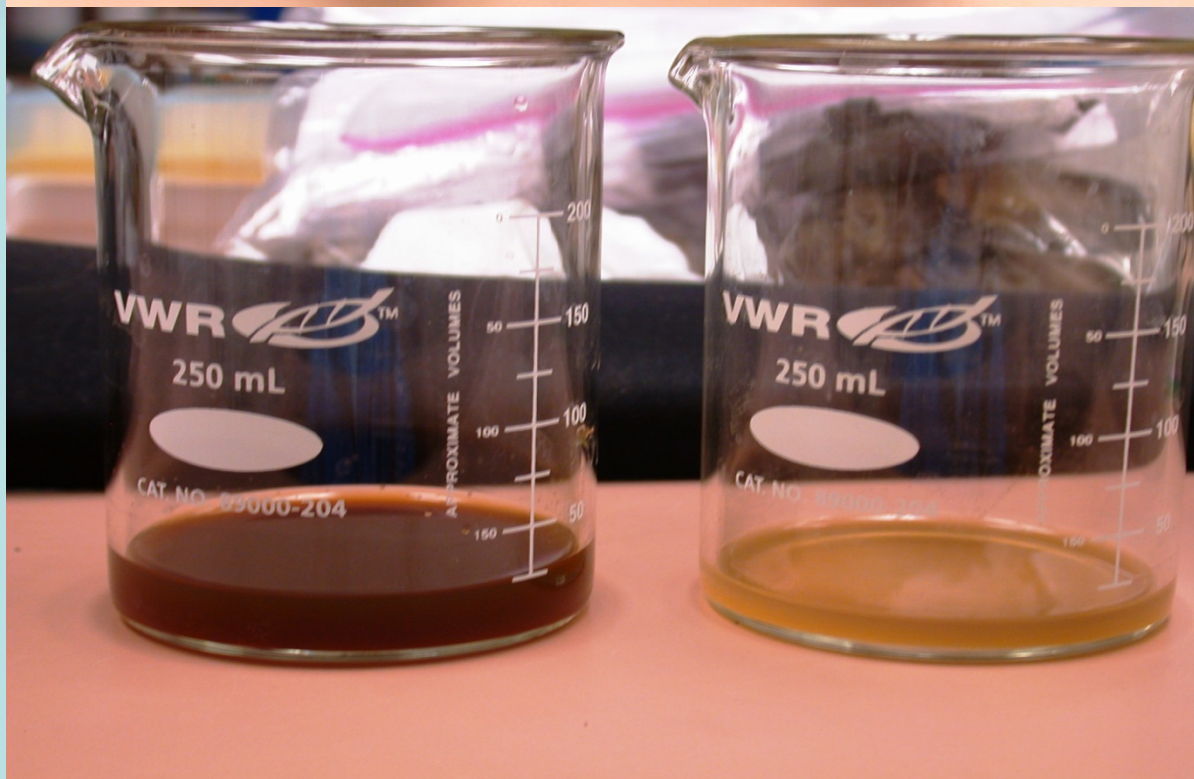
Starbucks



Pete's



Starbucks



60% less

barley



lettuce



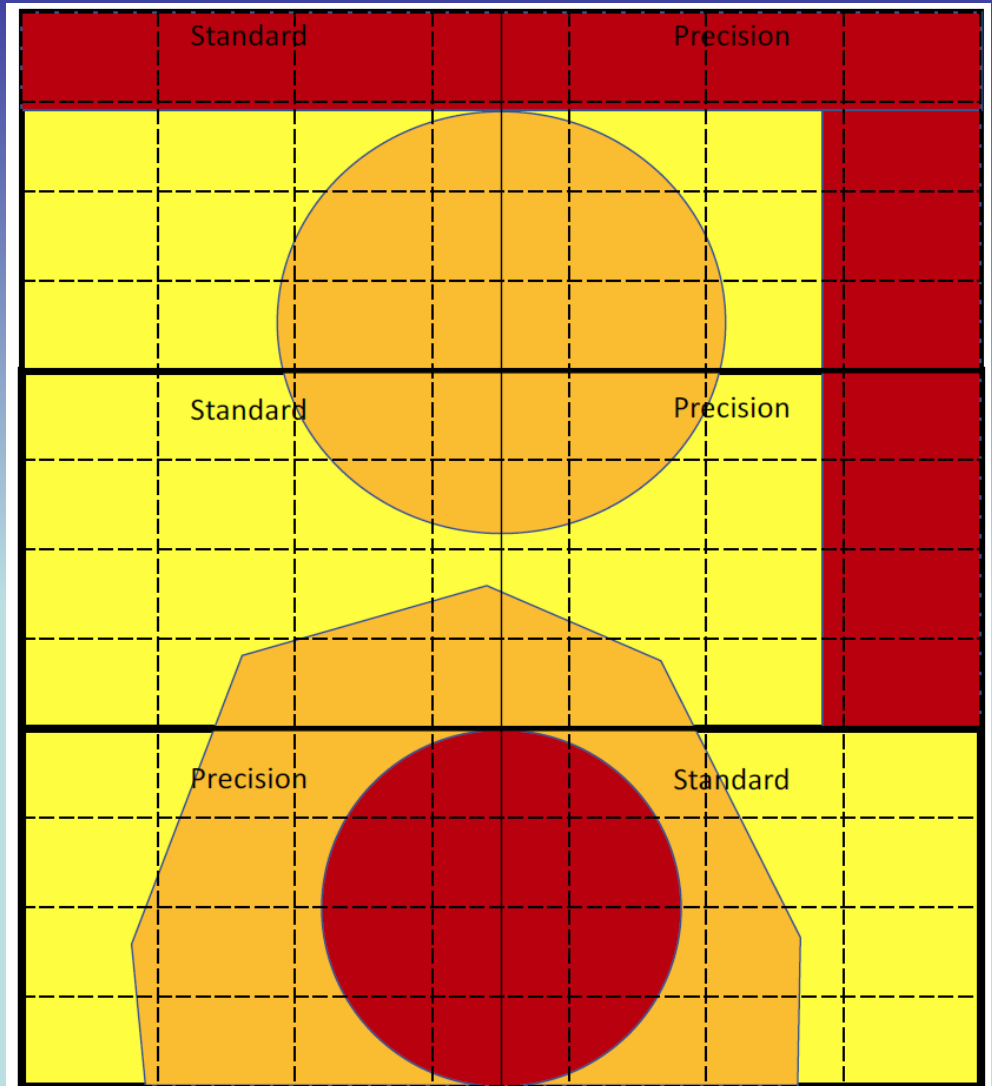
Continuation of soil disinfestation work

- C-sources that are cheap, abundant, local and **WORK**
- Since we don't eradicate the problems:
 - intergrade ASD with other strategies (rotation, fumigation, steam, varieties)
 - Site-specific management






Mapping pathogen density in soil using rapid diagnostic tools



Applying variable rate flat fumigation accordingly



Hypothetical distribution of pathogen infestation and plot arrangement

- | | |
|--|---|
|  Blocks | Standard = broadcast, single rate fumigation |
|  Plots | Precision = high, medium, low rate to zones of high, medium, low pathogen infestation |
|  High pathogen pressure | Design: randomized complete block with 3 replications |
|  Medium pathogen pressure | Experimental unit: approximately 1.5 acre plots |
|  Low pathogen pressure | --- = sampling grid |

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