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Managing nitrogen balance in cover-cropped vineyards

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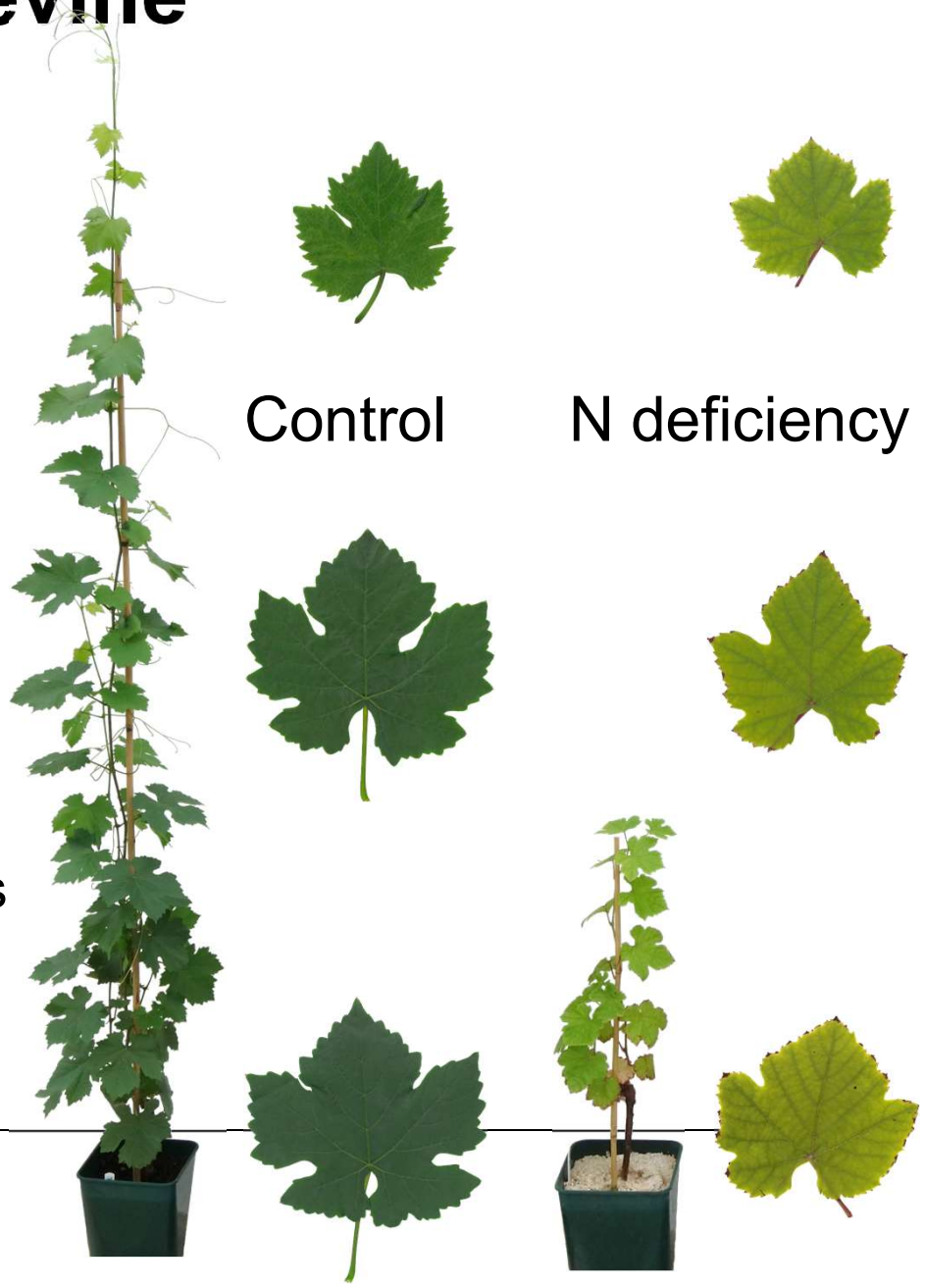
Crédit: J. Louvieaux, HEPH-Condorcet, CARAH, Belgique

