Evaluation of BRIX, Acidity and Tacy in PNW cranberries as a function of harvest time

Kim Patten, Pete Bristow and Gwen Windom
Washington State University

Introduction: Traditional payment to growers from processors focuses on the amount of cranberries plus a color (Tacy) incentive. There is a great interest in receiving additional payments for Brix. A study which documents the changes in fruit quality parameters over the extended harvest season would help provide data to warrant changes in how growers are paid for the fruit. This research would help answer question like how much does Brix change over time, how changes in Brix parallel changes in TACY and fruit fresh weight, and how much increase in yield do growers achieve by harvesting later?

Methods:

Oregon: Two grower beds of Stevens (DNA verified) were selected in Bandon Oregon. Fruit were harvested weekly starting September 13th and ending November 15, 2004. Sites selected for harvest were carefully chosen. Fruit were sent by next day UPS to WSU Long Beach where they were processed and frozen for analysis. Fruit were picked so that all fruit within in a square foot were sampled. There were three 1 ft^2 replications. Sample fresh weight, fresh and dry weight and percent of rot at harvest of a 50 fruit subsample were taken. The remaining frozen fruit were then shipped to WSU Pullman to determine total acidity, Tacy and BRIX.

Washington: Good beds producing Steven, McFarlin and Pilgrim berries in Long Beach Washington were selected. These beds were not DNA verified, but fruit and yield characteristics were indicative of being true to type. Fruit were harvested weekly starting August 16th to November 15, 2004. Sites selected for harvest were carefully chosen. Fruit were picked and immediately processed and frozen for analysis. Processing methods were the same as the Oregon samples, but samples were shipped to Ocean Spray headquarters in Massachusetts rather than WSU Pullman. An additional sample of fruit was shipped to WSU Puyallup for study of the change in fruit rot after six weeks storage at 38^o F.

Results: For the Washington samples, as expected, yield, fruit weight (fresh and dry), fruit field rot and storage rot, Brix and Tacy all increased over time. With only three replications, the variability was high, so no inference can be made about short-term change or data out of the norm. Of the production parameters measured, the increase in fruit fresh weight over time was most consistent. The increase in Brix leveled off in early September for Pilgrim, but continued to climb for McFarlin and Stevens. Tacy increase steadily for all varieties across the entire harvest period. TA varied by variety. TA increased over time with Stevens. It increased for Pilgrim until early September and then bounced around with a trend towards a general decline over time. For McFarlin, TA peaked in mid-September and then made a very slight decline. Fruit rot at harvest for McFarlin and Stevens only began to increase after late October, while for Pilgrim it began to increase in early October. Storage rot was more variable between varieties. The percent rot increased steadily over time for Stevens from September 20 to November 1. Storage rot for

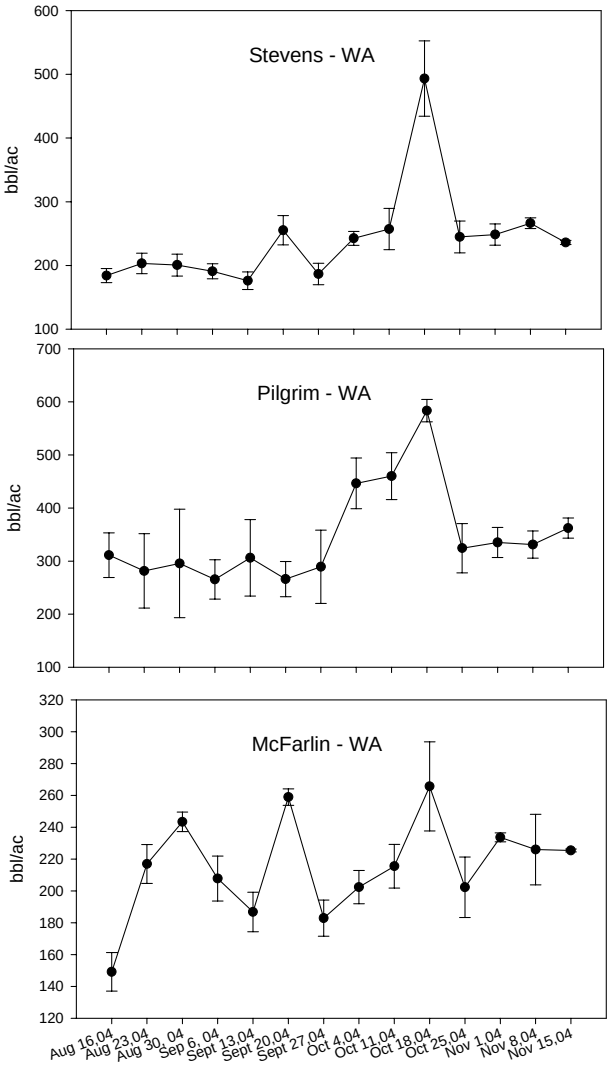
McFarlin was slightly higher for October and early November harvest than September or mid November. Pilgrim storage rot was very high during the entire season. It peaked October 18 at >50%) rot and decreased with later harvest. When rot was pooled across all varieties, the trend was for increased storage and harvest rot over time, with storage rot decreasing for the very late harvests.

