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## 高通量下水稻育种网络信息管理系统

### Research of network information management system for high-throughput rice breeding

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中文摘要:

高通量水稻种植试验以及表型现象检测是水稻分子遗传育种研究中的重要步骤。针对种植试验中容易大量存在的育种信息记录错误、延迟、整合繁琐、查询困难、共享不便等问题,设计了基于RFID、数据库和网络技术的水稻育种网络信息管理系统。该系统以水稻种植试验为研究对象,通过RFID电子标签实现水稻盆栽的实时标识;建立网络信息管理系统对种植水稻信息进行远程访问和操作;并针对水稻突变体库的多代种植,提出了水稻种植家系可追溯的数据管理方法,实现水稻家系的自动追溯和家系树的自动生成。种植区试验证明系统能可靠记录入场水稻盆栽信息,并有出错提示功能;能实现水稻盆栽在种植区位置的自动分配及跟踪管理。系统远程访问、操作,管理正常运行,有效地提高了水稻遗传育种试验的效率。

英文摘要:

Abstract: High-throughput rice planting experiments and phenotypic traits testing are the main methods in the research of rice molecular genetic breeding. In this research, a network information management system was designed based on the combination of RFID technology, database technology, and network technology to solve the problems of wrong/delaying-recording, inconvenient-searching/sharing and other issues during the acquisition of breeding information. The system efficiently improves the speed of rice planting experiments. The research is based on the greenhouse potted rice automation conveying equipment in Huazhong Agricultural University, which consists of the automatic greenhouse, the automatic irrigation system, the automated high-throughput potted rice planting and transmission system, and the rice phenotypic traits testing equipment. Its functions include potted rice breeding and cultivation, irrigation, transportation, scheduling, phenotypic traits testing, data recording in the phenotype of growth process, etc. This paper analyzes the network information management system, which is composed of RFID tags, RFID tag readers, networking software, and a database. RFID tags are placed on the bottom of each pot for real-time identification of rice, and RFID tag readers are installed under the transport line to get needed information by a unique code assigned to each corresponding RFID tag. The networking software, which could be accessed remotely, is built for the management of the rice breeding information and based on Visual Studio. The NET 2010 platform, programmed with C # and JavaScript language, realizes data management and interaction with the SQL Server 2008 database platform. We conducted the system in the Browser/Server structure with Windows platform. The mentionable point is that we added an ActiveX control in a web page, which can realize reading and writing RFID tags remotely via a browser, which is only needed to visit the system and to achieve accesses, queries, updates and other operations about breeding information data through the remote PC. With the establishment of the rice breeding information entity-relationship model, a unique code is proposed in this paper, including rice varieties and mutant libraries, generations of planting, sequential numbers of current generations, sequential numbers of parental generations, and flags of genetic mutations. Each code corresponds with one pot of rice, and is stored in both the RFID tag and database. According to the code, we can trace the family members of multi-generational rice from the database and build the family tree of rice for experiments. The system remotely realizes the real-time information management of breeding and rice mutant library planting trials. Tests in the planting area prove that the system is stable and reliable, and can improve the efficiency of rice genetics and breeding experiments.

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