2016 Precision Thinning and Predicting-Fruit-Set Demonstrations

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In 2016, I set up six precision thinning and predicting-fruit-set demonstrations, three at each of two locations: Tougas Family Farm, Northborough, MA, and UMass Cold Spring Orchard Research & Education Center, Belchertown, MA. McIntosh, Gala, and Honeycrisp were used at both locations. The precision-thinning procedure is as follows:

- Count and tag individual flower spurs on five representative trees per variety. For this demonstration I used ten spurs per tree for a total off 50 spurs per variety.
- Apply a petal-fall thinning spray and begin measuring individual fruit diameters on each spur. Enter fruit measurements into predicting-fruit-set spreadsheet calculating predicted fruit set for each measurement date.
- Continue measuring fruits and applying chemical thinning sprays until the desired crop load is predicted or achieved.

McIntosh flower cluster tagged in preparation for pricision-thinning assessment.

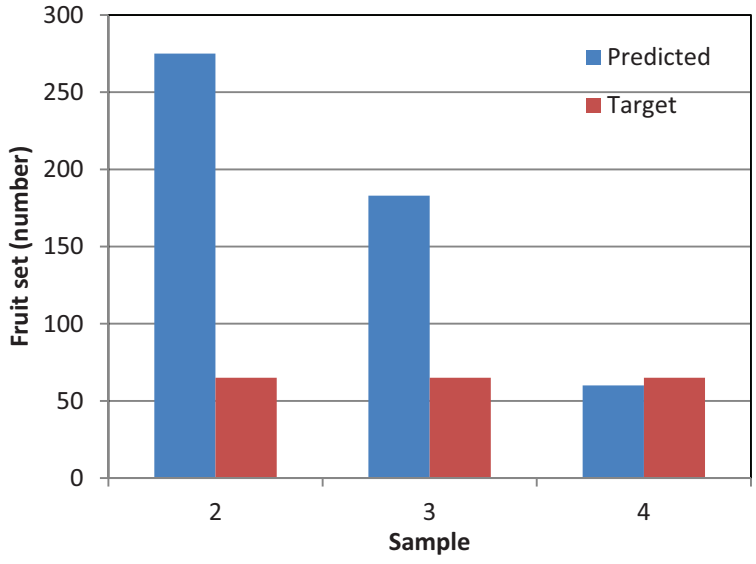

Figure 1. Predicted fruit set (number) vs. target fruit set at three sampling periods.

More information on the precision-thinning procedure and the predicting-fruit-set spreadsheet is available on the Michigan State University Extension Apples/Horticulture website: http://msue.anr.msu.edu/topic/apples/horticulture

Fruit growth data entered into the spreadsheet are used to calculate predicted number and percent fruit set based on the initial actual spur/flower count and the desired number of fruit (estimated) on the tree at harvest. See Figures 1 and 2 for examples of number of fruit and percent fruit set, respectively.

Chemical thinning applications were made on all demonstrations, but differed by orchard and variety.

