

地下滴灌条件下三倍体毛白杨根区土壤水分动态模拟

席本野, 贾黎明**, 王 烨, 李广德

北京林业大学省部共建森林培育与保护教育部重点实验室, 北京 100083

Simulation of soil water dynamics in triploid *Populus tomentosa* root zone under subsurface drip irrigation.

XI Ben-ye, JIA Li-ming, WANG Ye, LI Guang-de

Province Ministry Co-construct Key Laboratory of Silviculture and Conservation of Education Ministry, Beijing Forestry University, Beijing 100083, China

- 摘要
- 参考文献
- 相关文章

全文: PDF (1797 KB) HTML (1 KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要

在根系分布试验观测的基础上, 提出了三倍体毛白杨一维根系吸水模型, 在考虑根系吸水情况下利用HYDRUS模型模拟了地下滴灌条件下三倍体毛白杨根区的土壤水分动态, 通过田间试验对模型进行验证, 并利用HYDRUS研究了不同灌水技术参数对土壤湿润模式的影响。结果表明: 在灌溉结束和水分再分布24 h后, 土壤含水量模拟结果的相对平均绝对误差(RMAE)分别为7.8%和6.0%, 均方根误差(RMSE)分别为0.036和0.026 $\text{cm}^3 \cdot \text{cm}^{-3}$, 说明HYDRUS模型能很好地模拟地下滴灌条件下三倍体毛白杨根区的短期土壤水分动态, 且所建根系吸水模型合理; 与2、4 $\text{L} \cdot \text{h}^{-1}$ 的滴头流速和连续性灌溉相比, 流速1 $\text{L} \cdot \text{h}^{-1}$ 和脉冲式灌溉(每隔30 min灌水30 min)能增大土壤湿润体体积, 且可以减少水分深层渗漏量, 因此, 对试验地三倍体毛白杨根区进行地下滴灌应首选流速1 $\text{L} \cdot \text{h}^{-1}$ 的脉冲式灌溉。

关键词: 三倍体毛白杨 地下滴灌 土壤水分运动 HYDRUS 数值模拟

Abstract:

Based on the observed data of triploid *Populus tomentosa* root distribution, a one-dimensional root water uptake model was proposed. Taking the root water uptake into account, the soil water dynamics in triploid *P. tomentosa* root zone under subsurface drip irrigation was simulated by using HYDRUS model, and the results were validated with field experiment. Besides, the HYDRUS model was used to study the effects of various irrigation technique parameters on soil wetting patterns. The RMAE for the simulated soil water content by the end of irrigation and approximately 24 h later was 7.8% and 6.0%, and the RMSE was 0.036 and 0.026 $\text{cm}^3 \cdot \text{cm}^{-3}$, respectively, illustrating that the HYDRUS model performed well in simulating the short-term soil water dynamics in triploid *P. tomentosa* root zone under drip irrigation, and the root water uptake model was reasonable. Comparing with 2 and 4 $\text{L} \cdot \text{h}^{-1}$ of drip discharge and continuous irrigation, both the 1 $\text{L} \cdot \text{h}^{-1}$ of drip discharge and the pulsed irrigation with water applied intermittently in 30 min periods could increase the volume of wetted soil and reduce deep percolation. It was concluded that the combination of 1 $\text{L} \cdot \text{h}^{-1}$ of drip discharge and pulsed irrigation should be the first choice when applying drip irrigation to triploid *P. tomentosa* root zone at the experiment site.

Key words: triploid *Populus tomentosa* subsurface drip irrigation soil water movement HYDRUS numerical simulation

引用本文:

. 地下滴灌条件下三倍体毛白杨根区土壤水分动态模拟[J]. 应用生态学报, 2011, 22(01): 21-28.

. Simulation of soil water dynamics in triploid *Populus tomentosa* root zone under subsurface drip irrigation. [J]. Chinese Journal of Applied Ecology, 2011, 22(01): 21-28.

链接本文:

<http://www.cjae.net/CN/> 或 <http://www.cjae.net/CN/Y2011/V22/I01/21>

没有本文参考文献

[1] 孙秀娟; 马孝义; 刘继龙; 战国隆. 膜孔灌溉条件下点源平均入渗水深的数学模拟[J]. 应用生态学报, 2010, 21(3): 654-660.

服务

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ E-mail Alert
- ▶ RSS

作者相关文章