FINAL PROJECT REPORT **YEAR**: 2010

Project Title: Programs to increase yields of target fruit in peach and nectarine

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Budget 1:
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Item	Year 2009	Year 2010
Salaries	3,092	1000
Benefits	915	350
Wages	5,244	1600
Benefits	1,441	300
Equipment	276	
Supplies	529	50
Travel	1,048	500
Cooperator payments	(2,400)	0
Total	**10,145***	**3,800***

***NOTE:** Project was funded through the Internal Program budget of WTFRC; budget figures are shared for informational purposes only

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OBJECTIVES

1. Evaluate the performance of chemical blossom thinners in peach and nectarine (2009-2010).

2. Determine horticultural effects of reflective groundcovers on 2 peach cultivars (2009).

SIGNIFICANT FINDINGS

1. None of the chemical blossom thinners evaluated in peaches and nectarines (ATS, NC99, Tergitol) reduced fruit set or increased harvest fruit size more than once in six trials over two years.

2. Daybright increased yields and enabled the majority of the fruit to be harvested in the first and second pick, whether deployed for the entire growing season or 8 weeks prior to harvest.

METHODS

Chemical blossom thinning: We evaluated three chemical thinning programs: Tergitol (1.0%), NC 99 (6%), and ATS (2%) were applied at both 20 and 80% bloom with an AccuTec sprayer. Four randomized complete block trials with four replicates were established in 2009 in one peach ('Brittany Lane'/Lovell, 6' x 16', 9 years old) and three nectarine blocks ('Scarlet Sun'/Lovell, 6' x 16', 9 years old; 'Red Gold'/seedling, 7.5' x 15', 8 years old; 'Grandbright'/Lovell, 6 x 18, 8 years old). Two trials of similar design were established in 2010 using the same 'Brittany Lane' peach and 'Scarlet Sun' nectarine blocks. Data recorded included: initial bloom counts, green fruit set, hand-thinning time, whole tree yields, and standard harvest fruit quality indices.

Reflective ground covers: Two 2009 trials were established near Wapato, WA consisting of 6 strips of Daybright applied in four plots (5 trees long) alternating with untreated control plots of approximately equal dimensions. Daybright was placed in orchard alleyways and attached to the tree trunks with elastic bands (ca. 4 inches above ground), covering approximately 80% of intra-row space. Daybright was deployed in a 'Country Sweet' peach block (Lovell rootstock, 12' x 18' spacing, 9 years old) from full bloom through harvest in early August. The same material was then moved into an 'O'Henry' peach block (Lovell rootstock, 7' x 15' spacing, 7 years old) until harvest, approximately 2 months later. All fruit samples were taken from trees in middle rows. For each experiment, yields and fruit maturity were determined from 1 tree per plot at each commercial pick. Standard fruit quality parameters were assessed from 10 fruit per tree at each pick.

RESULTS AND DISCUSSION

Chemical blossom thinning: For stone fruit chemical thinning programs to prove cost effective, they must significantly reduce the need for expensive hand thinning and/or increase the yields of large, high quality fruit. Unfortunately, significant reductions in fruit set and increases in fruit size were rare from chemical thinning treatments in 2009 (Table 1) and 2010 (Table 2). Even in cases where treatments produced desired effects, marginal losses in yield efficiency (kg/cm^2 TCSA) likely offset any financial benefits of those programs. Growers would also potentially gain financially from reduced hand-thinning inputs for chemically treated blocks, but these results have been rare in our studies (Tables 1 & 2). Even in cases where fruit set is significantly reduced, an orchard worker still typically has to make the same number of ladder sets to hand thin a tree, whether he/she has to climb the ladder to remove 2 fruitlets or 20.

Over 10 years of stone fruit chemical thinning trials, we typically observed more successful results than those of 2009 and 2010. Unusually cool and damp spring conditions in 2010 may have muted treatment effects during the critical stages of fruit set and early cell division. Over the course of these studies, frequent losses in yield have often negated the financial benefits of reduced hand thinning and increased fruit size.

Chemical blossom thinning of soft fruit can be achieved by a variety of chemicals, but ATS has been the most consistent performer in our experiments. Tergitol has shown some potential, but has been comparatively inconsistent, sometimes over-thinning and often failing to produce significant results. Other materials including NC99 and lime sulfur rarely demonstrated treatment effects.

