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紫外线-臭氧组合式营养液消毒机的设计及灭菌性能试验

Development and test of nutrient solution disinfection machine by combining UV with ozone

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英文关键词: [disinfection](#) [design](#) [experiments](#) [combining UV with ozone](#) [nutrient solution](#) [disinfection rate](#)

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中文摘要:

为了充分利用紫外线、臭氧在封闭式无土栽培系统营养液消毒上的优势,设计、试制并检测了一种紫外线-臭氧组合式营养液消毒机。样机主要包括紫外线消毒器、4个文丘里射流器、臭氧发生器、自吸泵、ABS管路及自动控制设备等。工作时,灌溉后回收的营养液首先由自吸泵提高压力后以一定流量和速度通过文丘里射流器的喉管,在此由臭氧发生器产生的臭氧由于负压作用吸入并与营养液充分混合,从而杀灭营养液中的病原微生物;然后营养液再经过紫外线消毒器,在紫外线的照射下进一步杀灭病原微生物。对所研制的消毒机,用经过了180 d番茄栽培试验的营养液进行了UV、O₃、UV+O₃ 3种方法的灭菌性能测试,结果表明:主要微生物(细菌、真菌、放线菌)总的消毒效果分别达到70.6%、15.9%和89.9%。可以看出,紫外线-臭氧组合式消毒,达到了比单一灭菌方法更好的灭菌效果,显现出了协同效应,可以较大幅度地提高消毒效率。

英文摘要:

In order to make full use of superiority of ultraviolet radiation (UV) and ozone (O₃), to disinfect nutrient solution in a closed soilless cultivation system, a kind of ultraviolet-ozone combined-type nutrient disinfection machine was designed, tested and inspected. Prototype mainly included a UV sterilizer, four Venturi jet devices, an ozone generator, a self-suction pump, a ABS piping and automatic control equipment, etc. In operation, the collected nutrient solution after irrigation was pumped firstly through the connected parallel Venturi throat and mixed with ozone which produced by ozone generator to inhibit microbial pathogens by oxidation. Then it passed through the ultraviolet disinfectant where UV light radiation killed the pathogens further. The disinfection rate could be increased compared with UV or O₃ alone. A commercial prototype was manufactured and its performance was tested by disinfecting nutrient solution from tomato hydroponics, which was used for over 180 days continuously. The main pathogens such as bacteria and fungi in the nutrient solution were sterilized by UV, O₃ and UV+O₃ separately, and disinfection rates were detected. The total disinfection rates of three methods were 70.6%, 15.9% and 89.9%, respectively. It was inferred that the method of ultraviolet-ozone combined-type nutrient disinfection can reach better sterilization effects than single ones, and can improve disinfection efficiency greatly with a synergy effect.

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