王方艳,张东兴.圆盘挖掘式甜菜联合收获机设计与试验[J].农业工程学报,2013,29(13):7-14

圆盘挖掘式甜菜联合收获机设计与试验

Design and experiment of disc-dig sugar beet combine

投稿时间： 2013-01-21 最后修改时间： 2013-05-27

中文关键词：联合收获机,设计,试验,甜菜

英文关键词:combine harvester design experiment sugar beet

基金项目:农业部土壤-机器-植物系统技术重点实验室资助项目

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中文摘要:

为了缓解中国甜菜收获装备短缺的现状，设计了一种适合国内甜菜种植模式和农艺要求的圆盘挖掘式甜菜联合收获机，并阐述了该机的总体配置及主要部件的结构。该机主要由传动系统、对行装置、挖掘装置、输送分离装置、升运装置等组成。其中，液压控制系统提高了机械的操控性及自动化程度；对行装置减少了甜菜的漏挖，实现了自动对行收获；圆盘式挖掘部件参数的优化设计有效减少了工作阻力，输送分离装置和升运装置中的杆式输送链减少了甜菜的输送损失和含杂。田间试验表明，收获机甜菜收获损失率不大于3.42%，粘土率不大于1.18%，损伤率不大于1.82%，折断率不大于1.6%，含杂率不大于4.86%，符合甜菜收获要求。该研究可为甜菜收获机械设计提供参考。

英文摘要:

Abstract: The combine harvester is one of important tools for a sugar beet harvest. In order to solve time-consuming, tedious, and inefficient process in manual picking up of sugar beet by a traditional digger, and alleviate the shortage of sugar beet harvesting equipment, a disc-dig sugar beet combine harvester with medium horsepower tractors was designed based on the planting pattern and agronomic requirements, and the overall configuration and the structure of the main parts were described. The combine was composed of a rack, transmission system, guiding mechanism, digging device, conveying and cleaning device, hoisting equipment and driven system, et al. which enabled a one-stop achievement of sugar beet digging, conveying, removing soil and collecting. It effectively decreased the labor cost, simplified the commodity sugar beet processing links, and enhanced the efficiency of production. The driving system was configured in two independent ways, and equipped with a mechanical hydraulic control system, which improved the control accuracy and automation. With the hydraulic control system, the guiding mechanism reflected quickly and reduced the leakage (loss) of the sugar beet during harvesting. The disc digging component of the digging device reduced the excavated soil volume, improved the ability of breaking soil, and reduced the working resistance effectively. The throwing wheel moved sugar beet to the conveying and cleaning device, which was arranged behind the digging device. The hoisting equipment has a compact structure and good working reliability. Meanwhile, the web chain was composed of bending rods and bar rods, realized the chain jitter without source vibration, and reduced the transmission loss and the impurity of sugar beet. Field tests indicated that the rate of sticking to soil, the loss rate, the damage rate, the broken rate, and the impurity rate reached 0.8%, 4.5%, 2.4%, 1.6%, and 3.1%, respectively, which are in line with the sugar beet harvesting requirement. The results show that the developed harvester exhibits better performances and adaptation on the dry land. The further study will focus on the key parts parameters, in order to improve the applicability of the sugar beet harvester. This study can provide some references for the development and design of medium scale agricultural farming machinery based on the above parameter design, and at the same time, it can help to promote the development of sugar beet mechanization production, especially in China.

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