Wang Jian

Areas of Research

Facilities Horticulture, Agricultural biological environment and engineering .

Contact Information

Office location: Room B6019, Biological Sciences Building, Nanjing Agricultural University.

Office phone：0-18020129778

Email address： wangjian@njau.edu.cn

Research Interests

Simulation of agricultural biological environment; Design and optimization of greenhouse structure

Engaged in teaching and Research on Facilities Horticulture Engineering and facility agricultural science and engineering. Many valuable theoretical and engineering experiences have been accumulated in the research of greenhouse configuration optimization and environmental simulation. Some of the problems we are currently working on are described below:

1．Design

Two new types of greenhouses have been presented with removable back walls particularly suitable for composite climate (cold days in winter and spring, as well as hot days in summer) as a replacement for conventional single-span polyethylene film covered greenhouse. One greenhouse had a fully-removable back wall and one had a half-removable back wall. The removable back walls, made of jute fiber boards, were installed in cold days for heat preservation and removed in summer for ventilation. The thermal environment of the greenhouses were examined and compared with a typical single span polyethylene hoop greenhouse used in the area. The results indicate that in that area two types of greenhouses with removable back walls could be better alternatives to the conventional greenhouse.

Based on the economical level of rural areas and the theory of Chinese solar greenhouse, two new types of straw block (type I and type II straw block) are proposed. The main functions of type I straw block and type II straw block are to store heat and

reduce heat losses. The new type straw block north wall has many merits, including large thermal capacity, good thermal insulation, low cost, environmental friendliness and easy installation. A new type of solar greenhouse with straw block north wall was developed. The heat transfer characteristics, temperature, heat absorption, release and loss of its north wall were investigated by theoretical and experimental analyses and the economic and environmental evaluations of north walls were carried out. The new type straw block north wall had better thermal properties and could improve thermal environment of greenhouse. Besides, it was low-cost and environmentally friendly.

2. Analysis

With the increase of abnormal climatic conditions in recent years, the safety of the structure has become a noteworthy issue in the design and construction of plastic greenhouses. The mechanical behavior of a plastic greenhouse with a span of 20m was investigated using finite element method. Numerical model of the 3-D structure frame was developed, and typical load actions were analyzed based on relevant provisions of the Chinese Standard and Eurocodes. Then the analysis and evaluation of strength, stiffness and stability characteristics on the structure under different load actions were carried out.

3. Simulation

The structure of the ventilation vent used in a greenhouse has a significant impact on the ventilation of the greenhouse. A large number of studies have shown that a good structure of vent is conducive to guiding the flow of external air into the interior and forming a good greenhouse airflow field, which will be effective in cooling the greenhouse. Ventilation is important for crop production and quality in greenhouse cultivation, and vent dimension and position are the basis of greenhouse design. The effect of the back wall vent dimension on solar greenhouse cooling was investigated by CFD (Computer Fluid Dynamics).

Education Background

Bachelor：Su Zhou University of Science and Technology
Doctor：Nan Jing Agricultural University

Work experience

Lecturer, Nan Jing Agricultural University, 2007-2011

Associate Professor, Nan Jing Agricultural University, 2012-

Selected Publication

Ren Jie, Zhao Zhe, Zhang Jian, **Wang Jian ***, Guo Shirong, Sun Jin. Study on the hygrothermal properties of a Chinese solar greenhouse with a straw block north wall. Energy and Building, 2019, 193: 127-138.

Ren Jie, **Wang Jian ***, Guo Shirong, Li Xing, Zheng Kunpeng, Zhao Zhe. Finite element analysis of the static properties and stability of a large-spanplastic greenhouse. Computers and Electronics in Agriculture, 2019, 165: 104957.

Ni Mengwei, Lan Dun, Mohammad Shah Jahan, **Wang Jian***, Guo Shirong. A pilot study on the microclimate of a multi-span solar energy greenhouse. Applied Engineering in Agriculture, 2019, 35(4): 601-616.

Lei Wang, Shirong Guo, Ying Wang, Dandan Yi, **Jian Wang***. Poultry biogas slurry can partially substitute for mineral fertilizers in hydroponic lettuce production. Environmental Science and Pollution Research，2019, 26: 659-671.

He Xiangli, **Wang Jian ***, Guo Shirong, Zhang Jian, Wei Bin, Sun Jin, Shu Sheng. Ventilation optimization of solar greenhouse with removable back walls based on CFD. Computers and Electronics in Agriculture, 2018, 149: 16-25.

Zhang Jian, **Wang Jian** *, Guo Shirong, Wei Bin, He Xiangli, Sun Jin, Shu Sheng. Study on heat transfer characteristics of straw block wall in solargreenhouse **.** Energy and Building, 2017, 139: 91-100.

Wei Bin, Guo Shirong, **Wang Jian** *, Li Jie, Wang Junwei, Zhang Jian, Qian Chuntao, Sun Jin. Thermal performance of single span greenhouses with removable back walls. Biosystems Engineering, 2016, 141: 48-57.

Wei Bin, Guo Shirong, Li Jie, Li Shuhai, **Wang Jian ***, Wang Junwei, Qian Chuntao, Sun Jin. Design and Experimental Evalution of Greenhouses with Removable Back Walls. Applied Engineering in Agriculture, 2015, 31(4): 633-642.