果树喷雾用圆盘风扇三维气流速度场数值模拟与验证 Numerical Simulation and Experimental Verification of 3-D Air-velocity Field of Disk Fan Used in Orchard Sprayer

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关键词： 果树 仿形喷雾 圆盘风扇 气流速度场 CFD模拟 试验

摘 要： 为研究用于果树风送喷雾的圆盘风扇气流速度场分布特性，采用 k-ε 紊流模型和稳态求解方法，设置合适的边界条件，对单、双风扇不同出口风速的气流速度场进行三维稳态数值模拟和试验验证。结果表明，双风扇同时送风时，在离两风扇中心1~3 m的范围内，中心区域的风速明显小于两边的风速，在3~5 m的范围内中心区域的风速和两边的风速相差不大。模拟值与试验值对比表明变化趋势一致，二者的拟合直线决定系数 R2分别为0.804 4和0.795 7，所建模型可以比较准确地模拟风扇气流速度场的分布。 In order to investigate the characteristics of air-velocity field of disk fan used in orchard sprayer, a turbulence model by means of the standard sub-model with appropriate boundary condition was developed and 3-D steady state of air-velocity field of single and double fans was simulated and verified. The results showed that in the distance of 1 m to 3 m from the double fans center, the velocities of the center region were lower than the both sides, but in the distance of 3 m to 5 m, the air-velocity distribution of double fans was uniform. The results of comparison showed that the trends of simulated and measured curves were coincident, the correlation determination (R2) of single and double fans were 0.804 4 and 0.795 7, respectively. The model could accurately predict air-velocity distribution pattern.

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