CLIMED-FRUIT

IFV

PEI SICTAG

Tillage and frost in the vineyard: how to anticipate practices to avoid increasing the risks

Extended Practice Abstract Nº 19

Challenge

Spring, particularly the month of April, is the period for resuming tillage. As temperatures increase, weeds resume actively growing, the soils dry out from winter precipitation and tractors can pass, so it is imperative to prepare the *cavaillon* (area located under the vines in the axis of the row) for future work by carrying out *décavaillonnage* to remove the mounds of earth that have formed at the foot of the vines at the start of winter and thus limit the growth of weeds. In a context of reducing the use of herbicides, these *cavaillon* working techniques are increasingly being adopted by winegrowers.

In 2020, it was observed that a 25% increase in air humidity can lead to a 50% increase in the number of frozen buds at the same temperature. This phenomenon is explained by relative humidity, which increases when the temperature decreases, increasing plants' sensitivity to spring frost. Previously moistened surfaces are more sensitive to frost phenomena.

Anticipating the risk of spring frost is a major issue. Anticipatory and prophylactic solutions are possible, in particular by adapting cultural practices. The objective is to know the factors that increase the effects of freezing and to reduce the impacts of these episodes by adapting practices better.

Solution

By anticipating tillage practices, it is possible to avoid increased damage from spring frost on broken buds. Whether it is tillage itself or grass cover management, the objective is to have the buds in the driest environment possible.

Benefits

Careful management of tillage practices during these risky periods makes it possible to avoid significant

Applicability box

Theme

Adaptive management
Climate change adaptation

Context

Loire Valley, central France.
Increasingly earlier vine bud burst due to global warming
3 consecutive years of spring frost damage (> 20%)

Application time

End of winter–early spring (bud burst)

Required implementation time

None – Organisation time needed for implementation

Period of impact

From bud burst to harvest

Equipment

No specific equipment is required

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damage to yield and improve the efficiency of vineyard areas.

Practical recommendation

In case of the risk of spring frosts is announced, one week before:

- The atmosphere around the buds needs to be as dry as possible.
- No tillage or mowing 5–6 days before the announced risk.
- Failure observed due to mowing of a dense cover of clover five days before frost.
- '*Le mieux est l'ennemi du bien*' = 'The best is the enemy of good'
- Sometimes it is better to do nothing!

All the observations carried out on the plots in the central Loire Valley region made it possible to establish a set of best practices: seven days before an announced frost (timeline corresponding to the anticipation possible thanks to forecast weather data), it is necessary to avoid releasing moisture, either by working the soil (from the sloping ground or between the rows) or by mowing or crushing inter-row plant cover. It is preferable not to do anything regarding the soil (covering or managing weeds by tillage) in the week before a frost episode.

Further information

Videos

Results presentation :
https://www.youtube.com/watch?v=752SF02YhqY

Web links

Project presentation :
https://www.sictag.fr/

Contact information

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Project website: https://www.sictag.fr/

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Simplified cost/benefit analysis

Tillage recommendations when there is a risk of spring frost

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

For 3 days after tillage, an increase of up to 30% in relative humidity is noted at the level of the vine buds above a tilled soil. Considering that 25% relative humidity can increase frost damage on buds by 50%, tillage 3 days before frost would considerably increase the damages (ex-ante situation). But this can be avoided by not tilling the soil or by mowing 5/6 days before the risk of frost is announced (ex-post situation). In both cases, the crop itinerary does not change as it is just a question of timing.

Economical costs and benefits

Legend

Estimated indicator

Measured indicator

The economic benefit of applying the ex-post situation compared with the ex-ante situation is based on the loss of yield that is avoided, as the ex-ante situation can increase frost damage on buds by 50%.

It is difficult to put an economic figure on the impact of implementing the ex-post situation compared with the ex-ante situation, as the loss of yield caused in the ex-ante situation depends on many conditions, and in particular the intensity of the frost event itself.

