

# 中国农机化学报

中国农业核心期刊

中华人民共和国农业部主管  
农业部南京农业机械化研究所主办



ISSN 2095-5553



9 772095 555161

万方数据

2016

第37卷 总第269期

7

# 目 次

## 农业装备工程研究

- |                            |               |      |
|----------------------------|---------------|------|
| 夹持输送式残膜捡拾机气力脱膜机理研究         | 明光,毕新胜,王晓东,等  | (1)  |
| 振动深松机机架的有限元分析              | 郭金龙,王维新,李霞,等  | (6)  |
| 气吸式棉花穴播器吸附精度试验研究           | 李猛,王卫兵,杜晨,等   | (10) |
| 免耕播种机仿形机构的模态分析与优化          | 李俊虎,王卫兵,郭德卿,等 | (14) |
| 轻简型茶园深松耕作机驱动轮和深松铲优化配置研究    | 易文裕,庹洪章,程方平,等 | (19) |
| 手扶式玉米精量播种机的设计与试验           | 邓莹,王林凤,蒋光兵,等  | (23) |
| 水平旋转搂草机地面仿形机构设计            | 张平,王振华,李凤鸣,等  | (29) |
| 残膜捡拾机起膜铲的设计与仿真             | 张琴,李亚丽,王保爱,等  | (33) |
| 基于 TRIZ 理论的方捆机喂入装置创新设计     | 罗金海,李志杰,张平    | (38) |
| 水田整地筑埂联合作业机变速箱的设计及其刀轴的模态分析 | 赵丽萍,何新如,徐杰,等  | (42) |

## 设施农业与植保机械工程研究

- |                   |               |      |
|-------------------|---------------|------|
| 温室大棚双热源辅助增热控制系统设计 | 王昕,李佳雯,高杰,等   | (47) |
| 有边界式棉田喷雾机的研制与试验   | 初晓庆,张晓辉,刘刚,等  | (51) |
| 风送式葡萄园弥雾机的设计与试验   | 张晓辉,王亮杰,侯存良,等 | (57) |

## 农产品加工工程研究

- |                        |               |      |
|------------------------|---------------|------|
| 圆形水果分类包装机的设计和结构分析      | 柴永生,杨栋雪,李刚,等  | (62) |
| 栅栏式二次核桃破壳特性研究及有限元分析    | 张毅,周军,史建新     | (66) |
| 基于复水干燥的绿茶干茶色泽提升工艺研究    | 张坚强,叶阳,朱宏凯,等  | (70) |
| CFD 模拟两种风机位置的苹果冷藏库的温度场 | 周舸,王瑞华,孙海亭,等  | (75) |
| 高光谱图像技术检测农作物含水量的研究进展   | 魏利峰,纪建伟       | (80) |
| 便携式水果硬度测量仪的设计          | 陈广大,刘德君,李天旭,等 | (85) |
| 粗纤维粉碎机核心机构的模态分析        | 祁晓敏,张立新,张翔,等  | (89) |

**中国农机化学报**

(1957 年创刊)

2016 年第 7 期 第 37 卷 总第 269 期  
月刊, 2016 年 7 月 15 日

**Journal of Chinese Agricultural Mechanization**

(Started in 1957)

Vol. 37 No. 7 2016 Total 269  
Monthly, Published in July 15, 2016

主 管 中华人民共和国农业部  
主 办 农业部南京农业机械化研究所  
社 长 王利民  
主 编 陈巧敏  
出 版 中国农机化杂志社  
编 辑 《中国农机化学报》编辑部  
(南京市柳营 100 号, 210014)  
电话: 025-84346270, 84346296  
传真: 025-84346271  
电子信箱: jcam@vip. 163. com  
印 刷 南京四彩印刷有限公司  
国内订阅 全国各地邮局  
国外发行 中国国际图书贸易集团公司  
(北京 399 信箱)