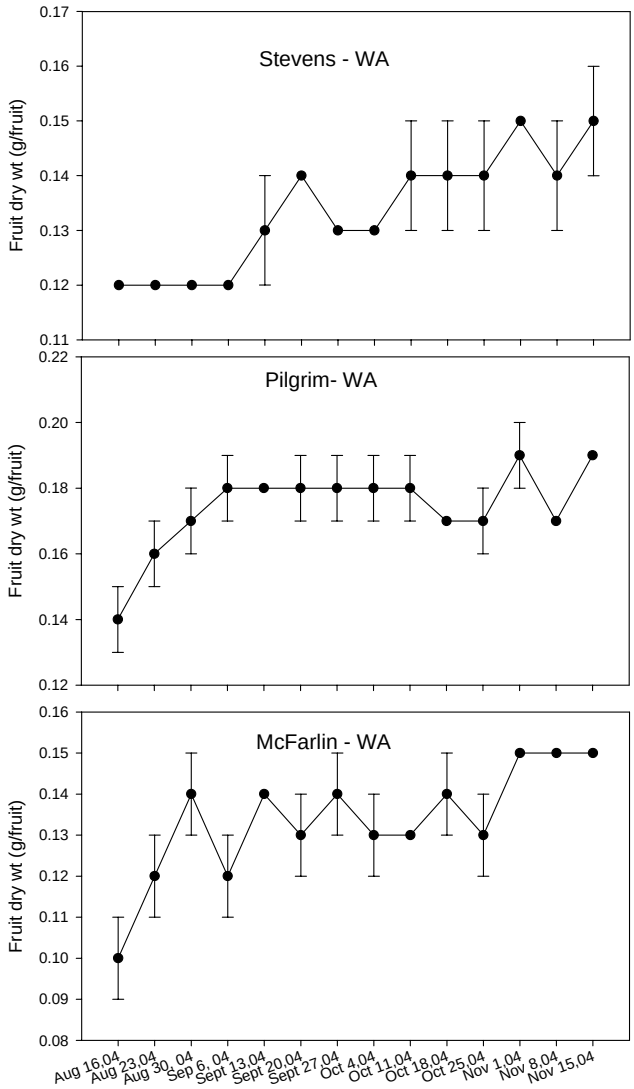
For the Oregon samples, there was a major contrast in fruit size and yield between to two beds, even though they were theoretically the same Stevens vines. The WS bed had considerably larger fruit and higher yield than the DR beds. The DR fruit increased in size until mid October and appeared to slightly decrease after that. The WS fruit, although more variable, showed a slight increase in size throughout harvest. There was a continued but slight increase in yield throughout harvest with the DR fruit, but nor for the WS fruit. Brix and percent TA at both sites increased throughout harvest. Tacy values (different units than those used in Washington) bounced around a lot and showed no real consistent increase over time. Fruit rot at harvest increased over time, but, in contrast to the Washington fruit, it was very low.

For both states and all varieties, the average increase in fruit fresh weight from what would be considered a traditional early harvest to a late harvest was about 0.1 gram/fruit. This is approximately a 6% increase in fresh weight. This is enough to consider a later harvest to slightly increase yield. There was a positive relationship between Brix and fruit weight with McFarlin and Stevens, but a negative one with Pilgrim.