COMPARISON	**Estimation: up to 50% reduction of the damages on vine buds:** 

Environmental costs and benefits

The analysis of environmental costs and benefits is not appropriate in this case. In fact, the crop itinerary does not change, only the period of application, which therefore implies no change in environmental terms.

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SICTAG project: frost protection methods for wine growing

Short description of the project

The SICTAG project is studying different ways of combating frost in vineyards. The project is organised into four parts.
The first part aims to define a method for modelling frost risk situations in different terroirs.
The second part focuses on the implementation of solutions to anticipate the risk of frost by drawing up recommendations on the management of grass cover during periods of frost.
The third part is devoted to characterising and modelling the operation of a fleet of frost protection towers.
Finally, the fourth part is working on the development of an innovative, connected system to remotely activate anti-freeze towers, with a monitoring tool accessible by mobile phone.

Benefits

Limitation of frost damage resulting from global warming

Stage of implementation

The SITCAG project has ended (2020–2022).

Key data box

Theme
Adaptive management
Climate change adaptation

Context
Loire Valley, central France.
Increasingly earlier vine bud burst due to global warming
3 consecutive years of spring frost damage (> 20%)

Duration
3 years (2019–2022)

Partners involved
FRCUMA, Vinopole, Végépolys Valley (growers association), Weather Measures (weather specialist), INRAE and IFV (research centre)

Budget
€115,000

Particularity
Development of a methodology to streamline empirical methods.

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Main achieved or expected results

__The main achieved results for part 2 on the implementation of solutions to anticipate the risk of frost:__

Three days after tillage, an increase of up to 30% in relative humidity (Chart 1) is noted at the level of the buds above a worked *cavaillon*, as seen in Picture 1. Considering that a 25% increase in relative humidity can increase frost damage on buds by 50%, tillage three days before the frost would have considerably increased the damage.

It takes up to eight days with daily temperatures > 12°C to find equivalent relative humidity at the level of the buds between the modalities. In some situations, it takes up to 20 days if precipitation greater than 20 mm has been recorded after tillage and when daily temperatures are low.

