

## TECHNICAL DATA SHEET

### Insertion of wood dowels inoculated with *Trichoderma* spp. inside grapevine trunk

Atypical practice applied in field to limit GTDs symptoms expression



This document is the result of interviews made on field with the principal objective to highlight the diversity of techniques used in field. To date, no assessment, no validation or checking efficacy of this practice was made. In the absence of any assessment, its success in different conditions of the ones exposed is not guarantee and the responsibility of Winetwork partners can't be involved.

**Network for the exchange and transfer of innovative  
knowledge between European wine growing regions**



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# Trichoderma spp. in wood dowels

## General principle

The technique consists of inserting **into the trunk of a vine** small **wood dowels inoculated with *Trichoderma* spp.**, by **drilling small holes** into the trunk. Two examples of this practice in two wine Designations of Origin in Galicia (Spain) Ribeiro and Valdeorras are described in this datasheet.

## Application cases

Two case studies are available in two wine Designation of Origin areas: Ribeiro and Valdeorras

### 1- First case : application in a vine aged over 100 years old of variety Doña Blanca

This is an unusual vine of huge dimensions and high yields (50-70 kg/year), which does not seem to have been grafted on a rootstock, but to have been planted directly. You can appreciate in the picture its dimensions in 2006.

This vine started showing the first symptoms in 2006 and these symptoms were a mix of Esca and Eutipiosis (necrosis formed around the pruned arms, shoots with short knots, smaller leaves and sometimes with necrosis on edges plus absence of blooms and clusters). The rotten wood had a brownish or salmon color.

#### Application area:

The application area is located in the **South of Galicia**, parish of Lebosende, Leiro within denomination of origin Ribeiro. This area is characterized by an annual average temperature of 13,6 °C and 17,8 °C between April and September, with a total rainfall of 1.182,7 mm and 220,5 mm during the vine's growing period.

#### Specific application:

The application took place on April 26th 2016. The phenological stage of grapevine was **1-3 leaves unfloded**. The **sap was flowing** completely. Before the drilling, dead bark was removed until healthy timber was reached. **3 wood dowels inoculated with *Trichoderma* spp.** were inserted, 1 in the **base of trunk** below sucker which arised in 2015 and the other 2 **in the main arms** (pict 1-3). Days after the insertion, rotten wood on each arm was cleaned out.



Picture 1: Driller and small dowels inoculated with *Trichoderma* sp. (INGACAL)



Picture 2: Drilling in Blanca Bona (INGACAL)



Picture 3: Hole at the basis of the trunk prior to insertion of dowel (INGACAL)



## 2- Second case: application in a 0.5 ha vineyard of Godello cultivar

Cultivar: Godello

Rootstock: Richer 110

Vine age: 29 years

Planting Density: 2,25x 1,2 m

Soil : Loamy, deep, fertility medium.high, fresh. PH: 6.5

Training system: double cordon Royat with 3 spur each side

Pruning system: Spur pruning (2 buds/spur and 12 buds/vine)

Yield: 8000 kg/Ha

### Application area:

Area in SE Galicia within Designation of Origin Valdeorras. This area is characterized by an annual average temperature of 13,9 °C and a temperature of 18,8 °C between April and September. A total rainfall of 1.118 mm and 274 mm during the vine's growing period.

**Symptoms of Esca** appeared 8 or 10 years ago, starting with chlorotic leaves, necrosis and dried canes and shoots and ended up with the death of the plant.

### Specific application:

In order to be able to adapt the treatment to time availability, the plot of land was divided into **4 blocks, applying the treatment to each of them in consecutive years**. Treatment was applied into the 1st and 4th block in 2013- in October and April respectively (Pict 4-5). It was applied into the 2nd block in April 2015 and into the 3rd block in May 2016.

**Symptomatic plants were marked** in summer, **rating the severity of the affection** from 1 to 5 as follows:

- < 25% affected : 1 point
- 25-50% : 2 pts
- 50-75% : 3pts
- 75- <100 %: 4 pts
- 100%: 5 pts

In each block affected vines were treated, leave some as control. **Two wood dowels** inoculated with *Trichoderma* were inserted into each vine, on **both sides of the base of trunk** with differences of 1-2 cm of height (Pict 6).

Dowels used in 2013-2015 were the same as the ones used in the first case. The ones used in 2016 did not belong to the same producer although they were the same strain as the ones used for the other treatments.

