



Under-Vine Cover Crops as an Alternative to Herbicides in Vineyards

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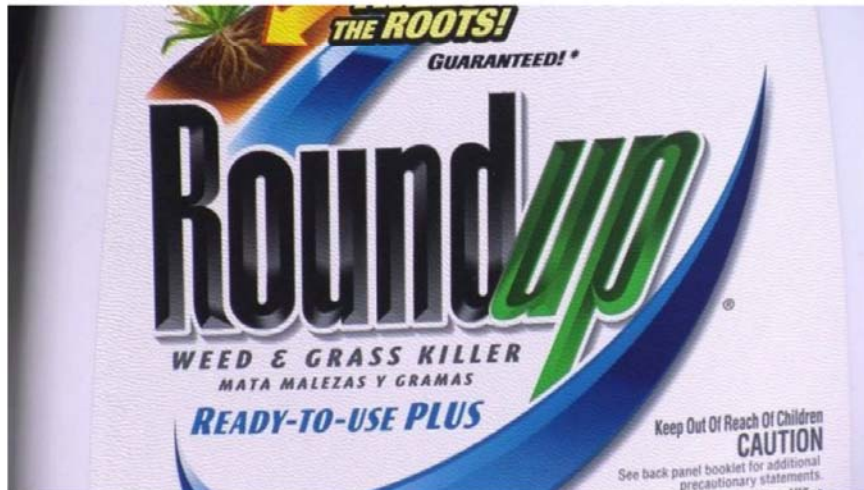
Dept. of Horticulture, Cornell University

Current management



World Health Organization's International Agency for Research on Cancer classified glyphosate as a probably carcinogen

by Betty Palmer | @ | November 17, 2015 7:52 pm



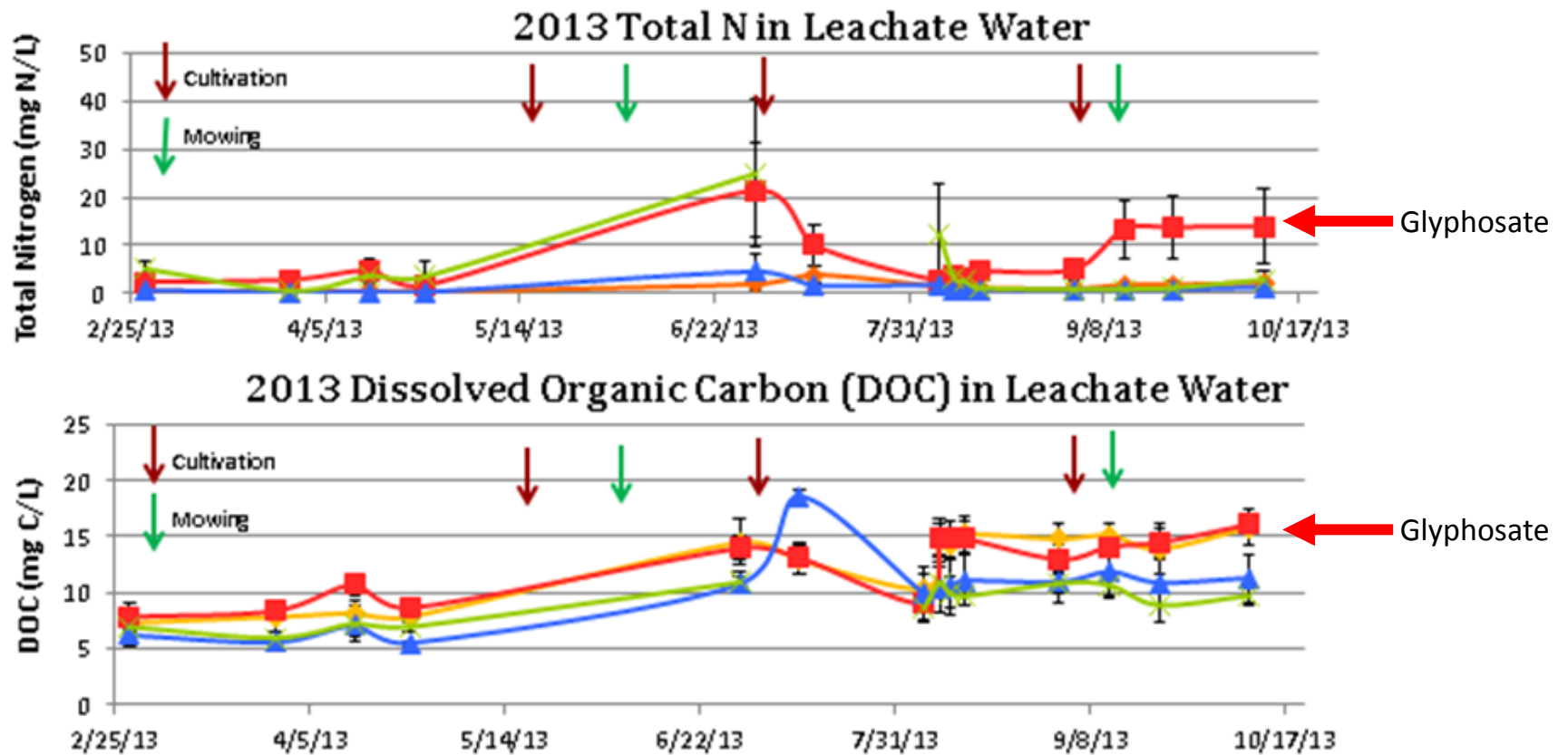
Agent	Activity (current status)	Evidence in animals	IARC classification
Glyphosate	Herbicide (currently used; highest global production volume herbicide)	Sufficient	2A (probable)
Malathion	Insecticide (currently used; high production volume chemical)	Sufficient	2A (probable)
Diazinon	Insecticide (restricted in the USA and EU)	Limited	2A (probable)
Parathion	Insecticide (restricted in the USA and EU)	Sufficient	2B (possible)
Tetrachlor-vinphos	Insecticide (restricted in the EU and for most uses in the USA)	Sufficient	2B (possible)

