Extended Practice Abstract Nº 7

VIRECLI - Viticulture Resilient to Climate Change

Short description of the OG

Increase wine farms' competitiveness through the implementation of precision farming techniques.

Test, in several wine production districts, new techniques to counteract the effects of climate change.

Introduce innovation management protocols suitable for the oenological objectives and respectful of the typicity of the territory.

Transmit economically sustainable soil management techniques able to promote productivity and hydrological slope stability.

Benefits

Less water used for irrigation; avoid soil erosion and less water use for irrigation; fewer inputs; fewer losses due to spring frosts.

Stage of implementation

Project completed.

Applicability box

Theme

Climate change mitigation - Digital technologies - Erosion control - Soil health - Water-use efficiency

Context

Mediterranean climate, tests in northern Italy (Lombardy)

Duration

3 years (2019-2022)

Partners involved.

3 independent winegrowers, 2 universities located in Northern Italy (Milan, Piacenza and Pavia

Budget

800. 000,00€

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Main achieved or expected results

P1. Irrigation 4.0 guidelines: to explain steps to follow to design a precision irrigation system to maintain production and quality standards even in the most difficult years and to optimise water use. Uses variable rate technology that takes into consideration soil variability within the vineyard.

P2. Soil management practice guidelines: to increase vineyard resilience to extreme rain events or drought and to reduce the impact of superficial landslides and erosion phenomena to limit structural damage in vineyards and organic substance losses.

P3. Impact of new rootstocks to cope with water stress conditions.

P4. Guidelines on how to assess the effect of space variability in the vineyard on the fertility of the basal buds of a variety characterized by productive alternation and a low basal fertility such as Croatina.

P5. Guidelines on late winter pruning to postpone bud break to avoid damage due to spring frost and to obtain a better freshness of the grape if the initial phenological delay is maintained until ripening.

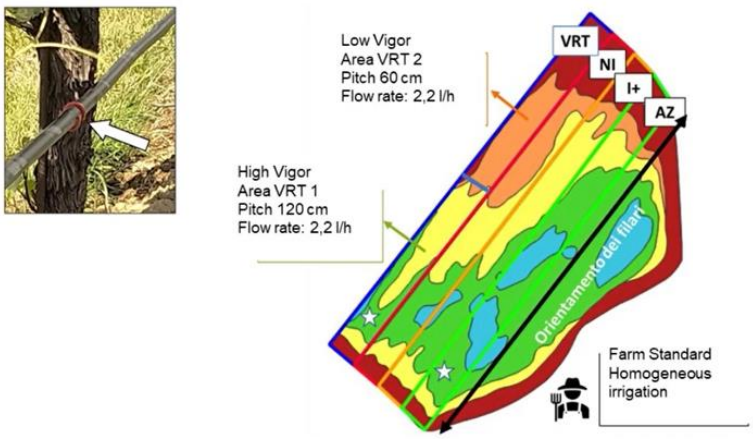

Fig 1. Example distribution of different irrigation theses and characteristics of a variable rate irrigation system

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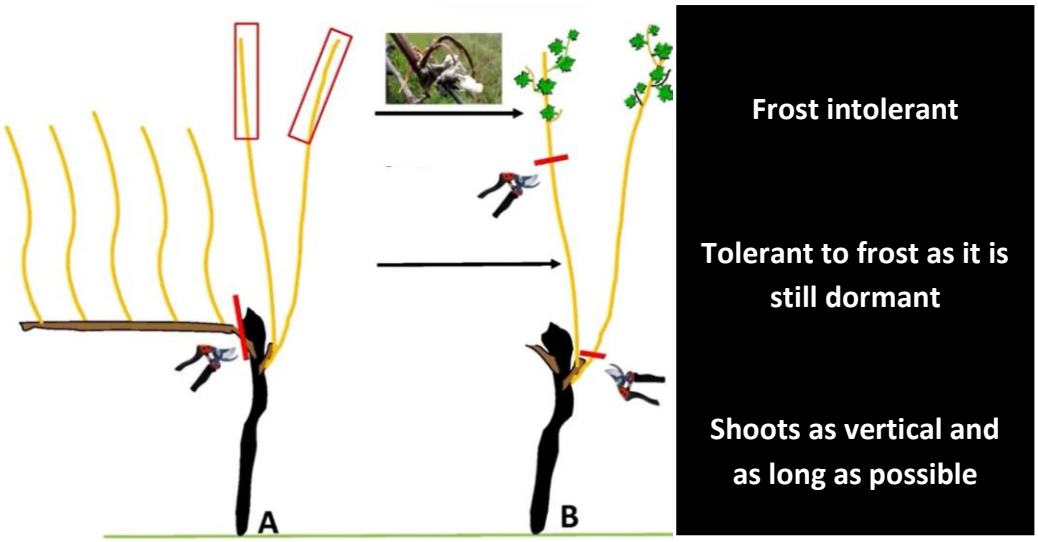

