Southern California Pomology Research Update

Kirk Larson, UC South Coast R.E.C. - Irvine

Performance of advanced selections & new cultivars

Breeding for disease tolerance/resistance

Irrigation management - plantation establishment

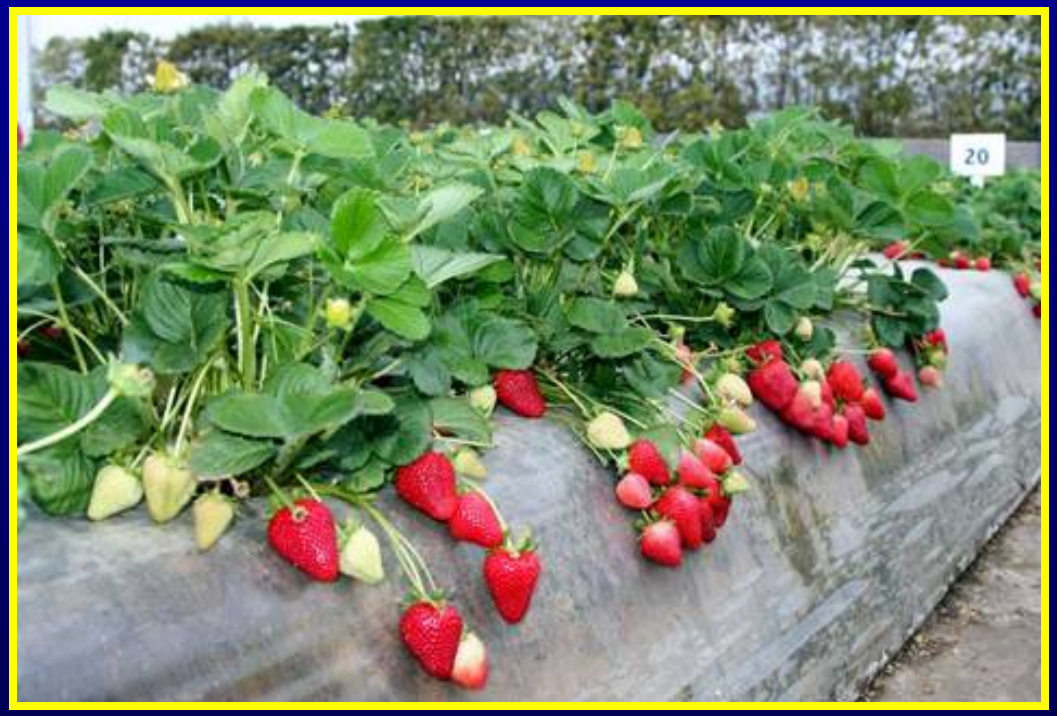
Fumigation alternatives

Performance of advanced short-day selections in Southern California, 2006-2009

C225 = 4.39-1

C227 = 4.44-603

C226 = 4.41-7



Short-day strawberry breeding objectives

Early production

Long fruiting season

Easy to grow (nursery & fruiting field)

Consistently good fruit quality and flavor

Plant architecture that facilitates harvest efficiency

Disease & environmental tolerance

C225 (4.39-1)

C227 (4.44-603)

C226 (4.41-7)

Three-year average[x] yield performance for high-elevation advanced short-day selections compared with Camarosa & Ventana, 2006-09

Dig/plant 9/26-9/30	Yield perform to 3/1			Yield performance to 6-8					
							Fruit		
Item	G/plt[y]	Mkt g/plt[z]	Cull (%)	G/plt	Mkt g/plt	Cull (%)	size (g)	app. (1-5)	firm. (1-5)
C225	396	378	4.6	2227	1791	21.6	34.4	3.1	3.4
C226	432	381	11.8	2245	1782	20.6	32.6	3.2	3.0
C227	507	471	6.0	2176	1888	13.2	36.6	3.8	3.2
				9,792	8,496				
Ventana	407	345	15.2	1962	1540	21.5	32.5	3.2	3.4
Camarosa	332	269	19.0	2042	1534	24.9	31.0	2.6	3.4

Grams per plant x 4.5 = number of 12# crates/acre

[x] One-year of data for C225 and C226 (2008-09)

[y] G/plt = total grams per plant; [z] Mkt g/plt = marketable grams per plant

Three-year average[x] yield performance for high-elevation advanced short-day selections compared with Camarosa & Ventana, 2006-09

Dig/plant 10/3-10/6	Yield perform to 3/1			Yield performance to 6-8					
							Fruit		
Item	G/plt[y]	Mkt g/plt[z]	Cull (%)	G/plt	Mkt g/plt	Cull (%)	size (g)	app. (1-5)	firm. (1-5)
C225	234	221	5.6	1784	1462	18.1	33.3	3.4	3.5
C226	273	237	13.2	1803	1420	21.2	32.2	3.2	3.2
C227	259	244	5.8	1803	1570	12.9	35.8	3.7	3.3
				8,114	7,065				
Ventana	273	245	10.3	1856	1415	23.8	32.1	3.4	3.4
Camarosa	163	119	27.0	1808	1293	28.5	30.9	2.7	3.4

Grams per plant x 4.5 = number of 12# crates/acre

[x] Two years of data for C225 and C226 (2007-09)

[y] G/plt = total grams per plant; [z] Mkt g/plt = marketable grams per plant

Three-year average[x] yield performance for high-elevation advanced short-day selections compared with Camarosa & Ventana, 2006-09

Dig/plant 10/15-10/20 Item	Yield perform to 3/1 G/plt[y]	Mkt g/plt[z]	Cull (%)	Yield performance to 6-8 G/plt	Mkt g/plt	Cull (%)	Fruit size (g)	app. (1-5)	firm. (1-5)
C225	219	201	8.2	1921 8,645	1613 7,260	16.0	33.5	3.4	3.5
C226	230	203	11.7	1848	1544	16.5	34.2	3.5	3.4
C227	236	217	8.1	1756	1534	12.6	36.3	3.8	3.2
Ventana	252	230	8.7	1910	1559	18.4	33.1	3.4	3.4
Camarosa	182	145	20.3	1832	1381	24.6	30.9	2.8	3.4

