

# 1. Resilient Substrates: Use Of Biostimulators, Biofertilizers And Antagonists In Resilient Growing

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Greenhouse horticulture is confronted with an increased restriction on the use of chemical agents to control plant pathogens. This is the result of an unwanted emission of chemicals to the environment; an increased public demand for horticultural products without chemical residues and the substantial costs and time involved for manufacturers to authorise new means of crop protection. Therefore, growers seek new and sustainable means of crop protection. An alternative is known as "resilient growing". Instead of chemicals, means of a biological origin are added to growing media in order to achieve stress resistant plants and thereby prevent outbreaks of plant pathogens and to increase production. These means are generally grouped into composts, micro-organisms (bio fertilizers and control agents), organic extracts and bio stimulators. Typically, a stack of products is used to build up a resilient substrate and -plant.

This is inspired by the natural phenomenon of soil suppressiveness and aims at utilizing several mechanism in order to obtain a resilient-, and synergetic control of plant pathogens. In our greenhouse facility in Bleiswijk, the Netherlands, ten concepts were investigated during nursery and subsequent six weeks trials with tomato (cv. komeett), cucumber (cv. proloog) and gerbera (cv. optima). Three of these concepts were already available for growers, while seven other concepts were newly assembled. Among the products were seaweed-, plant- and compost extracts, humic acid, *Gliocladium catenulatum*, *Trichoderma* spp., *Bacillus subtilis*, chitin, liquid nitrogen fertilizer, aminolevulinic acid, phosphites and orthosilicate. The effects of these concepts on plant growth-, and early production parameters were assessed, *i.e.*, fresh- and dry weight of plants, stems, leaves and fruits or flowers and total leaf surface.

In addition, the magnitude of disease suppression towards *Rhizobium radiobacter* in tomato and towards a plant pathogenic *Fusarium oxysporum* in gerbera was investigated. An interaction between the concepts, plant parameters, disease suppression and substrates, *i.e.*, stone wool, perlite and coir, is shown. The rationale for the assembly of the concepts together with an overview of the results is given and the opportunity of these methods as sustainable alternatives for crop protection in greenhouse horticulture is discussed.