



ISSN 0496-3490

CN 11-1809/S

作物学报

ACTA AGRONOMICA SINICA

第46卷 第2期 Vol. 46 No. 2



中国作物学会 中国农业科学院作物科学研究所 主办
Sponsored by Crop Science Society of China and
Institute of Crop Sciences, CAAS

科学出版社 出版
Published by Science Press

2
2020

作物学报

(ZUOWU XUEBAO)

第 46 卷 第 2 期 2020 年 2 月

目 次

作物遗传育种·种质资源·分子遗传学

- | | | | | | | | |
|-----|---|-----|-----|-----|-----|-----|-----|
| 157 | 小麦品种扬麦 16 赤霉病抗扩展 QTL 定位及分析 | 胡文静 | 张 勇 | 陆成彬 | 王凤菊 | 刘金栋 | 蒋正宁 |
| | | 王金平 | 朱展望 | 徐小婷 | 郝元峰 | 何中虎 | 高德荣 |
| 166 | 甘蔗热带种金属硫蛋白家族基因的克隆及响应重金属胁迫的表达分析 | 高世武 | 傅志伟 | 陈 云 | 林兆里 | 许莉萍 | 郭晋隆 |
| 179 | 小麦抗麦红吸浆虫基因标记的开发与验证 | 郝志明 | 耿妙苗 | 温树敏 | 闫桂军 | 王睿辉 | 刘桂茹 |
| 194 | 诸葛菜小孢子培养及其单倍体减数分裂染色体配对观察 | 殷家明 | 钟荣棋 | 林 呐 | 唐章林 | 李加纳 | |
| 204 | 水稻半外卷叶突变体 <i>sol1</i> 的表型分析与基因定位 | 谢园华 | 李凤菲 | 马晓慧 | 谭 佳 | 夏赛赛 | 桑贤春 |
| | | 杨正林 | 凌英华 | | | | |
| 214 | 基于 QTL 定位和全基因组关联分析筛选甘蓝型油菜株高和一次有效分枝高度的候选基因 | 霍 强 | 杨 鸿 | 陈志友 | 荐红举 | 曲存民 | 卢 坤 |
| | | 李加纳 | | | | | |

耕作栽培·生理生化

- | | | | | | | | |
|-----|-----------------------------------|-----|-----|--------------------|-----|-----|-----|
| 228 | 磷营养对水稻籽粒锌生物有效性的影响及其与植酸等磷酸肌醇谱含量的关系 | 苏 达 | 吴良泉 | Søren K. Rasmussen | 周庐建 | | |
| | | 潘 刚 | 程方民 | | | | |
| 238 | 基于磷肥施用深度的夏玉米根层调控提高土壤氮素吸收利用 | 陈晓影 | 刘 鹏 | 程 乙 | 董树亭 | 张吉旺 | 赵 斌 |
| | | 任佰朝 | 韩 坤 | | | | |
| 249 | 增施磷肥提高弱光环境中夏大豆叶片光合能力及产量 | 赵 伟 | 甄天悦 | 张子山 | 徐 铮 | 高大鹏 | 丁 聪 |
| | | 刘 鹏 | 李 耕 | 宁堂原 | | | |
| 259 | 秸秆还田与化肥配施对汉中盆地稻麦轮作农田土壤固碳及经济效益的影响 | 吴玉红 | 郝兴顺 | 田霄鸿 | 陈 浩 | 张春辉 | 崔月贞 |
| | | 秦宇航 | | | | | |
| 269 | 不同成膜剂对玉米噻虫啉悬浮种衣剂的持效性及安全性影响 | 姚晨涛 | 乔治华 | 宋雪慧 | 张风文 | 孙 晓 | 李 刚 |
| | | 李向东 | 张吉旺 | 姜兴印 | | | |
| 280 | 长期施肥处理对双季晚稻叶绿素荧光特征及籽粒产量的影响 | 侯红乾 | 林洪鑫 | 刘秀梅 | 冀建华 | 刘益仁 | 蓝贤瑾 |
| | | 吕真真 | 周卫军 | | | | |
| 290 | 滴灌玉米临界氮稀释曲线与氮素营养诊断研究 | 付江鹏 | 贺 正 | 贾 彪 | 刘慧芳 | 李振洲 | 刘 志 |