Grams per plant x 4.5 = number of 12# crates/acre

[x] Two years of data for C225 and C226 (2007-09)

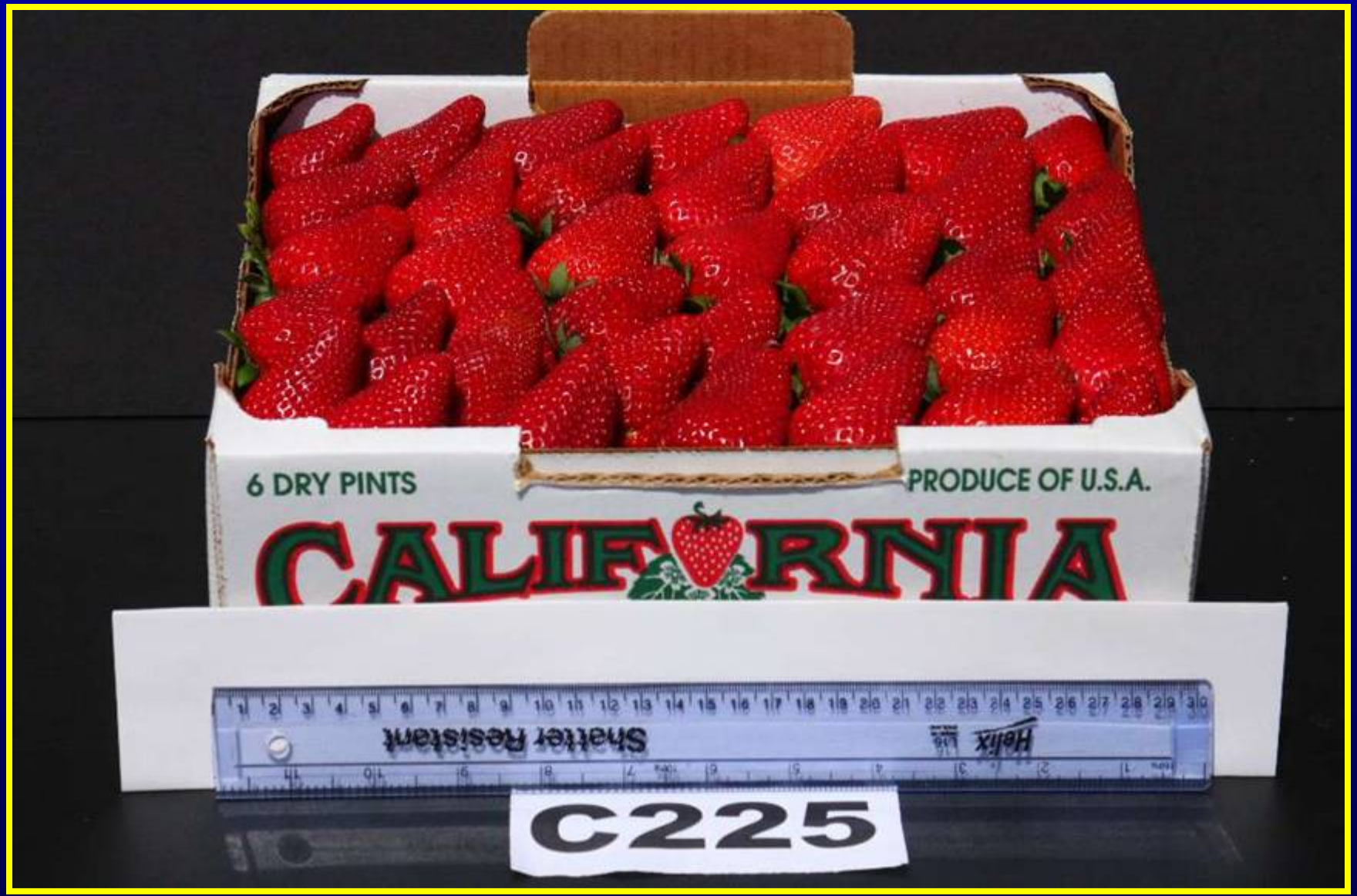
[y] G/plt = total grams per plant; [z] Mkt g/plt = marketable grams per plant