Fig. 2. Bud frost tolerance versus bud position on the shoots

Existing materials

Videos

P1. Irrigation 4.0 guidelines:
https://youtu.be/9dRWHH6Gggw
Short version: https://youtu.be/zFtAw4XfHpU
Detailed explanation: https://www.youtube.com/watch?v=m7Cob6QmyoM

P2. Soil management practice guidelines:
Short version: https://youtu.be/u4rHy0o4k9A
Detailed explanation: https://youtu.be/caQ2fXNJH_A

P3. Impact of new rootstocks to cope with water stress conditions:
https://youtu.be/sJCvDoTLIWg

P4. Guidelines on how to assess the effect of space variability:
Short version: https://youtu.be/2Jzq4zk-vNg
Detailed explanation: https://youtu.be/5QVrj5TaDek

P5. Guidelines on late winter pruning
https://youtu.be/3DBISJ5o-jo
Short version https://youtu.be/AXao_SlrISs
Detailed explanation: https://youtu.be/9Yt4kt153wE

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Web links

P1. Irrigation 4.0 guidelines:

https://www.infowine.com/en/technical_articles/application_of_precision_irrigation_systems_sc_21182.htm

https://www.infowine.com/it/video/irrigazione_di_precisione_sc_21194.htm

P2. Soil management practice guidelines:

https://www.infowine.com/en/technical_articles/resilient_soil_management_techniques_sc_21195.htm

P3. Impact of new rootstocks to cope with water stress conditions:

https://www.infowine.com/en/technical_articles/rootstocks_compared_sc_21183.htm

P4. Guidelines on how to assess the effect of space variability:

https://www.infowine.com/en/technical_articles/intra_parcel_variability_sc_21193.htm

P5. Guidelines on late winter pruning:

https://www.infowine.com/en/technical_articles/late_winter_pruning_as_a_frost_damage_prevention_and_ripening_control_sc_21184

https://www.infowine.com/it/articoli_tecnici/potatura_ritardata_come_tecnica_di_prevenzione_dei_danni_da_gelate_e_di_controllo_della_maturazione_sc_21797.htm

Contact information

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Author(s): factsheets made by Céline Caffot, Vinidea based on the work carried out under the VIRECLI Operational Group by:

- Davide Modina and Professor Lucio Brancadoro from the University of Milan (Italy).
- Professor Claudia Meisina, Massimiliano Bordoni and Valerio Vivaldi from the University of Pavia.
- Professor Alberto Vercesi, Professor Matteo Gatti and Alessandra Garavani from the Catholic University of Piacenza (Italy).
- Professor Stefano Poni from the Catholic University of Piacenza (Italy).

Contact : celine.caffot@vinidea.it – gianni.trioli@vinidea.it – davide.modina@unimi.it – lucio.brancadoro@unimi.it - claudia.meisina@unipv.it - matteo.gatti@unicatt.it - stefano.poni@unicatt.it

This practice abstract was elaborated in the CLIMED-FRUIT project.
Project website: www.climed-fruit.eu

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Extended Practice Abstract № 7

LATE WINTER PRUNING to prevent spring frost damage and maintain the freshness of the grapes/delay ripening

Challenge

Late frost events are taking place, with up to 100% damage. Harvest dates are brought forward to maintain the freshness thus having a potential negative effect on overall wine quality/typicity.

Solution

Late winter pruning is proposed as an economical technique to postpone budding and, in some cases, grape ripening.

It is essential to remove the correct leaf surface area to obtain good results without decreasing yield.

Benefits

The practice helps to prevent losses due to spring frost, and therefore farmers do not have to switch to varieties with later budbreak.

Applicability box

Theme
Climate change mitigation
Natural resource conservation

Context
This technique can be applied in all vineyards.

Application time
At late winter pruning stage

Required implementation time
The same time is required for the pruning operation as for standard winter pruning.