**Responsible Department:** Ministry of Agriculture of the PRC  
**Sponsored by:** Nanjing Research Institute for Agriculture Mechanization  
**President of Magazine Office:** Wang Limin  
**Editor in Chief:** Chen Qiaomin  
**Published by:** Chinese Agricultural Mechanization Magazine Office  
**Edited by:** Journal of Chinese Agricultural Mechanization editorial office  
(No. 100 Liuying, Nanjing, 210014, China)  
**Tel:** 025-84346270, 84346296  
**Fax:** 025-84346271  
**E-mail:** jcam@vip. 163. com  
**Printed by:** Nanjing Sicai Printing Co., LTD  
**Subscribed by:** All local Post Offices in China  
**Issued abroad:** China International Book Trading Group  
(P. O. Box 399, Beijing, China)

中国标准连续出版物号: ISSN 2095-5553  
CN 32-1837/S

国内邮发代号: 28-116 国外发行代号: BM5576 国内定价: 60 元

新型棉桔秆揉丝粉碎机的结构设计及优化	喻晨,张丽,赵志艳,等	(93)
烟叶滚刷铺平装置的设计	吴雪梅,顾金梅,张富贵,等	(97)
网带式缢蛏蒸煮开壳机主要工作参数试验研究	芦新春,孙星钊,王伟	(101)
菊芋酶解高果糖浆单因素及响应面优化工艺研究	禚同友,丛建民	(106)

## 车辆与动力工程研究

柴油发动机特性曲线分析与建模	赵小辉,张明柱,白东洋,等	(112)
基于自主研发测试系统的内燃机燃烧分析	许冠杰,施爱平,庞弋骥	(116)
三缸车用小型汽油机富氧燃烧特性的研究	刘阳,徐斌,张玉银,等	(121)
基于 TB6600HG 的步进电机驱动控制设计	马文斌,杨延竹	(126)
平行不对中叠片联轴器系统非线性动力学分析	申屠留芳,赵庆佳,杨平	(130)
拖拉机悬挂系统耕深自动控制策略的研究	商高高,谢凌云,季顺静	(136)

## 农业电气化与信息化工程研究

利用最大圆盘提取作物行骨架的改进算法	刁智华,吴贝贝,魏玉泉,等	(141)
基于 SPSS 的果树农学参数模型构建	沈明明,张富贵,彭敏	(145)
基于粗糙集 C4.5 算法的应用	贾晨光,陈桂芬	(149)
仿生电子鼻对食品货架期识别进展研究	徐赛,陆华忠,吕恩利,等	(154)

## 农业智能化研究

基于 CC2530 和嵌入式 Web 服务器的智能灌溉系统	张庆辉,祝志远,齐仁龙	(161)
基于物联网的寒地玉米大斑病预警系统的设计与实现	邓晓璐,王培,马宁,等	(166)
短信平台下基于神经网络的施肥模型建立	田苗	(171)
旱田节水灌溉智能监控系统的研究	赵斌,范学佳,衣淑娟,等	(174)
基于 Zigbee 和 GPRS 的仿真机器鱼水质监测系统设计	付焕森,曹健,李元贵	(179)
基于 ZigBee 的温室图像传输技术研究	姚仲敏,丁海,孟洪颜,等	(183)

## 农业生物系统与能源工程研究

Mn <sup>+</sup> -Dipy-SCN <sup>-</sup> 共沉淀分离—拉曼光谱法测定水中镉的研究	刘燕德,张宇翔,江丽霞	(187)
储煤气化热风炉结构设计及试验研究	刘娜,张丽,齐新洲,等	(191)
高效连续式生物质炭化炉的研制与试验	张丽,魏正英,张海春,等	(195)
生物质半焦 FTIR 分析及孔隙结构变化规律研究	车德勇,蒋文强,李少华,等	(199)
地源热泵孵化系统中均温装置的优化和试验	林俊,张毅,蒙健	(205)
太阳能干燥/采暖联合系统的研究设计	李彩霞,于清东,张奎庆	(210)
沼气能源对仔猪舍的增温效果分析	袁奎,张富贵,熊小龙,等	(213)