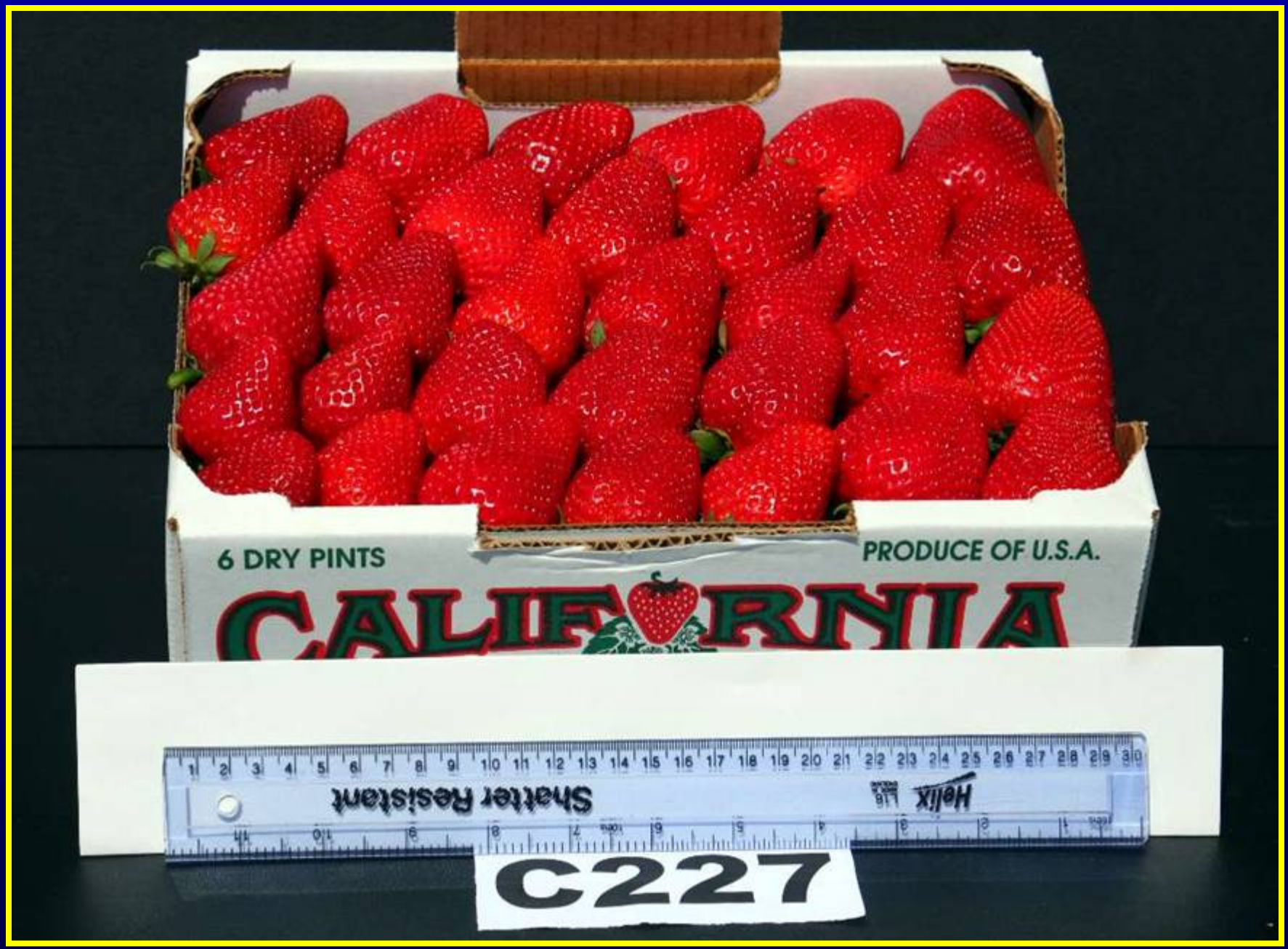
Performance of short-day selections and cultivars in Oxnard, 2008-09

Glen Hasegawa / Steve Imoto - Camarillo Ranch

Item	Crates/acre to 3/1	Crates/acre to 5/16
C225	658	5,051
C226	1,049	5,790
C227	997	5,419
Ventana	1,199	5,337
Palomar	1,217	5,701

Cultivars planted Oct. 1, advanced selections planted Oct. 8


6 DRY PINTS
PRODUCE OF U.S.A.
CALIFORNIA
Shatter Resistant
Helix
C225


6 DRY PINTS
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Shatter Resistant
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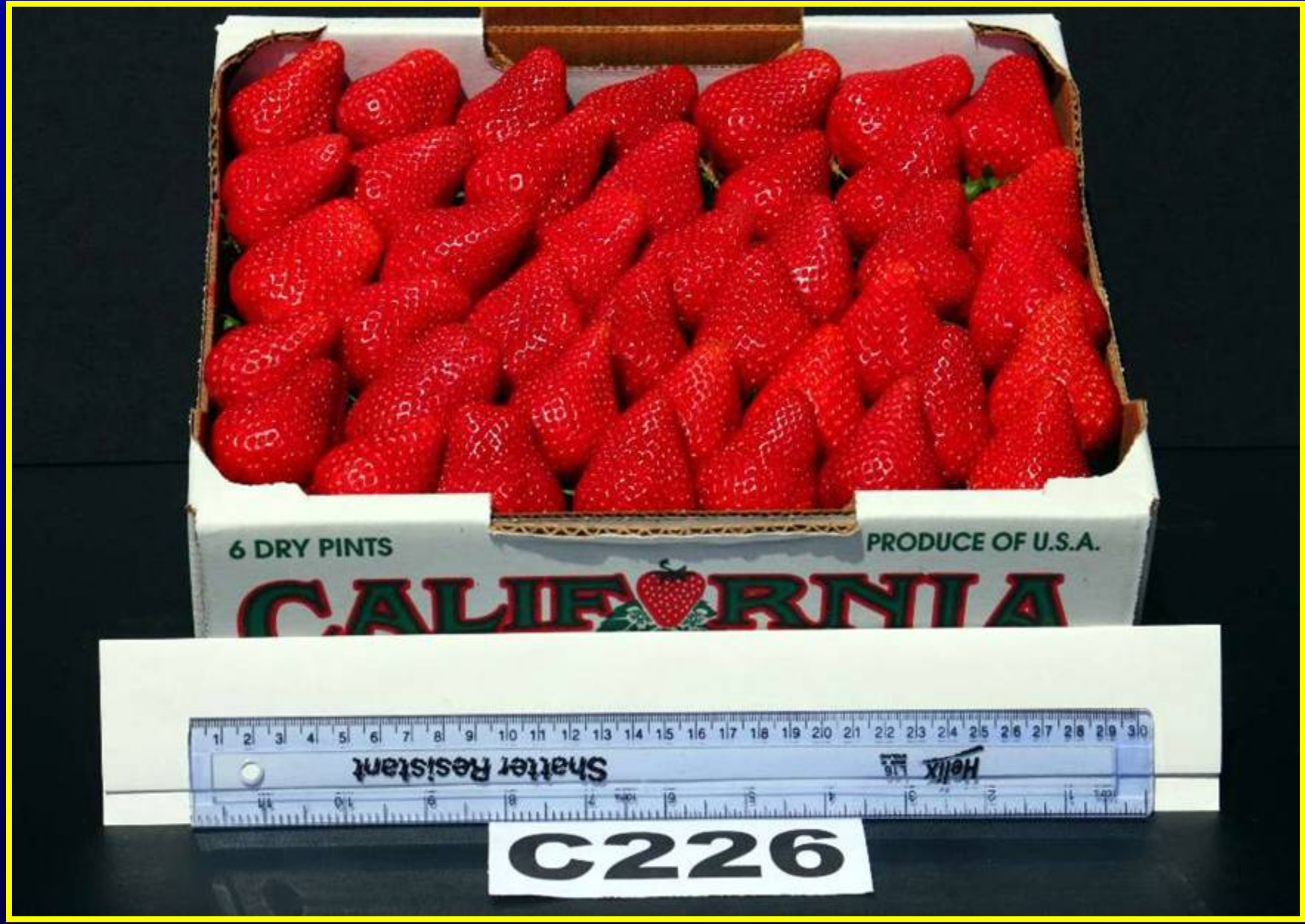
C227


6 DRY PINTS
PRODUCE OF U.S.A.
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Helix
C226

C225

C226

C227

Qualitative Performance Evaluations for Short-day Selections: So. Calif.