Period of impact
The impact will be seen in spring (avoid spring frosts) and in the harvest season (delay ripening)

Equipment
No specific equipment is required

Practical recommendation

The practice helps to prevent losses due to spring frost, and therefore farmers do not have to switch to varieties with later budbreak. It also can lead to a delay in ripening, which helps to maintain freshness and other organoleptic properties/typicity. It is an adaptation of normal winter pruning that is based on grape acrotony. The farmer must wait until after budbreak (2 leaves unfolded) has occurred in the apical portion of the shoots to perform winter pruning. Acrotony is the natural behaviour of the vine to favour the buds located in the apical position, thus causing budbreak in the apical positions while inhibiting it in the basal positions. The buds located in the basal position are thereby protected in case of spring frosts.

The following steps shall be applied:

- Perform a pre-pruning operation to optimize the organization of the pruning steps (reduce the time needed for pruning) – the two shoots that are kept must be long and kept upright. Be careful: this operation will help to get through the spring frost stage, however, it might not have any impact on the ripening delay at harvest time.

- Perform the pruning step to remove the correct leaf area, which is not more than 2 unfolded leaves on the apical shoots. If the operation is performed at a later point, it will cause a yield loss.

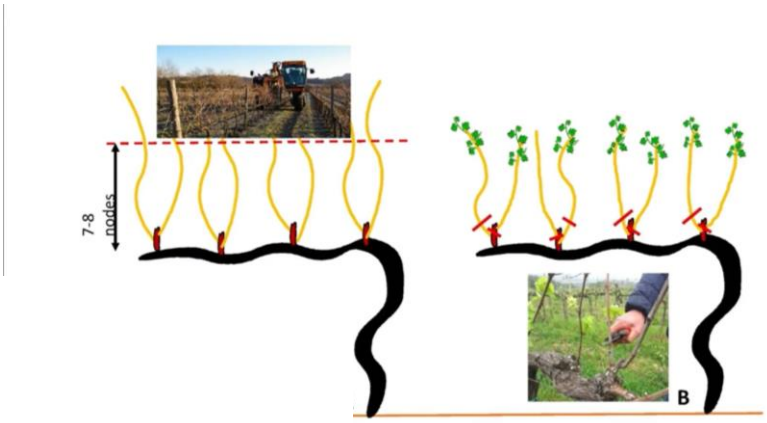

Fig. 1. Late winter pruning in two steps: pre-pruning and pruning.
Pre-pruning can be done to keep the shoots as upright and long as possible.

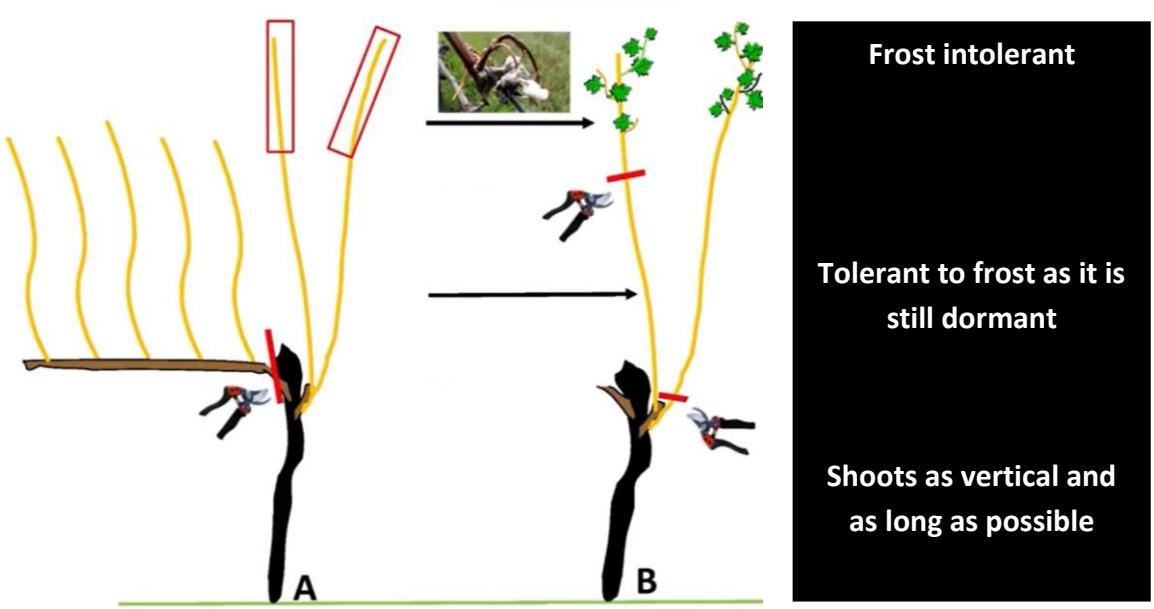

Fig. 2. Bud frost tolerance versus bud position on the shoots.