Until new chemistries are identified as potential thinners, the merit of ongoing trials in this area seems marginal. It is our opinion that the best available option for reducing fruit set and subsequently increasing fruit size is use of mechanized thinners like the Darwin or Bonner. Even though we are still learning how best to best adopt these new mechanical technologies, they offer the benefit of guaranteeing results independent of weather conditions. We will continue to work with Karen Lewis to fine tune the use of these machines in the coming seasons.

Table 1: WTFRC peach and nectarine chemical blossom thinning trials 2009.

TREATMENT	Fruitlets /branch (cm^2 TCSA)	Fruit set (%)	Fruit diameter (in)	Hand thining (min/tree)	Yield (kg/cm^2 TCSA)	Firmness (lbs)	Sugar (% Brix)	Acids (% malic acid)
'Grandbright' Nectarine / Lovell - Basin City								
NC99	5.9 b	66 ns	2.58 b	-	0.15 ns	21.5 ns	9.5 ns	1.115 ns
Control	7.6 a	74	2.62 a	-	0.15	22.4	9.0	1.128
'Red Gold' Nectarine / Seedling - Monitor								
ATS	5.1 b	75 ns	2.79 ab	-	0.27 b	28.2 b	13.2 ns	1.397 ns
NC99	5.3 b	74	2.81 a	-	0.26 b	28.6 b	13.4	1.405
Tergitol	6.9 a	74	2.68 ab	-	0.30 ab	28.9 ab	13.5	1.287
Control	6.5 ab	80	2.67 b	-	0.34 a	29.5 a	13.7	1.270
'Scarlet Sun' Nectarine / Lovell - Wapato								
ATS	5.5 ab	60 ns	2.48 ns	8.3 ns	0.22 ns	23.5 ns	11.1 ns	1.085 a
NC99	4.9 b	58	2.41	8.5	0.23	23.3	10.5	0.897 b
Tergitol	6.4 ab	64	2.32	7.8	0.21	23.4	10.9	0.976 b
Control	6.8 a	65	2.37	9.3	0.23	24.8	9.7	0.913 b
'Brittany Lane' Peach / Lovell - Wapato								
ATS	5.4 ns	40 ns	2.62 ns	10.3 ns	0.20 ns	18.0 ns	10.2 ns	0.967 ns
NC99	6.6	33	2.57	8.8	0.25	17.5	10.4	0.997
Tergitol	5.4	45	2.62	10.5	0.19	17.8	9.9	0.925
Control	6.1	43	2.52	9.5	0.20	18.1	9.7	1.120

Table 2: WTFRC peach and nectarine chemical blossom thinning trials 2010.

TREATMENT	Fruitlets /branch (cm^2 TCSA)	Fruit set (%)	Fruit diameter (in)	Hand thining (min/tree)	Yield (kg/cm^2 TCSA)	Firmness (lbs)	Sugar (% Brix)	Acids (% malic acid)
'Scarlet Sun' Nectarine / Lovell - Wapato								
ATS	1.6 ns	17 ns	2.65 ns	7.9 ns	0.10 b	6.6 ns	12.2 b	1.05 ns

NC99	1.0	17	2.68	6.9	0.06 c	5.0	11.8 bc	0.94
Tergitol	1.0	12	2.58	6.1	0.06 c	4.0	13.3 a	1.05
Control	1.8	18	2.59	8.8	0.14 a	6.3	11.4 c	1.04
'Brittany Lane' Peach / Lovell - Wapato								
ATS	1.2 b	17 b	2.58 ns	9.5 ns	0.09 ns	12.7 ns	9.9 ab	1.20 ns
NC99	2.7 a	29 a	2.57	9.6	0.13	11.9	10.1 a	1.22
Tergitol	1.2 b	18 b	2.64	7.6	0.10	10.0	10.1 a	1.19
Control	1.9 ab	32 a	2.51	9.2	0.12	12.1	9.6 b	1.17

Reflective ground covers 2009: Fruit size effects were insignificant except for the first pick of 'Country Sweet,' where treated fruit were 10% larger (Table 4). Yields were increased by Daybright in 'O'Henry' (Table 3). Sugars and acids were largely unaffected by the Daybright treatment. Firmness at harvest was increased in 'O'Henry' and unaffected in 'Country Sweet' (Table 4). Daybright shifted more fruit toward earlier harvests based on the percentage of fruit harvested in the first two picks; in both 'Country Sweet' (Figure 1) and 'O'Henry' (Figure 2), more than 50% of fruit was picked in the first two passes as compared to 30% or less in control plots.