	C225 compared with Ventana	C226 compared with Ventana	C227 compared with Ventana
Productivity	0	0	0
Production pattern	0	0	+
Fruit size	+	+	+
Firmness	+	0	0
Appearance	0	0	+
Flavor	+	+	+
Postharvest	+	0	0
Rain - weather tolerance	0	+	0
Disease tolerance	0	+	0
Mite tolerance	0	0	0
Harvest ease	+	+	+
Cull rate	+	0	+
Runners (nursery)	+	0	+

"+", "0" or "–" indicates performance that is better, equal, or inferior to that of Ventana

Advanced selections: resistance/tolerance to major pathogens

	Resistance score (5 = best)		
Genotype	Phytophthora	Verticillium	Colletotrichum
Ventana	2.1	2.9	2.7
C225	3.5	2.1	2.6
C227	2.3	3.8	2.7

C225 in Southern California

Adapted to early planting

Similar production to Ventana with greater total yield and lower cull rate

Larger fruit than Ventana

Consistently excellent flavor

Vigorous plant w/ open structure - harvest efficiency

Cautions:

- Fruit can darken during periods of hot weather
- Phytophthora cactorum

C227 in Southern California

Adapted to early planting

Earlier fruiting than Ventana with greater total yield

Larger fruit than Ventana with better flavor

Very low cull rate

Consistent fruit shape and color: bright shiny red

Open plant structure - harvest efficiency

Cautions:

- Not quite as firm as most UC cultivars
- Phytophthora cactorum

C226 in Southern California

Equal or greater fruit yield compared to Ventana

Consistently excellent flavor

Open plant structure - harvest efficiency

Cautions:

- Low nursery runner production
- Low firmness scores
- Lighter external and internal fruit color
- Higher cull rate; misshapen fruit in early plantings

February 2009

Developing strawberry cultivars with tolerance to pests and diseases

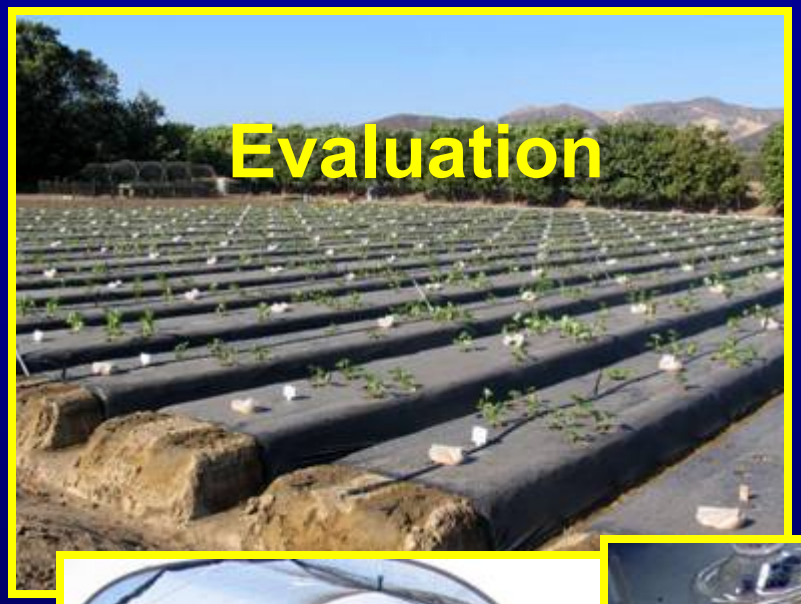
P. cactorum, V. dahliae, S. macularis, T. urticae : UCD