Nitrogen in grapevine

- Under nitrogen deficiency

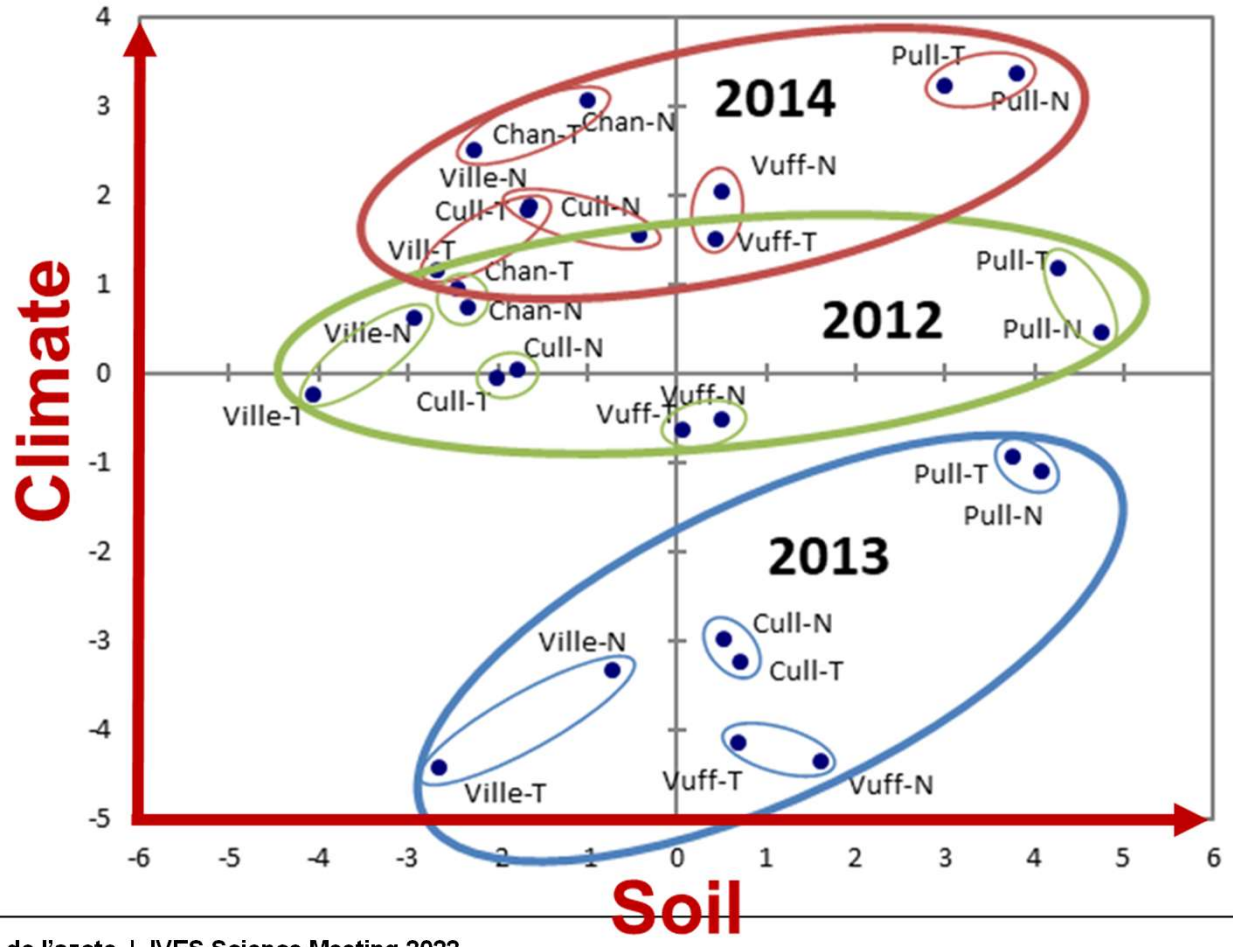
- Vineyard
  - ↓ Vigour
  - ↓ Yield

- Oenology
  - ↓ Fermentation kinetics
  - ↓ Aroma development



Impact of Climate and Soil

- Terroir study in Vaud, Switzerland, 2012-2014, Doral



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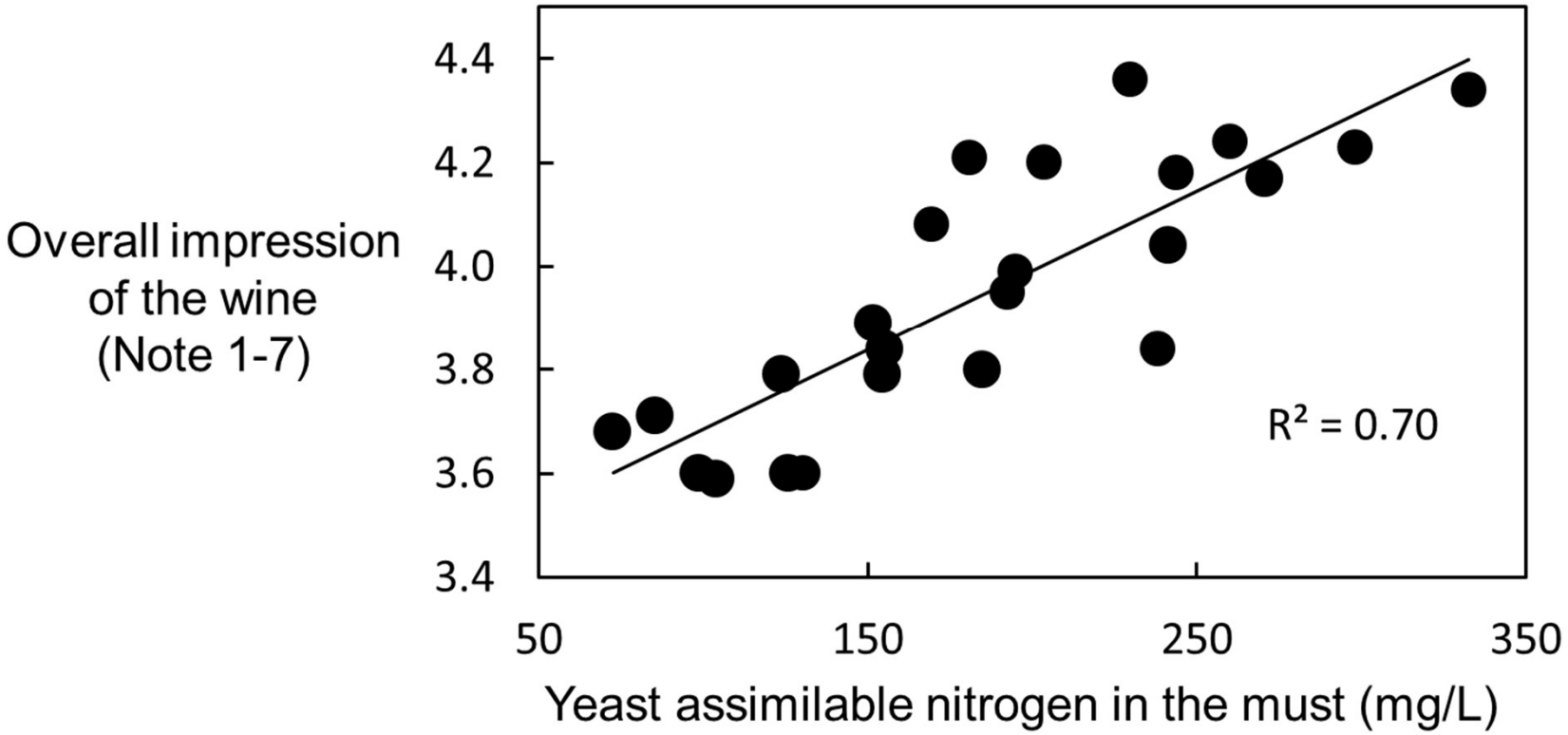