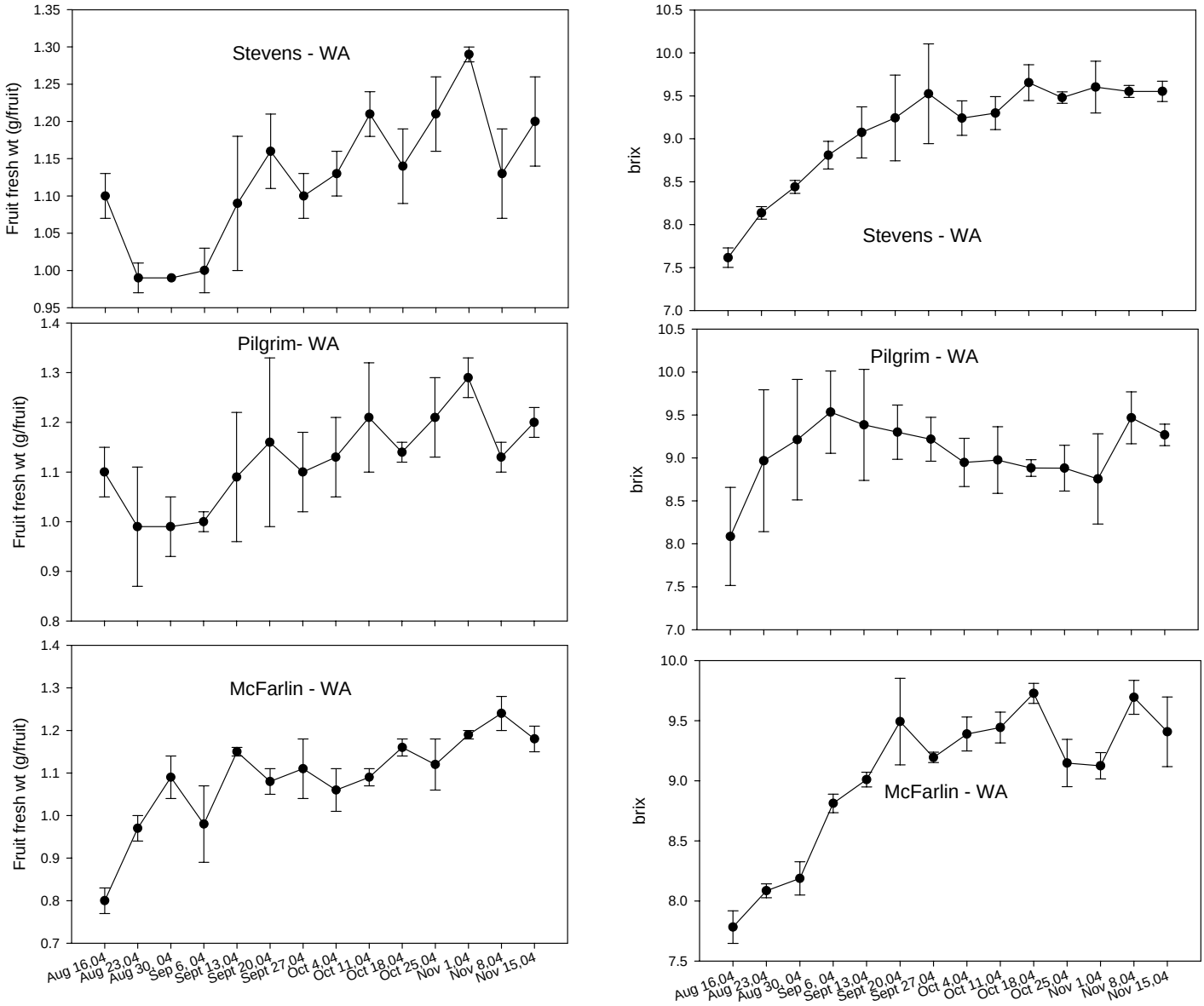
Discussion: This study was not definitive and only represents what happened over one year. There were some problems in methodology. The different analyses used for Tacy and TA between the two states make direct comparisons difficult. With only three replications, there was a lot of variability in many of the parameters. Varieties behaved differently, and even within varieties there were major differences. If variability is this high, making predictive broad inferences about maximizing grower returns by optimizing yield, rot, Tacy and Brix would be difficult. Determining the ideal harvest time to optimize all these variables for highest returns is not feasible at this time without several years of data from which to make that decision.

Figures 1a & b. Change in yield and fruit dry weight for Stevens, Pilgrim and McFarlin in Washington over harvest time.

