Photobiological Control of Crop Production and Plant Diseases

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Plants, as well as fungi, use ambient sunlight as information to regulate photomorphogenetic processes. The photobiological control of this information showed that the development of photobiological greenhouse plastic covers simulates a photonic information that leads to a physiological enhancement of plant productivity and fungal disease control, thus minimizing the need for the use of agrochemicals. The main characteristics of these photobiological greenhouse plastic covers are the high transmission of photosynthetically active radiation (PAR, 400–700 nm) combined with an increase of the factor $\zeta = RL_{(655-665\ nm)}/FRL_{(725-735\ nm)}$, which affects the cellular phytochromic equilibrium Φ = Pfr/(Pfr + Pr) and regulates the photosynthetic activity and therefore the plant productivity. Additionally, increase of the spectral ratios from the transmitted light: $BL_{(420-500\ nm)}/nearUV_{(290-370\ nm)}$ and $BL_{(420-500\ nm)}/FRL_{(725-735\ nm)}$, cause mainly the induction of biochemical, physiological and morphological responses, regulated by cryptochromes in plants (*e. g.* inflorescence and infructescence) and mycochrome in fungi (*e. g.* inhibition of sporulation). In the present work, comparative studies with randomly selected greenhouse plastics showed that small changes in the abovementioned "photobiological" parameters raise the productivity of tomato plants and inhibit the sporulation of several isolates of the fungal pathogen *Botrytis cinerea*. Thus, a model for the photoregulation of these two phenomena in greenhouses is proposed.

Key words: Fungal Sporulation, Photobiological Greenhouse Covers, Plant Production