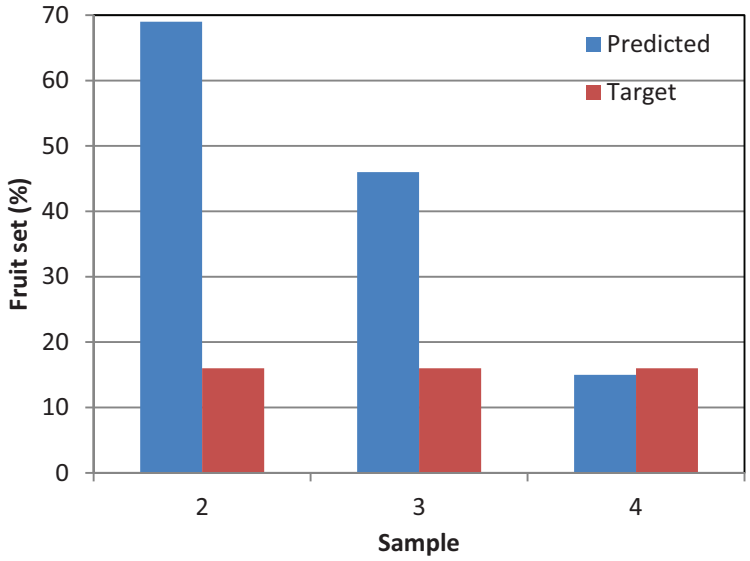

Figure 2. Predicted fruit set (%) vs. target fruit set at three sampling periods.

The Malusim carbohydrate excess/deficit model as calculated on NEWA was (or should have been) used to guide chemical thinning applications, and the outputs are shown in Figures 3 and 4 for Tougas Family Farm and UMass Cold Spring Orchard, respectively.

For each of the varieties at both locations, results of the spreadsheet outputs are summarized in Tables 1 and 2, for Tougas Family Farm and UMass Cold Spring Orchard, respectively. Chemical thinning applications are presented in each table, and results are discussed for each location.

Conclusions per Variety at Tougas Family Farm

McIntosh at harvest had 90 apples left on trees (actual count in August), which is below the target number of 125 identified in the spring. In retrospect, the target was probably too high and the final crop load was quite acceptable according to the grower. The predicting-fruit-set protocol worked well in general in this case.

Table 1. Predicted fruit set for three varieties at Tougas Family Farm.

Variety	Spurs per tree (number)	Target fruit number (%)	May 20 Predicted number (%)	May 24 Predicted number (%)	May 31 Predicted number (%)	June 3 Predicted number (%)
McIntosh	125	120 (24%)	265 (53%)	282 (56%)	194 (39%)	123 (25%)
Gala	105	100 (25%)	-	285 (71%)	215 (54%)	135 (34%)
Honeycrisp	100	45 (10%)	-	380 (84%)	217 (48%)	104 (23%)

Chemical thinning applications at Tougas Family Farm:

- McIntosh: AmidThin 7 oz. per acre at late bloom/early petal fall. Maxcel 100 ppm on 5/25. Carbaryl 1 quart applied 6/3. One hand-thinning run-through.
- Gala: Promalin (1 pt. per acre) applied 5/4 and 5/11. Maxcel (100 ppm) applied 5/25 or 26. Carbaryl (1 qt.) applied after 5/31 measuring. One hand-thinning run-through.
- Honeycrisp: AmidThin 7 oz. per acre at late bloom/early petal fall. Maxcel 100 ppm on 5/25. Carbaryl 1 qt. applied 5/31. Hand thinning twice.

Table 2. Predicted fruit set for three varieties at the UMass Cold Spring Orchard.

Variety	Spurs per tree (number)	Target fruit number (%)	May 26 Predicted number (%)	June 2 Predicted number (%)	June 8 Predicted number (%)
McIntosh	90	75 (20%)	328 (88%)	191 (51%)	115 (31%)
Gala	85	65 (16%)	275 (69%)	183 (46%)	60 (15%)
Honeycrisp	55	45 (16%)	224 (81%)	115 (42%)	51 (19%)

Chemical thinning applications at UMass Cold Spring Orchard:

- McIntosh: NAA 2 oz. per acre (5 ppm) plus Maxcel 75 ppm on 5/26. Carbaryl (1 qt.) applied 6/4.
- Gala: carbaryl (1 pt.) plus Maxcel (75 ppm) applied 5/29. Carbaryl (1 qt.) applied 6/4.
- Honeycrisp: NAA 2 oz. per acre (5 ppm) plus Maxcel 75 ppm on 5/26. Carbaryl (1 qt.) applied 6/4.