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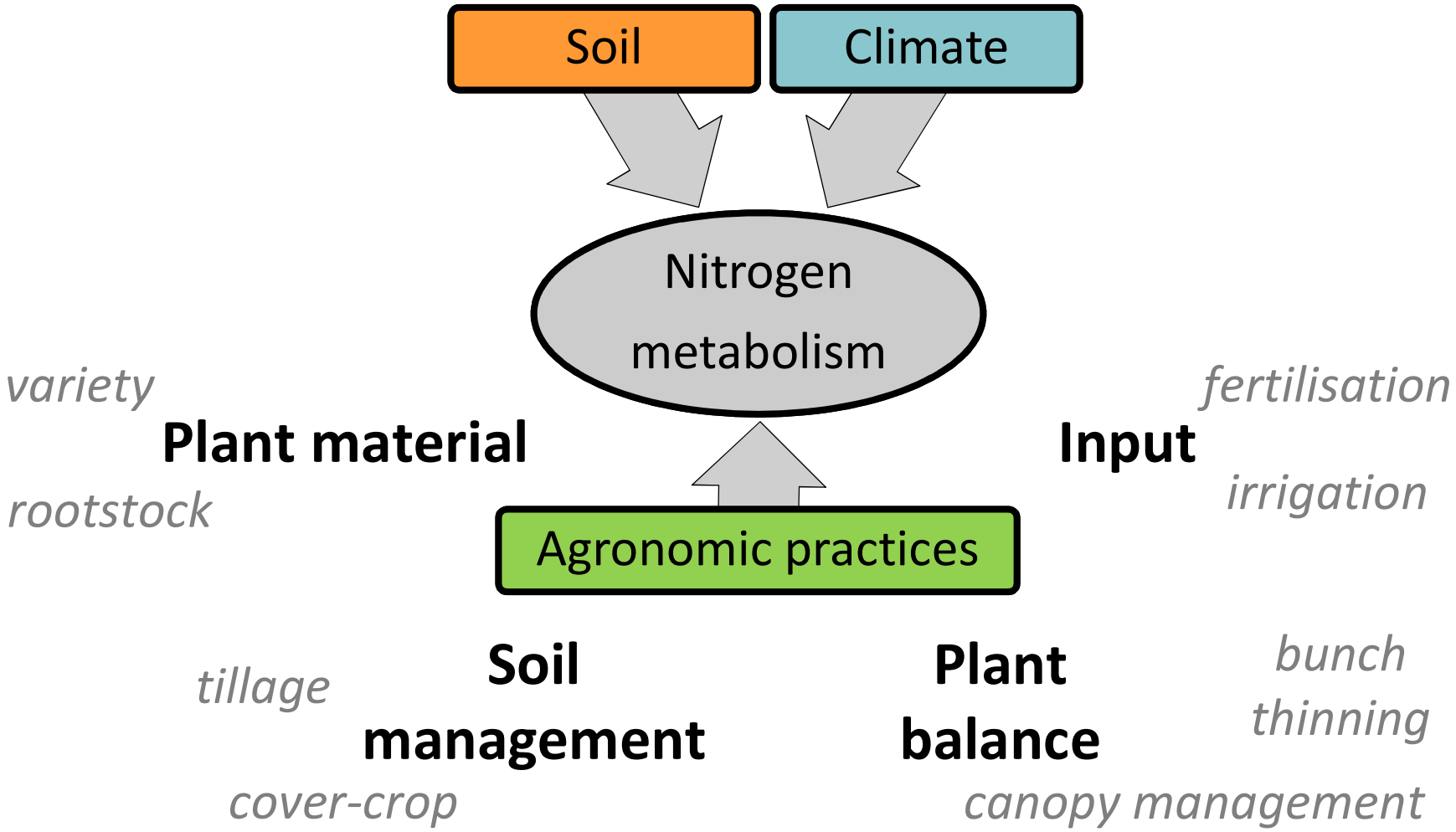
Factors of variation in nitrogen metabolism



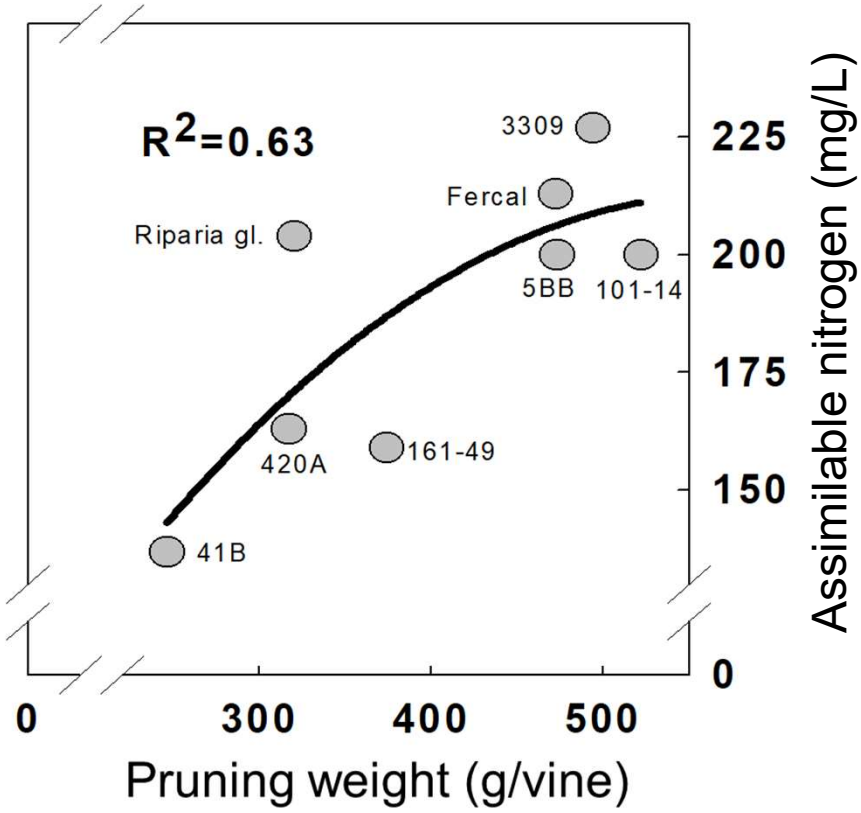
Vegetal material

- Trial on rootstocks,1999-2010

Pinot noir, Leytron

→ Ability to uptake nitrogen from the soil

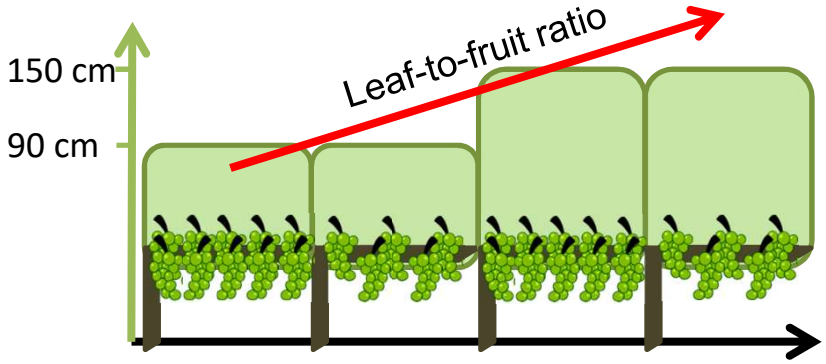
- As a function of
  - Soil
    - Structure, depth
  - Climate
    - Water accessibility
    - Temperature, light

