

Irrigating Prunes: What is known and unknown

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Since 1986 we have information for
five irrigation research projects in
California

(Prune Research Reports)

The Effects of Four Years of Variable Preharvest Irrigation Cutoff Periods on Prune Tree Performance

*Dave Goldhamer, Steve Sibbett and Don Katayama
1986-1989 • Tulare Co.*

- Preharvest Fruit Drop
- Fruit Load and Development
- Yield

Treatment No.	Date of Last Irrigation	Days Prior to Harvest
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1	Jul 3	44
2	Jul 10	37
3	Jul 17	30
4	Jul 24	23
5	Jul 31	16
6	Aug 7	9

Fruit Load, Seasonal Fruit Drop and Harvest Parameters for 1989 after 4 Years of Deficit Irrigation

Date of Last Irrigation	Fruit load (#/tree)	Total fruit drop (%)	Harvest weight (dry lbs/tree)	Dryer dry ratio	Fruit count (dry fruit/lb)
Jul 3 (44)	2199 a	23.3 a	34.8 a	2.77 a	51.8 a
Jul 10 (40)	4075 b	16.6 a	62.5 b	2.87 b	55.6 a
Jul 17 (30)	3934 ab	15.9 a	61.8 b	2.91 bc	53.8 a
Jul 24 (23)	3508 ab	19.2 a	53.2 ab	2.96 c	53.9 a
Jul 31 (16)	3551 ab	19.4 a	54.7 ab	2.98 c	52.7 a
Aug 7 (9)	3268 ab	19.9 a	52.1 ab	2.97 c	50.9 a

Individual Fruit Characteristics for 1989 after 4 Years of Deficit Irrigation

Date of Last Irrigation	Fresh weight (gms/fruit)	Post dryer wt. (gms/fruit)	Soluble Solids (°Brix)	Flesh pressure (lbs/in ²)
Jul 3 (44)	24.5 ab	8.76 a	23.9 c	1.93 a
Jul 10 (37)	23.8 a	8.17 a	22.7 ab	2.55 a
Jul 17 (30)	24.8 ab	8.44 a	22.3 ab	2.46 a
Jul 24 (23)	25.6 ab	8.42 a	23.0 bc	2.32 a
Jul 31 (16)	25.5 ab	8.61 a	21.8 a	2.46 a
Aug 7 (9)	26.8 b	8.92 bc	23.0 bc	2.05 a

