

IFAS Citrus Initiative
Annual Research and Extension Progress Report 2008-09
Mechanical Harvesting and Abscission

Investigator:

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Co-PIs – Kelly Morgan (SWFREC)

Objective(s) Pursued (Priority Topics):

Processor issues A) fruit (peel) quality

Detailed Accomplishments in 2008-09: Processors are concerned about peel integrity of CMNP-treated fruit. We conducted 2 trials in March and April with Valencia oranges to determine the postharvest effect of CMNP applied to canopies for the purpose of loosening fruit on fruit crush force, peel puncture resistance, and peel puncture depth. Fruit were collected during our harvesting trial studies reported elsewhere. Briefly, 300 ppm CMNP was applied to canopies at 300 gal/acre, and canopy shaker machine harvesting commenced 4 days after application. The machine cpm settings were 180, 220 and 260 and the rate of travel was 1.0 mph. Trials were conducted on approximately 150 trees divided into 4-tree plots; 4 replicates were selected for each treatment. Machine harvested fruit were collected and transported to CREC, and stored overnight on the packinghouse floor under ambient conditions. The following day, fruit were prepared for peel integrity analysis or storage. Fruit crush force measures the force necessary to crush the fruit, whereas peel puncture resistance and peel puncture depth measures the force necessary to pierce the peel surface and the depth before piercing occurs, respectively. An instron instrument was used to measure these parameters. Postharvest storage studies were conducted simultaneously on a subset of fruit to determine if CMNP-treated fruit had higher decay than those not treated with CMNP. Storage studies were conducted at 27 °C (80 °F) for one week, and decay evaluated 0, 1, 2 and 7 days during storage. Fruit crush force, peel puncture resistance or peel puncture depth was not statistically different between treatments. Fruit decay percentage, however, varied. No decay was measured after 1 day of storage in any treatment. After 2 days of storage, decay was numerically higher as compared with day 1 but not significant in any treatment. After 7 days of storage, decay was higher than the previous storage period. CMNP increased % decay, especially in fruit harvested at the higher cpm settings of the canopy shaker. Decay averaged 4% in untreated controls to 9.3% in 300 ppm CMNP fruit harvested at 260 cpm. Two additional trials are planned at the end of May and early June to complete the data set for this year.

Areas where progress exceeded expectations: nothing to report.

Areas where progress didn't meet expectations: nothing to report.

Impact of accomplishments towards overall goals of funding: These preliminary results suggest that processors should process incoming fruit from CMNP-treated areas as soon as possible. A delay of more than 2 days may lead to loss of fruit to decay.

Presentations associated with 2008-09 efforts: nothing to report.

Publications from 2008-09 efforts: nothing to report.

Next steps: After the results of the remaining trials are tabulated, we will consult with the processors and harvesting advisory council to assess whether additional trials will need to be conducted to follow losses in the processor yard in greater detail.

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Mechanical Harvesting and Abscission

Investigator:

PI – Kelly T. Morgan

Co-PIs –

Objective(s) Pursued (Priority Topics): Factors affecting peel splitting in MH fruit under
 1) Horticultural Considerations- Grove management and 2) Processor Issues- Fruit (peel) quality.

Detailed Accomplishments in 2008-09: Ten fruit from each of 4 Hamlin of Swingle trees in a long term phosphorus and potassium rate study block were harvested on two dates. Splitting of Hamlin fruit during mechanical harvesting was observed in 2004/2005 and 2006/2007 harvest years. It was determined during the 2004/2005 harvest year that low leaf and K concentration lead to thin fruit peels and splitting. The selected dates were chosen to simulate early (December 5, 2008) and late (January 20, 2009) harvests for Hamlin. Fruit peel thicknesses were not significantly different among P and K fertilizer treatments (Table 1). No significant differences were found in juice quality (acid and Brix), but leaf and peel K concentrations were significantly greater with increased K fertilizer applications. Fruit splitting increased with increased height but no significant difference was found among K treatments in number of split fruit when dropped from heights of 4, 8 or 12 feet (Table 2). However, fruit splitting for all K treatments was significantly greater when dropped on a 90 degree edge compared with flat metal surface at the 8 foot height but not the 4 or 12 foot heights. A second study was conducted to determine if fruit peel damage caused by application of the abscission compound (CMNP) would cause fruit splitting. Ten Hamlin fruit were collected from each of four replicate trees with CMNP applied at three rates (12 total trees) at harvest on December 12, 2008. CMNP rates were 0, 100, and 200 ppm. No significant difference in fruit peel thickness (Table 1), or dropped fruit splitting (Table 2) was observed among CMNP rates. Unlike the fruit from the P and K fertilizer trial, no significant difference was found in number of fruit split by surface orientation.