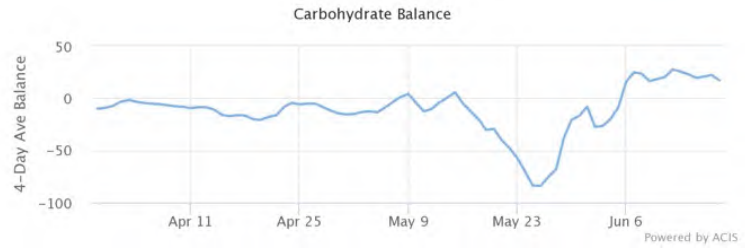

Figure 3. Malusim carbohydrate model estimates through the spring at Tougas Family Farm.

Figure 4. Malusim carbohydrate model estimates through the spring at UMass Cold Spring Orchard.

Gala at harvest had 80 apples left on trees (actual count in August), 20% less than the target number identified in the spring. Tougas Family Farm felt, however, that the number of apples left on these Gala was just about right.

Honeycrisp at harvest had 55 apples left on trees (actual count in August), which is slightly above the target number identified in the spring. The predicting-fruit-set protocol worked well in general, indicating the need for more chemical thinning, but that last carbaryl application did not do too much because hand thinning was needed twice in this Honeycrisp block.

Conclusions per Variety at UMass Cold Spring Orchard

McIntosh: on July 11, a fruit count on each spur was made which resulted in 56 fruits left on 50 spurs.

With a potential of 250 fruits, that is 22% fruit set. A total of 553 fruit remained on the 5 data trees at harvest, an average of 111 fruit per tree. This is pretty close to the predicted number of fruit setting of 115 on June 8, but far above the target of 75. There were too many small fruit, 120-count or smaller. The April freeze and subsequent drought may have contributed to the small-fruit situation in addition to the heavier than desired crop load.

Gala: on July 11, a fruit count on each spur was made which resulted in 26 fruits left on 50 spurs. With a potential of 250 fruits, that is 10% fruit set, which is below the prediction. A total of 535 fruit remained on the five trees at harvest, an average of 107 fruit per tree. This is far more than the predicted number of fruit setting on Sample 4 (June 3), which was 60. Obviously, the spurs used were not representative of the trees. As a result, there were way too many small fruit, 120-count or smaller, left on the tree at harvest. Additional thinning was needed despite the predicting-fruit-set model. The last thinning application of carbaryl alone on June 4 was largely ineffective at removing any more fruit. Note the high carbohydrate balance (Figure 4) following this chemical thinning application.

Honeycrisp: on July 11, a fruit count on each spur was made which resulted in 35 fruits left on 50 spurs. With a potential of 250 fruits, that is 14% fruit set, which is very close to the fruit set prediction. But, a final fruit count at harvest resulted in 35 apples left on the trees. This is below the target fruit number per tree. It is likely the April freeze killed some flower buds, and that resulted in less fruit than the predicting-fruit-set model predicted. The model may not work so well in years where buds were damaged by weather extremes. Also, with fewer number of spurs tagged and measured (10 vs. 15), that increases the chance of choosing "bogus" spurs that may not be particularly representative of the trees.

Considerations for Future Use

- Increasing efficiencies and accuracy in counting flowering spurs, tagging spurs, and measuring fruits is needed. For example, a smartphone app to improve measuring efficiency would help.
- Accurately counting the number of flowering spurs and deciding on the appropriate crop load is important for the predicting fruit set protocol to work properly.
- If "bogus" spurs are used/measured, i.e., they are not representative of the tree, the predicting-fruit-

McIntosh trees used in the precision thinning demonstration at harvest at the UMass Cold Spring Orchard.

set calculations are compromised. Reducing the number of spurs counted from the recommended 15 adds to the risk of error in prediction.

- Although time consuming, it is valuable to go through the process of measuring and tracking fruit growth. The process adds greatly to the "seat of the pants" approach to chemical thinning and precision crop load management.

Thanks to Mo and Andre Tougas of Tougas Family Farm for assisting in tagging spurs and measuring fruits.

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