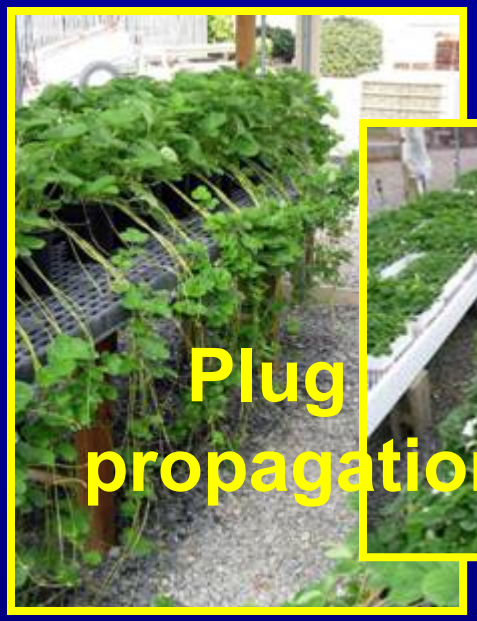
C. acutatum, M. phaseolus : UC SCREC

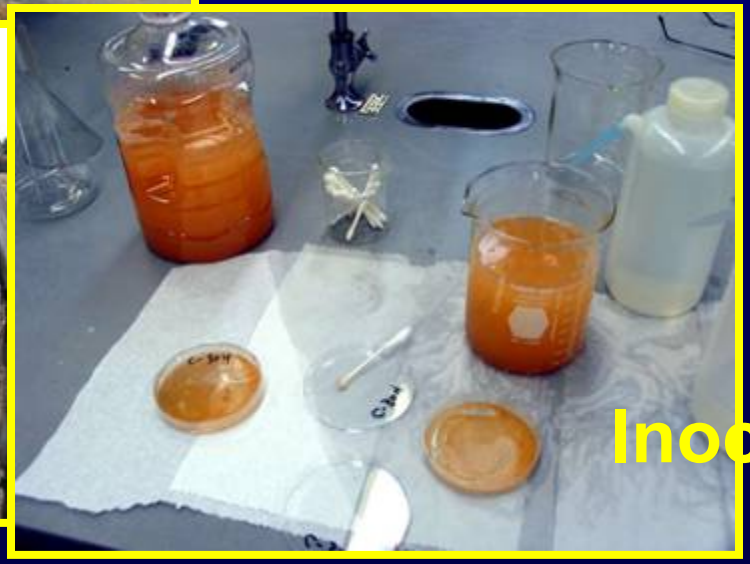
Assess tolerance/susceptibility of cultivars & advanced selections to important pests/pathogens

Identify sources of genetic resistance/tolerance, incorporate into breeding lines

C. acutatum genetic screen







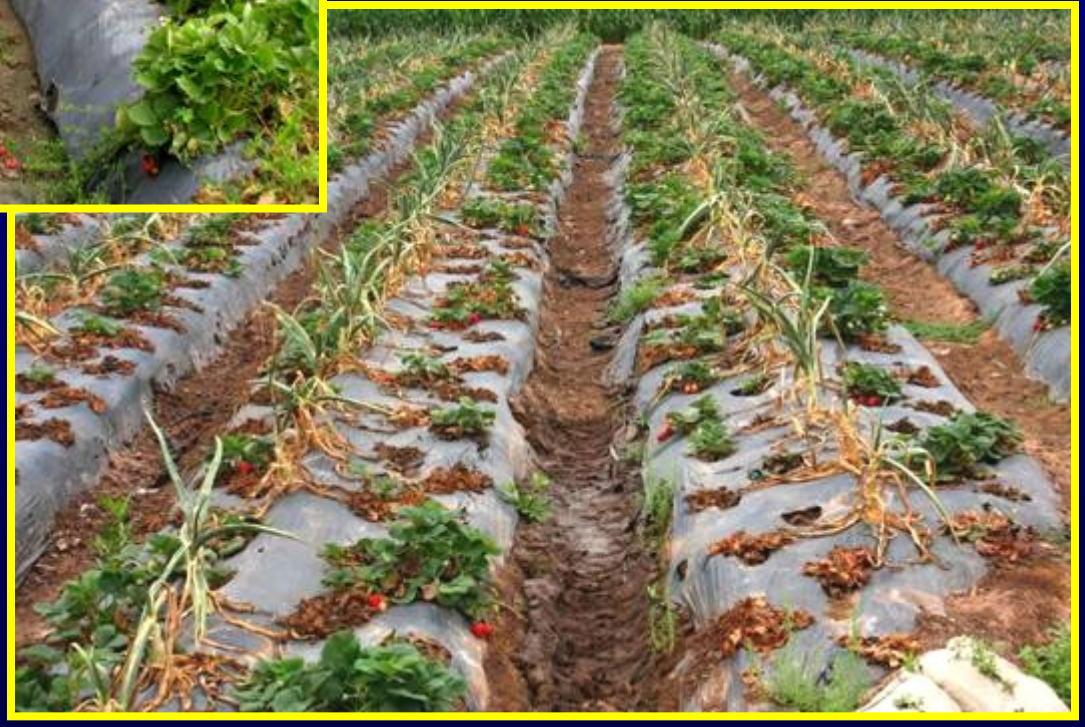
C. acutatum genetic screen

Evaluate ~50 cultivars and
advanced selections annually

Moderately tolerant

Highly susceptible

Macrophomina plant collapse in southern California



An increasingly common problem

Macrophomina phaseolus Project, UC SCREC

Collaboration: Tom Gordon, Steve Koike

Wanted: experimental site with *M. phaselous* only

Site fumigated with MB:Pic (57:43, 350#/A): 5-20-09

Albion frigo plants established: 6-09-09

Inoculate with *M. phaseolus*: 8-12-09

Incorporate infected plants into soil: 8-31-09

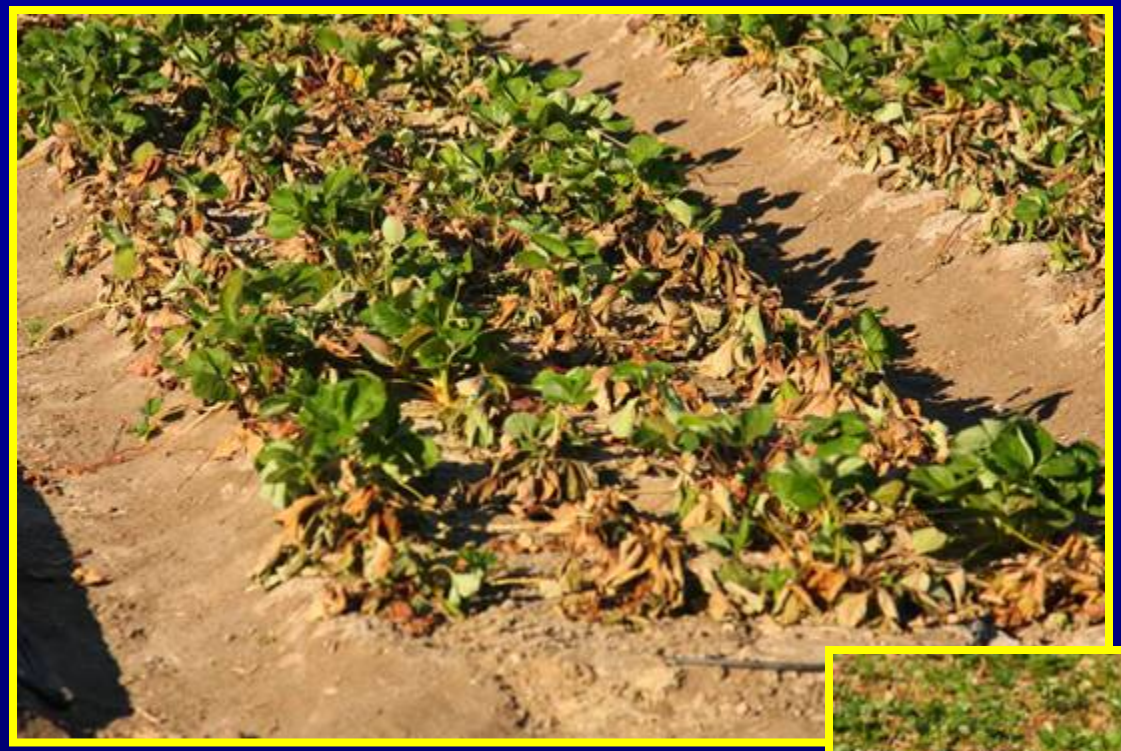
Re-establish beds - plant cultivars & adv selections