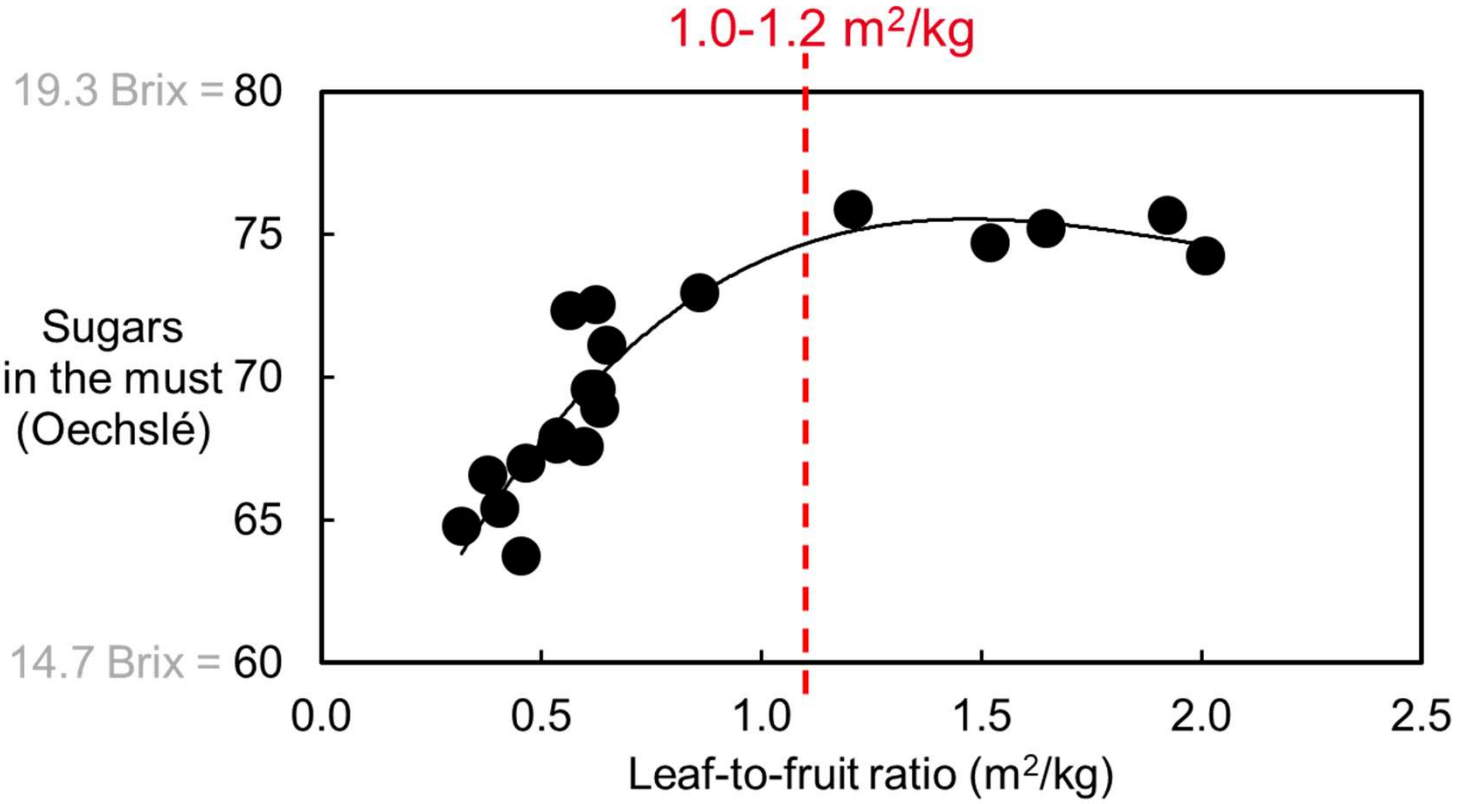


Leaf-to-fruit ratio

(m^2 of leaves per kg of fruits)