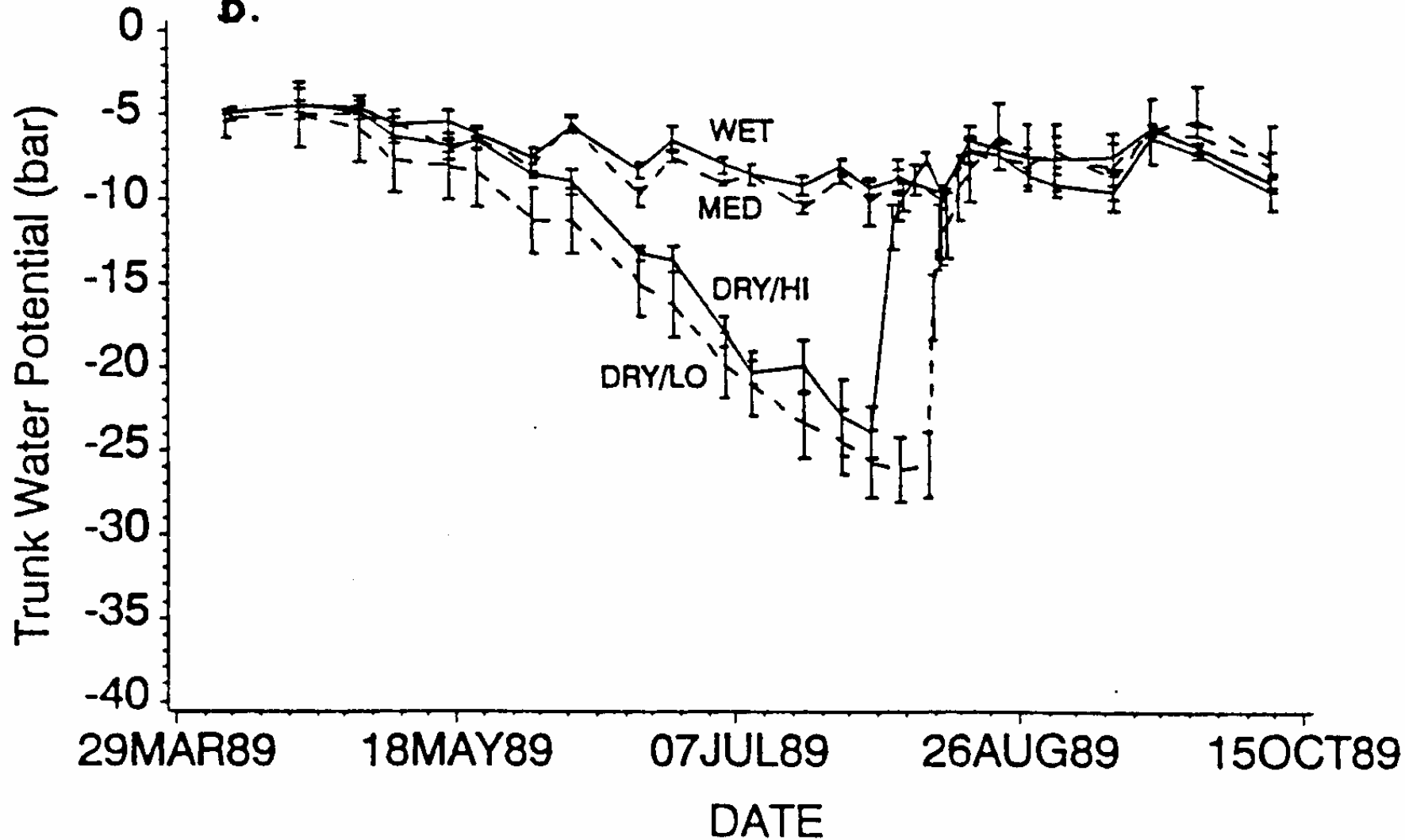
Plant-based Prune Tree Water Stress Measurement

Ken Shackel – 1989

Could leaf water potential detect irrigation treatment differences?

UCD Prune Water Relations, 1988

b.



Sensitivity of French Prune Seasonal Growth Stages to Water Deprivation

Dave Goldhamer, Steve Southwick, Ken Shackel, Bill Olson and Bruce Lampinen – 1989-1992

Water deprivation at different seasonal prune growth stages.

Description of Irrigation Treatments

Treatment	Growth stage of water deprivation	Dates of Cutoff
1	None (control)	
2	1 (early growth phase)	Through May 4
3	1 st half II (lag phase)	May 5 – Jun 6
4	2 nd half II (lag phase)	Jun 7 – Jul 18
5	Entire II (lag phase)	May 5 – Jul 18
6	III (late growth phase)	Jul 19 – harvest
7	Post harvest	Harvest – season end