Why not herbicide?

- Negative effects on long-term soil health
- Nutrient leaching
- Vigorous vine growth, increased management costs
- Herbicide resistant weeds



Why not herbicide?



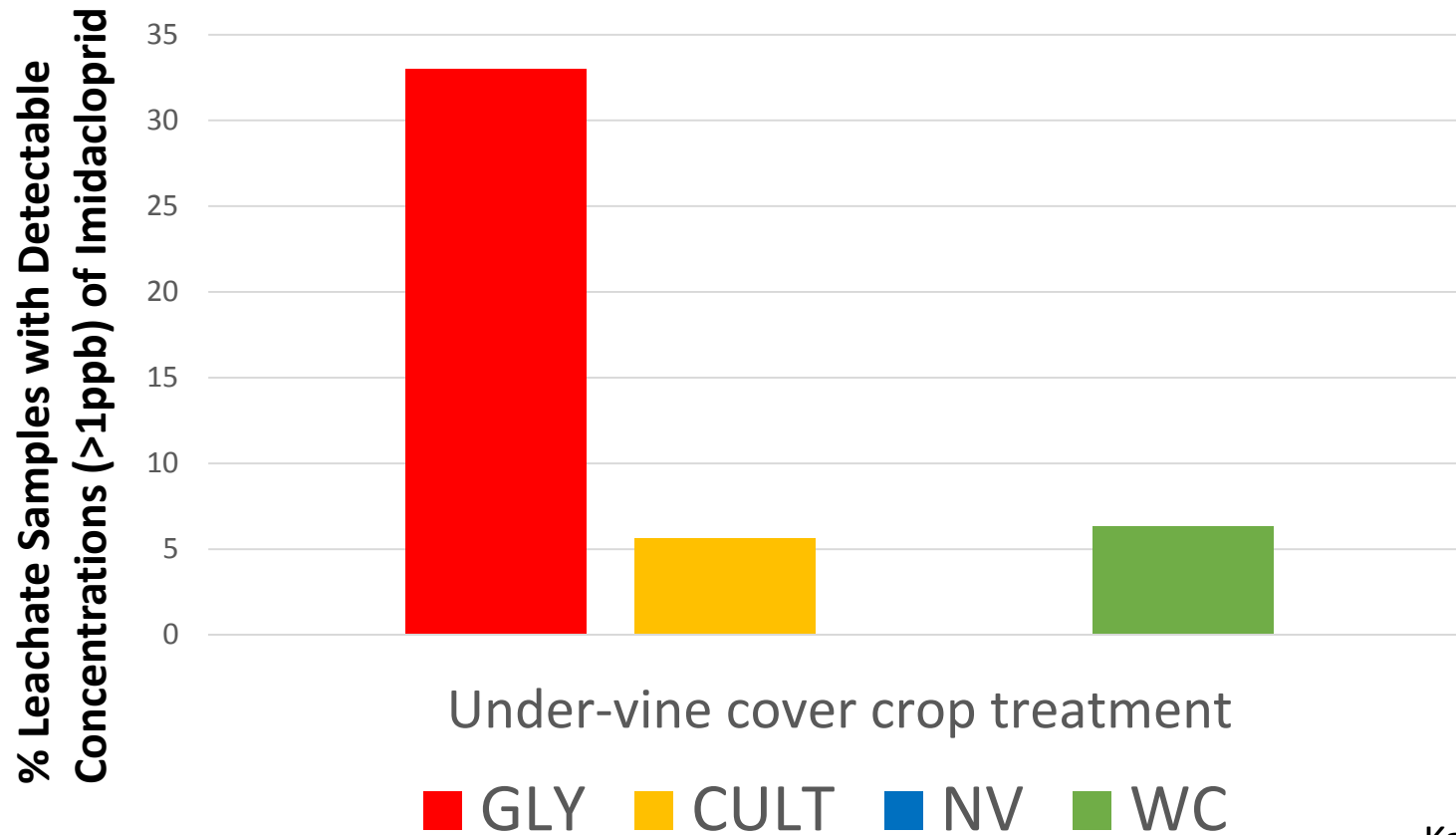
Total Carbon and Nitrogen concentrations in leachate water, for 2012.
 CULT=Cultivation, GLY=Glyphosate, NV= Native Vegetation, WC=White Clover.

