

Improving Crop Yield and Soil Quality with Mulches and Cover Crops

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Objectives

- Evaluate availability and efficacy of locally available mulch materials.
- Generate mulch materials in the orchard.
- Improve spray-on mulch for multi-year weed control.
- Evaluate plant species for in-row living mulch.

Locally available wood waste mulch in new planting

In a recent survey (Kuchta and Hogue, 2002) wood waste products were found to be one of the most readily available mulch materials in BC. A trial in a grower orchard, therefore, was initiated in 2003 to evaluate the efficacy of two commonly available wood wastes (Figure 1).



Figure 1. Comparing the efficacy of lumber mill waste ("hog fuel") and coarsely chipped pine to shredded paper, for weed control and soil moisture conservation in a newly planted Ambrosia/M.9 apple orchard, 2003 (photo 12 weeks after planting).

All three mulches provided good full season weed control but only "hog fuel" significantly increased growth. Check plots required an application of glyphosate after the 4 week evaluations and all plots were treated after the 12 week evaluations. Very few weeds had come through any of the mulches and those that did were mostly along the plot edges.

Generating mulch materials in the orchard

Three trials were conducted, two in Summerland and one in Wenatchee, to measure biomass production in orchard alleys that could serve as tree row mulch material.

Multiple harvests were difficult to obtain in 2 sites because of interference of other management practices. At one site (Summerland A) biomass measurements from 4 of 5 mowings provided 0.78 kg/m² (3.47 tons/A) yield of dry matter (Figure 2).



Figure 2. The third of 4 cuts of alley vegetation at Summerland Site.

A trial at the Wenatchee Valley College orchard established in 2002 demonstrated that a yearly application of 1.5 kg/m² of grass hay provided season-long weed control (Figure 3).



Figure 3. Weed control provided by 1.5 kg/m² of spring applied hay mulch to the rows of an established apple orchard.

A high density apple orchard with a 3.5 metre row spacing, a full 2m wide alley cover crop and a biomass productivity equivalent to that of the Summerland site of 0.78 kg/m² could, therefore, provide the required 1.5 kg/m² mulch material for a one metre row width (2:1 factor).

Improved spray-on mulch technology for multi-year weed control.

Modifications to a trial to evaluate underlays initiated in 2002 were made in spring 2003 by substituting polyethylene vegetable mulch in 2 treatments with a very economical polypropylene landscape fabric fully permeable to water. These, and all other underlay treatments provided excellent full season weed control (Figure 4).

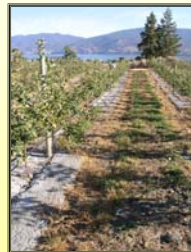


Figure 4. Excellent full season weed control was provided by spray-on mulch over polypropylene landscape fabric (photo Oct. 15/03)

Spray-on Trials in Grower Orchards

Three grower orchard spray-on mulch trials initiated in 2001 were continued in 2003. As in 2002, after controlling weed escapes resulting from overwintering effects on the mulch, spray-on mulch was re-applied at all three locations.



Figure 5. Weed control in spray-on mulch re-application plots at Peachland site, Oct. 21/03.

At all sites weed control was improved each year in the spray-on mulch plots and weed growth was minimal throughout the 2003 season. At the Peachland site spray-on treatments implemented in a newly planted orchard in 2001, in addition to providing season-long weed control (Figure 5), also significantly increased tree vigour.

Plant material for in row living mulches

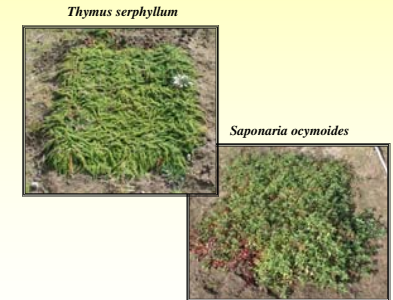
a) *Equisetum arvense* as a living mulch. A trial was conducted in an established grower orchard (Braeburn/M.9 and Gala/M.9), in Summerland with established stands of *Equisetum arvense* (field horsetail). Plots with *E. arvense* and plots without were either kept free of weeds with glyphosate application or allowed to grow weeds until late summer. Weed pressure in all plots was low. Plots with *E. arvense* were essentially free of all annual weeds for the entire growing season (Figure 6).

Tree vigour and crop yield data could not be obtained but leaf N measurements in plots with and without *E. arvense* supported observations that competition of this cover crop is, if anything, minimal.



Figure 6. Established stand of *Equisetum arvense* in a non-herbicide tree row inhibited growth of annual weeds for the entire season (photo taken July 9/03)

b) **Dwarf ground cover establishment.** Thirty 2x2 cm plugs of six dwarf ground cover species (*Cerastium tomentosum*, *Arabis alpina*, *Cerastium alpinum*, *Saponaria ocymoides*, *Sedum spatulifolium* and *Thymus serpyllum*) were planted 10 cm apart in 0.9x1.2 m sprinkler irrigated plots in spring 2003.



Saponaria ocymoides filled in the open spaces the fastest and provided good weed control relatively early in the season. *Thymus serpyllum* and *Arabis alpina* also showed good spreading ability and definite potential for competing with germinating weeds. The *Cerastium tomentosum* starting material was not as good quality as the other species, but once established spread rapidly. This preliminary trial, therefore, indicated that four species warrant further evaluation as candidates for living mulches.

Summary and Conclusions

1. Locally available wood waste mulches can provide season-long weed control in new plantings, with spot treatments of escapes, particularly at mulch edges.
2. Preliminary trials indicated that growing sufficient biomass in the alleys for in-row mulching is possible providing there is a) a good stand of a suitable cover crop, b) management practices to promote cover crop growth and c) a method of harvesting and delivering the biomass on the tree row efficiently.
3. Yearly re-application of spray-on mulch increased its weed controlling efficacy appreciably.
4. Various underlays, including a light landscape fabric or a compost layer, increased the long term efficacy of spray-on mulch and replaced the need for yearly re-applications.
5. A strong stand of *Equisetum arvense* greatly reduced the annual weed populations in the tree row without significant competition to established apples in a high density planting.
6. Several dwarf creeping ornamental species established rapidly, providing complete ground cover and preventing annual weed growth.

Acknowledgements

We gratefully acknowledge the financial support of the Washington Tree Fruit Research Commission and Agriculture and Agri-Food Canada's Matching Investment Initiatives. We thank the Wenatchee Valley College and Allan Bros. for the use of their orchards to conduct our trials.

Literature Cited

1. Kuchta, S. and E.J. Hogue. 2002. Mulch Materials for Okanagan Valley Fruit Growers. 4 pp.