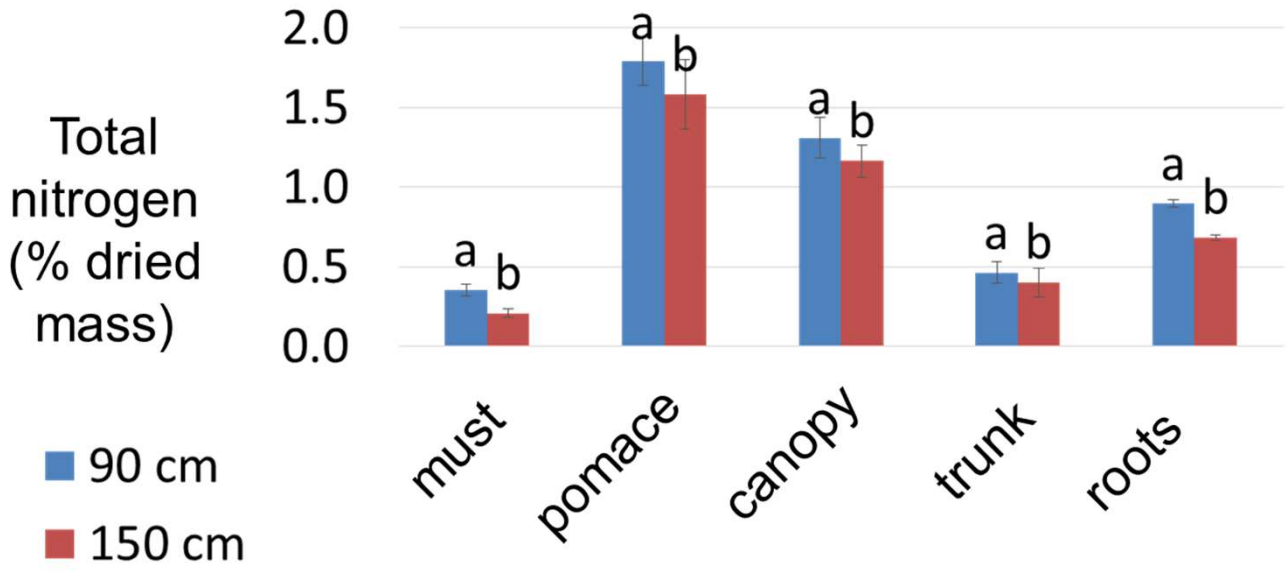
- Chasselas 2015, Pully VD





Canopy height and nitrogen

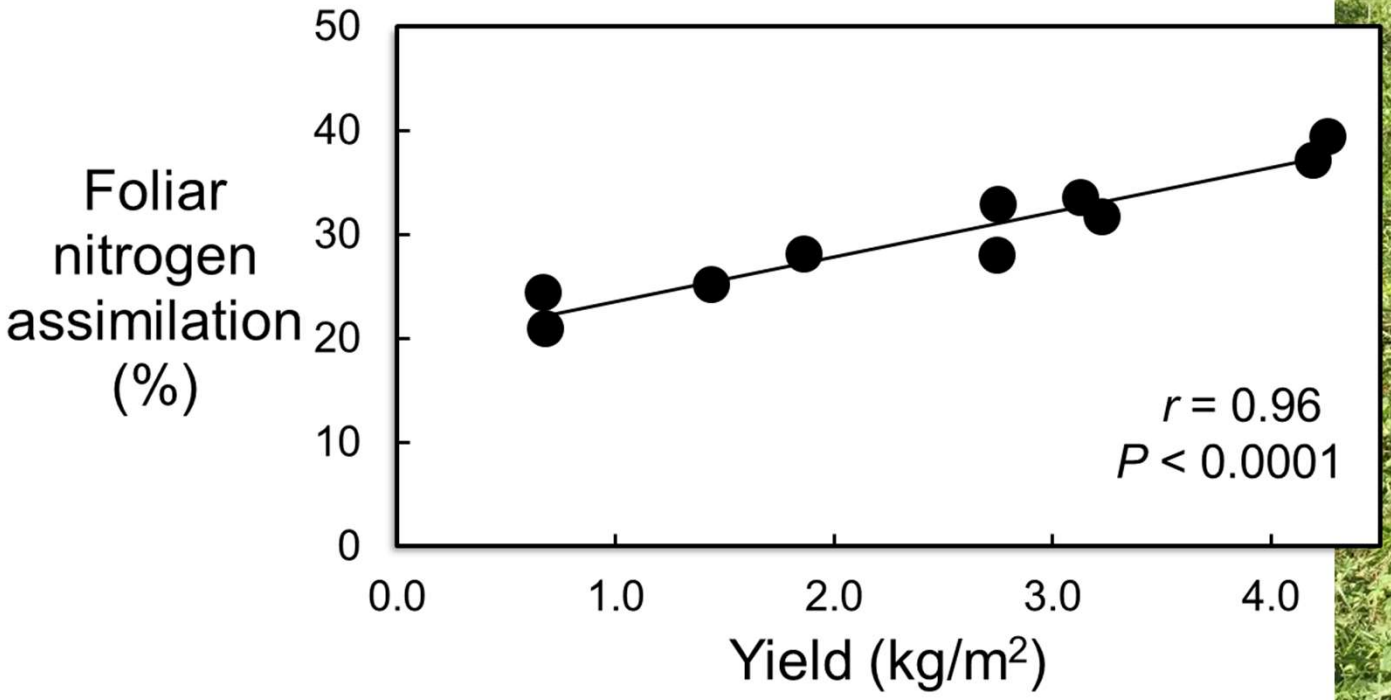
- Chasselas, Pully 2013



Trial on canopy height
Pully

Bunch thinning and nitrogen

- Chasselas, Pully 2017-2018



Bunch thinning and nitrogen

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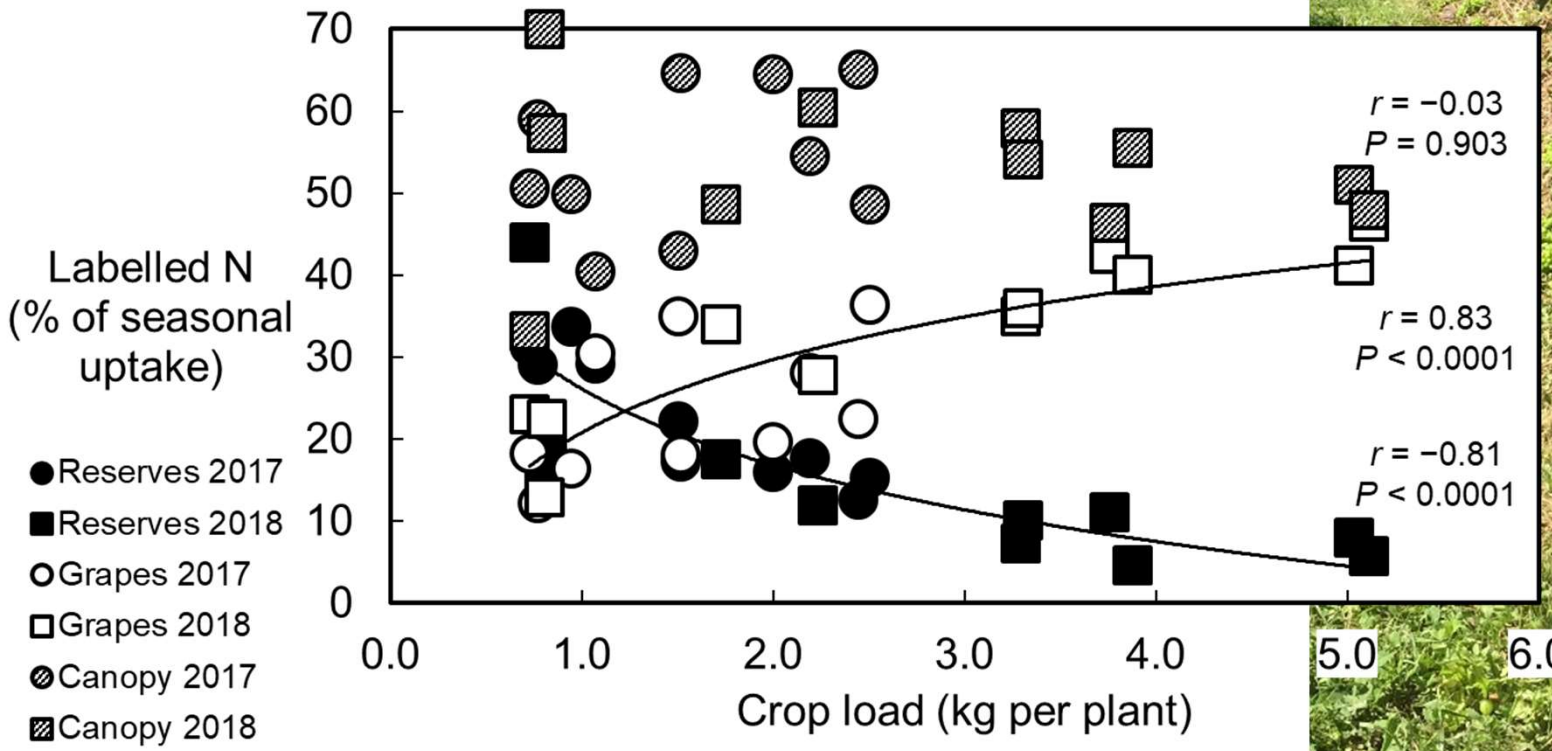