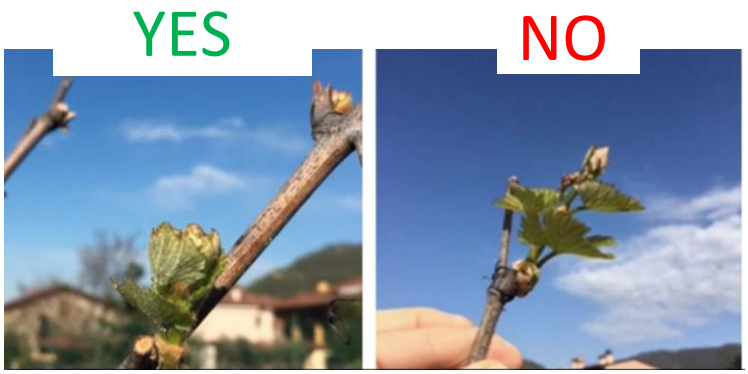

Fig.3. Pruning has to be performed when the leaf area to be removed is not more than 2 unfolded leaves on the apical bud.

Further information

Videos

https://youtu.be/3DBISJ5o-jo

Short version: https://youtu.be/AXao_SlrISs

Detailed explanation: https://youtu.be/9Yt4kt153wE

Web links

https://www.infowine.com/en/technical_articles/late_winter_pruning_as_a_frost_damage_prevention_and_ripening_control_sc_21184

https://www.infowine.com/it/articoli_tecnici/potatura_ritardata_come_tecnica_di_prevenzione_dei_danni_da_gelate_e_di_controllo_della_maturazione_sc_21797.htm

Contact information

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www.inforwine.com

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Contact: celine.caffot@vinidea.it – stefano.poni@unicatt.it

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Simplified cost/benefit analysis

LATE WINTER PRUNING to prevent spring frost damage and maintain the freshness of the grapes/delay ripening.

Introduction – presentation of ex-ante and ex-post situation

As a consequence of climate change, late spring frost events are increasing in frequency and in locations, with up to 100% damage in the affected lots. Moreover, the high summer temperatures decouple the maturity trends leading to grapes with unbalanced low acidity. The proposed practice delays the time of susceptibility to frost and delays ripening to maintain the freshness thus having a potential negative effect on overall wine quality/typicity.

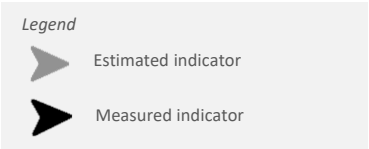
Ex-ante is a standard winter pruning practice.

Ex-post is a late winter pruning practice that is performed when the apical shoots have reached the "2 unfolded leaves" phenological stage (in Italian climate, indicatively late March - early April).

Economical costs and benefits

When the practice is applied with a pre-pruning in January-February, and a second finishing step at "2 unfolded leaves", it entails a slightly increase the hours of workforce (+15%), although it does not require extra machine operation.

On the other hand, the practice reduces the risk of harvest losses due to late spring frosts that cause turnover reduction in the following year, commercial problems with clients, and lower productivity of the damaged grapevine plants in the following years.



	Ex-ante	Ex-post
Variable costs		
Labour (excluding installation)	Labour for pruning 100%	Labour for pre-pruning + pruning 115%
Machine costs (fuel + depreciation)	-	-
COMPARISON	*The slight increase of labour costs is abundantly balanced by the lower incidence of late spring frost damages. The overall economical comparison is in favour of the late pruning practice*: 	

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Environnemental costs and benefits

Energy	No significant change: 
No variation on mechanical operation.	
Water	Unmeasured impact: 
No direct relationship between the practice and the indicator in question	
Soil	Unmeasured impact: 
No direct relationship between the practice and the indicator in question	
Air	Unmeasured impact: 
No direct relationship between the practice and the indicator in question	
Biodiversity	Unmeasured impact: 
No direct relationship between the practice and the indicator in question	

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