



Comparison of Polyunnel Structures on Agronomic and Economic Performances of Salad Cucumber (*Cucumis sativus* L.) Under Warm Humid Tropical Environment

L.D.N.C. Liyanage¹, M.K.D.K. Piyaratne², K.K.L.B. Adikaram², D. Ratnasekara³, K.M.C. Fernando^{1*}

¹Department of Crop Science, Faculty of Agriculture, University of Ruhuna

²Faculty of Agriculture Centre for Information Technology, Faculty of Agriculture, University of Ruhuna

³Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna

*Corresponding author: menaka@crop.ruh.ac.lk

Protected cultivation offers several advantages for high-value crops such as salad cucumber by providing a better-controlled environment, reducing pest and disease pressure, and enabling year-round production. One of the main factors affecting yield attributes in controlled environmental cultivation is the structural design of the polyunnel. An experiment was conducted to evaluate the effectiveness of two polyunnel designs using salad cucumber (*Cucumis sativus* L. var. Hanyan CU-13502) as the test crop. The experiment compared two polyunnel designs: an improved, naturally ventilated Design (T1) and a conventional design (T2). Data on cucumber growth and yield, tunnel temperature and relative humidity, disease incidence, and cost-benefit analysis were collected. Growth and yield parameters were recorded from thirty replicates per treatment for 90 days from seed germination. Under identical management conditions, T1 demonstrated superior vegetative growth with a significantly higher number of leaves per vine and greater above- and below-ground dry biomass compared to T2. However, time to flowering, vine length, number of fruits per vine, fresh fruit weight, and total fruit yield per vine did not differ significantly between tunnels. Despite similar yield quantities, T1 produced a higher proportion of internationally marketable fruits (dark green fruits without defects and diameter 4.0–3.5 cm), indicating superior fruit quality. Disease incidence was significantly higher in T2, with 70% greater prevalence of downy mildew and powdery mildew, which could be associated with elevated temperatures hence reduced incubation period. Mid-day tunnel temperatures were higher in T2 compared to T1, while relative humidity did not differ significantly. Economic analysis indicated a benefit-to-cost ratio of 1.82 for T1 and 1.63 for T2, with the difference mainly attributable to construction costs. Based on the results of the present study, the improved polyunnel design with effective natural ventilation is recommended for adoption in the warm and humid tropical areas of Sri Lanka to achieve superior product quality and reduced fungal disease incidence in salad cucumber cultivation.

Keywords: Growth and yield, Microclimate, Polyunnel structure, Salad cucumber