Table 1. peel thickness, juice quality, and leaf and peel K concentrations at two harvests from a K rate test and one harvest from a mechanical harvest abscission compound study.

Treatment	Peel thickness (mm)		Juice acid		Juice Brix (deg)		Leaf K (%)		Peel K (%)	
	5	20	5	20	5	20	5	20	5	20
	Dec 2008	Jan 2009	Dec 2008	Jan 2009	Dec 2008	Jan 2009	Dec 2008	Jan 2009	Dec 2008	Jan 2009
K (lb/ac)										
0	3.04	2.34	2.78	1.48	10.8	11.9	1.3	1.1	0.4	0.4
50	3.10	2.51	2.78	0.82	12.1	14.0	1.2	1.3	0.6	0.7

100	2.57	2.67	2.10	0.98	11.2	10.7	1.6	1.8	0.8	0.9
200	2.39	2.32	2.72	1.34	11.0	10.4	1.8	1.9	0.9	0.8
Significance (p)	ns	ns	ns	ns	ns	ns	ns	0.02	0.03	0.03
CMNP (ppm)	12						12		12	
	Dec						Dec		Dec	
	2008						2008		2008	
0	0.9						1.4		0.6	
100	0.2						1.6		0.5	
200	0.6						1.5		0.8	
Significance (p)	ns						ns		ns	

Table 2. Number of split fruit as a result of fruit dropped from 4, 8, and 12 foot heights on to a flat metal surface of the 90 degree edge of a metal surface.

Treatment	4 ft height		8 ft height		12 ft height	
	flat	edge	flat	edge	flat	edge
K (lb/ac)	Number of split fruit per 10 fruit dropped					
0	0	2	0	4	6	6
50	0	0	0	2	1	2
100	0	1	2	3	6	6
200	0	1	1	2	5	5
Significance	ns	ns	ns	ns	ns	ns
CMNP (ppm)						
0	0.0	1.7	5.3	6.2	8.5	9.5
100	0.0	0.3	6.2	5.0	9.2	9.8
200	1.0	0.3	6.5	6.0	8.8	8.3
Significance	ns	ns	ns	ns	ns	ns

Areas where progress exceeded expectations: The determination of fruit splitting among CMNP treatments were not part of the proposed study. The lack of significant differences would indicate that peel injury caused by application of CMNP does not create an increase risk of fruit splitting and therefore would not cause fruit loads to be rejected.

Areas where progress didn't meet expectations: Even though leaf and peel K levels were reduced, fruit peel thickness and splitting was determined not to be a problem in this study. Results from the earlier 2004/2005 fruit year study where fruit splitting was determined to be associated with reduced leaf and peel K concentration. The current study should have produced similar results given the significant difference in both leaf and peel K. We are aware of growers reported fruit splitting from mechanical harvesting

in 2008/2009. The combined data from 2004/2005 and 2008/2009 may indicate that the fruit splitting reported in 2004/2005 and again in 2006/2007 may have been associated with large fruit crops and reduced nutrient status due to tree recovering from hurricane injury.

Impact of accomplishments towards overall goals of funding: This study has shown that the effect of horticultural practices (fertilizer rates and CMNP application) on fruit splitting caused by mechanical harvesting observed in earlier splitting problems may not be an ongoing concern for citrus growers and harvesters.

Presentations associated with 2008-09 efforts: none

Publications from 2008-09 efforts: none

Refereed:

Non-refereed:

Next steps: none required