Implantation of *Trichoderma* dowels was made on May 26th 2016, on vines of phenological stage **inflorescence visible** (Pict. 6).



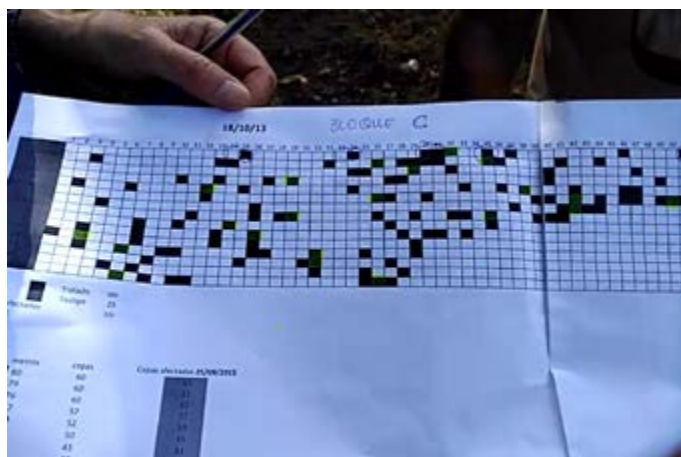
Picture 4: Godello vineyard in winter (INGACAL)



Picture 5: Treated plot of Godello cultivar (INGACAL)



Picture 6: Drilling in Godello cultivar (INGACAL)



Picture 7: Observation sheet of the plot (INGACAL)

# Trichoderma spp. in wood dowels

## Background

The dowels were manufactured by a New Zealand company which has carried out research on implantation on this kind of treatment for a decade.

Instructions based on essays in both field and laboratory for using this product indicate that these **dowels are working against Eutypa Lata** and some species of *Botryosphaeria*. It is a **preventive treatment**, so it is recommended to **carry it out as soon as possible** and in **healthy vines** or in those where the affected part is eliminated and the healthy part is treated.

In **Galicia**, there were **two winegrowers** applying this practice. Both cases seemed to have plants affected by **Esca** and also **Eutypa**. Both of them used this type of dowels that came from NZ commercial house.

However, it must be taken into account that conditions of application of this treatment were not implemented in accordance with the recommendations for this type of treatment. The cases which are showed below occurred in very **adult vineyards**. Symptoms seemed to respond more to Esca and Eutypa and plants had also **showed symptoms for several years** (8-10) before carrying out this practice.

## Some scientific elements

It is **no clear which is the mechanism of control** that can reduce the incidence on treated vines. It is considered that the main mechanism is not the bio-inoculant growing throughout the plant but rather the elicitor response on the part of the vines "**Trichoderma has been shown to be capable of eliciting a systemic acquired resistance (SAR) response in plants**, which can raise the levels of resistance to diseases by stimulating phytoalexins, which are natural plant defense chemicals «.

The researcher John S. Hunt showed that **Trichoderma can live in healthy grapevine tissues** in association with the pith parenchyma cells. Furthermore, other experiments performed by John have shown that a particular *T. harzianum* strain, when inoculated into healthy vines actively **grows through the tissue over time**. It has been isolated up to 18cm from the site of inoculation 18 months later(6). These observations suggest *Trichoderma* has the **potential to be applied as a treatment to vines for a prolonged protective effect**.

## Outcomes

It must be considered that **treatment applied in very old vines** (as it is presented in both cases, especially the first ), have **low effectiveness**.

To obtain statistically significant data, it is necessary to carry out the treatment in a **high number of vines** and for **more than 3 years** since the **symptomatology of this type of disease is erratic** (some years vine is expressing symptoms and others do not).

### 1- First case: application in a vine aged over 100 years of the variety Doña Blanca

The same year of implantation, 2016, the vine showed **symptoms of recovery**, with shoots and fruit set in parts that were affected.

Although the production obtained, approximately 3 kg, was very low, it was much greater than in the previous year in which the vine produced practically nothing. This can be significant if we also take into account that that summer there was a heat stroke, with high temperatures causing severe stress on vines.

The same treatment was carried out by the same wine-grower in 2012 in **5 vines** that showed the mainly common symptoms of Esca. 3 were of Albariño cultivar and 2 were Treixadura. One of the latest suffering from severe attacks.

