基于分形理论的地下滴灌灌水器水力特性研究 Research on the Hydraulic Properties of SDI Emitter Based on Fractal Theory

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关键词：　地下滴灌 分形特征 土壤颗粒质量分形维数

摘　要：　为了研究滴头工作压力和土壤物理特性对地下滴灌灌水器流量的影响，采用分形理论分析各种级配土壤的分形特征；以土壤颗粒质量分形维数、灌水器工作压力、土壤容积密度、土壤初始含水率为试验因素，运用混合水平均匀设计方法进行试验。结果表明，粘粒含量大小是土壤分形维数的主要影响因素，土壤分形维数随着粘粒含量的增加而增大；PLASSIM公司地下滴灌灌水器流量随土壤分形维数的增大而减小，即土壤质地越细地下滴灌滴头流量就越小；通过试验所建立的包含有土壤分形维数因素的地下滴灌灌水器流量计算经验公式的普适性较高。　In order to study the effect of work pressure and soil physical properties on the flow rate of the subsurface drip irrigation (SDI) emitter, the soil fractal feature under different gradations was analyzed using fractal theory. Uniform design method was applied and the following four factors were considered in the experiment: the fractal dimension of the soil particle-weight, work pressure of the emitter, soil bulk density, and initial soil water content. The results showed that the fractal dimension was significantly influenced by the soil clay content; the fractal dimension increased as the soil clay content increased. When the PLASSIM SDI emitter discharge was increased, the soil fractal dimension decreased; the finer the soil texture was, the smaller the emitter discharge became. By taking soil fractal dimension factor into account, the experimental empirical formula for estimating the SDI emitter discharge has preferable universality.

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