Authors: Vincent Michel (Agroscope, Switzerland), Michael Gaffney (Teagasc, Ireland)

MICROBIAL ANTAGONISTS & BCA: PRACTICAL INFORMATION

This factsheet contains complementary information to the Best4Soil video on Microbial antagonists & BCA: Practical information

INTRODUCTION

Soil microorganisms are a major factor in the four best practices promoted by the Best4Soil network to reduce the pressure of soilborne diseases in arable and vegetable crops. The two preventive practices, compost/organic amendments and cover crops/green manures, increase the activity and number of microorganisms antagonistic to soilborne pathogens and nematodes, so-called microbial antagonists. The two curative practices, ASD and solarisation, also rely on the effect of microbial antagonists, which cause the physical and chemical effects making these methods effective. Another use of microbial antagonists is the application of biological control agents (BCA), commercially produced microorganisms with a high ability to control certain soilborne diseases.

DIRECT EFFECT ON PLANT GROWTH

Microbial antagonists have an indirect positive effect on plants because they reduce the pressure from soilborne pathogens on the crop plants. But there is also a great number of microorganisms in the soil, which have a direct positive effect on plant growth and health (Somers et al., 2004). One group of such microorganisms are bacteria which are located on or close to the roots, the so-called rhizobacteria. They stimulate plant growth by producing phytohormones or by making mineral nutrients more available to the plants. Therefore, they are designated plant growth-promoting rhizobacteria (PGPR).
A second group are microorganisms which induce the activation of a systemic defense mechanism (Pieterse et al., 2003). Both bacteria and fungi can stimulate such an induced systemic resistance (ISR). Induced systemic resistance does not provide complete protection, but it has the advantage that it protects the plant from several pathogens in the same time (Raaijmakers et al. 2009).

COMMERCIAL BCA PRODUCTS

With the increasing pressure from consumers, and also for environmental reasons, there is a need for alternative plant protection products to replace synthetic plant protection products. In the case of soilborne diseases, the phasing-out of the methyl bromide (Gullino et al., 2003) added additional pressure to find such solutions. Fungicides, bactericides and nematicides containing BCAs as active ingredients are available as commercial products. Their efficacy has been demonstrated as they are officially registered (fig. 1). As they can be costly in comparison to more traditional fungicides, their application should be aimed at the treatment of seeds or roots of the plantlets before planting. For the treatment of the whole field, their use is too expensive and the distribution of organic amendments rich in microorganisms, such as compost, are currently more appropriate for this purpose.
Because of the comparative high costs of the registration, many BCA-containing products are not registered as plant protection products. They are sold as plant strengtheners, plant stimulants, organic fertilizer and similar products, and their efficacy may be unknown or not yet demonstrated. A way to find out how much such a product is worth to control soilborne diseases could be setup of a community of practice i.e., a group of persons who share knowledge on a specific topic. The Best4Soil network supports the setup of communities of practice by organizing a workshop dealing with the concerned topic. If you are interested, then contact Best4Soil (contact form is on www.best4soil.eu).

Best4Soil has received funding from the European Union's Horizon 2020 Programme as Coordination and Support Action, under GA n° 817696

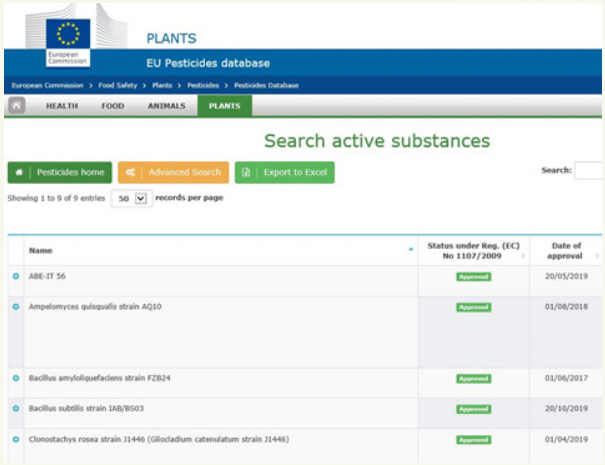

Fig. 1: Fungicides and other plant protection products containing microorganisms as active ingredient have to be registered.

Additional information on biofumigation are published as an EIP-AGRI minipaper:

https://ec.europa.eu/eip/agriculture/sites/agri-eip/files/8_eip_sbd_mp_biocontrol_final.pdf

References

Gullino M. L., Camponogara A., Gasparrini G., Rizzo V., Clini C., Garibaldi A. 2003. Replacing methyl bromide for soil disinfestation: The Italian experience and implications for other countries. Plant Dis. 87, 1012-1021.

Pieterse C. M. J., van Pelt J. A., Verhagen B. W. M., Ton J., van Wees S. C. M., Leon-Kloosterziel K. M., van Loon L. C. 2003. Induced systemic resistance by plant growth-promoting rhizobacteria. Symbiosis 35, 39-54.

Raaijmakers J. M., Paulitz T. C., Steinberg C., Alabouvette C., Moënne-Loccoz Y. 2009. The rhizosphere: a playground and battlefield for soilborne pathogens and beneficial microorganisms. Plant Soil 321, 341-361.

Somers E., Vanderleyden J., Srinivasan M. 2004. Rhizosphere bacterial signaling: A love parade beneath our feet. Crit. Rev. Microbiol. 30, 205-240.

Best4Soil has received funding from the European Union's Horizon 2020 Programme as Coordination and Support Action, under GA n° 817696