Grape yield and quality are influenced by vegetation cover management in vineyards

PromESSinG project : Promoting Ecosystem Services (ESS) in Grapes

The objective of PromESSinG project is to identify soil management options for promoting biodiversity linked ESS.

9 French vineyards originally covered with permanent herbaceous vegetation (destroyed in April 2015)

Vine agrosystem

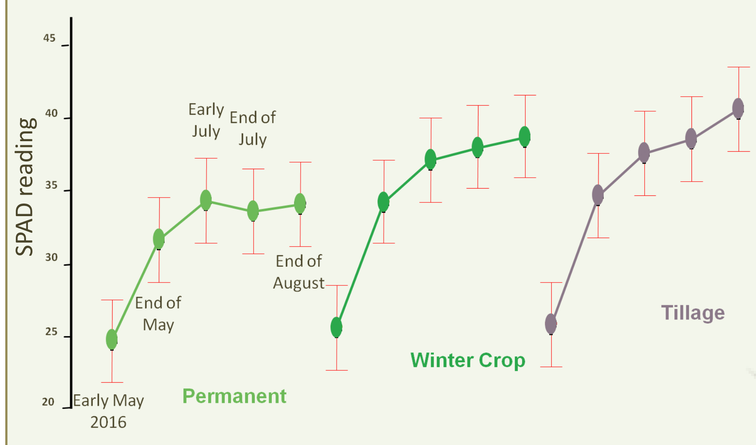
Measurements of soil perturbation effects on vine growth, yield and quality in 2016

- Leaf chlorophyll content in spring and summer using SPAD meter
(10 vines x 2 leaves x 3 values / treatment ; 5 dates)
- Water stress in summer : Schölander pressure chamber (5 leaves / treatment)
- *Botrytis* attack in September : 80 bunches observed / treatment
- Yield estimations in September: mean bunch weight (20 bunches) x mean bunches number (10 vines) x vine density
- Berry ripeness estimations in September 2016: 200 berries sampled

Soil management options: gradient of soil perturbation
permanent herbaceous cover, winter crop, tillage

Winter crop : vetch/oat mix (50kg/ha) ; sown in October 2015 / destroyed in May 2016

Leaf chlorophyll content

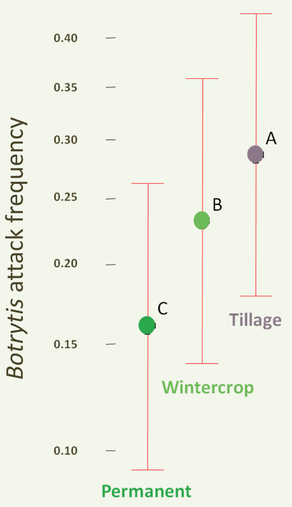


✓ **Permanent < Winter Crop < Tillage for leaf chlorophyll content values**
(all differences significant with *P*-values < 1.10^{-04} ***)

Vine water stress

✓ No significant difference between treatments for vine sensibility to water stress ➔ **strong heterogeneity between sites**

Vine sensibility to *Botrytis*



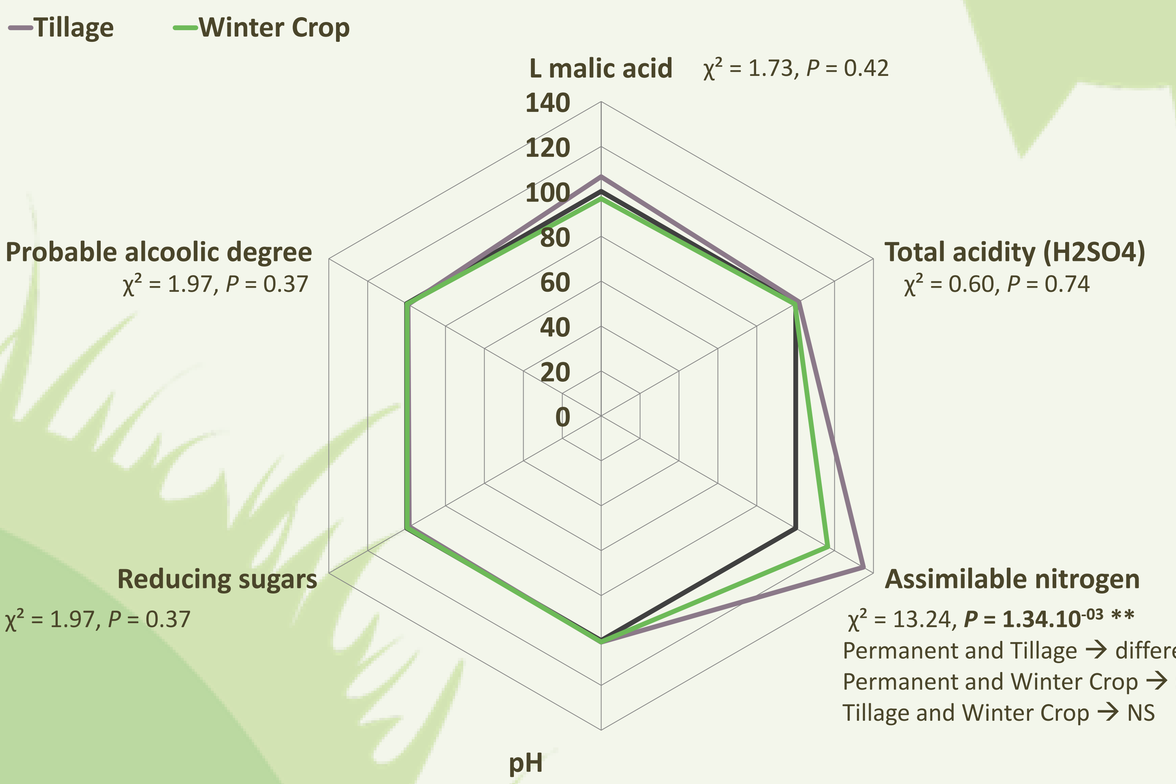
✓ ***Botrytis* frequency is lower with permanent cover** (ca.16% of bunches attacked) compared to winter crop (ca.23%) and tillage (ca. 28%)

