

Cover Crops Effects on Grape Yield and Yield Quality, and Soil Nitrate Concentration in Three Vineyards in Ontario Canada

Mehdi Sharifi (AAFC, Summeland, BC),
Kathryn Carter, Scott Baker, Anne
Verhallen, and Deanna Nemeth



Cover crops in vineyards

- Essential services: water infiltration, carbon sequestration, nutrient supply and retention, weed suppression, biological control agents, microbial activity and diversity, and reduction of soil erosion.
- Positive effects on yield and/or sensory attributes and soil function are reported.
- Results variable among years, and under influence of grape varieties, growth stages, cover crop species and management, climate, and soil resource availability and properties



Cover crops in vineyards

- Interest in reducing herbicide application by adopting in-row cover crops
- Cover crops are increasingly adopted by the temperate region grape growers.
- Concerns about water and nutrient competition between cover crops and grapevines.
 - N competition: early in the season
 - Water competition: late in the season
 - Root distribution
- **Research needs:** to introduce suitable cover crop species for each region and develop management practices that address trade-offs between provided services and competition for resources need.



Annual Ryegrass + Forage Radish



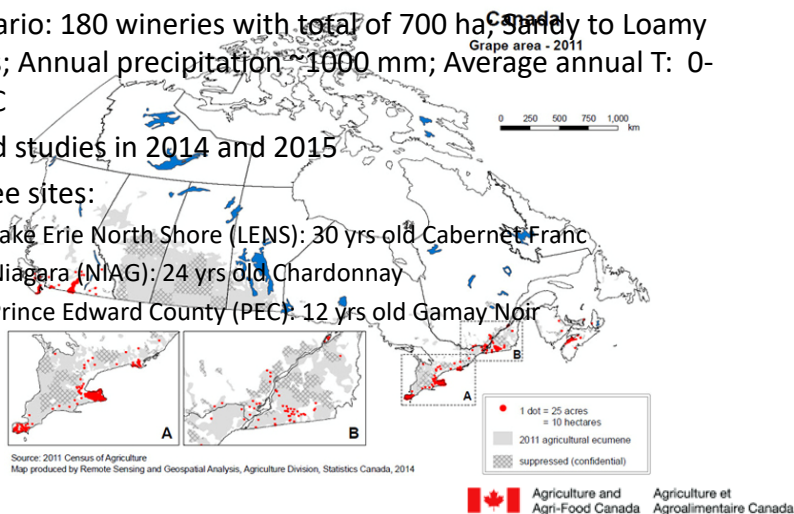
Objectives

- to screen a number of cover crops for their establishment and performance, in three grape growing regions of Ontario Canada
- to evaluate their impacts on yield and yield quality, soil properties, and nitrogen dynamics



Methods

- Ontario: 180 wineries with total of 700 ha, Sandy to Loamy soils; Annual precipitation ~ 1000 mm; Average annual T: 0-12°C
- Field studies in 2014 and 2015
- Three sites:
 - Lake Erie North Shore (LENS): 30 yrs old Cabernet Franc
 - Niagara (NIAG): 24 yrs old Chardonnay
 - Prince Edward County (PEC): 12 yrs old Gamay Noir



Methods

- Cover crop treatments included:
 - annual ryegrass (AR; **control**)
 - annual ryegrass and red clover (AR + RC)
 - annual ryegrass and forage radish (AR + FR)
 - creeping red fescue and microclover (CF+MC)
 - Super Mix- oats(20%), Italian ryegrass (40%), red clover (10%) alfalfa (10%), alsike clover(10%), and forage radish (10%)

Methods

- Randomized complete block design with 3 replications.
- Planting date: early July
- Soil sampling for mineral N (0-30 cm) at:
 - Bud break
 - Bloom
 - Veraison
 - Harvest
- Cover crop sampling at : veraison and harvest
- Yield and yield quality (Brix, TA and YAN) at harvest