## 农业机械化综合研究

新疆棉农采用机采棉技术影响因素调查及分析	张立杰,王志坚	(217)
新疆红枣收获机械的研究现状与发展对策	胡灿,鲁兵,侯书林,等	(222)
基于产量分析的河北省冬小麦栽培技术变迁历程概析	纪朋涛,周团委,张月辰	(226)
基层农技推广人员培训需求及影响因素分析	郑佩佩,马辉,陶佩君	(230)
不同行距种植模式下机采棉品质比较分析	崔岳宁,高振江,杨宝玲	(235)
基于外观设计专利的秸秆综合利用现状分析	刘勤,郑砚砚,檀律科,等	(241)
农业机械部级推广鉴定受理审查的两个属性关系分析	徐峰,李英杰,郝文录,等	(246)
农田地面振动谱的研究综述	徐竹凤,薛新宇,崔龙飞,等	(251)
青海省农牧业综合机械化发展研究	张学林	(256)
构建现代农业社会化服务体系框架和运行机制研究	姜岩,窦艳芬,裴育希	(260)
城镇化背景下贵州省耕地压力与粮食安全问题探讨	李福夺,杨兴洪	(265)
贵州烟区残膜污染状况与治理技术分析	苏国樟,张富贵,樊国奇,等	(273)
北京市农村污水处理反应器研究进展分析	诸刚,蒋晓,杨学坤	(277)
考虑摩擦力时受圆柱面约束弹性杆的平衡	刘昭	(281)

责任编辑 凌小燕 杨建平 张进龙 高 雅

# Contents

## **Research on Agriculture Mechanization and Equipment Engineering**

Research on mechanism of air force separating residual film for gripping and delivering residual plastic film collector .....	Ming Guang, Bi Xinsheng, Wang Xiaodong, et al	(1)
Finite element analysis on the frame of vibratory subsoiler .....	Guo Jinlong, Wang Weixin, Li Xia, et al	(6)
Experiment study on adsorption accuracy of air-suction cotton dibbler .....	Li Meng, Wang Weibing, Du Sheng, et al	(10)
Modal analysis and optimization of the organization of no-till planter .....	Li Junhu, Wang Weibing, Guo Deqing, et al	(14)
Study on optimal allocation of driving wheel and sub-soiling shovel of deep loosening tillage machine on light simple type of tea plantation .....	Yi Wenyu, Tuo Hongzhang, Cheng Fangping, et al	(19)
Design and experiment of handheld precision seeder for corn .....	Deng Ying, Wang Linfeng, Jiang Guangbing, et al	(23)
Design of the horizontal rotary rake profiling mechanism .....	Zhang Ping, Wang Zhenhua, Li Fengming, et al	(29)
Design and simulation on loosening shovel of residual plastic film pickup machine .....	Zhang Qin, Li Yali, Wang Baoai, et al	(33)
Innovative design on the feeding device of square bundle baler based on evolution theory of TRIZ .....	Luo Jinhai, Li Zhijie, Zhang Ping	(38)
Design of the rotating and building ridge combined work machine's gearbox and modal analysis of rotary cutter shaft .....	Zhao Liping, He Xinru, Xu Jie, et al	(42)

## **Research on Facilities Agriculture and Plant Protection Machinery Engineering**

Design on double heating source control system in greenhouse .....	Wang Xin, Li Jiawen, Gao Jie, et al	(47)
Development and experiment on bounded type cotton field sprayer .....	Chu Xiaoqing, Zhang Xiaohui, Liu Gang, et al	(51)
Development and experiment of air-assisted vineyard sprayer .....	Zhang Xiaohui, Wang Liangjie, Hou Cunliang, et al	(57)