✓ Vine attacks from *Botrytis* significantly increase with soil perturbation (all *P*-values < 0.025)

✓ **Attack intensities are also higher with soil perturbation** but not significantly

Ripeness and yield estimations

Comparison of berry ripeness parameters (%) in September 2016 (Permanent = 100%)

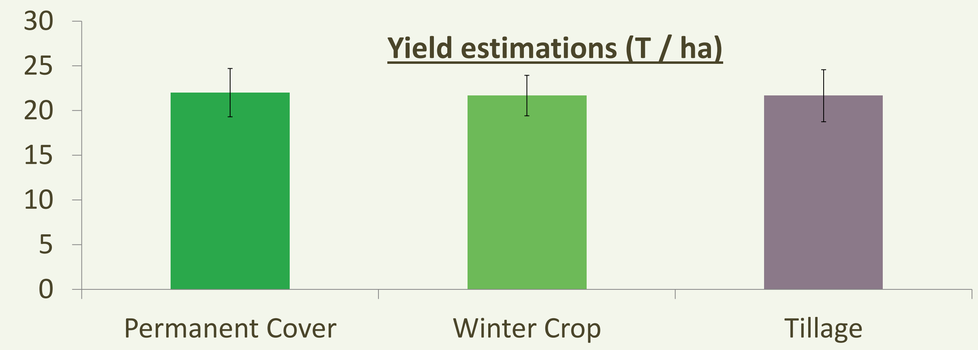


Mean values of berry ripeness parameters

	Permanent Cover	Winter Crop	Tillage	Reference values (Merlot Saint-Emilion)
L-malic acid (g / L)	1,4	1,4	1,5	< 2
Total acidity (g H_2SO_4 / L)	3,8	3,7	3,8	< 4
Assimilable nitrogen (gN / L)	**68,0**	**79,2**	**91,7**	90 < x < 130
pH	3,4	3,4	3,4	3,5
Reducing sugars (g / L)	218,8	218,1	215,8	200 < x < 220
Probable alcoolic degree (%vol.)	12,5	12,5	12,4	> 12,5

✓ Reducing sugars, total acidity, malic acid, and probable alcool rate reach **satisfactory values for grape harvest in each treatment** (no significant differences)

✓ **Assimilable nitrogen values are quite low in all treatments = the value** is only sufficient in the tillage treatment.



✓ **No significant difference in yield between the 3 treatments** (about 22 T / ha)

Conclusion/Discussion about the effects of soil management options on grape quality and quantity

✓ Leaf nitrogen content increase with tillage

✓**Surprising result! Winter crop implementation did not increase leaf nitrogen content**, probably because of a **« storage effect »** caused by oat, that is still not degraded 6 months after its destruction ➔ To be confirmed in 2017

✓ ***Botrytis* attacks increase with perturbation** (frequency attack on bunches =18 to 28%) ➔ microclimate or nitrogen nutrition of berries?

✓ **Quite strong water stress in every sites** because of dry climatic conditions during summer 2016 ➔ **No significant effect** of soil management

✓ Assimilable nitrogen concentration in berries significantly increases with winter crop and tillage treatments → strong effect of competition / soil characteristics ➔ **need to improve nitrogen plant nutrition in 2017**

✓ No significant differences between treatments for others technologic ripeness parameters. **Need to assess phenolic ripeness between soil management options in 2017**

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