



Biostimulant fungal strains and applications

Background

Grapevine Trunk Diseases (GTD) are one of the most serious grapevine diseases recently, threatening vineyards throughout the world. Extreme environmental conditions are associated with the climate that deteriorate the plant and reduce its natural defense, which may enhance the infection and the distribution of the GTD pathogens in the woody tissues.

Trichoderma species can control plant pathogens with different mechanisms: (i) they grow rapidly, therefore they are effective space competitors; (ii) they produce antagonistic and mycotoxic metabolites (antibiosis); (iii) moreover, they are able to destroy other fungi with mycoparasitic activity. *Trichoderma* species are well-known biocontrol agents since 1930. Besides, the *Trichoderma* species were reported to induce systemic and local defense in the plant, and may stimulate the plant growth. Special *Trichoderma* strains with the above properties can increase the plant's tolerance against the biotic (e.g.: pathogens) and the abiotic (e.g.: drought) stress effects.

Technology

The technology developed by the researchers of the University of Debrecen is similar to the mechanism of the probiotics effectively used in human medicine. These 'plant probiotics' are able to increase the overall condition of the grapevine and its defense against complex diseases, like GTD.

GTD pathogens can be detected both in asymptomatic plants and in grapevines with mild or serious GTD symptoms. Disease expression is increased by abiotic stress, or can be affected by different biotic factors.

The biostimulant developed at the University of Debrecen contains **special, newly identified *Trichoderma* strains** with 'plant probiotic' potential, as these fungal strains have adapted for living in the plant tissues and permanently colonizing them without any negative effects for the host. This permanent colonization ability is unique among the other *Trichoderma* based biostimulants, already on the market. The grapevines colonized by our endophytic *Trichoderma* strains have the potential for increased growth and production accompanied by activated defense mechanisms against abiotic and biotic stress. Fungal pathogens are also repressed by their mycoparasitic activity.

Our technology has a preventive and/or curative effect against GTDs, and it is able to stimulate plant growth. It has been tested in Hungary in different climatic (continental, sub-Mediterranean, Mediterranean) and edaphic conditions on different varieties, thus it has the potential for worldwide application. Please see *Figure 1* and *Figure 2* on page 3.

Experimental results

The used strains were able to colonize the cordons of the older plants (>15 years), the rootstock, the grafts, the roots, and later the whole plant in the field experiments with different treatments.

In vivo experiments are proved that the strains are able to colonize permanently the woody tissue of the different grapevine varieties ('Furmint', 'Hárslevelű', 'Cabernet Franc', 'Kékfrankos', 'Cabernet

sauvignon' and variety candidate: 'Tarcál 26'). The strains were re-isolated from the trunk at least one year, or even two years later.

The decrease of the typical, visible GTD symptoms were observed on the vegetative organs of the treated plants, indicating the curative effect. The curative ability was likewise supported by the isolation of the applied *Trichoderma* strains from the plants' necrotic woody tissues. Our strains were able to colonize not only the surface of the pruning wounds (like the other *Trichoderma* based stimulants on the market), but also the woody tissues of the whole plant. The applied *Trichoderma* strains were re-isolated even three years following a single treatment. This indicates a long-time increase of the vitality of the grapevines, and control of the GTD pathogenic fungi, the disease incidence and the dieback of the grapevine.

Application

Our new product can be applied at different stages of the viticulture: (i) at the preparation of the propagating materials, before grafting; (ii) during planting; or (iii) treating of pruning or other wounds of the older plantations. Our strains have the ability to grow as low as 5°C, therefore they can be used in different climates, e.g. at pruning or planting in late winter or early spring in Europe.

Our strains also have the potential for application as biostimulants, as they have effectively increased the growth and grape production. Please see *Figure 3* on page 4.

The application of the product was effective in case of monocots as well, with increasing the germination activity of treated corns (*Figure 4*).

Advantages

- Can be applied in extreme weather conditions – worldwide usage
- Effective, stable colonization of several grapevine varieties
- Rapid, whole plant colonization – adaptation for host
- Bio stimulant - increasing the vitality and the yield of the plants
- Not only preventive, but also curative effect
- Can be applied at different stages of the viticulture (grafting, pre-planting, older plantations)

IP status

PCT patent application has been filed. The strains have been deposited in the National Collection of Agricultural and Industrial Microorganisms, according to the Budapest Treaty.

Who we are looking for

Business partners interested in licensing and commercializing a new and effective biostimulant.

Figure 1.

Candidate variety 'Tarcál 26' with/without *Trichoderma* spore solution one year after the treatment



Figure 2.

Clusters of the 'Tarcál 26' candidate variety



Figure 3.

Average budburst level ratio four years after the pre-planting Trichoderma application in Villány (summary of the results from 300 plants of three grapevine varieties).

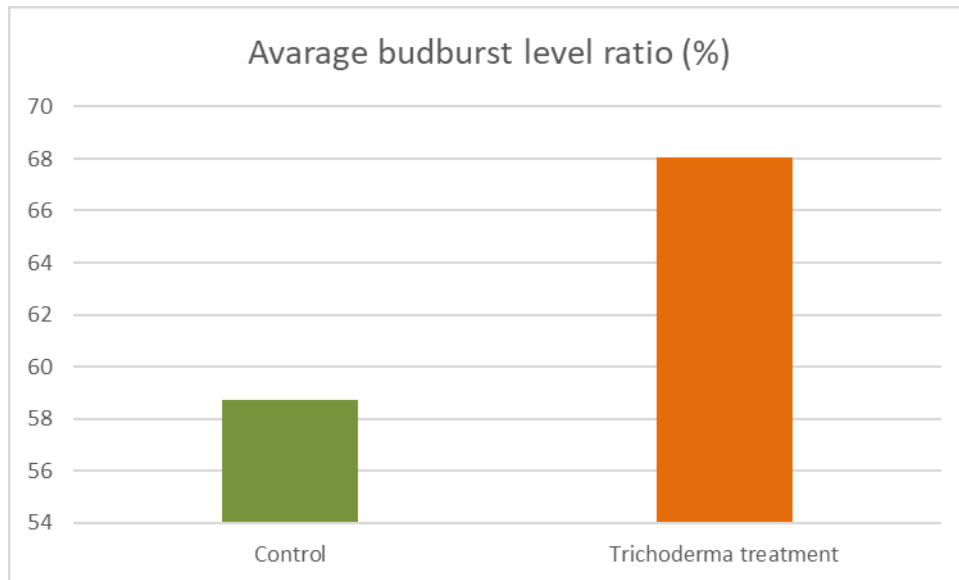


Figure 4.

The effect of Trichoderma treatment (sucking in 10^5 conidia/ml for 20 hours) on the germination efficiency of 'Golden Bantam' sweet corn seven days following the treatment.