## **Research on Agricultural Products Processing**

Design and structural analysis for the round fruits categorize packer .....	Chai Yongsheng, Yang Dongxue, Li Gang, et al	(62)
Characteristics research and finite element analysis on secondary broker for walnut shell .....	Zhang Yi, Zhou Jun, Shi Jianxin	(66)
Research on promotion of green tea related to dry color based on rehydration and drying .....	Zhang Jianqiang, Ye Yang, Zhu Hongkai, et al	(70)
Simulation on the temperature field of the two fan solution in cool store based on CFD .....	Zhou Ke, Wang Ruihua, Sun Haiting, et al	(75)
Advancement of detection of crop moisture content based on hyperspectral imaging .....	Wei Lifeng, Ji Jianwei	(80)
Design of the portable fruit hardness measuring instrument .....	Chen Guangda, Liu Dejun, Li Tianxu, et al	(85)
Modal analysis of crude fiber mill core institutions .....	Qi Xiaomin, Zhang Lixin, Zhang Xiang, et al	(89)
Structural design and optimization of cotton straw rubbing filament crusher .....	Yu Chen, Zhang Li, Zhao Zhiyan, et al	(93)
Design and experiment of roller-spreading device for tobacco leaves .....	Wu Xuemei, Gu Jinmei, Zhang Fugui, et al	(97)
Experimental study of key working parameters of shelling equipment for razor clam .....	Lu Xinchun, Sun Xingzhao, Wang Wei	(101)
Research on single factor of jerusalem artichoke enzymatic hydrolysis high fructose syrup and response surface optimization technology .....	Zhuo Tongyou, Cong Jianmin	(106)

## **Research on Vehicle and Power Engineering**

Modeling and analysis on diesel engine characteristic curve .....	Zhao Xiaohui, Zhang Mingzhu, Bai Dongyang, et al	(112)
Combustion analysis on internal combustion engine based on independent test system .....	Xu Guanjie, Shi Aiping, Pang Yixiang	(116)
Study on oxygen-enriched combustion characteristics of a 3-cylinder small gasoline vehicle engine .....	Liu Yang, Xu Bin, Zhang Yuyin, et al	(121)
Design on driving control of stepper motor based on TB6600HG .....	Ma Wenbin, Yang Yanzhu	(126)
Nonlinear dynamics analysis of diaphragm coupling systems with parallel misalignment .....	Shentu Liufang, Zhao Qingjia, Yang Ping	(130)
Research on plowing depth automatic control for tractor hitch system .....	Shang Gaogao, Xie Lingyun, Ji Shunjing	(136)

## **Research on Agricultural Electrification and Informationization Engineering**

Improved algorithm of crop rows skeleton extraction

based on maximum disc ..... Diao Zhihua, Wu Beibei, Wei Yuquan, et al (141)

Relationship model between fruit agronomic parameters based on SPSS ..... Shen Mingming, Zhang Fugui, Peng Min (145)

Application of C4.5 algorithm based on rough set ..... Jia Chenguang, Chen Guifen (149)

Research on progress of bionic electronic nose for food shelf-life recognition ..... Xu Sai, Lu Huazhong, Lv Enli, et al (154)

## **Research on Agricultural Intelligence**

Intelligent irrigation system based on CC2530 and the embedded Web serves ..... Zhang Qinghui, Zhu Zhiyuan, Qi Renlong (161)

Design and implementation on early-warning system of the northern corn leaf blight

in cold area based on internet of things ..... Deng Xiaolu, Wang Pei, Ma Ning, et al (166)

Model establishment of fertilization based on neural network in SMS platform ..... Tian Zhuo (171)

Research on dry field water-saving irrigation intelligent monitoring system ..... Zhao Bin, Fan Xuejia, Yi Shujuan, et al (174)

Design on simulation robotic fish water monitoring system

based on Zigbee and GPRS ..... Fu Huansen, Cao Jian, Li Yuangui (179)

Research on technology of greenhouse image transmission

based on ZigBee ..... Yao Zhongmin, Ding Hai, Meng Hongyan, et al (183)

## **Research on Agricultural Biosystems and Energy Engineering**

Research on fast determination of heavy metal Cd using the Mn<sup>+</sup>-Dipy-SCN<sup>-</sup>

co-precipitation separation and Raman spectroscopy ..... Liu Yande, Zhang Yuxiang, Jiang Lixia (187)

Structure design and experimental research on hot blast stove

with coal storage and vaporization ..... Liu Na, Zhang Li, Qi Xinzhou, et al (191)

Test and design on efficient continuous carbonization of biomass furnace ..... Zhang Li, Wei Zhengyin, Zhang Haichun, et al (195)

FTIR analysis and pore structure changed rule of the biomass char ..... Che Deyong, Jiang Wenqiang, Li Shaohua, et al (199)

Optimization and study on average temperature equipment in

ground source heat pump incubator system ..... Lin Jun, Zhang Yi, Meng Jian (205)