The most important determinant of profitability for soft fruit growers is reliable cropping of high yields of target fruit. Reflective ground covers such as Daybright consistently increase individual fruit size, as well frequently improving overall yields. In addition, treated fruit can often be harvested in fewer picks. Best results are typically obtained by season-long application; however, we have shown that fruit size and yield gains are possible when applied 8 weeks before harvest. Deploying materials like Daybright across multiple blocks in one growing season considerably increases amortization costs.

Our program has evaluated the horticultural effects of Extenday and Daybright in apples, pears, cherries, and peaches over several growing seasons. As with the other crops, our peach results consistently reflect an increase in individual fruit size and/or total fruit set from use of Daybright. These increases typically produce higher yields of target fruit, but these financial gains must be weighed against the high capital costs of investing in and maintaining this technology. Even though Daybright can help the production of most stone fruit systems, a grower's best chance to recoup investment costs would be to use the material in already profitable blocks, rather than using the material to increase the marginal production of a struggling block.

Table 3: Yield effects of reflective groundcovers for two peach varieties ('Country Sweet', 'O'Henry'). 2009.

	Total yield	Total fruit ct	Yield efficiency	
TREATMENT	(kg/tree)	(fruit/tree)	(fruit/cm^2 TCSA)	(kg/cm^2 TCSA)
'Country Sweet' Peach / Lovell - Wapato				
Daybright	45 ns	215 ns	0.9 b	0.2 ns
Control	41	228	1.0 a	0.2
'O'Henry' Peach / Lovell - Wapato				
Daybright	37 a	156 a	1.3 ns	0.3 a
Control	27 b	123 b	1.1	0.2 b

Table 4: Maturity effects of Daybright on 'Country Sweet' and 'O'Henry' peaches. 2009.

	TREATMENT	SUGARS (% Brix)	ACIDS (% malic acid)	DIAM (in)	WT (g)	FIRMNESS (lbs)
'Country Sweet' Peach / Lovell - Wapato						
1st pick	Daybright	11.8 ns	0.390 ns	3.15 a	257 a	13.6 ns
	Control	12.2	0.401	3.08 b	235 b	15.4
2nd pick	Daybright	10.4 ns	0.363 a	3.04 ns	229 ns	15.9 ns
	Control	10.7	0.326 b	2.97	228	14.5
3rd pick	Daybright	9.8 ns	0.325 ns	2.89 b	205 ns	13.9 b
	Control	10.2	0.309	2.98 a	217	15.8 a
4th pick	Daybright	8.8 ns	0.376 ns	2.86 b	199 ns	14.2 ns
	Control	9.1	0.332	2.92 a	206	14.3
'O'Henry' Peach / Lovell - Wapato						
1st pick	Daybright	12.5 ns	0.678 ns	3.17 ns	264 ns	14.1 ns
	Control	12.7	0.711	3.19	272	14.0
2nd pick	Daybright	12.5 ns	0.693 ns	3.11 ns	252 ns	15.8 a
	Control	12.3	0.691	3.15	260	14.0 b
3rd pick	Daybright	11.4 ns	0.636 a	3.10 ns	247 ns	11.1 a
	Control	11.6	0.598 b	3.11	250	7.2 b
4th pick	Daybright	10.8 a	0.570 ns	2.85 ns	195 ns	10.2 a
	Control	9.9 b	0.560	2.86	199	7.1 b