Nitrogen and DOC leaching from Glyphosate under-vine floor treatment

Karl et al 2014

Why not herbicide?

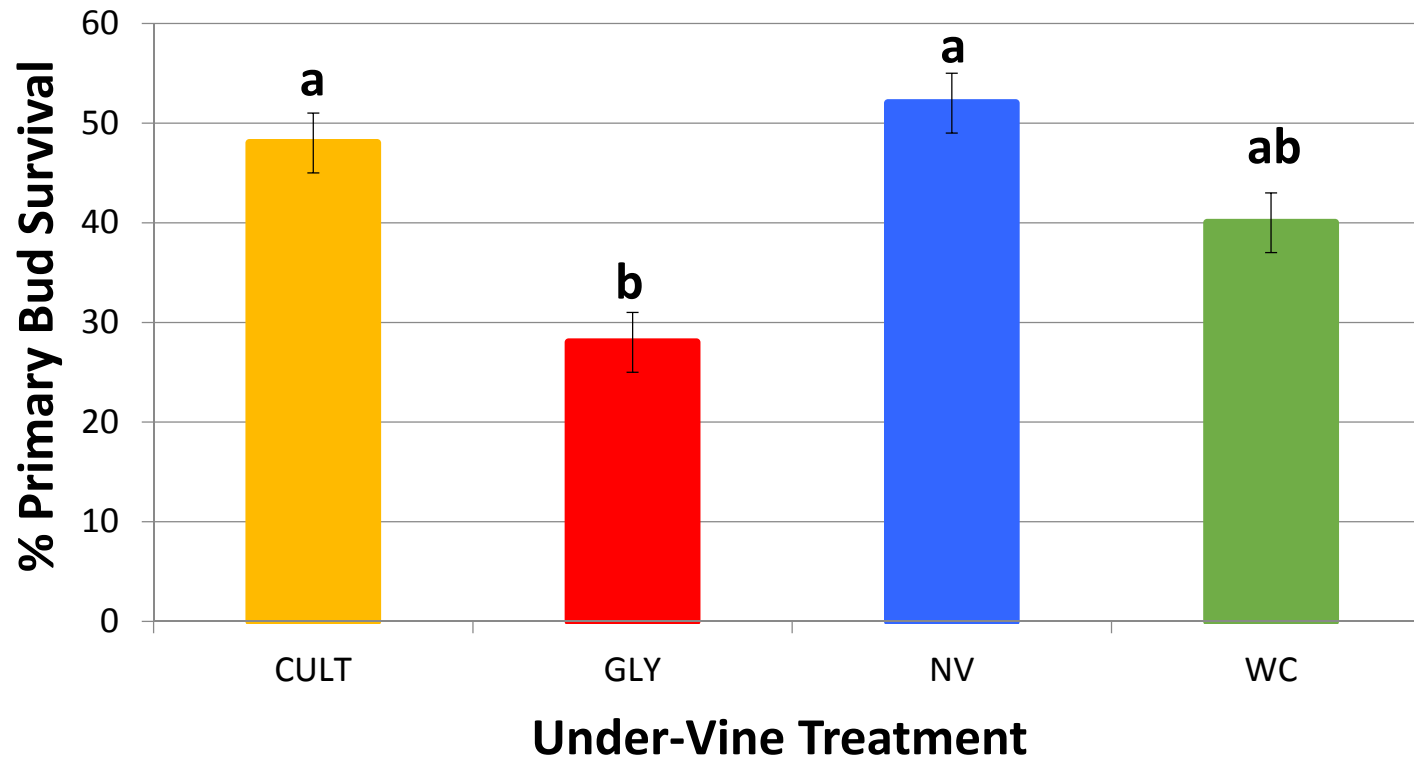
High detectable insecticide in leachate water from Glyphosate treatment