Study and design of solar drying/heating system ..... Li Caixia, Yu Qingdong, Zhang Kuiqing (210)

Analysis on biogas energy for the effect of piglets homes warming ..... Yuan Kui, Zhang Fugui, Xiong Xiaolong, et al (213)

## **Comprehensive Research**

Investigation and analysis on influence factors of cotton farmers' mechanic harvesting

technology adoption in Xinjiang ..... Zhang Lijie, Wang Zhijian (217)

Research status and development countermeasures on harvesting machinery

of jujube in Xinjiang ..... Hu Can, Lu Bing, Hou Shulin, et al (222)

Analysis on transformation process of winter wheat planting technology

in Hebei province based on yield analysis ..... Ji Pengtao, Zhou Tuanwei, Zhang Yuechen (226)

Analysis on influencing factors and needs of primary agricultural

extension officer training ..... Zheng Peipei, Ma Hui, Tao Peijun (230)

Quality analysis of different mechanical harvesting cotton planting patterns ..... Cui Yuening, Gao Zhenjiang, Yang Baoling (235)

Study of straw utilization based on the perspective of design patents ..... Liu Qin, Zhen Yanyan, Tan Lvke, et al (241)

Analysis on the relationship between two properties of agriculture machinery

promotion and identification acceptance inspection ..... Xu Feng, Li Yingjie, Hao Wenlu, et al (246)

Review on farmland ground vibration spectrum ..... Xu Zhufeng, Xue Xinyu, Cui Longfei, et al (251)

Study on the comprehensive mechanization development of agriculture

and animal husbandry in Qinghai province ..... Zhang Xuelin (256)

Study on the constructing system framework and operation mechanism of

the modern agricultural socialized service ..... Jiang Yan, Dou Yanfen, Pei Yuxi (260)

Discussion on the cultivated land pressure and food security problem under the background

of urbanization in Guizhou Province ..... Li Fuduo, Yang Xinghong (265)

Pollution condition and treatment technical analysis of residue film

in Guizhou tobacco-growing areas ..... Su Guozhang, Zhang Fugui, Fan Guoqi, et al (273)

Analysis of the research progress on the wastewater treatment

reactors in Beijing rural area ..... Zhu Gang, Jiang Xiao, Yang Xuekun (277)

Considering the friction equilibrium of an elastic rod constrained to a cylinder ..... Liu Zhao (281)

**The duty editor** Ling Xiaoyan Yang Jianping Zhang Jinlong Gao Ya

- 中华人民共和国农业部主管
- 中国农业机械化行业年鉴
- 发布农业机械化数据的平台
- 了解中国农业机械化的窗口



# 《中国农业机械化年鉴》

《中国农业机械化年鉴》是农业部主管、农业部南京农业机械化研究所主办的我国农业机械化行业年鉴。出版宗旨为记录农机化发展历史,传承农机化文化精髓,博采农机化研究成果,推动农机化快速发展。编辑定位为成就纪实、发展研究、行业导向、数据参考、决策依据、工作借鉴、市场指南。体现盛世修志、传承文明,携手奋进、共创未来的办刊理念。

《中国农业机械化年鉴》自创刊以来逐年客观地反映我国农机化发展现状,拓展农机化视野,承担中央与地方农机化信息沟通、数据传递的桥梁与平台,有效地向基层传达党和国家关于农机化的方针政策,及时地向中央反馈地方农机化的发展信息,展现权威性、综合性、科学性、指南性、文献性、数据性和史料性等办刊特色。《中国农业机械化年鉴》正式发布权威的农业机械化数据,有助于各地借鉴农机化发展经验,把握农机化发展规律,掌握农机化发展数据,制定农机化发展规划,是各级农机化管理(业务)部门必备的工具书。

2015 年版《中国农业机械化年鉴》自 2015 年 12 月开始发行,每册定价 320 元,欢迎有关单位组织订阅。另外,年鉴编辑部尚有部分自 2005 年创刊以来的各版年鉴,有需求者欢迎征订。

编辑部地址:南京市柳营 100 号

邮编:210014

电话:025-84346296 84346270

传真:025-84346271

E-mail:zgnyjxhnj@163.com

## 《中国农业机械化年鉴》编辑部