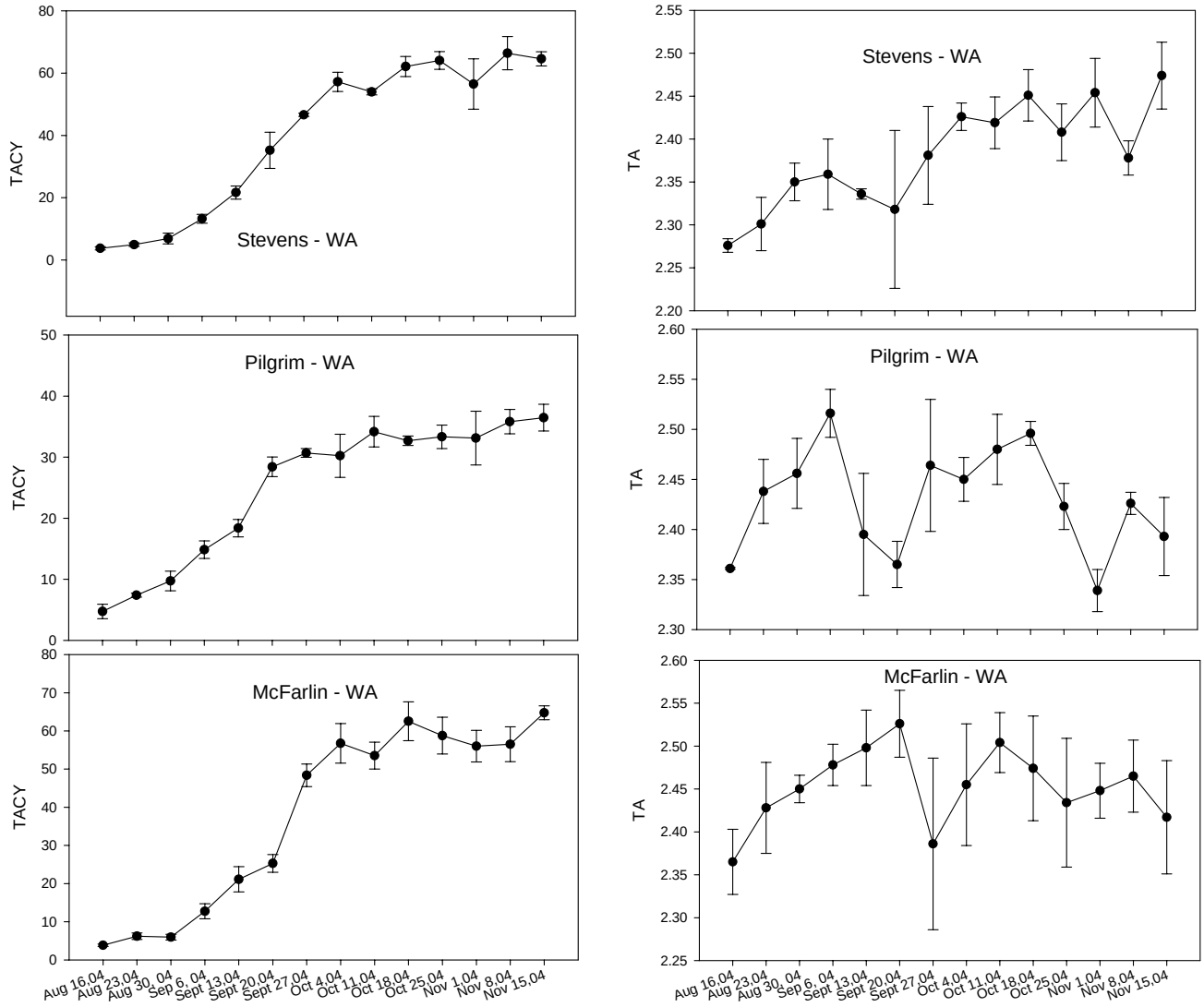




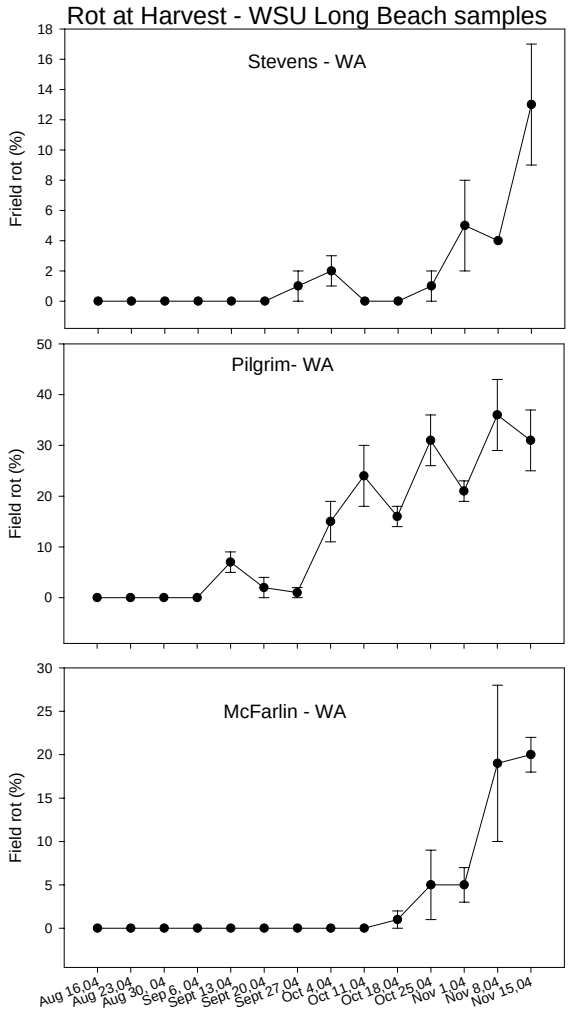
Figures 2a & b. Change in fruit fresh weight and Brix for Stevens, Pilgrim and McFarlin in Washington over harvest time.

