

**FINAL PROJECT REPORT****WTFRC Project Number: PH-05-500****(WSU Project #13C-3655-6299)****Project Title:** Branch induction in pear trees with bioregulators**PI:** Don C. Elfving**Organization:** WSU Tree Fruit Research and Extension Center**Telephone/email:** 509-663-8181 x252/delfving@wsu.edu**Address:** 1100 N. Western Avenue**City:** Wenatchee**State/Province/Zip:** WA 98801**Cooperators:** Dwayne Visser, WSU-TFREC**Other funding Sources****Agency Name:** N/A**Total Project Funding:** 2005: 6,950 2006: 7,407 2007: 7,864**WTFRC Collaborative expenses: NONE****Budget History:**

<b>Item</b>	<b>Year 1: 2005</b>	<b>Year 2: 2006</b>	<b>Year 3: 2007</b>
<b>Salaries</b>	4,500	4,750	5,000
<b>Benefits</b>	1,530	1,615	1,700
<b>Wages</b>	200	220	240
<b>Benefits</b>	20	22	24
<b>Equipment</b>	0	0	0
<b>Supplies</b>	200	200	200
<b>Travel</b>	500	600	700
<b>Miscellaneous</b>	0	0	0
<b>Total</b>	6,950	7,407	7,864

### **Objectives of the project:**

1. Determine the effectiveness of cyclanilide® as a soil-based, branch-induction treatment on young, vigorous pear trees in the year of planting in the orchard.
2. Determine whether proprietary cytokinin/gibberellin mixtures such as Promalin® or Maxcel® can be used prior to or at budbreak on vigorous, one-year-old wood to stimulate lateral branching in spring.
3. Compare pruning requirements for branched trees vs. those managed normally.
4. Establish one or more trials to assess the benefit of a multi-year branching treatment strategy on canopy development, pruning requirements and the onset of flowering and productivity.
5. Examine cytokinin and gibberellin treatments alone or in combination for stimulation of growth activity in latent buds on pear branches.

### **Significant findings 2005:**

1. Application of cyclanilide to newly-planted 'Bosc' pear trees by soil drench resulted in minor growth effects on the central leader but no change in shoot or bud development in 2005.
2. Notching or scoring of bark on one-year-old, vigorous, upright 'Bartlett' pear shoots plus painting those cuts with 5,000 ppm Perlan (cytokinin/GA mixture) doubled branch development compared to untreated trees or trees receiving notching or scoring cuts only. Notching or scoring alone had no effects.
3. Increased fruit production in 2005 in 6<sup>th</sup>-leaf 'Bosc' trees was directly related to increased branching induced by spray applications of cyclanilide in June, 2003 (Fig. 1).
4. Soil drenches of cyclanilide as low as 50 – 150 milligrams of active ingredient per tree produced carryover effects on branching in the year following treatment applications. Pear trees are extremely sensitive to cyclanilide.
5. In a test of soil drenches of cyclanilide on newly-planted trees of five pear cultivars on several rootstocks in Oregon, cyclanilide again showed modest effects on shoot development, likely as a result of the relatively low vigor of these trees as they established their root systems in their first year in the orchard.

### **Significant findings 2006:**

1. Application of cyclanilide to newly-planted pear trees by soil drench is ineffective for increasing lateral branching.
2. In a test of soil drenches of cyclanilide on newly-planted trees of five pear cultivars on several rootstocks at the Mid-Columbia Agricultural Research and Extension Center (MCAREC) in Hood River, Oregon, cyclanilide treatments at 5-20 mg/tree in 2005 produced no carryover effects in 2006.
3. Increased fruit production in 2005 in 6<sup>th</sup>-leaf 'Bosc' trees was directly related to increased branching induced by spray applications of cyclanilide in June, 2003. No effect of 2003 cyclanilide treatments on yield was observed in 2006.
4. Soil drenches of cyclanilide as low as 50 – 150 milligrams of active ingredient per tree produced carryover effects on branching in the year following treatment applications. Pear trees treated with 5-20 mg/tree of cyclanilide do not show carryover effects.