Karl et al 2014

Why not herbicide?

Primary bud survival rate reduced by Glyphosate



Average primary bud survival measured on 5/10/2014. CULT=Cultivation, GLY=Glyphosate, NV= Native Vegetation, WC=White Clover.

Alternatives to herbicide strips



Problem with cultivation/tillage



https://www.youtube.com/watch?feature=player_embedded&v=ToKavHhu4PE

Problem with cultivation/tillage

- Increases soil compaction (especially when soil is wet)
- Degrades soil structure
- Increases organic matter decomposition
- Increased runoff and erosion
- Uses a lot of energy/fossil fuel



Van Es 2015

Smith et al 2008

Under-vine cover crop experiments at Cornell

- **Riesling**
Glyphosate, Native vegetation, Cultivation, Chicory, Buckwheat and Annual rye grass
- **Cabernet franc**
Glyphosate, Native vegetation, Cultivation, Chicory, White clover, Tall fescue, Alfalfa and Tillage radish
- **Noiret**
Glyphosate, Native vegetation, Chicory, Tall fescue, Alfalfa, Tillage radish and seed-mix









Under-vine cover crop impacts on vine size



❖ No impact on vine size:
Buckwheat



❖ Reduction in vine size:
Blue chicory

Chicory reduces pruning weight v.s Buckwheat maintains vine size

Treatment	2013	2014
GLY	1.41	1.16
CHI	0.63	0.84
BW	1.15	1.24
	kg/vine	

Pruning Weights (kg/vine) of treatment vines.
GLY=Glyphosate, CHI=Chicory, BW=Buckwheat