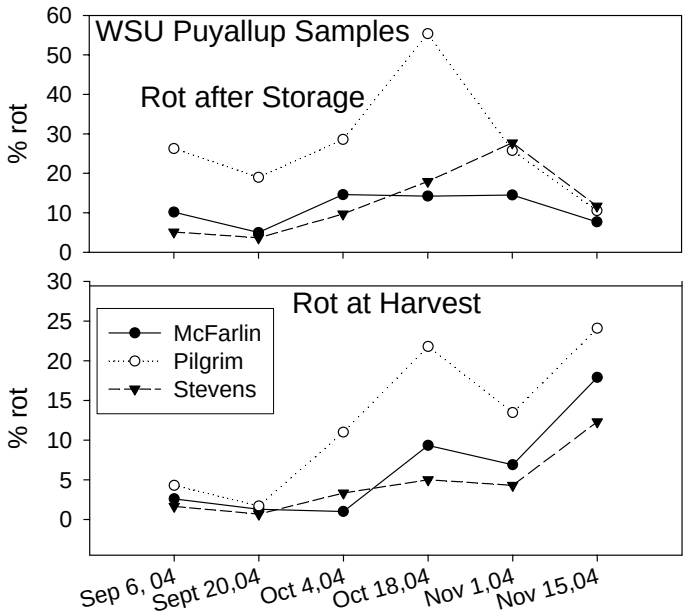


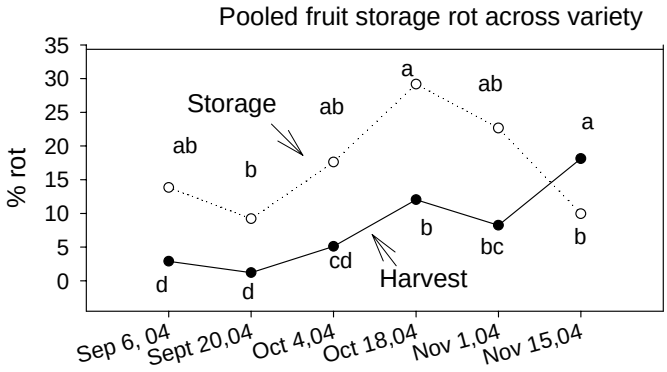
Figures 3a & b. Change in Tacy and TA across at harvest for Stevens, Pilgrim and McFarlin in Washington over harvest time.