Evaluate germplasm tolerance and fungicides

MAC field inoculation

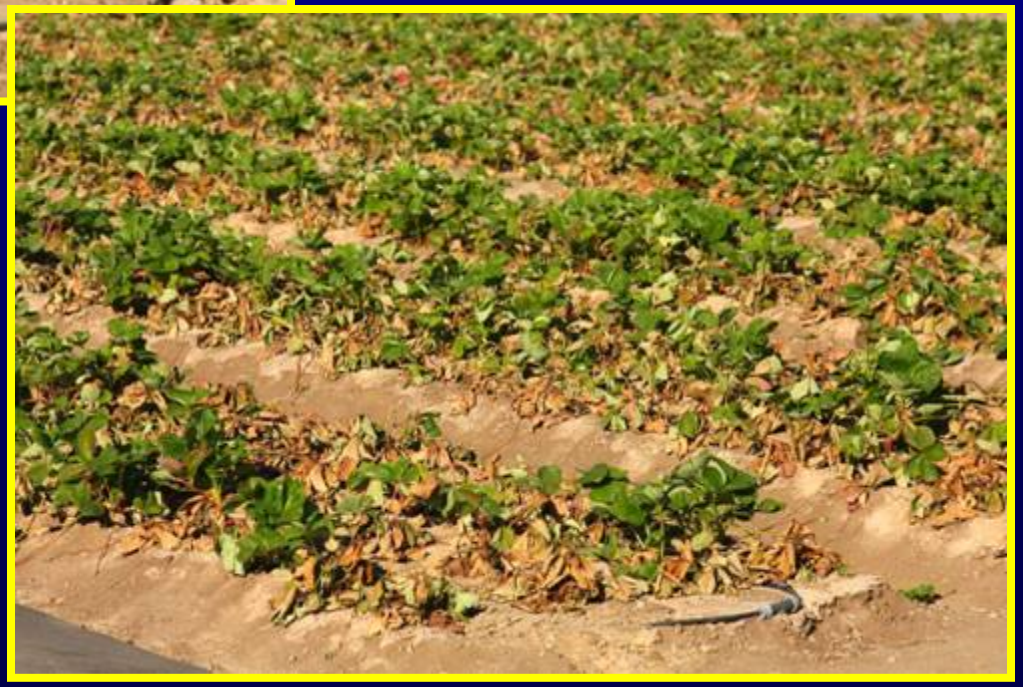
Aug. 11-12, 2009 UC SCREC

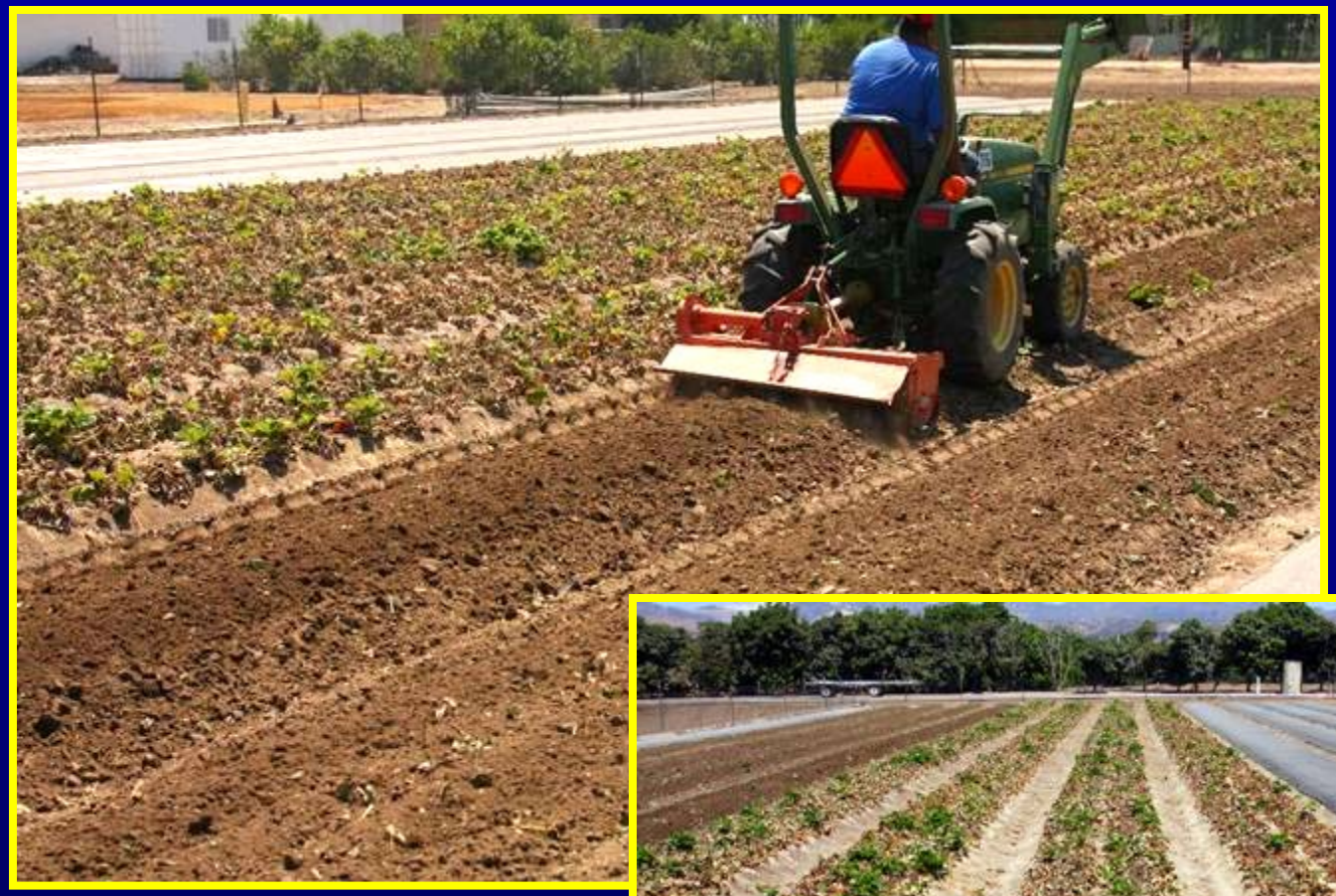
Frigo Albion



Albion plants
2 weeks after
inoculation

Widespread
disease
symptoms





Incorporate infected plants

Irrigation management challenges in southern California

Local Water Districts' concerns:

1. Demand exceeds supply for establishing strawberries with sprinkler irrigation
2. Water run-off, water quality concerns

Grower concerns:

1. Fresh-dug, bare-root plants are highly sensitive to drought, heat and soil salinity
2. Reduced ag. water quality requires that greater amounts of water be applied to reduce Ec, salinity

Field studies to determine irrigation BMPs for establishing fresh-dug strawberry plants, 2008-09