FRUIT DIAMETER SEASONAL PATTERNS

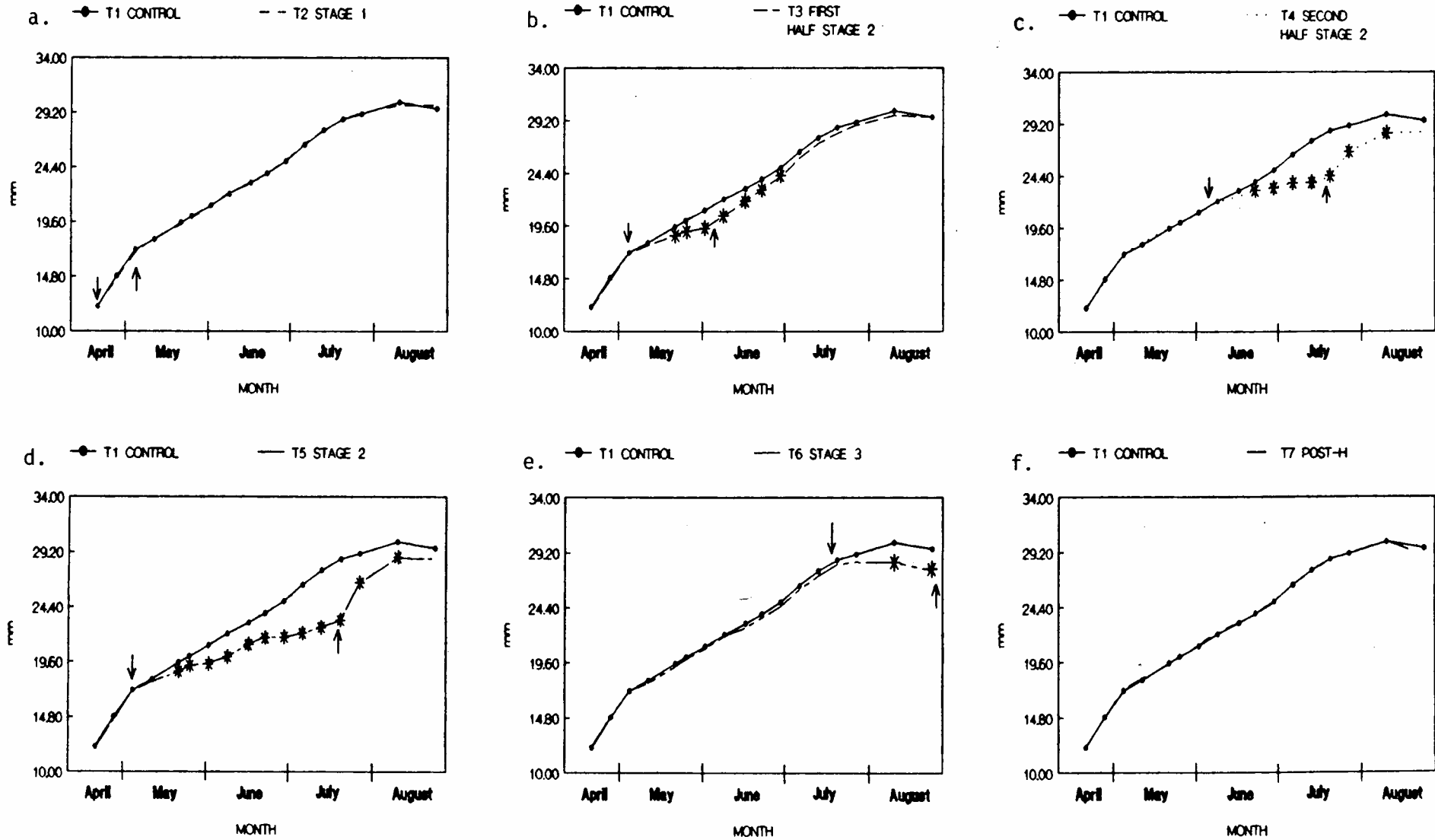


Figure 1. Fruit growth with time over the season.

Fruit Load, seasonal fruit drop, and harvest parameters

Treatment	Fruit load (#/tree)	Total fruit drop (%)	Fruit yield (lb/tree)	Dry fruit yield (lb/tree)
Control	1417 d	28.2 a	69.9 d	24.5 d
to 5/4	1963 c	29.2 a	91.5 bc	31.3 bc
5/5 – 6/6	2547 b	24.2 a	113.5 a	38.8 a
6/7 – 7/18	1753 cd	24.2 a	74.5 cd	27.3 cd
5/5 – 7/18	3194 a	30.0 a	102.0 ab	36.7 ab
7/19 – H	1618 cd	30.0 a	72.8 d	27.5 cd
Post H	1599 cd	19.2 a	84.7 bcd	29.1 cd