Annual ryegrass + Forage radish at Niagara site, 2014

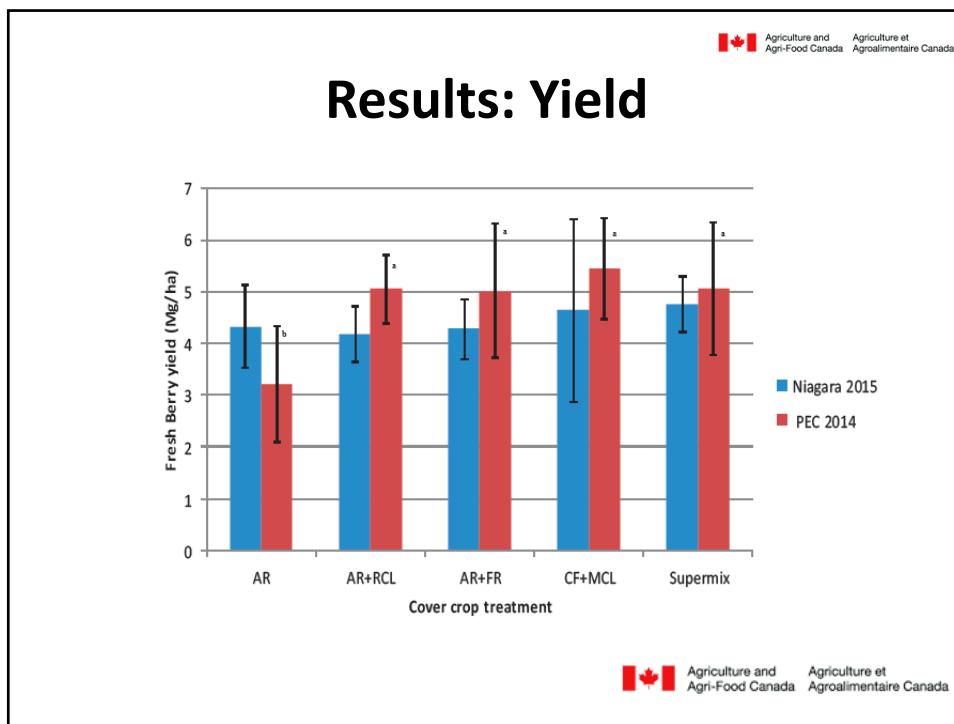


Soil Properties

Year	pH	Organic C (%)	Total N (%)	NH ₄ OAc K (mg P kg ⁻¹)	Olsen P (mg P kg ⁻¹)
PEC	5.79	1.3	0.11	149	21.2
Niagara	6.89	1.45	0.13	250	30.9
Lake Erie	7.94	1.5	0.22	235	19.6


Lake Erie July 2015



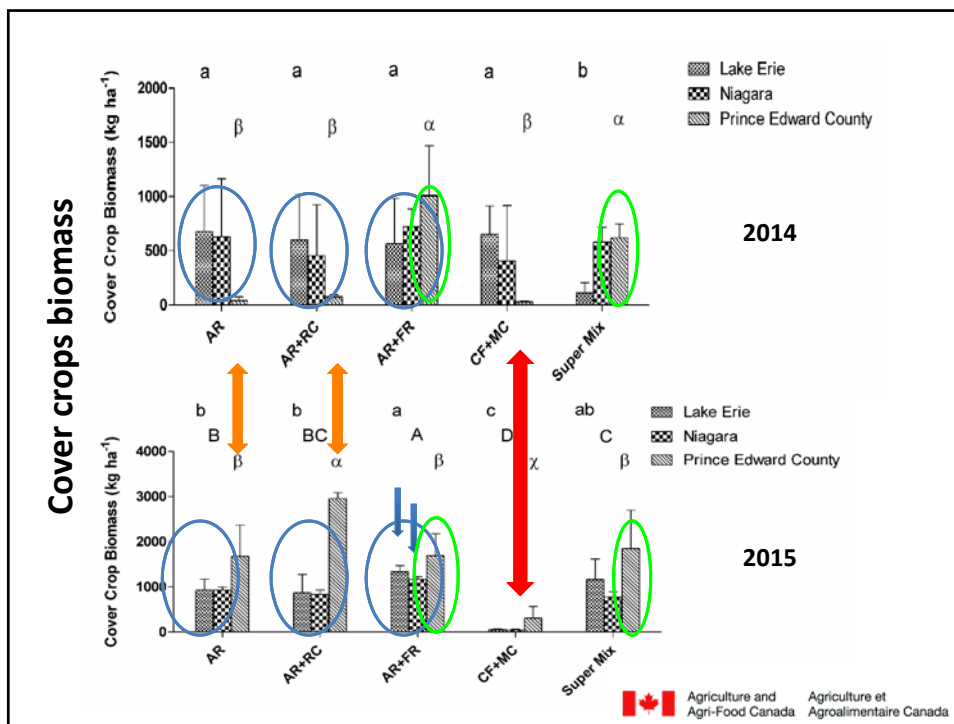


Yield quality parameters

SITE	Brix	pH	TA	YAN
PEC 2014	17.9-18.8	2.8	5.7-6.4	84-135
Niagara 2015	20.2-20.9	3.3	7.5-7.9	243-271



Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

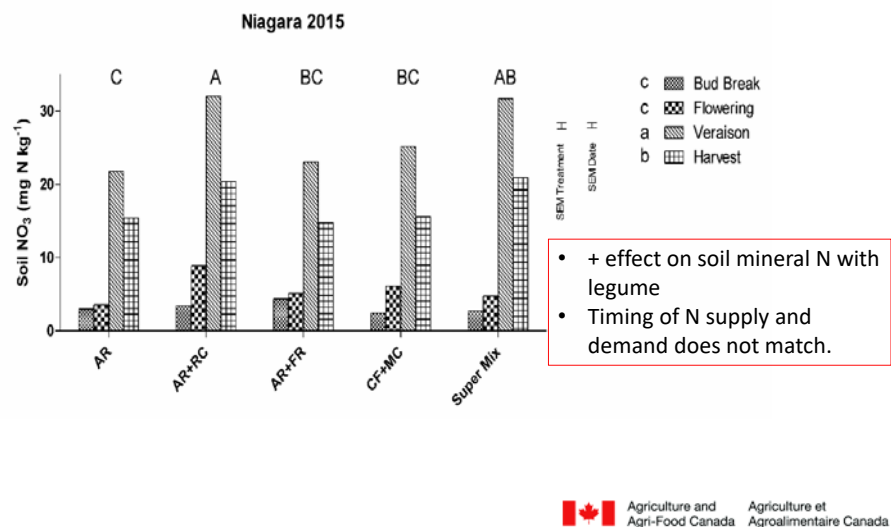


Nitrate concentration in 2014

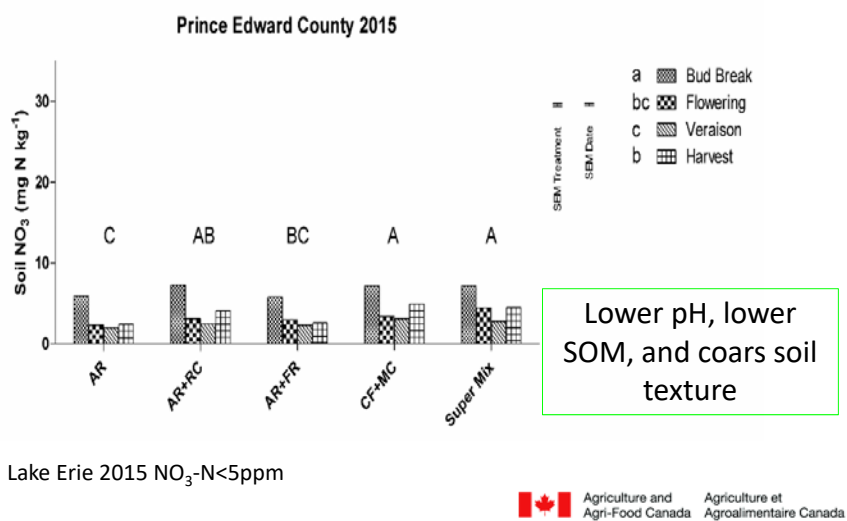
- Soil nitrate concentrations among treatments were not different in 2014.
- Lake Erie 2014 NO₃-N <3ppm
- Niagara Falls 2014 NO₃-N <10ppm
- PEC 2014 NO₃-N <5ppm



Soil nitrate concentration during the growing season in Niagara site in 2015



Soil nitrate concentration during the growing season in PEC site in 2015



Summary

- Grapes yields and yield quality were not affected by cover crop treatments except for PEC in 2014 (mixtures >AR).
- Dry cover crops biomass: mix cover crop \geq AR
- The AR+FR showed promising results (high cover crop biomass and weed suppression) with minimal cost differences from AR, but FR is annual.
- The CF+MC did not establish well in Ontario vineyards and SuperMix was too expensive.

Summary

- Weed suppression was greatest in cover crop treatments with high biomass.
- The differences in soil properties among treatments were not significant in two years.
- The interaction between soil properties, climate factors and cover crop establishment under southern Ontario climate need to be explored.

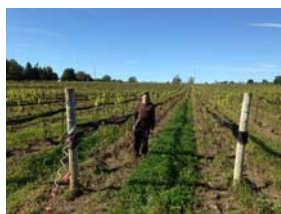


ACKNOWLEDGEMENT

Funding: Ontario Ministry of Agriculture Food and Rural Affairs and the Grape Growers of Ontario

Technical support: Dominic Marrocco, Kahlan Coates, Anisah Madden, Gerrit Boersma, Litza Coello.

Wineries: Hillier Creek Estates Winery, Colio Estate Winery and Lambert Vineyard



2015 climate data