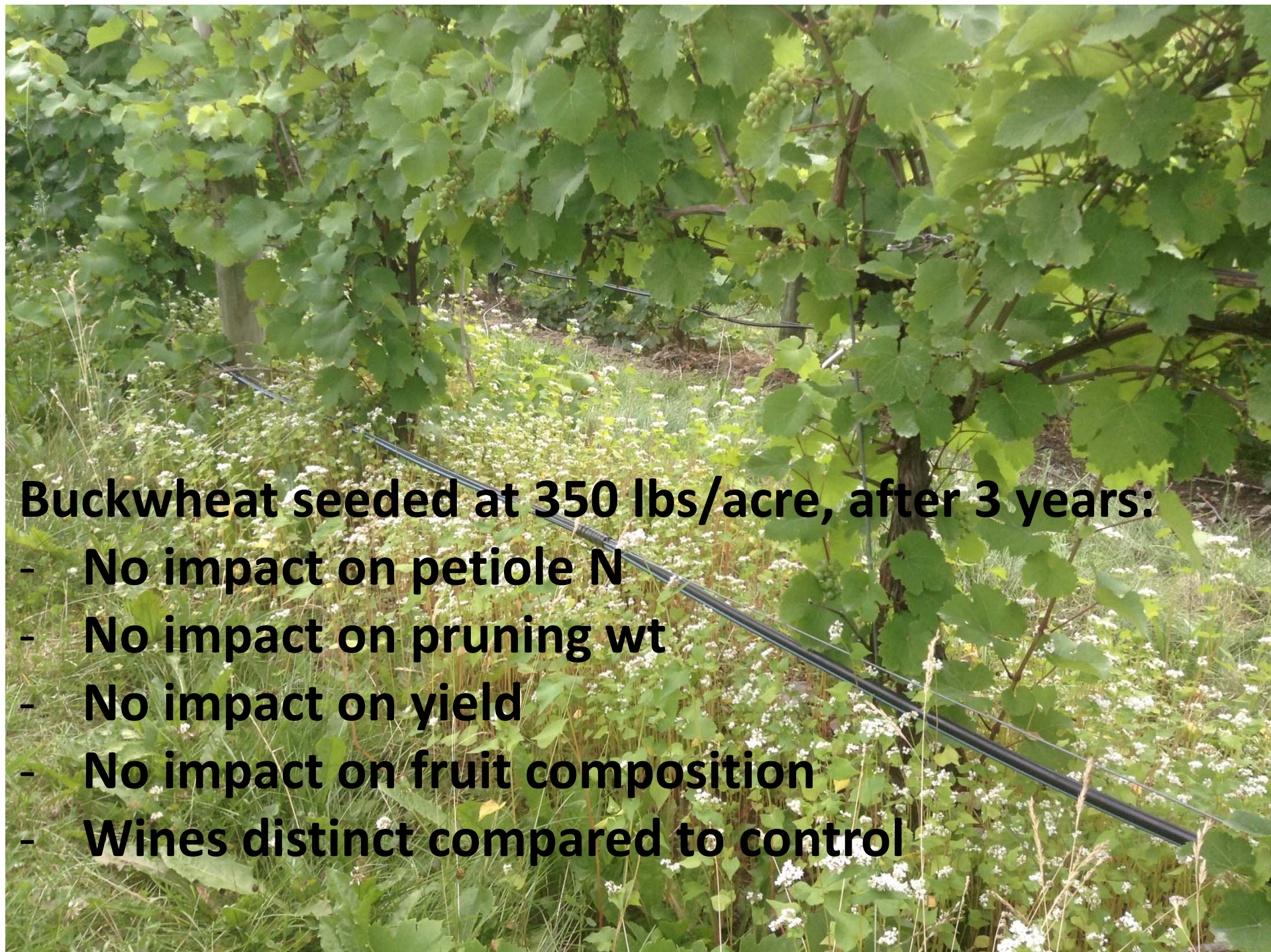


Tim Martinson



Chicory seeded at 5 lbs/acre, results after two years:

- Decrease in petiole N of ~15%
- Decrease in pruning wt of ~28%
- Decrease in yield of ~28%
- Decrease in TA of 1 g/L
- Wines distinct compared to control



Buckwheat seeded at 350 lbs/acre, after 3 years:

- **No impact on petiole N**
- **No impact on pruning wt**
- **No impact on yield**
- **No impact on fruit composition**
- **Wines distinct compared to control**



Glyphosate

Chicory

Impact on cost of production

- Herbicide costs \$128/acre per year (Yeh et al., 2014)
- Buckwheat seed cost = \$75/acre
- Blue chicory seed cost = \$27/acre
- Cost of seeding?
- Cost of mowing?
- Potential savings on canopy management?



Under-vine floor management cost

Description	Value	
Glyphosate	222	\$/acre
Cultivation	419	\$/acre
Cover Crops	68	\$/acre

Glyphosate= application*2+spot application

Cultivation= till*4

Cover crops= seeding+mowing*4

Thank you

Feel free to contact us if you have any related questions or thoughts!

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Yield: kg/vine

Treatment	2011	2012	2013
CULT	5.4 ab	2.8 b	6.5 ab
GLY	5.8 a	5.1 a	7.7 a
NV	5.2 ab	2.6 b	6.0 b
WC	4.1 b	3.0 b	7.4 a
p-value	0.03	<0.001	0.01



Yield (kg/vine) of treatment vines. CULT=Cultivation, GLY=Glyphosate, NV= Native Vegetation, WC=White Clover.

Partial Budget Analysis