Compare establishment and yield performance with sprinklers and drip-only

Evaluate effects of:

- mulch color (clear, black)
- mineral nutrition
- cultivar

Sprinkler vs drip establishment trial 2008-09 UC SCFS

0.3 acre

Treatments:

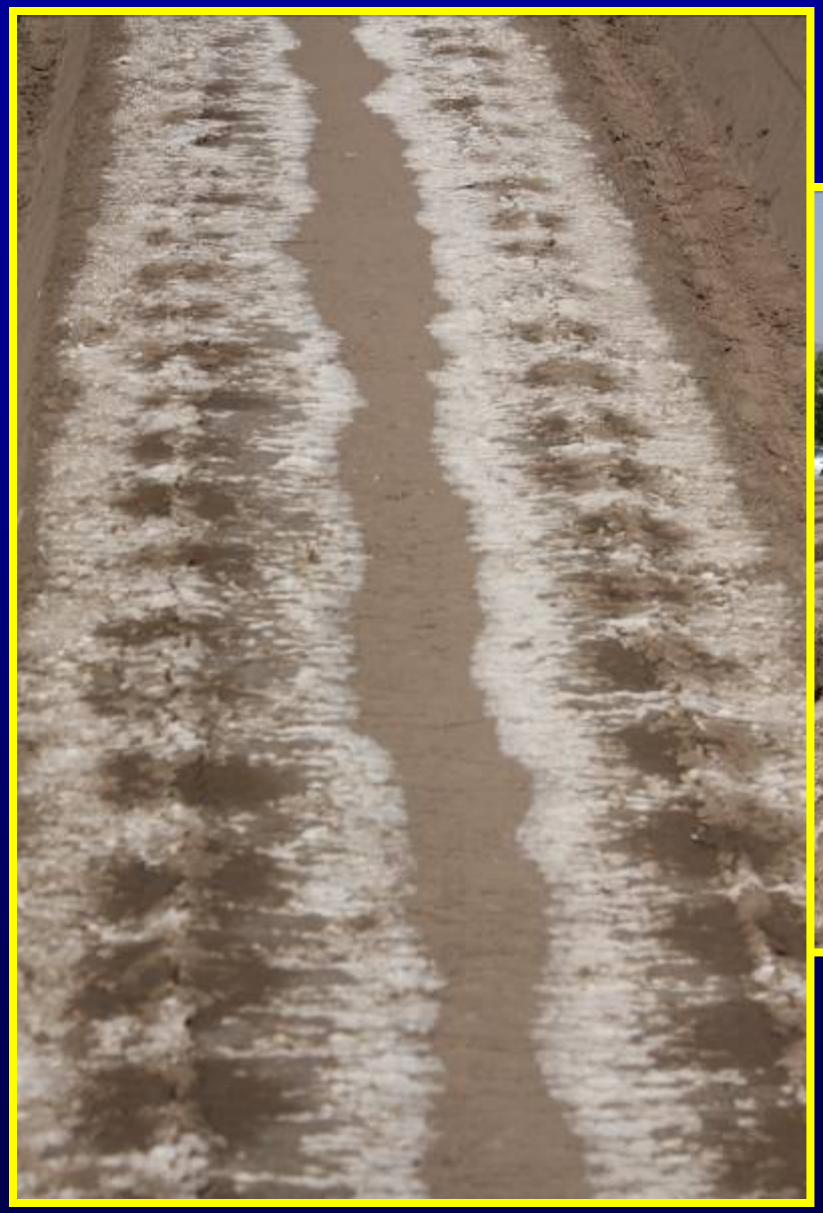
- Sprinkler+drip vs. drip only
- Clear vs. black bed mulch
- CR fertilizer vs. CR + soluble fertilizer (15-15-15)
- 4 cultivars

Irrigation, soil fertility management and bare-root transplant mortality, 2008-09 Irvine

Irrigation treatment	Fertilizer treatment	No. of dead plants per 720 plants	% plant mortality
Drip only	200# N/acre: 18-8-13 CR*	33	4.5
	100# N/acre: 18-8-13 CR + 100# N/acre: 15-15-15	176	24.4
Sprinkler + drip	200# N/acre: 18-8-13 CR	0	0
	100# N/acre: 18-8-13 CR + 100# N/acre: 15-15-15	1	0.15

