FINAL REPORT

Project title: Improving fruit quality in Concorde pear as influenced by boron and pollination.

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Organization: OSU – Mid-Columbia Agricultural Research and Extension Center

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Objectives:

1. Determine if color sorting and segregation at harvest can improve color appearance following storage.
2. Determine the role of pollination in fruit set and fruit quality of Concorde pears following harvest.
3. Determine if fall pre-harvest or spring full bloom applications of boron can correct the physiological problems affecting Concorde pears following storage.

Significant findings:

- Based on the first-year results, it appears that "at-harvest" color segregation of Concorde fruit may greatly reduce the lack of uniformity in color following storage.
- Concorde pears can set and mature fruit without cross-pollination.
- Cross- pollination dramatically increased set. Non-cross-pollinated fruit were greener at harvest, and had a greater percentage of the fruit fall below the median color value for the crop.
- Summer boron applications were not effective in correcting the postharvest disorders in Concorde as they had been in Conference (Haibo et al., 2000).
- Spring full-bloom and petal fall applications of foliar boron significantly improved yields in Concorde pear by increasing fruit numbers without affecting fruit weight.

Methods:

Objective 1: Determine if color sorting and segregation at harvest can improve color appearance following storage.

Concorde fruit were harvested from four random trees four weeks prior to anticipated harvest in 2001 and 2002. The fruit were passed thru the Greefa color-sorter. Color values were obtained for each fruit and a median color value determined for each year. The resulting median values were used to establish the mature color-sorting standard for their respective years.

Harvest maturity was previously determined to be two weeks following the onset of CA d'Anjou harvest. In 2001, fruit were collected from 14 randomly selected trees. Fruit from each tree were segregated into two lots by color by passing through the Greefa color sorter.

These were: less than the median color value, "green", or greater than the median color value, "yellow". The fruit were placed in regular air storage at 31F and held for 5 months. The amount of yellow, green and "yellow to green" fruit from each lot was determined following storage. In 2002, fruit from each of the 24 trees utilized in objectives 2 and 3 were segregated and stored as described for the 2001 fruit. These will be evaluated following 5 months of storage.

Objective 2: Determine the role of pollination in fruit set and fruit quality of Concorde pears following harvest.

In 2002, twelve uniform 6-yr-old Concorde trees were selected (four each in three rows). Two randomly selected trees in each row were covered with bee-proof cages from green tip to three weeks after petal fall. Thirty flower clusters were randomly selected on each tree and tagged. From first bloom (Ballard, et al.) to one week past petal fall, 15 of the tagged clusters were hand pollinated every other day with a mixture of d'Anjou and Bartlett pollen. Initial fruit set was determined in early July and final fruit set at harvest. The diameter of the resulting fruit was measured in early August.

At harvest, fruit from the pollinated and non-pollinated spurs were harvested separately. Each fruit was individually passed thru the Greefa color-sizer to determine diameter, color and weight. The remainder of the fruit on each tree were harvested and passed thru the Greefa color-sizer to determine fruit size in "yellow" and "green" color categories. The fruit were stored in regular air storage at 31 F. The samples will be evaluated for color and storage defects following five months of storage.

Objective 3: Determine if summer pre-harvest, or spring full bloom applications of boron can correct the physiological problems affecting Concorde pears following storage.

Twelve uniform 6-yr-old Concorde trees were selected in summer 2001. Four trees were treated with three pre-harvest foliar sprays in 2001 (4 lb Solubor/100 gal, 100 gpa, at 14, 24, and 34 days before harvest), four trees received two spring 2002 foliar sprays (1 lb Solubor/100 gal, 400 gpa, at full bloom and petal fall), and four trees served as controls.

At harvest, the fruit from each tree were collected, passed thru the Greefa color-sizer to obtain yield and fruit size, segregated as "green" or "yellow", packed into 42 lb cardboard boxes with polyethylene liners, and stored in regular air storage at 31F for five months (2001 fruit – 2002 fruit will be stored for 5 months).

Following storage, the 2001 fruit were ripened for five days at 68F, and evaluated for storage disorders. The 2002 fruit will be evaluated in February.

Results and discussion:

Objective 1: The color patterns developed for the pre-harvest samples followed similar patterns in 2001 and 2002. The median color values determined were 309 and 395 for 2001 and 2002, respectively. The color camera was replaced in the color sizer between the 2001 and 2002 seasons, and while every attempt was made to adjust it to the same standards, it is possible the difference in the 2001 and 2002 median color values is due to camera calibration and/or seasonal differences in the fruit itself.

Evaluation of the 2001 fruit, following five months of storage, revealed 8.8 % of the fruit classified as "yellow" to be yellowish-green, and 8.6% of the fruit classified as "green" to be greenish-yellow. The distribution for the "unsorted" sample would have been 50 %, 8.7 %, and 41.3%, respectively, for the yellow, yellowish-green, and green fruit.

Objective 2: Yield from trees within the cages was about 25% of that of the non-caged trees. The reduction in yield was due primarily to fruit numbers. Fruit size was reduced significantly in the open-pollinated trees; however, it is not possible to determine if the size reduction was due to cage effect or crop load.

Fruit from the caged trees had a significantly lower average fruit color. A greater percentage of the fruit from the caged trees was greener than the median color value.

Initial fruit set and final fruit numbers were increased three-fold by hand pollination within the caged trees. No significant effect of supplemental hand pollination was observed on non-caged trees. The significant increase in set by hand pollination inside the cages as compared to outside the cages may be due to reduced wind exposure or slightly elevated temperatures inside the cages.

Objective 3: Summer 2001 pre-harvest foliar boron applications had no effect on fruit number, fruit weight, or yield in 2001 or 2002. Spring 2002 full bloom and petal fall foliar boron applications significantly increased the number of fruit per tree in 2002 by 60%, and yields by 52%, without affecting fruit size.

Summer 2001 boron applications had no effect on storage disorder in the 2001 crop. Storage samples for the 2002 crop year will be evaluated in February.

References:

Ballard, James K., E. L. Proebsting, and R. B. Tukey. 1973. Critical temperatures for blossom buds: Pears. Washington State Univ. Ext. Circ. 373.

Haibo, X., J. Streif, and F. Bangerth. 2000. Does boron affect the occurrence of physiological disorders of 'Conference' pears during CA storage? Abstracts 8th Intern. Pear Symp. 281.

Budget: Project total summary

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Project Duration: 1999-2003

Current year: 2002-2003

Project total (3 years – Commissions): $15,950

Project total (4 years – Total): $56,183

Current year request $0

Item	1999-2000	2000-2001	2001-2002	2002-2003*	Total
Salaries	2,063	2,098	3,178	28,333	35,672
Benefits	887	902	1,447	11,900	15,136
Wages					
Benefits					
Equipment					
Supplies	750	2200	1,125	0	4,075
Travel	300	750	250	0	1,300
Miscellaneous					
Total	4,000	5,950	6,000	40,233	56,183

* Sabbatical salary contributed by Lincoln University (Christchurch, NZ) and Iowa State University (Ames).