Individual fruit characteristics at harvest

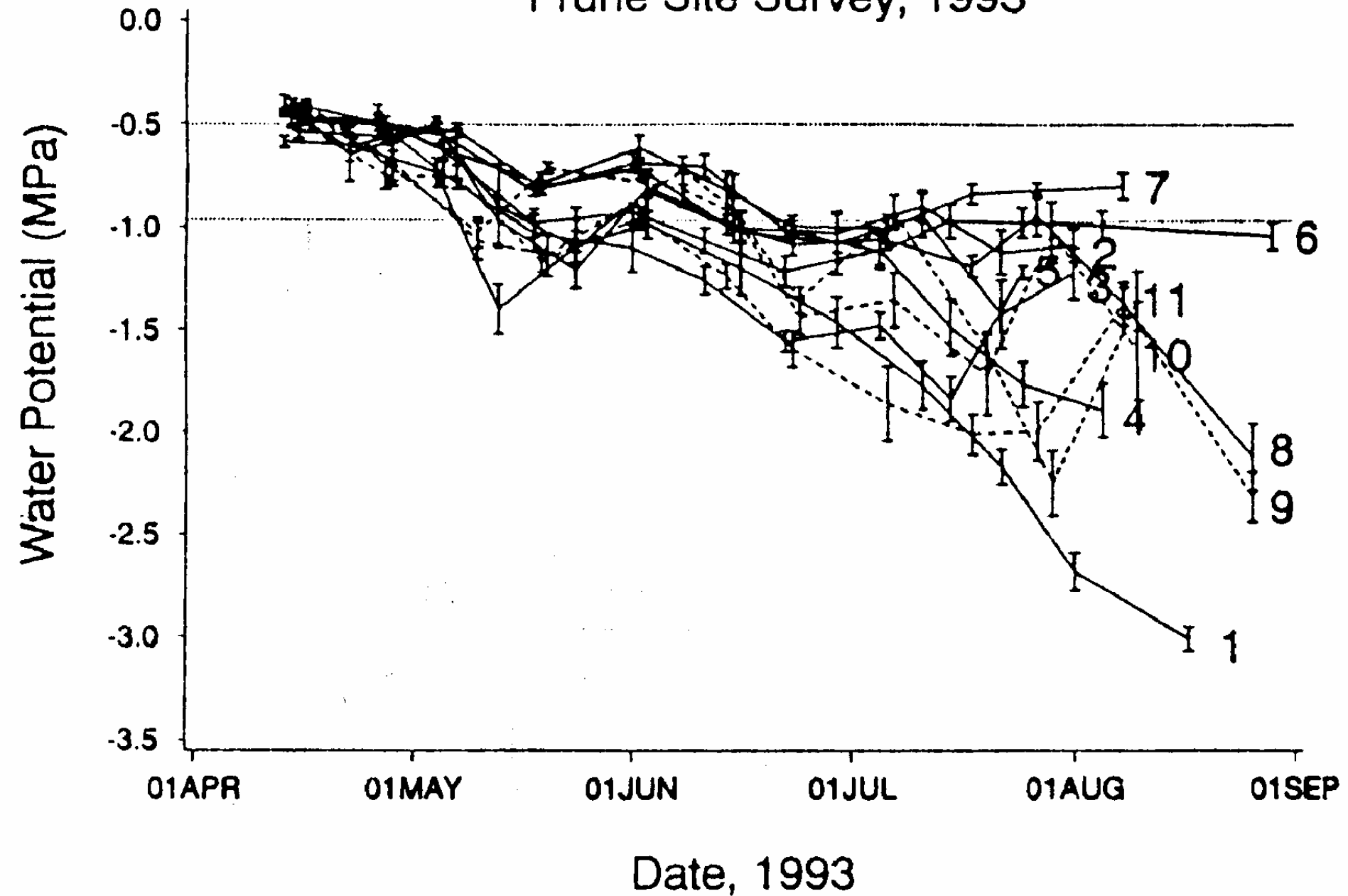
Treatment	Fresh weight (gm/fruit)	Post dryer weight (gm/fruit)	Fruit count (dry fruit/lb)
Control	28.4 a	9.91 a	46.1 c
To 5/4	27.9 a	9.49 ab	48.1 bc
5/5 – 6/6	27.2 ab	9.06 b	50.9 b
6/7 – 7/18	24.6 c	9.05 b	50.3 b
5/6 – 7/18	21.1 d	7.65 c	61.3 a
7/19 – H	25.6 bc	9.71 a	47.2 c
Post H	28.7 a	9.79 a	46.4 c

Prune Orchard Water Status in Contrasting Prune Growing Areas of California

*Bruce Lampinen, Ken Shackel, Steve Southwick,
Dave Goldhamer, Jim Yeager, Rick Buchner, Bill
Krueger, Bill Olson, Steve Sibbett, Frank
Yoshikawa – 1993*

Assess the range of midday stem water potentials.