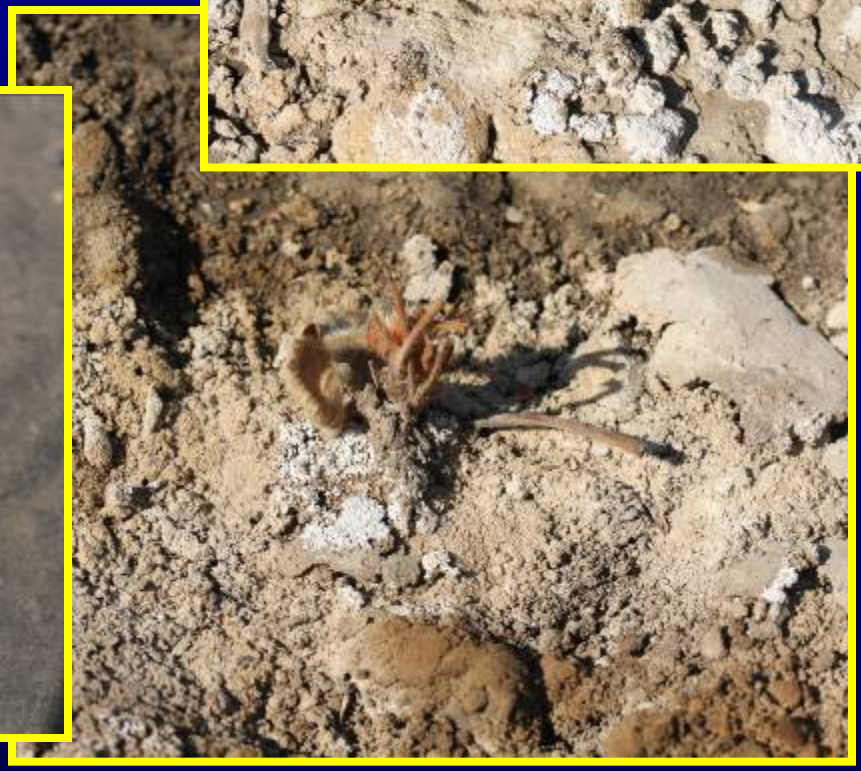
*CR = controlled release fertilizer

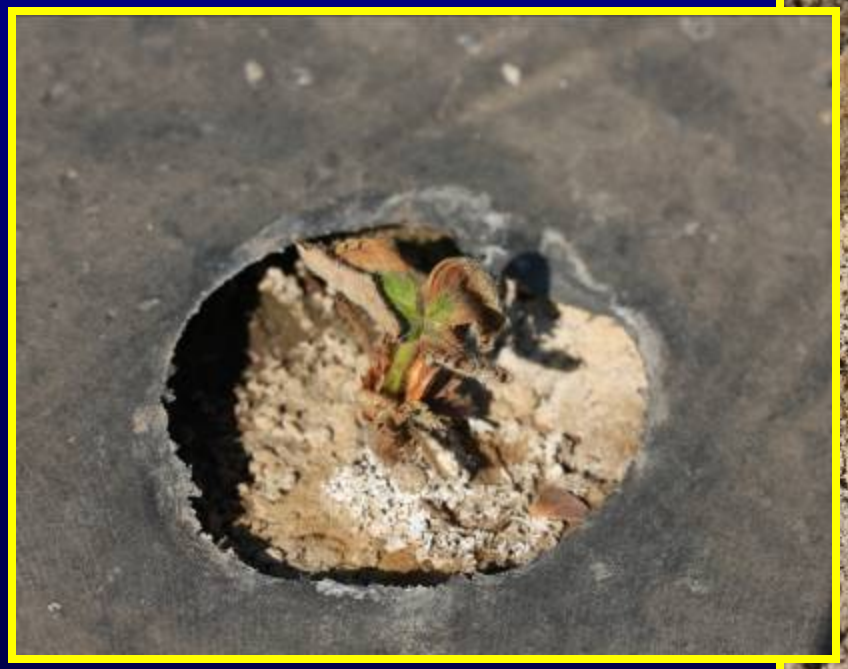
Soil salinity concerns



Effect of soluble (dry) fertilizer in drip-only plots

Drip establishment and soil salinity





Repeated bed collapse due to daily drip irrigation in drip-only plot

0.6 mm T-tape, 0.67 gals min-1 100 ft-1

Ventana yield performance to April 1, 2009 with drip-only or sprinkler+drip irrigation

Irrig. trt.	Mulch	Soil Fert.*	Yld. (C/A)**	Mkt. Yld. (C/A)	Fruit Size (g)	Fruit App. (1-5)	Fruit Firm. (1-5)
Drip	Black	CR	3534	3010	35.6	3.3	3.4
		CR+sol.	2728	2403	33.1	3.4	3.4
	Clear	CR	3588	3095	35.8	3.4	3.4
		CR+sol.	3021	2671	35.3	3.3	3.4
Sprinkler	Black	CR	3731	3306	34.9	3.4	3.4
		CR+sol.	4142	3728	37.0	3.3	3.4
	Clear	CR	3730	3277	37.2	3.3	3.4
		CR+sol.	4127	3677	37.6	3.4	3.4

* CR = control release 18-8-13 @ 200# N/A;
CR+sol. = CR 18-8-13 @ 100# N/A + soluble 15-15-15 @ 100# N/A

** C/A = number of 12-pound fruit crates/acre

Sprinkler + drip establishment

Ventana

Drip-only establishment

DRIP

SPRINKLER

Alternatives to sprinkler irrigation

- Drip
- Augmented drip (> 2 drip lines per bed)
- Microjet sprinklers

Managing drip-only irrigation systems

- Minimize use of soluble pre-plant fertilizers
- Clear mulch increases soil temp & fert. solubility
- Low-flow drip tape for daily irrigation (?)
- How to frost/freeze protect?


THANK YOU!