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Influence of the Diffusivity and Transmittance of a Plastic Greenhouse Cover on the Development of Fungal Diseases in a Cucumber Crop

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Abstract: Mediterranean greenhouses are usually covered by plastic materials (films); these films allow light to pass through them, modifying some of their characteristics. The properties of the plastic cover influence the development of greenhouse crops. In addition, it can influence the stresses that the plants endure and the development of fungal diseases in the crop. The aim of this study is to analyze the effect that an experimental film cover, with high transmittance and high light diffusivity, produces on the development of fungal diseases on a cucumber crop (*Cucumis sativus* L.). Two different film covers were compared: (i) commercial film (transmittance of 85%; diffusivity of 60%); and (ii) experimental film (transmittance of 90%; diffusivity of 55%). The study was carried out across two autumn–winter crop cycles in a multi-span greenhouse divided into two isolated sectors. Three fungal diseases caused the main damage to the cucumber crop: downy mildew (*Pseudoperonospora cubensis*), powdery mildew (*Sphaerotheca fuliginia*) and gummy stem blight (*Didymella bryoniae*). In the case of powdery mildew, a greater severity in the sector was observed with the commercial film in comparison with the sector with the experimental film, with significant statistical differences between the two sectors in both crop cycles. Downy mildew and gummy stem blight were fungal diseases with less presence than downy mildew, and a greater presence of these two fungal diseases in the sector with the commercial film was also observed in both crop cycles.

Keywords: greenhouse; *Cucumis sativus* L.; diffuse film; transmittance film; fungal diseases



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1. Introduction

Solar greenhouses, characteristic of the Mediterranean coast, use passive climate control systems, which do not require external energy inputs, such as electricity or gas. With the energy of the sun or natural winds, Mediterranean greenhouses achieve climate control that is less expensive in terms of inputs. Mediterranean greenhouses are mostly covered with plastic films, which have passive systems for climate control; some of the plastic covers materials are infrared reflective films and are interesting materials that allow an increase in PAR transmission and optimal near infrared reflection, which can improve the air temperature management [1].

The type of covering material influences the energy consumption, performance and overall economy of greenhouses. A better understanding of the properties of these materials is of great importance to both researchers and farmers [2]. The physical properties of the cover material influence the quality of the indoor microclimate [3]. Transmittance is considered one of the most important physical properties; the characteristic values of transmittance in plastic films vary between 70–90%. The ideal material has to allow 100% of