CPPU for reduced preharvest drop and improved kernel, shell and hull size in almond

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Summary:

CPPU was applied to mature ‘Butte’ almond trees at three different timings: shuck split (SS), SS + 2 weeks or SS + 4 weeks. When compared to an untreated control, nut set was not statistically different among treatments. Yield components also not different among treatments included total lb yielded per tree, yield efficiency, hull or shell weight. Yield components that were affected by treatment included kernel and whole nut weights and number of nuts per pound. Whole nut and kernel weights were decreased by the last treatment. The number of nuts per pound was least in the untreated (nuts were largest, therefore), and number of nuts per pound increased as date of treatment increased.

Problem and Significance:

Almonds represent California’s #1 agricultural export valued at $1.081 billion dollars (2003 statistics, Almond Board of California); acreage continues to increase annually. California produces 80% of the world’s almonds (kernels) and use of the shell and hull are additional by-products with primary use as animal feed. An increase in size and dry weight of the kernel, shell and hull, therefore, could substantially increase growers’ profits.

CPPU has been shown to improve fruit size by at least 50% in early applications on apples in Israel (Stern et al., 2003) without any fruit thinning, when applied at 10 ppm at 2 weeks after full bloom. CPPU increased fruit size of ‘Spadona’ pear when applied at two weeks after full bloom, when fruitlets were 10 mm in diameter, and fruit shape and seed number were not affected (Flaishman et al., 2005). This size increase was due to an increased number of cells along the fruit radius. Many other fruits and vegetables have also shown a marked increase in size with CPPU.

Almond is a special case in that the seed is the higher value product, and the ‘fruit’ portion (the hull) that corresponds to the edible flesh of other Prunus species, is dry at maturity. The goal to increase size of all parts of the nut, therefore, is somewhat different from that in other fruits. Nonetheless, CPPU has been shown to accelerate growth of both the rind and fruit tissue of watermelon (Kano, 2000).

Plans and Procedures:

The orchard treated was in Glenn County, CA, and consisted of mature trees of Butte, Mission and Padre cultivars. Trees were planted at 18 ft x 20 ft, 121 trees per acre. Tree size was somewhat variable, so trunk circumferences were taken at the end of the growing season to calculate yield efficiency. Treatments were made to ‘Butte’ as 5 single-tree replicates per treatment, randomized complete block design. Four treatments included an untreated control and 10 ppm CPPU @ shuck split, and at two 2-week intervals following the first application. CPPU was applied with 0.25% Activator 90 + 0.25% RNA Activator 85 and at a carrier volume of 100 gallons per acre by mistblower. Treatment effects were measured by:

1. %Fruit set: 2 bearing limbs per treated tree were tagged prior to treatment and nuts counted. Final fruit set was determined after small nutlet drop. Treatments were applied on 7 April, 21 April and 5 May.

2. At harvest all nuts were harvested onto the ground, raked into discrete piles representing nuts from
each tree, and total harvest weighed without cleaning out debris. From the total a sample bag weighing 6 lb was removed for nut evaluation. That sample was cleaned of debris and final weight of the sample taken. Nuts in the sample were counted for a count per pound. An estimate of total yield of nuts and total number of nuts per tree was obtained by calculating percentage of debris in bag weight and subtracting that percentage from the total yield per tree (including debris). Fifty nuts from the net sample were taken for evaluation as weight of whole nuts, kernels, hulls and shells. Trunk circumferences were measured at the end of the growing season to adjust total yield for yield efficiency corrected for tree size differences.

**Results and Discussion:**

No treatment has proven of benefit in improving nut size or size of any portion of the nut. No benefit in reducing drop was found in CPPU treatments. It may be that timing or concentration should be adjusted—both upward and downward. In addition, combination treatments including MaxCel, AVG (ReTain) and ACC (ethylene inhibitors) should be tested in 2007.

**References:**


Table 1. Effects of 10 ppm CPPU applied at shuck split (7 April), and shuck split + 2 weeks (21 Apr) or + 4 weeks (5 May) on ‘Butte’ almond in 2006.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>%Nut set</th>
<th>Estimated yield of nuts/tree (lb)</th>
<th>Estimated #nuts/tree</th>
<th>Yield efficiency$^y$</th>
<th>Number of grams per 50</th>
<th>#Nuts/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Kernel</td>
<td>Hull</td>
</tr>
<tr>
<td>Control</td>
<td>80.0</td>
<td>30.1</td>
<td>3752</td>
<td>0.95</td>
<td>54 a</td>
<td>72</td>
</tr>
<tr>
<td>CPPU 7 Apr</td>
<td>79.6</td>
<td>26.8</td>
<td>3665</td>
<td>0.91</td>
<td>52 ab</td>
<td>68</td>
</tr>
<tr>
<td>CPPU 21 Apr</td>
<td>76.5</td>
<td>23.4</td>
<td>3395</td>
<td>0.82</td>
<td>54 a</td>
<td>68</td>
</tr>
<tr>
<td>CPPU 5 May</td>
<td>71.2 ns</td>
<td>23.9 ns</td>
<td>3605 ns</td>
<td>0.79 ns</td>
<td>48 b</td>
<td>68 ns</td>
</tr>
</tbody>
</table>

$^x$Mean separation within columns by Duncan’s Multiple Range Test, $P = 0.05$; ns = non significant differences.

$^y$Yield efficiency calculated as total lb yield per tree ÷ trunk circumference, to account for differences in tree size.