PROJECT TITLE

Evaluation and demonstration of organic sweet cherry production using precocious dwarfing root stock, the super spindle axe training system and high tunnels.

PROJECT SUMMARY

- The objective of this proposal is to evaluate promising and novel sweet cherry production methods (precocious, dwarfing root stocks trained using the super spindle axe method, in high tunnels) to mitigate late spring frost damage and bird damage while increasing yields. The knowledge gained from this farm scale trial will be shared with western slope fruit growers looking for ways to reduce production risk and improve their farms’ bottom lines.

- Background: Sweet cherry can be a profitable crop for Colorado fruit growers, however, spring freeze events are common, resulting in significant losses for sweet cherry growers. Mitigation of spring freeze damage using high tunnel technologies promises to reduce crop losses. Coupled with the use of precocious dwarfing root stocks and novel training systems, Colorado sweet cherry growers may be able to bring trees to full production in half the time traditional cherry production requires. Acceleration of production reduces maintenance costs over time. High tunnels provide frost mitigation and also provide infrastructure for hail and bird netting – two other concerns of sweet cherry growers. In Europe, high tunnels are being used to manage the timing of cherry harvest, allowing growers to bring fruit to market ahead of the main season,
resulting in higher prices for their fruit. All of these attributes add to the probable benefit of using high tunnels for growing cherries in western Colorado.

- Research trials evaluating the performance of sweet cherries on dwarfing root stocks grown in high density plantings around the country are showing great promise. Musacchi, Lang, Robinson, Whiting, and others have reported high yields of sweet cherry in as few as 3 years after planting. However, the varieties in high demand in Colorado (Bing, Lapin and Black Gold grown on Gisela 5 and Gisela 12 rootstocks) have not been evaluated. Researchers from Michigan State University, Cornell University and Oregon State University have indicated that these combinations of root stock/ scion, with novel training systems are likely to succeed, pointing out that the use of high tunnels in Colorado is likely to produce significantly different results than might be expected at their research sites.

**PROJECT APPROACH**

**Year 1: Tree establishment**

Soil tests obtained in the late winter of 2014 indicated soil fertility was reasonable but inadequate for optimal growth of sweet cherry trees. Composted poultry yard waste was applied in bands (approximately 10 ton/ac) where trees were to be planted. The compost was then disced into the soil providing the required nutrients for strong initial growth.

A tractor drawn tree planter was used to plant trees approximately 4 feet apart in-row. Tree rows were spaced 10 feet apart.

*Figure 1 Tree planting.*
Immediately following planting the trees were watered-in by hand, and a hanging micro-sprinkler system was connected to previously plumbed main lines that are connected to the farm’s pressurized irrigation system. The trees received micro sprinkler irrigation every 3 days for the following month.

Figure 2 Installation of irrigation.

All of the trees were topped to the height of 4 feet.

Establishment was excellent, no trees were lost.

Three varieties of sweet cherry (Bing, Lapin, Black Gold), all on Gisela 5 rootstock, were planted. No trees of these varieties on Gisela 12 root stock were available.
A series of watermark soil moisture sensors were installed at varying depths and in each of the three varieties. Water tension was observed, and after initial establishment weekly irrigation of 12 hours maintained water tension at less than 40 centibars – well within optimal ranges for tree growth.

Weeds were removed by hoe to maintain a weed free zone approximately 2 feet wide throughout the season.

A 9 foot tall trellis was built to support the trees when they begin fruiting. In the first year the trellis was used to suspend the irrigation system.
The aisle-ways between the tree rows were sown with Dutch white clover and perennial rye grass.

Tree growth was excellent throughout the season without additional fertility application (table 1). Soil tests taken in the fall will determine applications in 2015. No foliar analysis was done on account of the good growth and appearance of the trees.

Side shoots were pruned back to a length of 6-8 inches throughout the summer to encourage basal fruit bud development. A single leader was allowed to grow with the objective of producing a 8-9 foot tall tree. This height was attained.
Tree height and cross sectional measurements were taken at planting and at leaf fall in November. Ten trees were identified (every fifth tree) from each variety to be evaluated over the period of the study. Tree height growth was measured from the point at which the transplanted tree had been topped after planting to the final height at the end of the 1st growing season. Tree trunk diameter was measured 12 inches above ground level using a homemade device.

![Figure 7 Measuring tree height growth.](image)

![Figure 8 Measuring truck diameter.](image)

**Table 1 Height and diameter growth of sampled trees (inches).**

<table>
<thead>
<tr>
<th>Variety</th>
<th>Avg. height growth (inches)</th>
<th>Avg. diameter trunk growth (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Gold</td>
<td>57.1</td>
<td>0.23</td>
</tr>
<tr>
<td>Lapin</td>
<td>48</td>
<td>0.20</td>
</tr>
<tr>
<td>Bing</td>
<td>45</td>
<td>0.50</td>
</tr>
</tbody>
</table>
Pest management was limited to preventative fungicide applications (organic approved materials). Other pests were not significant and did not merit treatment.

Trees of a different root stock (Krymsk 6) were ordered for planting in 2015 to compare with Gisela 5 rootstock.

Hobo temperature loggers will be purchased and installed this fall to measure winter and spring temperatures.

GOALS AND OUTCOMES ACHIEVED

The establishment of the trees was very successful and growth achieved in the first year was on target for early fruiting. Measurements showed uniform development across all varieties, with Black Gold showing the greatest vigor. As the project proceeds into the 2nd and 3rd years, winter hardiness, frost tolerance in early spring and performance under high tunnels will provide valuable information to regional fruit growers.

BENEFICIARIES

The Western Colorado Horticultural Society has asked to include Osito Orchard in the 2016 bus tour during their annual conference. We look forward to presenting the outcomes of the early stages of this project.

LESSONS LEARNED

The unavailability of specific rootstock/variety combinations was frustrating, but reasonable alternatives were found and utilized. This sort of obstacle is common when investigating new production methods and the outcomes of this project will be unique because we were unable to exactly replicate studies done in other parts of the world. Additional plantings will occur in the spring of 2015, with another precocious rootstock (Krymsk 6), for comparison with the Gisela 5 rootstocks used in the 1st planting. Again, this is a variation from the original plan based on availability of rootstock/variety combinations that should provide comparable results to those proposed.

The establishment of a cover crop in the aisle ways established very well with microsprinkler irrigation. Soil preparation was minimal, and the seed thrown with a small hand held broadcaster after which a pass with a light cultivator incorporated the seed into the soil. The cover crop was mown several times during the summer providing additional organic matter.

High tunnel building is planned for the fall of 2015, challenges in this process are yet to be seen.
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