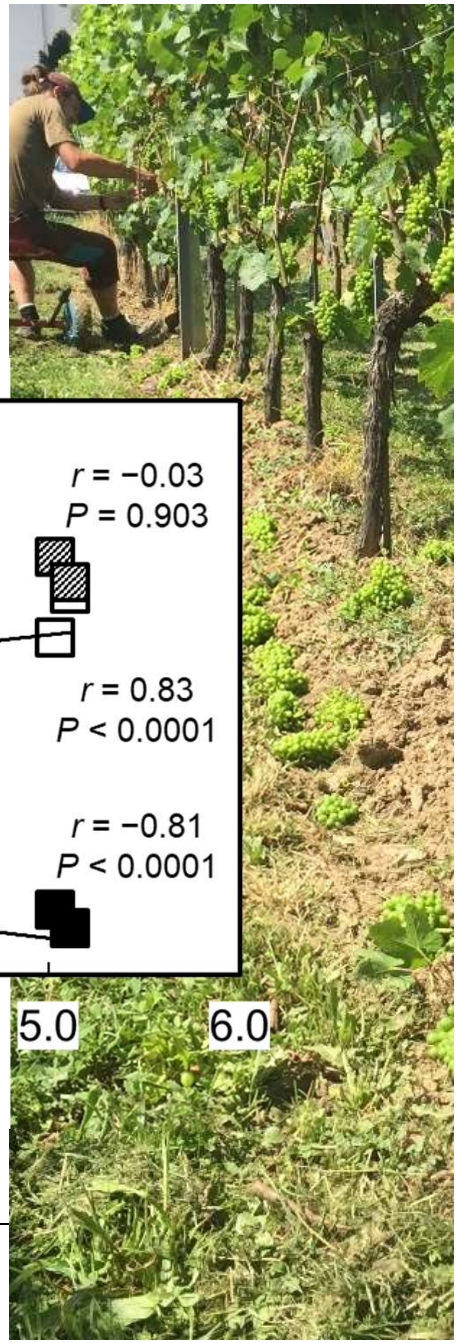

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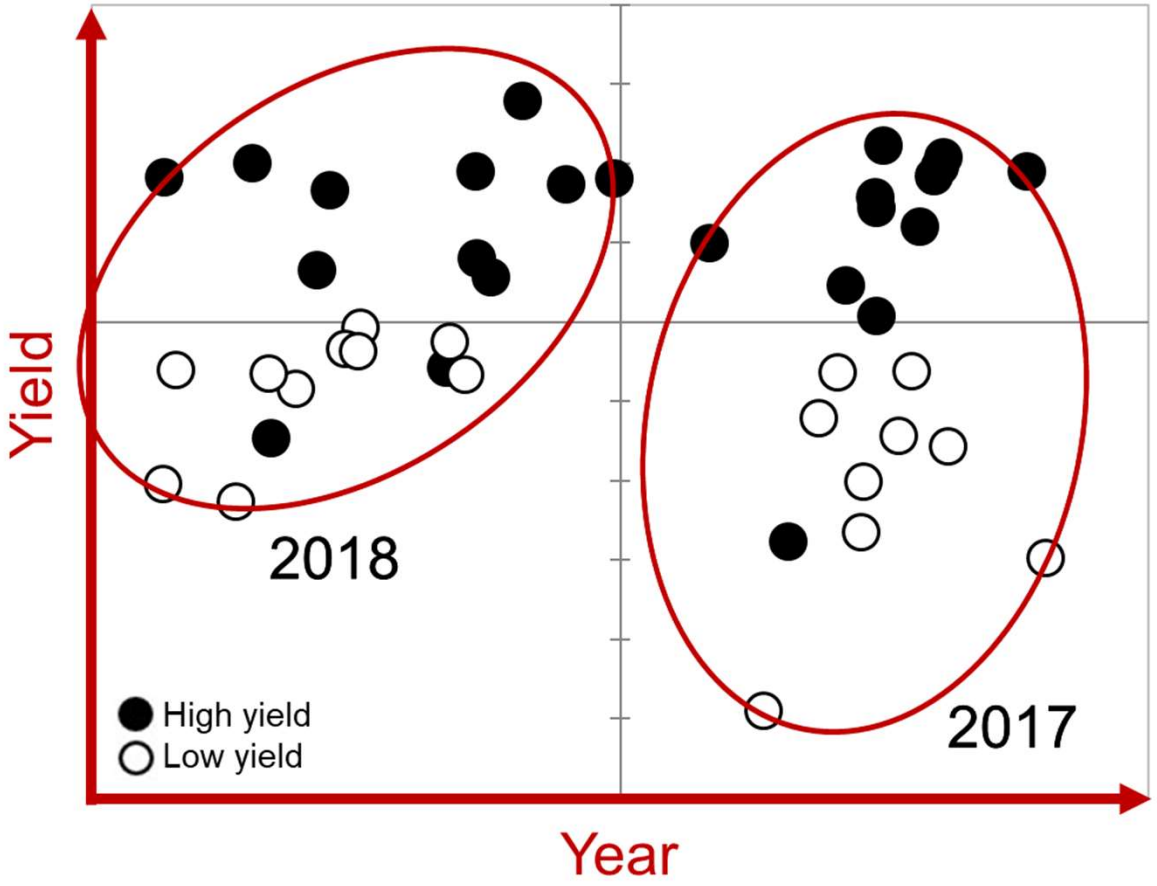
Bunch thinning affects amino nitrogen composition in must

