

IFAS Citrus Initiative

Annual Research and Extension Progress Report 2009-10

Mechanical Harvesting and Abscission

Evaluation of CMNP Formulations and the Effects of CMNP on Fruit Peel Integrity and Fruit Storability

Investigator:

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Objective(s) Pursued (Priority Topics):

1. Evaluate CMNP and other abscission compound formulations through field-based branch studies and growth chamber studies.
2. Determine the effects of CMNP application on peel integrity, fruit storability, and post processing peel quality.
3. Develop and deliver extension program materials about the use requirements of CMNP under an experimental use permit, anticipated for the 2010/11 harvest season.

Detailed Accomplishments in 2009-10:

Evaluation of CMNP formulations: Two experimental formulations of CMNP, containing 18 and 40% active ingredient were tested in branch studies on Hamlin (December 2009) and Valencia orange (April 2010) as compared to the standard formulation used in our regular trials, ASI-100 17EC, 17% active ingredient. Concentrations applied were 200 and 300 ppm a.i. using four branches per treatment. As well, applications were performed at 9 am and 1 pm as previous studies demonstrate the higher efficacy of noon application as compared with morning ones.

No differences were found between the two experimental formulations as compared to ASI-100 17EC regarding the reduction of fruit detachment force at each concentration and application time. Nevertheless, afternoon applications proved to be more effective for each concentration, with no differences between treatments at the same concentration and time of application. No formulation caused substantial leaf abscission regardless of the concentration or application time. All of the treatments caused pre-harvest fruit drop between 3-5 days after application. Again, afternoon application and 300 ppm caused the highest fruit drop.

CMNP effects on peel quality: To determine whether the peel scaring sometimes caused by CMNP application reduces peel integrity and increases losses due to fruit crushing and/or decay prior to processing data were collected from three harvest dates for Valencia oranges (early-mid May, late May and mid June, 2009). Fruit were harvested using the Oxbo 3210 pull-behind canopy shaker with the following settings: two ground speeds (0.8 and 1.6 km per hour), two shaker head frequencies (145 and 185 cycles per minute) and CMNP foliar applications (3 days prior to harvesting) at 250 mg L⁻¹ in a spray

volume of 2810 L ha⁻¹, untreated mechanically harvested fruit served as controls. Additionally, hand picked CMNP-treated and non-treated controls were included. Four 8-tree block replicates per treatment were used. After harvesting, samples of 10 and 40 fruit were randomly collected per block to perform peel resistance and postharvest decay evaluations, respectively. Peel resistance was determined by measuring both peel puncture force and fruit crushing force (kg). Fruit used to study post-harvest decay were stored at 27°C and 50% relative humidity and evaluated at 0, 3 and 7 days. The results showed that peel resistance was not affected by mechanical harvesting combinations or CMNP application at any of the tested harvesting dates. Low correlations were found between fruit crush force and fruit weight, regardless of the mechanical harvesting procedure or the use of CMNP, with a tendency to higher peel resistance in heavier fruit. No significant effects on post-harvest decay were found for any treatment as compared to hand-picked controls until day 3 of storage. CMNP caused a significant increase (4-5%) of post-harvest decay at day 7. The results indicate that CMNP can be used safely in combination with late-season mechanical harvesting under the conditions described in this study, without losses due to fruit crushing or decay for at least 3 days, which is within the processor-stated normal harvest-to-process time window. Additional samples are being collected from two late-season Valencia harvesting trials during May 2010 to verify these results. Those data will be reported in the 2010-11 report.

Extension program material development for EUP use of CMNP: The EUP application was submitted later than anticipated and, if granted, will not be in place until the 2011-12 harvest season. A planning meeting was held on April 21, 2010 between IFAS, FDOC, and AgroSource representatives to discuss the requirements of the EUP. At this meeting the responsibilities of each of the three parties was discussed in detail and a timeline for the development of program materials was established. Draft materials will be developed September 2010, materials will be finalized by the end of December 2010, and training classes will be scheduled for the spring/summer of 2011.

Areas where progress exceeded expectations:

The data on peel integrity were extremely consistent across the three trials studied to date and indicate very clearly that the peel blemishes associated with CMNP application are not detrimental to fruit harvested for processing when it is processed within the normal time window.

Areas where progress didn't meet expectations:

The development of the extension materials for the EUP did not progress as far as originally intended this year. This was in part due to the later than expected submission of the EUP application, which affected the entire project timeline. This delay in the development of the materials is not entirely a negative since it has allowed for the collection of an additional season of field data that can be incorporated into the usage recommendations sections of the extension materials.

Impact of accomplishments towards overall goals of funding:

This research has a significant impact towards the overall goals of the program. A continuing concern from growers and processors as CMNP has been developed is tree health and fruit quality. These data directly address concerns about fruit quality and

clearly indicate that there is no need for concern when applications are made according to recommendations and the normal harvesting/processing routine is followed.

Presentations associated with 2009-10 efforts:

Pozo, L. I. Kostenyuk, J.K. Burns and T.M. Spann. 2010. Effects of mechanical harvesting and an abscission agent on peel integrity and post-harvest decay of late-season 'Valencia.' International Society for Horticultural Sciences Congress, Lisbon, Portugal.

L.M. Friedrich, T.M. Spann, R. Ebel, M.D. Danyluk. 2009. Microbiological Evaluation of Mechanically-Harvested Citrus Fruit. Florida Citrus Processors and Subtropical Technology Conference, Lake Alfred, FL.

L.M. Friedrich, T.M. Spann, R. McEgan, R.C. Ebel, and M.D. Danyluk. 2009. Influence of Mechanical Harvesting System and Abscission Agent on Microflora of Citrus Fruit. Florida State Horticultural Society Annual Meeting, Jacksonville, FL.

Spann, T.M., M.D. Danyluk, R.C. Ebel and J.K. Burns. 2009. Debris Accumulation in Loads of Mechanically Harvested Oranges. 2009 Annual Conference of the American Society for Horticultural Science, July 2009.

Publications from 2009-10 efforts:

Spann, T.M. and M.D. Danyluk. 2010. Mechanical harvesting increases leaf and stem debris in loads of mechanically harvested citrus fruit. *HortScience* *accepted*.

Next steps:

New formulations of CMNP and/or other abscission agents will continue to be evaluated in small-scale branch studies on an as needed basis at the request of AgroSource. These data will continue to be shared with AgroSource and other researchers as we continue to develop CMNP for full registration as a citrus harvesting tool.

The data on fruit peel integrity and postharvest storage quality from the 2010 late-season trials will be evaluated and compared with the data from the previous season. Because some changes were made to application rates and volumes in this year's study we anticipate continuing these trials for an additional season to better clarify the results and determine if differences between the two seasons are environmental or rate related.

Per our meeting on April 21, the extension educational materials are beginning to be developed with a targeted completion of the first draft by September 2010. Currently a summary report from our meeting is being drafted listing the areas of responsibility for each contributor (IFAS, FDOC, and AgroSource). This will assist each group in the development of the materials for their respective areas. IFAS will be taking the lead on the developing application recommendations, post-application harvest scheduling, and training users on how to complete the EUP-required paperwork.