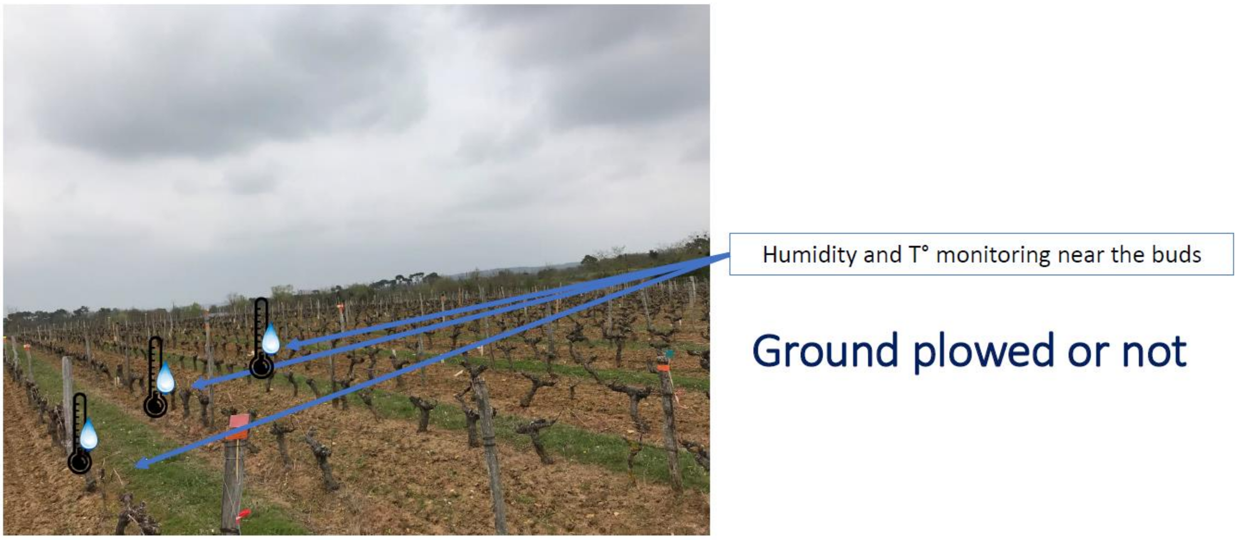

Figure 1: Measuring device near the buds

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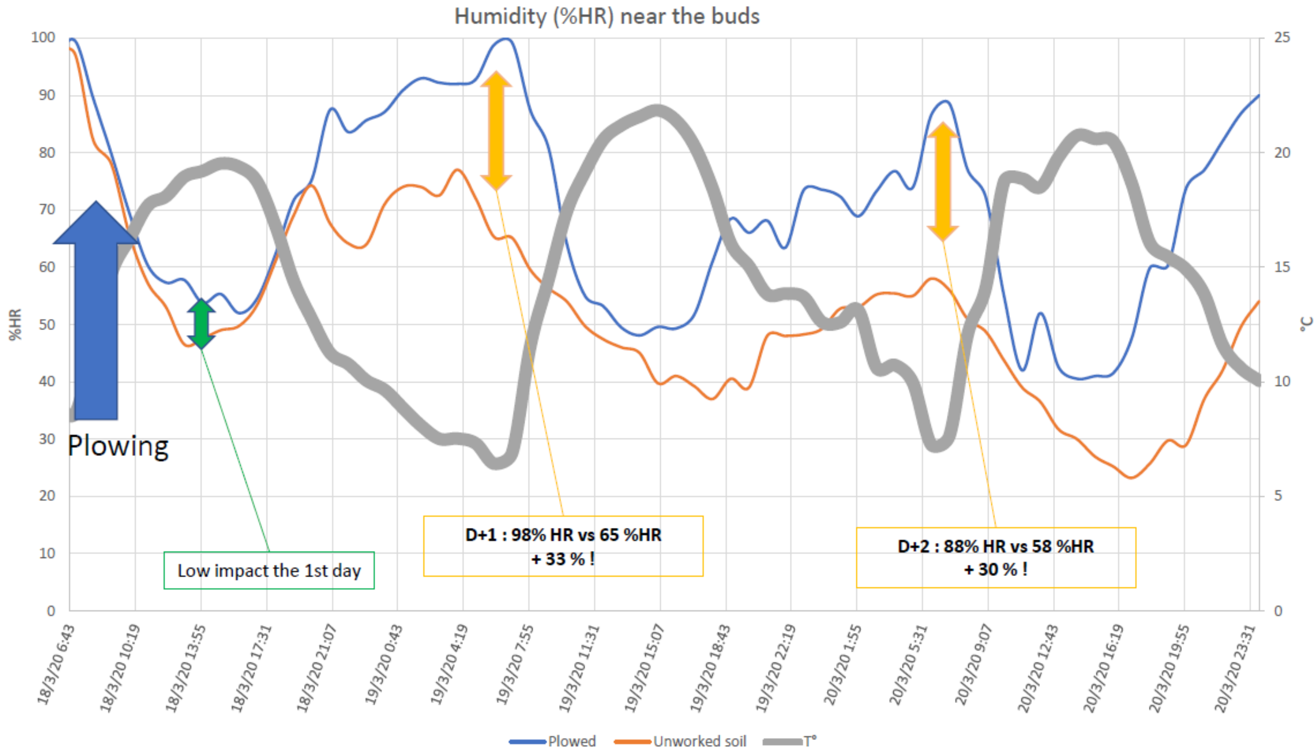

Figure 2: Humidity monitoring results three days after tillage

Existing materials

Videos

OG presentation :
https://www.youtube.com/watch?v=752SF02YhqY

Web links

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