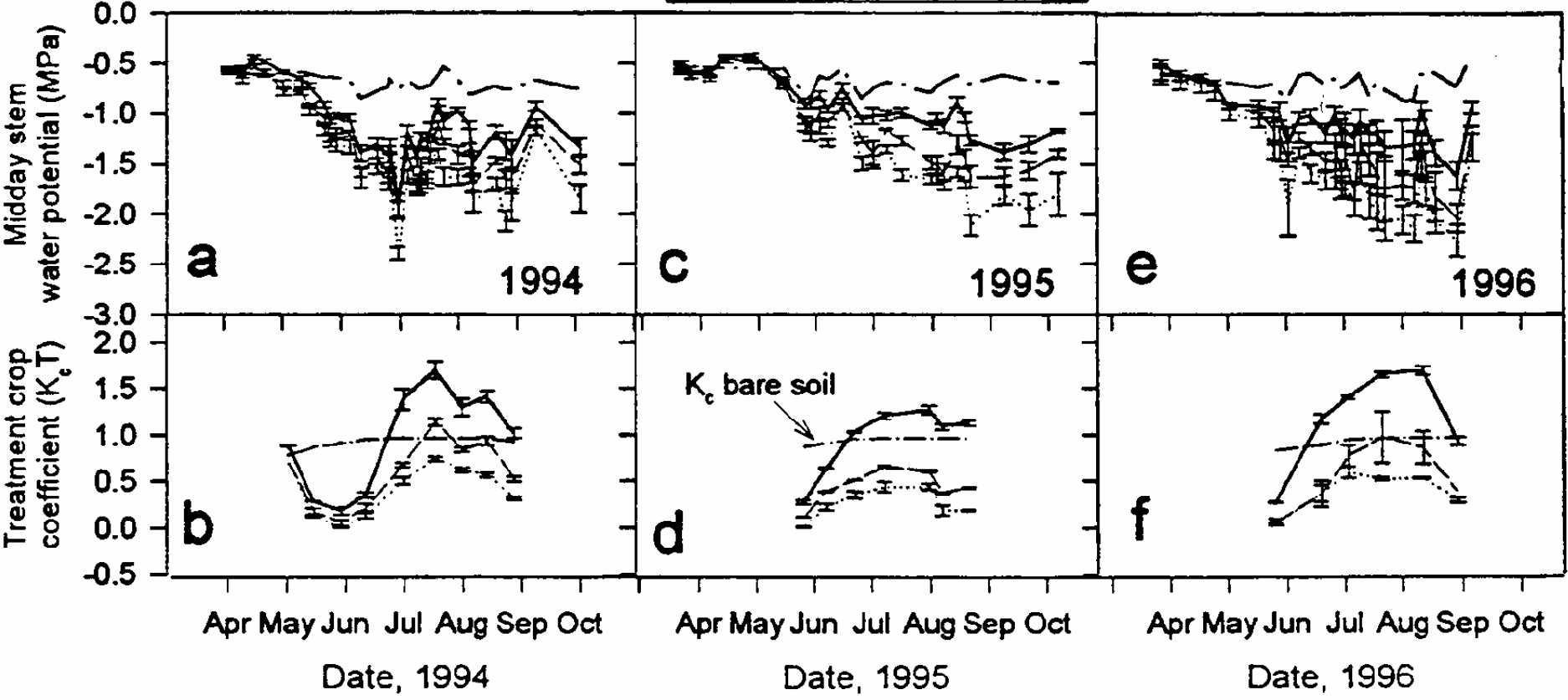
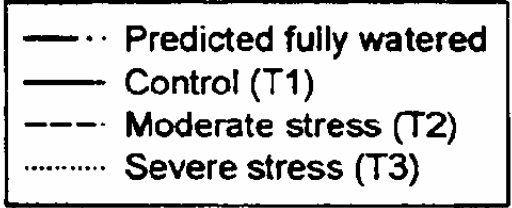
Prune Site Survey, 1993



Physiological Responses of Prune Trees to Moderate and Severe Water Stress: Three Year Summary

Bruce Lampinen, Ken Shackel, Steve Southwick, Dave Goldhamer, Steve Sibbett, Bill Olson, Jim Yeager – 1994-1996

Tried to achieve gradually increasing stress.