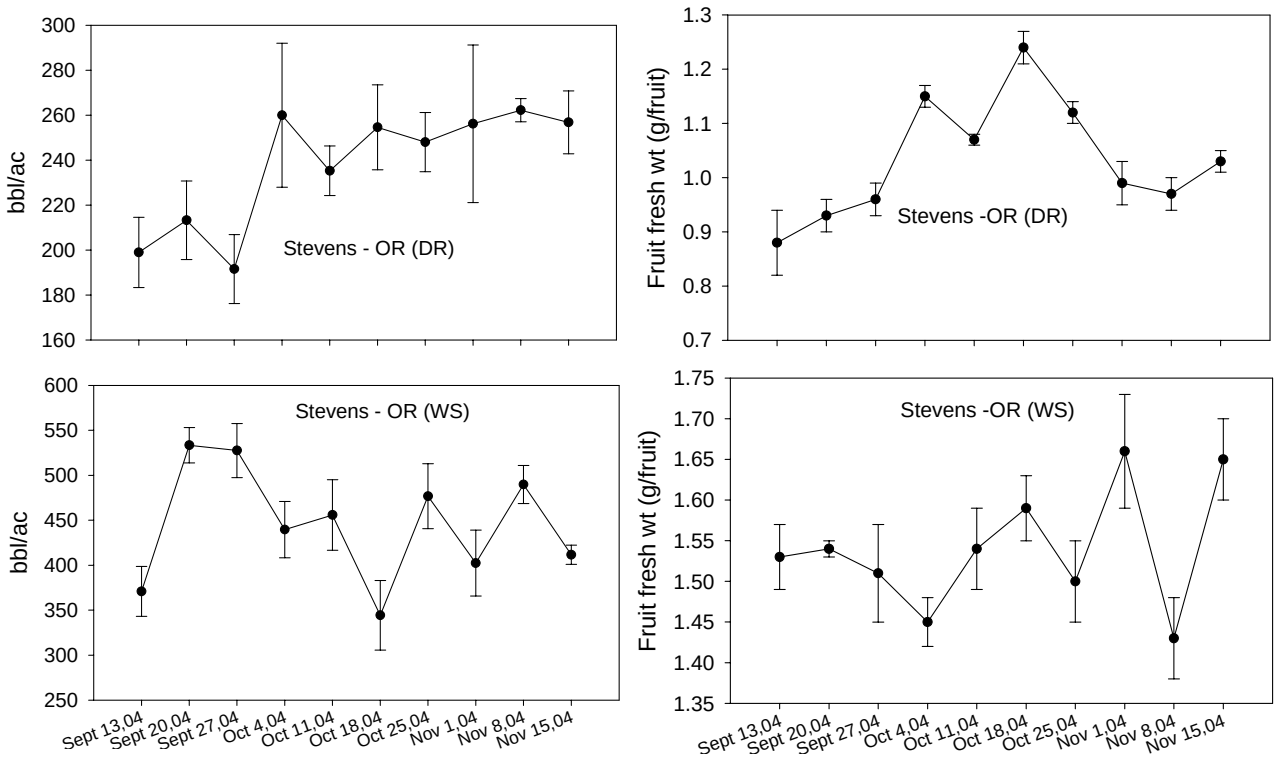
Figures 4a, b & c Change in fruit rot at harvest and after storage for Stevens, Pilgrim and McFarlin, and averaged across all varieties in Washington.