- Must amino nitrogen profile, harvest (%)



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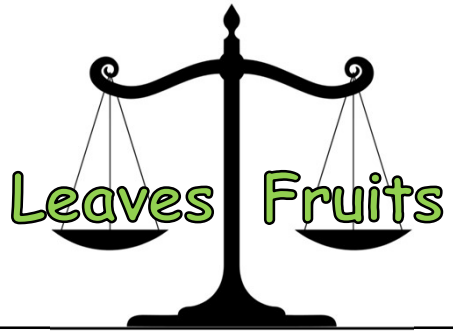
Managing vine balance

- Increasing the leaf-to-fruit ratio



	Grape nitrogen contration	Total nitrogen in whole plant
↑ leaf area	↓	=
↓ crop load	=	↓

Nitrogen fertilisation

- **When ?**

Spring, 3-4 leaves ↑ vigour ↑ yield

- **How ?**

Ammonitrate; urea; organic

Soil application, 30-50 kg N /ha /year

- **Cover-cropped vineyard?**

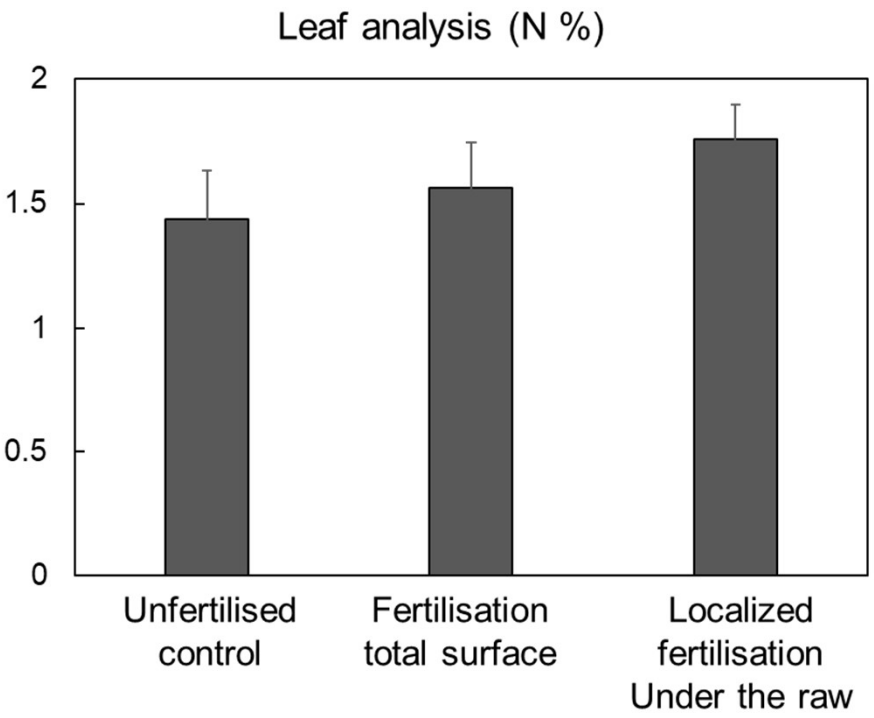
Partial cover-crop→ Localisation under the raw

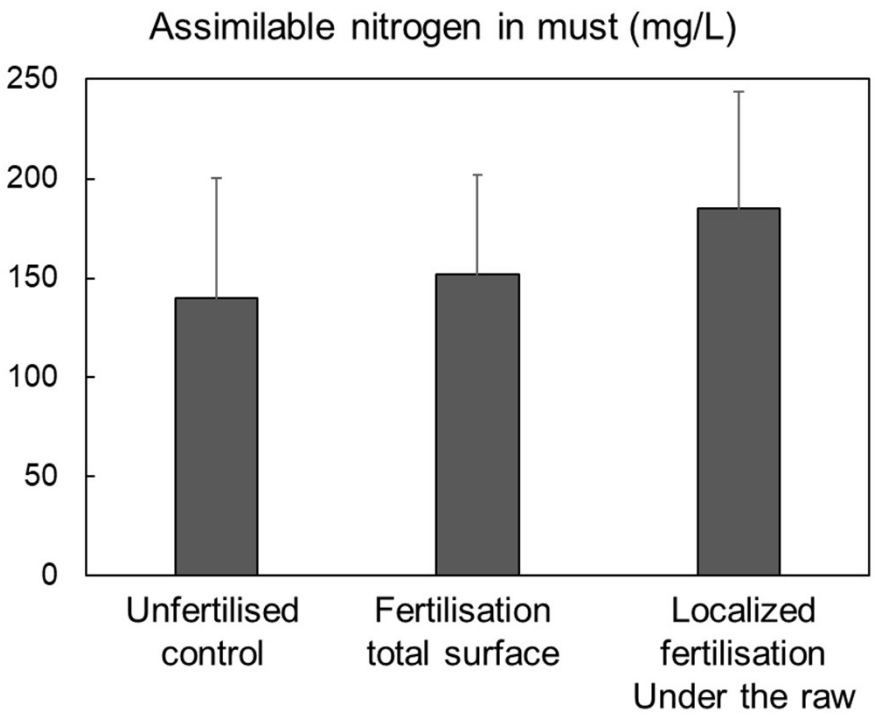
Total cover-crop→ Localisation efficiency ?