### **Significant findings 2007:**

1. By the third year in the orchard, 'Golden Russet Bosc'/OHxF97 trees did not respond as strongly to soil applications of cyclanilide at 5, 10 or 20 mg/tree. Even trees treated in 2005, 2006 and 2007 with 20 mg cyclanilide per tree did not show strong secondary branching. Evidently more work needs to be done to determine how larger tree mass affects the sensitivity of pear trees to soil-applied cyclanilide.
2. Five pear cultivar/rootstock combinations treated with cyclanilide in fall 2006 with the same 5, 10 or 20 mg/tree did not produce the desired control over vigor and increase in branch development,

emphasizing the idea that cyclanilide dose probably needs to be determined based on trunk cross-sectional area.

3. 'Bosc' trees treated in 2004 with higher doses of soil-applied cyclanilide (50 to 150 mg/tree) did not show any significant effect on fruit production in 2007 as a result of the very strong branching response in both 2004 and 2005 to cyclanilide applications.
4. Basal limb sections of both 'Bosc' and 'Kalle' (Red Clapp's) showed enhanced budbreak with applications of either thidiazuron (TDZ) at 2,500 ppm alone or TDZ + GA<sub>4+7</sub> (ProVide) at 5,000 ppm. ProVide applied alone had no effect on latent bud development.
5. In an unusual observation, the combination TDZ/ProVide applications soaked under the flagging tape tied onto the limbs and stimulated cell division in the area under the flagging tape. This response is being explored for possible useful applications.

## Results and discussion

### A. Effectiveness of cyclanilide as a soil-based branching treatment (Objectives 1, 4).

Cyclanilide was shown to be ineffective when applied the year of planting. This result almost certainly is related to the virtual absence of a functional root system at the time of planting. By the time a root system has developed, the chemical product has dispersed or degraded. Applications starting in year 2 are very effective if the correct amount is applied. Overdosing is possible. Insufficient trials have been run to determine precisely how much cyclanilide is needed to produce good branching without overdosing. Also, as trees get larger, more cyclanilide may be needed. Spray application of cyclanilide to pear trees can produce a similar branching response without having to be concerned with absolute amounts of active ingredient,

### B. Impact of cyclanilide on productivity (Objective 4).

Cyclanilide sprays on 4<sup>th</sup>-leaf 'Bosc' trees in 2003 led to yield increases in 2005 directly related to the amount of cyclanilide, which, in turn, was directly related to the amount of secondary branching developed (Fig. 1).

Unfortunately, the improvement in yield seen in 2005 was not observed in either 2006 or 2007. Similarly, in another trial in which 'Bosc' trees received strong doses of cyclanilide, yield was not improved despite substantial effects for 2 years on shoot development. Since tree training was not practiced on trees in either trial, might implementation of better canopy-management strategies led to a different outcome?

### C. Cytokinin/gibberellin effects on lateral branching (Objective 2).

Notching or scoring of one-year-old wood at budbreak did not improve branching. Painting either notches or scores with Perlan doubled the amount of branching over that occurring in control trees or those receiving only notching or scoring.

### D. Compare pruning requirements for branched trees vs. those managed normally (Objective 3).

'Bosc' trees subjected to branching by soil-applied cyclanilide showed an increase in number of spring pruning cuts required per tree in direct proportion to the amount of applied product.

### E. Stimulation of bud activity on "blind wood" in pear (Objective 5).

Thidiazuron (TDZ), a powerful cytokinin, was tested for efficacy in stimulating growth from latent buds on older limb sections (three to five year-old wood) of 'Kalle' (Red Clapp's Favorite) pear trees. TDZ at up to 1000 ppm did not produce significant changes in bud development on treated limb sections.

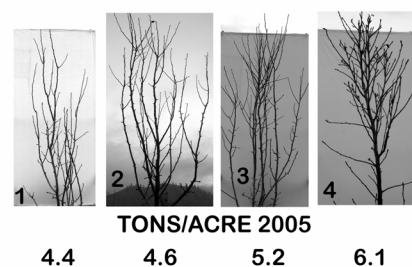


Fig. 1. 'Bosc' trees sprayed in June, 2003 with 0 (1), 5 (2), 10 (3) or 20 (4) ppm cyclanilide to induce branching. Photos taken fall, 2003.

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**Publications 2007:**

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