Yield characteristics, relative money return, applied water and seasonal average stem water potential for Tulare County site 1996

Treatment	Fresh fruit yield (ton/acre)	Dry fruit yield (ton/acre)	Fruit load (#fruit/acre x 1000)	Count per pound	Drying ratio	Relative dollars per acre return	Applied water (%ET _c)	Average stem water potential (MPa)
1996								
1	16.7 a	6.13 a	670.6 b	56 c	2.77 a	5017 c	109 c	-1.05 a
2	17.5 a	6.09 a	827.1 a	72 b	2.88 a	3662 b	95 b	-1.17 b
3	14.3 b	5.08 a	934.3 a	93 a	2.82 a	1558 a	67 a	-1.45 c

What about Irrigation Effects on Fruit Defects?

Cracking in 'French' Prune in 1999: Field Trial and Definition of Defects

Steve Southwick, Bill Olson, Jim Yeager, Nadeem Shawareb, Kitren Glozer – 1999

Evaluated irrigation and fruit load.

Results of thinning and irrigation regimes on harvest and defect indices in 'French' prune; harvested 27 August, 1999.

Treatment		Drying ratio	Dry yield (lb/tree)	%Good fruit	%Side cracks	%End cracks	%Gum pockets	
	Thinning/crop load	Irrigation regime						
1	No thinning/high	Normal	2.88 a	66.6 a	87.6 a	0.33 a	10.1 ab	1.2 c
2	No thinning/high	Dry to -20 bars/irrigate	2.84 a	86.2 a	74.4 a	1.2 a	18.5 a	5.5 bc
3	'Normal' thinning/medium	Normal	2.48 b	44.7 b	78.5 a	1.8 a	4.9 bc	13.5 ab
4	'normal' thinning/medium	Dry to -20 bars/irrigate	2.50 b	29.6 bc	76.3 a	0.7 a	2.4 bc	18.9 a
5	Shake twice to 100-500 fruit per tree/low	Normal	2.31 b	10.0 d	74.0 a	1.8 a	3.5 bc	16.8 ab
6	Shake twice/low	Dry to -20 bars/irrigate	2.32 b	11.0 cd	83.6 a	0.8 a	1.4 c	13.1 ab

Effect of Irrigation on Fruit Cracking for 'French' Prune

*Richard Buchner and Cyndi Gilles
– Tehama 2000*

Percent fruit cracking and stem water potential before and after irrigation on 8/17/2000.

Tree #	Stem water Potential 8/7 (Bars)	Side Cracks	% End Cracks	% Suture Cracks	% Stem water potential 8/17 (Bars)
1	-12.6	0.0	4.0	4.0	-9.3
16	-14.0	0.0	2.0	5.0	-9.9
17	-15.7	0.0	2.0	2.0	-11.5
5	-17.1	0.0	4.0	3.0	-14.0
12	-18.6	0.0	4.0	7.0	-14.4
19	-19.7	0.0	1.0	1.0	-14.0
8	-23.2	1.0	3.0	5.0	-14.2
9	-26.3	0.0	3.0	5.0	-17.5
Baseline	-8.6				-10.8

Summary

- Limited experimental information for prune irrigation
- Prune response to water stress is not completely understood
- Midday stem water potential can indicate tree stress
- Irrigation deficit does not appear to affect fruit drop
- Irrigation deficit appears to affect fruit size
- Irrigation deficit appears to affect dry ratio
- Early season stress plus irrigation appears to aggravate end cracks
- Late season stress plus irrigation may not affect fruit cracking