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后墙立体栽培草莓提高冬季日光温室内温度

Back wall stereo-cultivation of strawberry improves temperature in Chinese solar greenhouse in winter

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作者	单位
宋卫堂	1. 中国农业大学水利与土木工程学院, 北京 1000832. 农业部设施农业工程重点<综合>实验室, 北京 100083
栗亚飞	1. 中国农业大学水利与土木工程学院, 北京 100083
曲明山	3. 北京市农业局土肥工作站, 北京 100029
何华名	1. 中国农业大学水利与土木工程学院, 北京 100083
郑亮	1. 中国农业大学水利与土木工程学院, 北京 100083
邢文鑫	1. 中国农业大学水利与土木工程学院, 北京 100083

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中文摘要:

在日光温室的后墙上,采用管道无土栽培方式进行蔬菜或草莓生产,可以提高温室空间利用率和作物种植量,但可能会出现因为管道和植物的挡光而减少后墙蓄热、降低冬季温室温度的问题。为此,通过冬季连续31 d的温度监测,在3种典型气象(晴天、阴天、雪天)条件下,对比分析了有后墙立体基质栽培的日光温室(solar greenhouse with equipment, ESG)和无后墙立体栽培的日光温室(solar greenhouse with no equipment, NSG)温度环境的变化。监测结果表明,ESG的月平均气温较NSG高0.84℃,其中最大日温差为2.22℃,最小日温差为0.14℃。晴天条件下,ESG的日平均冠层温度和1.5 m高度处的空气温度分别是12.72和13.04℃,NSG分别是10.68和11.04℃;ESG的冠层温度最低值是4.68℃,而NSG最低值是4.10℃。可见,ESG较NSG的气温要略高一些;阴天和雪天条件下,2种温室内的温度环境无显著差别。因此,利用日光温室后墙进行立体基质栽培草莓,不但没有降低反而提高了冬季温室内的温度,是一种可行、值得推广应用的温室高效栽培技术。

英文摘要:

Abstract: In Chinese solar greenhouse production, pipe stereo-cultivation of vegetables or strawberry on the greenhouse back wall could improve the space utilization and increase the cultivation area and yield. However, it is possible that shading of pipes and plantings may reduce the back wall heat storage and result in the decreasing of internal temperature of the greenhouse in winter. The objective of this study is to find out whether the back wall pipe cultivation affects the temperature variations of solar greenhouse in winter. In this article, the experiment was conducted in two solar greenhouses of a strawberry park in suburb Beijing. The structure type, growing conditions and management methods of the two experimental greenhouses are exactly the same. Pipe strawberry cultivation facility was installed on the back wall (2.3m high) in one solar greenhouse. The pipe cultivation facility is composed of 4 rows of horizontal PVC pipe, center distance of each row is 40 cm, diameter of the pipe is 160 mm with 9cm width's notch on the upper side. Cultivation substrate (peat: perlite: vermiculite = 1:1:1 (v/v), depth is 10 cm) and drip irrigation to fertilizer nutrient solution were used. Five measurement points were arranged in both greenhouses, to measure the temperature of strawberry growth canopy and 1.5 m above the ground. Temperature condition of the two greenhouses for 31 days (from Jan. 20th, 2013 to Feb. 20th, 2013) was continuously monitored, and the temperature variations of solar greenhouse with equipment (ESG) and solar greenhouse with no equipment (NSG) of three typical climatic conditions (sunny, cloudy and snowy) were analyzed. The results showed that the monthly mean temperature in ESG was 0.84℃ higher than that in NSG, and the maximum and minimum of daily temperature difference was 2.22℃ and 0.14℃, respectively. In sunny days, daily mean canopy temperature and daily mean air temperature at 1.5m height in ESG were 10.68℃ and 11.04℃, but they were 10.68℃ and 11.04℃ in NSG, respectively. The highest and lowest canopy temperatures in ESG were 24.70℃ and 4.68℃, compared to they were 20.70℃ and 4.10℃ in NSG. The highest and lowest air temperatures at 1.5m height were 26.95℃ and 4.65℃ in ESG, while they were 22.73℃ and 4.13℃ in NSG. It could be inferred that the sunny day temperature condition in ESG was better than in NSG. In the cloudy and snowy days, there was no significant difference in temperature condition in ESG and NSG. Therefore, it can be concluded that back wall stereo-cultivation of strawberry in solar greenhouse increased the internal temperature in winter. There is a promising prospect of back wall stereo-cultivation and it is an efficient cultivation technology worthy of popularization and application in Chinese solar greenhouse.

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