Nowadays **after 4 years**, the **3 vines of Albariño have recovered** and are giving normal productions. Regarding the Treixadura, 1 is working regularly and the other is dead.

**However, the number of treated vines is very low so the results are not representative.**

### 2- Second case: application in a 0.5 ha of autochthonous vine Godello

There is plenty of data from the assessment of damages that has been taken on each block for 3 years, which should be studied statistically. However in a first general assessment it

can be observed that:

1. In all the blocks **the number of affected vines has increased** since first treatment. New affected vines appear apart from those already registered.

2. Comparing registered assessment for 3 years, the **incidence of damage on treated plants** (sum of affected plants) **is much lower**. But it occurs not only to treated vines but also to control plants. Therefore it could be said that the treatment is not having its effect.

However, it has only been analyzed for 3 years and this type of diseases **requires longer time for analyzing**. So registered data of plants treated in this last year and 2 years before **should be analyzed in more detail**, as well as the treatment conditions (insertion was not always done in the vegetative rest of vine, level of affection of the plant, age,...)

## Key points for succes / risks

1. Currently this kind of dowels seems to have effect against *Eutypa Lata* and *Boryosphaeria stevensii*
2. As it is considered as a **preventive treatment**, it is more advisable **to carry it out before plant gets infected** - in order to be able to resist the attack of fungus.
  - In case of healthy vine it is advisable to drill a hole at a slight upward angle 28mm deep x 6mm diameter into the trunk below the cordon and insert one Bio-implant.
  - For a moderate incidence level which only affects the cordon: Cutting-off affected cordon wood. Then drilling into clean trunk wood below the cordon and make the insertion of one bio dowel per vine.
  - For a high incidence which has reached the trunk it is recommended to replace by a suitable sucker at base of the trunk and drill it as close as possible to ground level or 25 to 50 mm below the position of the sucker and to apply 1 Bio-implant per vine.
3. Indications of the commercial company state that it should be treated when **sap does not flow**. Avoid late winter or early spring when the sap starts flowing.
4. It ensures a **protection for 4 to 6 years**. Then treatment should be repeated.
5. Since these implants contain living organisms, it is indicated to ensure there is a **24 hours period between its applications and the use of any fungicidal spray applications**.

## Innovative aspects

This form of application has been tested in other fruit species besides in vineyard for the control of other diseases. Nevertheless, the way to apply the *Trichoderma* by **insertion of dowels is not usual** and for what it has been observed in essays, it seems to protect the vines for several years. It has the difficulty of the time spent for its application and therefore its greater cost.

**Effectiveness of this atypical practice still need to be proved.**

## Other requirements

The time required for this application is about 2minutes/plant.

**Warning: In Spain *Trichoderma* spp. are not registered and authorized for application against GTDs and therefore this type of implants are not allowed either.**



## Source of information

John S Hunt . (2004). Trichoderma and trunk disease fungi: prospects for new protective management options. 2004. The Australian & New Zealand Grapegrower & Winemaker.

Mike Roberts (2012). Vinevax Bio-inoculant trichoderma treatment for Eutypa shows promise in Henschke Vineyards. Grapegrower and Winemaker Issue 582, 2012

John, S., Scott, E.S., Wicks, T.J. and Hunt, J.S. (2004). Interactions between Eutypa lata and Trichoderma harzianum. Phytopathologia Mediterranea 43, 95–104.

Mark Sosnowski. Dr Richard Lardner . Research Organisation: Cooperative Research Centre for viticulture. July 2006. Diagnosis and management of eutypa dieback. FINAL REPORT TO GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION. Chief Investigator: Assoc Prof Eileen Scott. <http://winetitles.com.au/gwm/view/?action=view&id=930>

## More information

[www.winetwork-data.eu](http://www.winetwork-data.eu)

### Technical datasheet:

- Good pruning practices
- Pruning with regard to sap flux

### Video seminars:

[Epidemiology and symptomatology of GTDs](#) (Dr. Vincenzo Mondello, URCA)

[Scientific overview of Grapevine Trunk Diseases](#) (Dr. Vincenzo Mondello, URCA)



Work realized in common by the facilitators agents of Winetwork project. Data came from practice through the help of 219 interviews and from a review of scientific literature.

The practice described in this datasheet has not been assessed scientifically and the data provided is coming directly from practice.