姜 凯,张 骞,王 秀.机械式自清洁播种头设计与试验[J].农业工程学报,2013,29(20):18-23

机械式自清洁播种头设计与试验

Design and test on self-cleaning seeding head for mechanism suction

投稿时间： 2013-07-22 最后修改时间： 2013-09-22

中文关键词：播种机,设计,试验,力学模型,自清洁,播种头

英文关键词:seeder design test mechanical model self-cleaning seeding head

基金项目:国家科技支撑计划资助项目（2012BAF07B02）和国家863计划资助项目（2012AA101903）

作者	单位
姜 凯	1. 北京农业智能装备技术研究中心，北京 100097
张 骞	2. 北京农业信息技术研究中心，北京 100097
王 秀	1. 北京农业智能装备技术研究中心，北京 100097

中文摘要:

为解决现有针式穴盘播种机的吸嘴易发生堵塞影响播种质量的问题，该文基于气吸-气吹的播种原理，设计了一种机械式自清洁播种头，结构包括吸嘴头、固定部、清洁活塞、顶针和复位弹簧等，通过清洁活塞和顶针对吸嘴头进行疏通和排种作业。建立了负压吸种、正压机械排种的力学模型，分析结果显示，吸种气流速度与吸嘴的吸附孔直径成正比，与吸种高度成反比；排种压力取决于种子重力、复位弹簧压缩力和种子吸附力。在吸种高度一定的条件下，吸种负压与吸附孔直径负相关；在吸附孔直径一定的条件下，吸种负压与吸种高度正相关。试验结果表明，在播种速度为40排/min，吸种真空度为35 kPa，排种压力为50 kPa时，自清洁播种头播种的单粒率为95.31%，空穴率为1.56%，重播率为3.13%，各指标与传统针式吸嘴相比分别提高了7.81%、6.25%、1.56%，播种质量和防堵效果均有显著提高。该文为自清洁播种头的参数优化与排种质量进一步提升提供了理论依据。

英文摘要:

Abstract: In China, the cultivation area of the facilities agriculture has reached 3.5 million hectares, and the industrialized farming will continue to develop during the period of the 12th "Five-Year Plan". The demand for intelligent equipment of facilities agriculture has become increasingly urgent with the rapid development of the ageing of population and the lacking of labor in rural areas of China. As for the air-suction seeders, there were many researches on positive pressure methods for dredging and ejecting seed head, but few reports about the research on the technology to prevent the seeding head blockage. The needle-type tray seeder consisted of seeding head, seeding pole, conveying cylinders, seeds plate, pneumatic vibrator, guide pipe, conveyor belt and so on. The seeds plate and pneumatic vibrator provide exciting force to boil the seeds to make the seeds being absorbed easily. Operations of absorbing the boiling seeds from the seeds plate and transporting the seeds to the guide pipe were implemented by the seeding head, seeding pole, conveying cylinders and guide pipe. In order to solve the problem that the suction nozzle of needle-type tray seeder was easily blocked to affect the quality of sowing, a kind of mechanical self-cleaning seeding head was designed based on air suction-blowing seeding principle. The structure of mechanical self-cleaning seeding head consists of a nozzle tip, fixed base, cleaning piston, thimble and reset spring and other parts. The suction nozzle was dredged by cleaning piston, and the seeding operation was performed by the thimble. The mechanical models that seeds were drawn at negative pressure and ejected mechanically at positive pressure were developed. The analysis results showed that the suction airflow rate was directly proportional to the inside diameter of the suction nozzle and inversely proportional to the height of suction position. The pressure of ejecting seed depended on the compression force of the reset spring, the gravity and adsorption force of seed. While the height of suction position was fixed, the negative pressure for sucking seed was negatively related to the inside diameter of the suction nozzle. While the inside diameter of the suction nozzle was constant, the negative pressure for sucking seed was positive correlated with the height of suction position. The experimental results showed that while the speed of seeding is 40 rows per minute, pickup vacuum is 35 kPa, shooting-seed pressure is 50 kPa, the single seed rate, cavity rate and repeat seeding rate were 95.31 %, 1.56 % and 3.13 % respectively, which increased by 7.81%, 6.25% and 1.56% respectively than traditional suction nozzle. The quality of sowing and effects of anti-blocking were improved significantly, so the self-cleaning seeding head can replace the traditional needle-type suction nozzle. The research can provide a reference for further improving quality and optimizing the parameter for self-cleaning seeding head.

查看全文 下载PDF阅读器

关闭