Bury in the soil to limit volatilization

Localized fertilisation Chasselas, Changins, 1995-1998

- 50U to the ground, at spring, weeded under the row





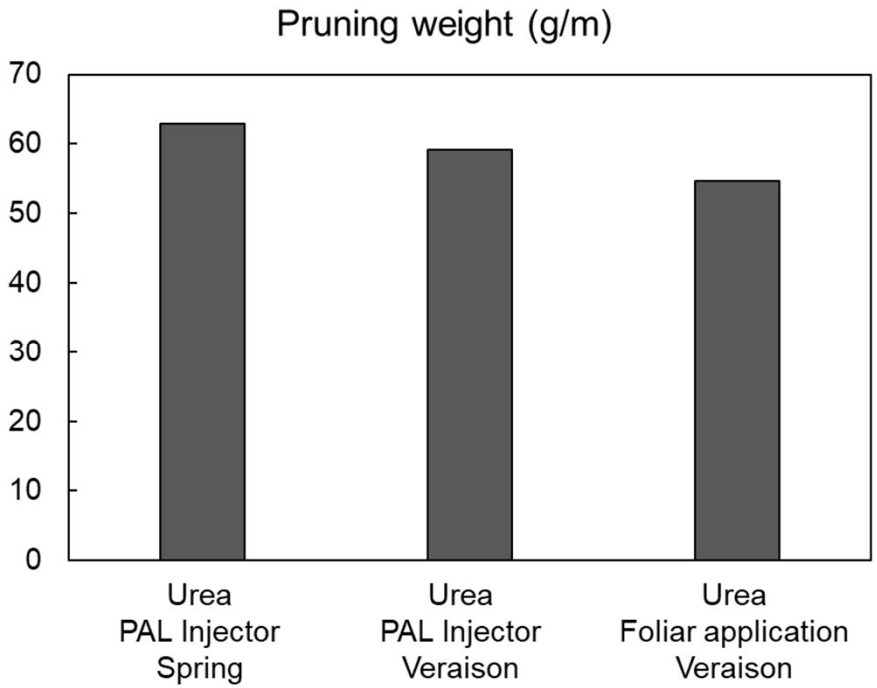
Localized fertilisation Chasselas in Pully, 2020-…

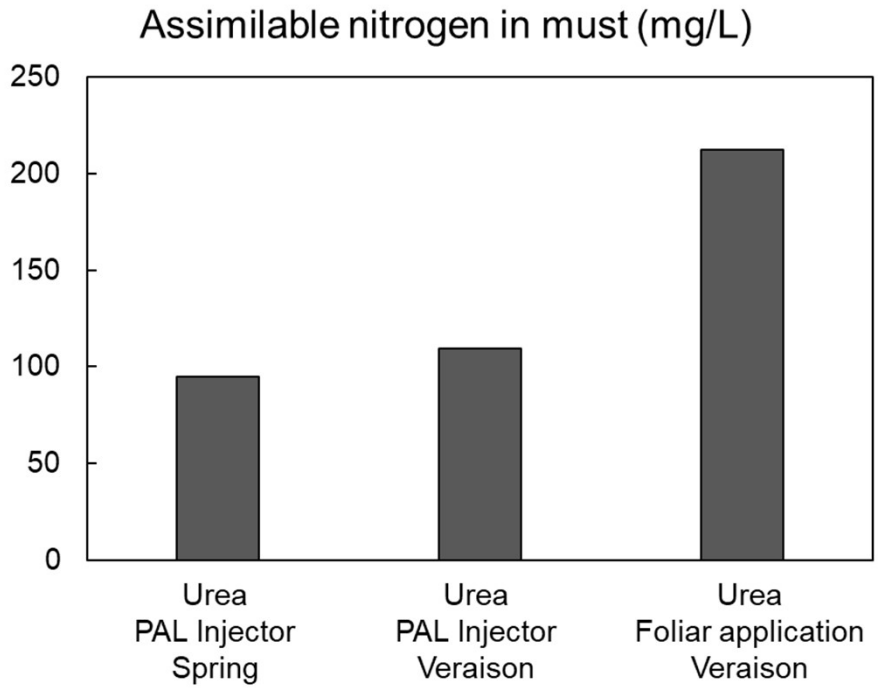
What ?	Ammonitrate	Urea
When ?	Spring	Summer
Where ?	On the ground	On the leaves
How ?	Surface	Underground

Pal injector

Localized fertilisation Chasselas in Pully, 2020-…

- results 2021





Foliar nitrogen fertilisation

- **When ?**

Veraison

↑ nitrogen concentration in grapes

↑ Fermentation kinetics ↑ Aromas

- **How ?**

Urea; readymade solutions

10-20 kg N /ha /year, split in several applications

Avoid heat periods

Min. dilution 300 L/ha

Application on the entire leaf area

Excess of foliar urea

In summary for an optimal nitrogen management

- **Variety and rootstock**

Adapted to soil and climate, promotes nitrogen uptake

- **Leaf-to-fruit ratio**
  - 1.0–1.2 m^2/kg
  - Promote optimal ripening AND proper nitrogen concentration in grape must
- **Fertilisation**
  - Spring, soil application → Vigour and yield
  - Veraison, foliar application → Grape nitrogen composition
- **In cover-crop vineyards**
  - Partial cover-crop → Localised soil application under the raw
  - Total cover-crop → lower efficiency, trials ongoing

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References

thibaut.verdenal@agroscope.admin.ch

- Localisation de la fumure azotée sur l'intercep dans les vignes enherbées

  Spring 2003, Revue suisse Vitic, Arboric, Hortic

- Leaf-to-fruit ratio affects the impact of foliar-applied nitrogen on N accumulation in the grape must

  Verdenal et al. 2016, J. Int. Sci. Vigne Vin

- Understanding and managing nitrogen nutrition in grapevine: a review

  Verdenal et al. 2021, Oeno One

- Leaf area management affects grape nitrogen content

  Verdenal et al. 2021, IVES technical reviews

- Nitrogen dynamics and fertilisation use efficiency: carry-over effect of crop limitation

  Verdenal et al., 2021, Aust. Journal of Grape and Wine Research