Spawn Control: What We Know and What We Need to Find Out

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Red Raspberry Production

- Eastern Europe as a whole produces most of the world's raspberries
 - Taken together, Western European production is usually ranked in the top three countries
 - US production is similar to Western Europe
- In the US, Washington state ranks first in production of red raspberries (~90% of total US production)
 - OR 5 million pounds
 - BC 18.5 million pounds
 - WA 55.5 million pounds
- In WA, 87% of raspberries are produced in extreme northwestern WA











The State of Washington raspberry production areas













WARNING!! Do Not Mix These Techniques Together!

Some Background

- Spawn control is the practice of chemically removing the first primocanes produced by field-grown raspberry plants in the spring
- The practice was first tried by a raspberry grower in British Columbia in the early 1970's
 - Scientists in Washington and Oregon began to investigate shortly afterwards
 - Became an aid to machine harvest of the predominant (and vigourous!) raspberry variety
 'Willamette' using the herbicide dinoseb
- It is now commonly practiced in red raspberry production in many parts of the world

Spawn Control: A Good Idea Whose Time Had Come?

- Lawson and Wiseman (1979) noted effects of alleyway suckers on cane and fruit production (the first true spawn control trial in Scotland!)
 - Lawson (1980) conducted studies on cane
 vigour control
 - Lawson and Wiseman (1982) evaluated chemical cane vigour control (settled on dinoseb for vigourous 'Glen Clova')

Why Control Spawn?

- There are several general benefits to this practice
 - First, it reduces shading of floricanes by primocanes, potentially resulting in more photosynthates for berry production and fewer for vegetative growth (= increased yield)
 - Second, it may decrease the labor involved in pruning and training overly long or numerous primocanes during the dormant season



Why Control Spawn?

- Third, early-season primocane suppression may increase berry picking efficiency by thinning out the fruiting canopy and increasing the percentage of fruit caught by machine harvest equipment
- Fourth, spawn control in Scotland reduced injury from:
 - Cane botrytis (*Botrytis cinerea*)
 - Spur blight (*Didymella applanata*)
 - Raspberry cane midge (*Resseliella theobaldi*) and associated cane blight or midge blight (*Leptosphaeria coniothyrium*)



'Meeker' after dormant-season diclobenil treatment



'Meeker' after dormant-season diclobenil treatment followed by carfentrazone treatment

Does Spawn Control Increase Yield?

- Spawn control was reported in early 1980's to increase yield in red raspberry cultivars with average to high vigour, such as 'Willamette', 'Chilcotin', 'Nootka', and 'Skeena'
 - Northeastern US cultivars 'Titan' and 'Royalty' also showed good yield response
- Yield increases ranged from 0 to 12%, depending on the year and the cultivar
- Lawson and Wiseman (1983) reported that 'Glen Clova' 5-year average yield increased by 38%

What Has Changed?

- Over the 25+ years since these trials:
 -'Willamette' has been almost completely
 - replaced in the US
 - 'Glen Clova' has been almost completely replaced in Scotland
 - Spawn control has not been evaluated in a systematic way for many recentlydeveloped cultivars





Cultivars Weren't The Only Change

- Berry harvesting machinery has also changed tremendously
 - With new designs, are harvest efficiencies still appreciably improved by spawn control?

Korvan Harvester



Littau Harvester

- What is the effect on hand-harvested fruit?

What About the Herbicides?

- Dinoseb registration was cancelled in US in 1987 (in UK in 1988)
- Lawson and Wiseman (1989) dinoseb replacement studies evaluated paraquat, diquat, tar oil, sodium hydroxide, freezing, and mechanical removal
 - "Propane gas and sulphuric acid treatments are worth further consideration, but have a number of important drawbacks"
- Howard et al. (1989) evaluated oxyfluorfen, lactofen, dinoseb, acifluorfen, and glufosinate
 - Oxyfluorfen was registered for this use in the US

Combination Effects?

- Dinoseb had been shown to reduce raspberry plant vigour after several consecutive years of use, and growers were concerned whether the same was true with oxyfluorfen
- So we tested tested oxyfluorfen in 'Meeker', as well as the soonto-be-labeled carfentrazone and glufosinate over three years in Vancouver, WA



Primocane Counts, Year #3

no./plot



Seasonal Primocane Growth With Oxyfluorfen Mixes, 2001



Seasonal Primocane Growth With Carfentrazone Mixes, 2001



Seasonal Primocane Growth With Glufosinate Mixes, 2001



What About The Weeds?

- Improved weed control is also sometimes offered as a reason to chemically suppress primocanes
 - While weed control is improved by spawn control compared to nontreated raspberries, residual herbicides can control annual weeds at least as well as spawn control herbicides

- Perennial weeds? No difference





Weed Control August

%



What's Current in Spawn Control?

- Spawn control trial in WA (2010-2012)
 - Effect of herbicides on 'Meeker' and 'Cascade Bounty'
 - Effect of non-registered "new" herbicides (pyraflufen, and saflufenacil) compared to carfentrazone and glufosinate on other "new" raspberry cultivars ('Chemainus' and 'Saanich') in addition to 'Cascade Bounty' compared to 'Meeker'
- Spawn control trial in Scotland (2012)
 - Effect of herbicides on fruit quality of tunnel-grown
 'Glen Ample' (with JHI and Peter Marshall)
 - Also a blackcurrant trial testing the effect of weeds ('Ben Hope') and herbicides ('Ben Dorain') on fruit quality (with JHI and Andrew Husband)

Preliminary Conclusions, WA Trials

 Spawn control increased yield of 'Meeker', but not 'Coho' or 'Cascade Bounty'

 Nonsignificant increase in 'Coho', less with 'Cascade Bounty'

- Weed control by August was poor when only spawn control herbicides were used
- Training efficiency was better with spawn control in 'Meeker' in 2010, but not for 'Cascade Bounty'; no difference in 2011
- Study to be complete in 2012

Tunnel-Grown 'Glen Ample'

• Yield data are still being collected, but berries have tended to be larger and earlier with more intensive control

Average berry weight (g/fruit)





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'Meeker' after oxyfluorfen treatment

Three-Year Raspberry Yield



Mid-season Weed Control

%



2000

2001

2002

WA Spawn Control Trials

Graduate Student Yushan Duan

M.S., 2011

WA Spawn Control Trials Off Station

• Treatments:

 Carfentrazone, oxyfluorfen, terbacil, carfentrazone + terbacil, oxyfluorfen + terbacil, nontreated

• Cultivars:

- 2010 'Meeker' and 'Coho'
- 2011-12 'Meeker' and 'Cascade Bounty'
- Measurements:
 - Primocanes, berry yield, and weed control

WA Spawn Control Trials On Station

- Treatments:
 - Carfentrazone, oxyfluorfen, nontreated
- Cultivars:
 - 2010-12 'Meeker' and 'Cascade Bounty'
- Measurements:
 - Primocanes, floricanes, berry yield, and weed control
 - Time for pruning and training

Raspberries were machineharvested at least ten times each season

Total Berry Yield Off Station Trial

kg/ha

12000 NS 10000 а а Carf а 8000 ab ab Oxy Terb 6000 b NS Carf + Terb 4000 Oxy + Terb None 2000 0 Meeker Coho **Cascade Bounty** 2010-11 2011 2010

Total Berry Yield On Station Trial

Pruning and Training Time On Station Trial, 2010 only

hours/person/ha

Tunnel-Grown 'Glen Ample'

• Yield data are still being collected, but first two berry samples tended to be larger and earlier with more intensive control

Total berry weight (g/fruit)