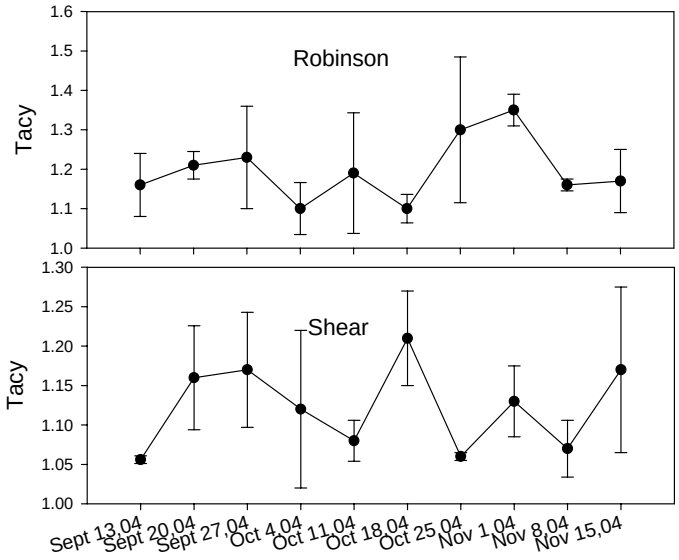


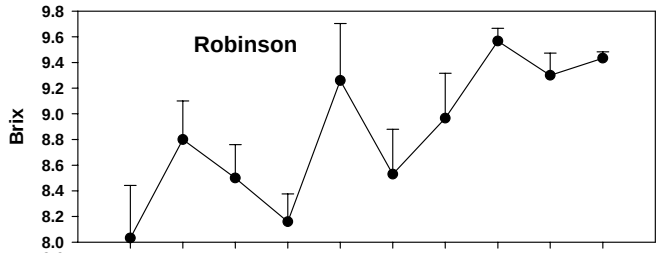


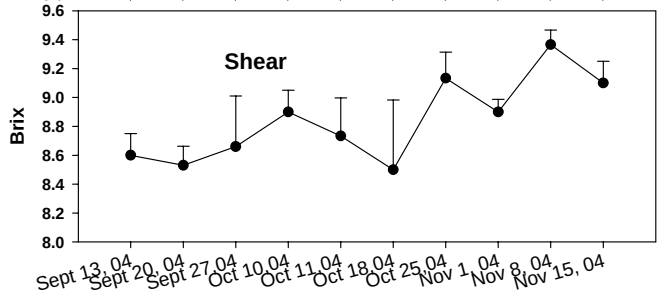
Figures 5a, b, c & d. Change in yield and fruit fresh and dry weight for two Stevens beds in Oregon over harvest time.

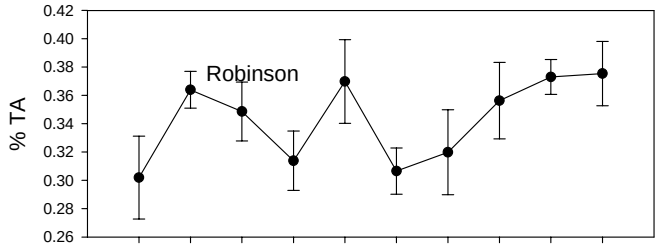


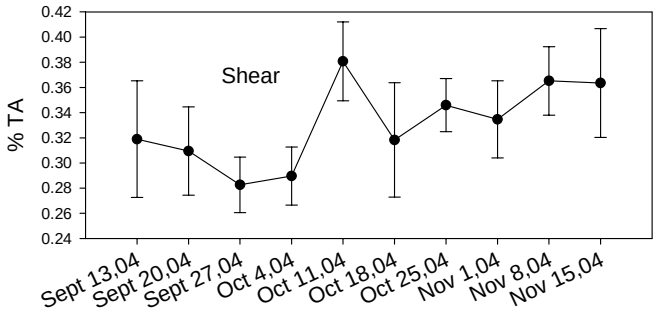
Figures 6 a, b, c, d, e & f. Change in Tacy, Brix and TA for two Stevens beds in Oregon over harvest time.