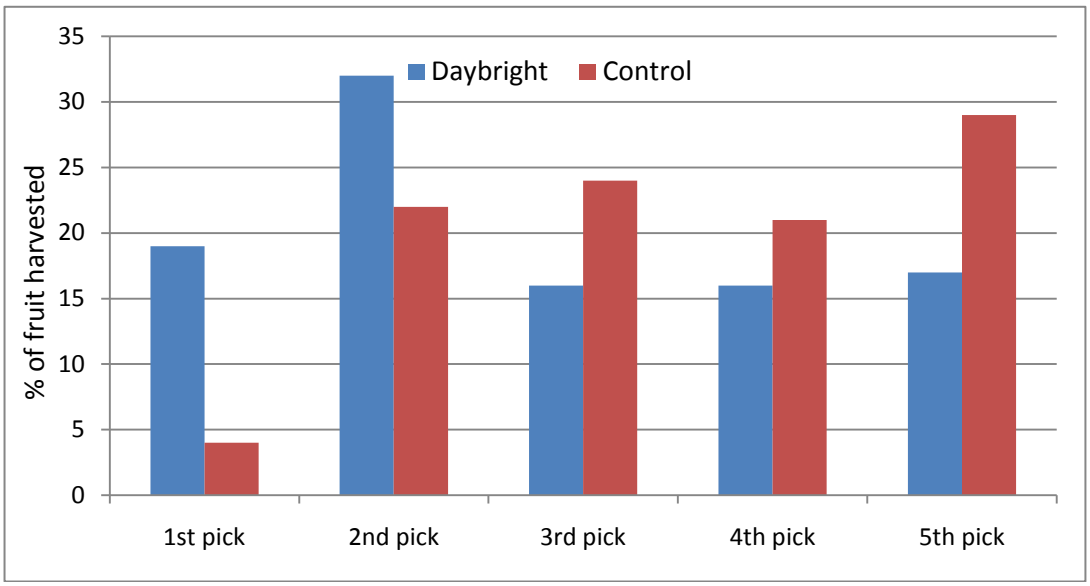

Figure 1: The influence of Daybright on the percentage of fruit harvested in each pick for 'Country Sweet' peaches. 2009.

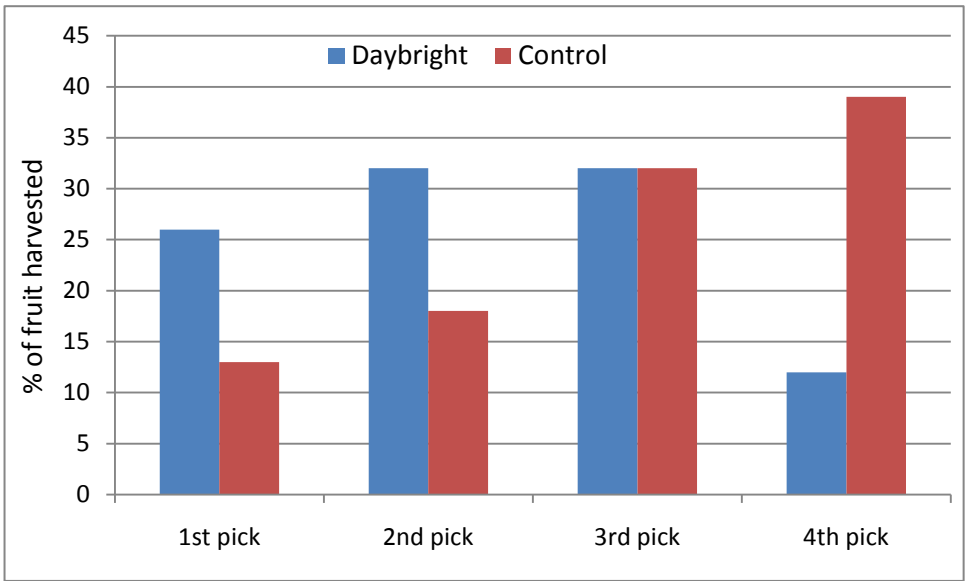

Figure 2: The influence of Daybright on the percentage of fruit harvested in each pick for 'O'Henry' peaches. 2009.

OUTREACH

I. Hanrahan, T. R. Schmidt and James. R. McFerson. 2009. Programs to increase fruit size and yields in stone fruit. ASHS Annual Conference. Saint Louis. USA (poster)

I. Hanrahan and T. Schmidt. 2010. WTFRC internal program: Chemical thinning trials in peaches and nectarines. Yakima Valley Soft Fruit Day. Buena. USA. (oral presentation)