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Computer simulation of traction effect of plant lateral roots on soil

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Abstract: Plant lateral roots play an important role in soil reinforcement and slope stabilization. Investigating the mechanical effect of roots on soil, and establishing the traction effect model of lateral roots on soil may provide a basis contributing to ecological slope protection. However, traction effect of plant lateral roots on soil is intricate to be analyzed, and its model is difficult to be solved. Therefore, computer simulation appears to be a viable solution to this problem. In this paper, the traction effect model of plant lateral roots on soil was established for computer simulation on the basis of analyzing its mechanics process, and the relative computer simulation system was developed in MATLAB to provide a simulation platform for analyzing the traction effect of lateral roots. In this platform, not only the complicated model of traction effect can be solved, but also its behavior can be observed and predicted in modeling simulation by changing the input variables and model parameters. Finally, the simulation and experimental testing were implemented for lateral roots of Yunnan pine. The results show that the proposed simulation model of traction effect is of good precision, and the simulation system is valid and reliable.

key words: plant lateral roots; traction effect; computer simulation

编者按: 本期追踪热点集中报道几篇有关油菜与生物柴油的文章

发展替代能源是保障国家能源安全的一项重要战略举措, 党中央、国务院对此高度重视。发展替代能源已成为近期研究的热点。2006年11月20日, 中共中央政治局委员、国务院副总理曾培炎主持召开会议, 研究发展替代能源研究工作。曾培炎指出, 发展替代能源要按照以新能源替代传统能源, 以优势能源替代稀缺能源, 以可再生能源替代化石能源的思路, 逐步提高替代能源在能源结构中的比重。当前, 要重点发展车用燃料和替代石油产品, 搞好煤炭液化, 煤制甲醇、二甲醚、烯烃和煤基多联产技术的试验示范和开发应用; 积极发展燃料乙醇和生物柴油; 大力发展沼气、太阳能、风能、水电、地热等可再生能源, 尽可能降低对化石燃料的依赖, 减少污染物的排放。

在国务院召开的发展替代能源工作会议中, 发展燃料乙醇和生物柴油是替代能源的发展重点之一。由

于油菜种植面积大, 油菜籽的总产量大, 菜籽油出油率高, 油菜籽油转化为生物柴油的转化率高, 因而发展以油菜籽为原料的生物柴油潜力巨大, 前景广阔。为加强这方面的报道, 本刊策划了有关油菜与生物柴油的专题文章, 涉及油菜的生产管理(第一作者: 汤亮, 下同), 酯交换制备生物柴油的工艺(张无敌), 为油菜机械化收获提供基础数据的油菜角果裂角力测定(谭小力), 菜籽油压榨数值模拟(郑晓), 生物柴油能耗与排放评价(胡志远), 菜籽饼粕中多糖的酸提取工艺(刘贝贝), 水酶法提取菜籽乳化油的工艺(章绍兵)。同一期集中刊登, 以便于读者参阅使用。由于时间和容量的限制, 本期只刊登了7篇相关文章, 以后将继续关注和报道有关替代能源开发工艺技术方面的文章。欢迎参阅引用, 欢迎关注和投稿。

(本刊 王应宽 供稿)