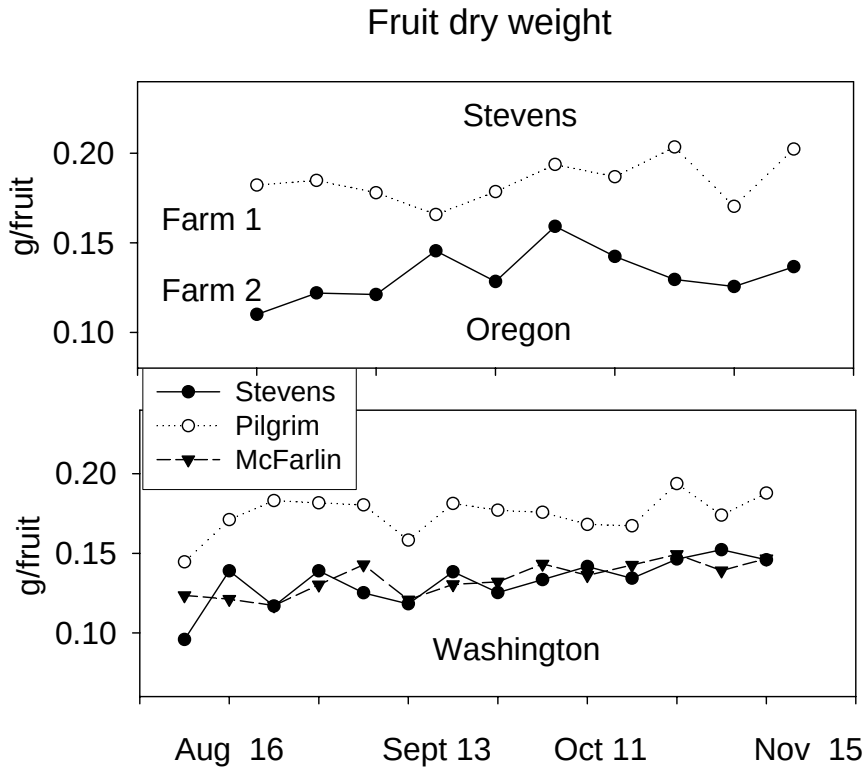


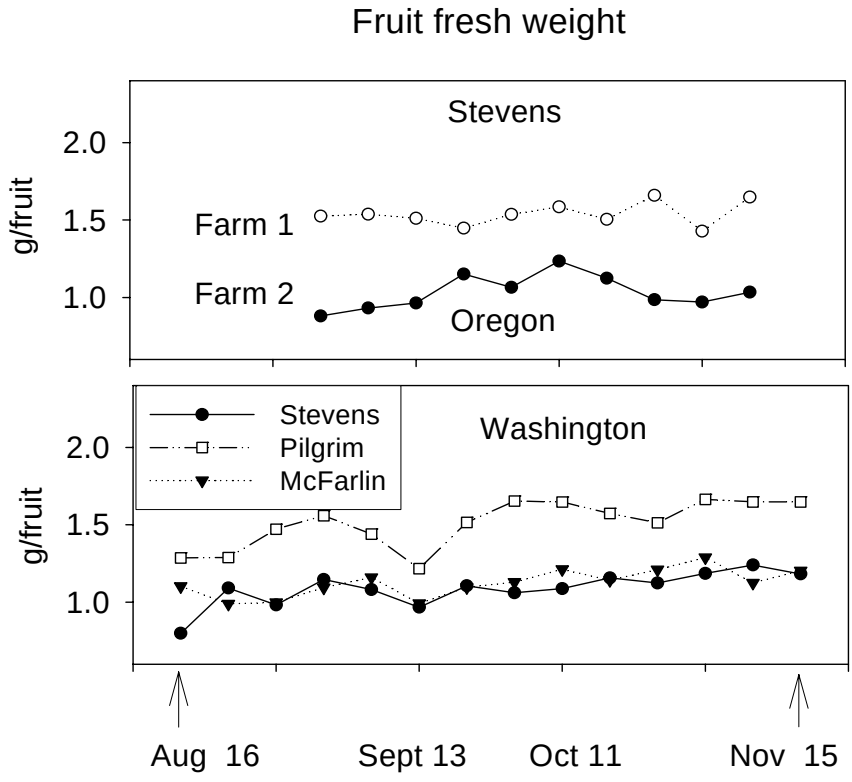






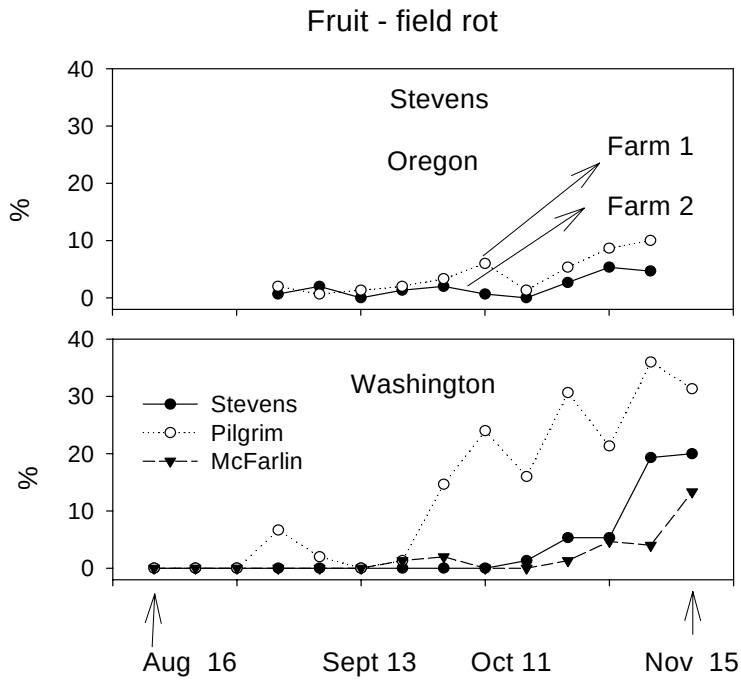
Figures 7 a, b, c, and d. Change in fruit fresh and dry weight for Washington and Oregon cranberries over time.





~ 0.1 g/fruit gain between early and late harvest
~6% gain

Figures 8 a and b. Change in fruit harvest rot for Washington and Oregon cranberries over time.



Figures 9 a, b and c. The relationship between Brix and fruit fresh weight.