研究简报

- | | | | | | | | |
|-----|----------------------------|-----|-----|-----|-----|-----|-----|
| 300 | 海岛棉棉铃阶段性发育与产量品质的关系 | 曹新川 | 胡守林 | 韩秀锋 | 何良荣 | 郭伟锋 | |
| 307 | 基于 SNP 标记揭示我国小麦品种(系)的遗传多样性 | 刘易科 | 朱展望 | 陈 冷 | 邹 娟 | 佟汉文 | 朱 光 |
| | | 何伟杰 | 张宇庆 | 高春保 | | | |

ACTA AGRONOMICA SINICA

Vol. 46 No. 2 February 2020

CONTENTS

CROP GENETICS & BREEDING • GERMPLASM RESOURCES • MOLECULAR GENETICS

- 157 Mapping and genetic analysis of QTLs for *Fusarium* head blight resistance to disease spread in Yangmai 16
HU Wen-Jing, ZHANG Yong, LU Cheng-Bin, WANG Feng-Ju, LIU Jin-Dong, JIANG Zheng-Ning, WANG Jin-Ping, ZHU Zhan-Wang, XU Xiao-Ting, HAO Yuan-Feng, HE Zhong-Hu, and GAO De-Rong
- 166 Cloning and expression analysis of metallothionein family genes in response to heavy metal stress in sugarcane (*Saccharum officinarum* L.)
GAO Shi-Wu, FU Zhi-Wei, CHEN Yun, LIN Zhao-Li, XU Li-Ping, and GUO Jin-Long
- 179 Development and validation of markers linked to genes resistant to *Sitodiplosis mosellana* in wheat
HAO Zhi-Ming, GENG Miao-Miao, WEN Shu-Min, YAN Gui-Jun, WANG Rui-Hui, and LIU Gui-Ru
- 194 Microspore culture and observations on meiotic chromosome pairing of the haploid in *Orychophragmus violaceus*
YIN Jia-Ming, ZHONG Rong-Qi, LIN Na, TANG Zhang-Lin, and LI Jia-Na
- 204 Phenotype characterization and gene mapping of the semi-outcurved leaf mutant *sol1* in rice (*Oryza sativa* L.)
XIE Yuan-Hua, LI Feng-Fei, MA Xiao-Hui, TAN Jia, XIA Sai-Sai, SANG Xian-Chun, YANG Zheng-Lin, and LING Ying-Hua
- 214 Candidate genes screening for plant height and the first branch height based on QTL mapping and genome-wide association study in rapeseed (*Brassica napus* L.)
HUO Qiang, YANG Hong, CHEN Zhi-You, JIAN Hong-Ju, QU Cun-Min, LU Kun, and LI Jia-Na

TILLAGE & CULTIVATION • PHYSIOLOGY & BIOCHEMISTRY

- 228 Influence of phosphorus on rice (*Oryza sativa* L.) grain zinc bioavailability and its relation to inositol phosphate profiles concentration
SU Da, WU Liang-Quan, Søren K. Rasmussen, ZHOU Lu-Jian, PAN Gang, and CHENG Fang-Min
- 238 The root-layer regulation based on the depth of phosphate fertilizer application of summer maize improves soil nitrogen absorption and utilization
CHEN Xiao-Ying, LIU Peng, CHENG Yi, DONG Shu-Ting, ZHANG Ji-Wang, ZHAO Bin, REN Bai-Zhao, and HAN Kun
- 249 Increasing phosphate fertilizer application to improve photosynthetic capacity and yield of summer soybean in weak light environment
ZHAO Wei, ZHEN Tian-Yue, ZHANG Zi-Shan, XU Zheng, GAO Da-Peng, DING Cong, LIU Peng, LI Geng, and NING Tang-Yuan
- 259 Effect of straw returning combined with NPK fertilization on soil carbon sequestration and economic benefits under rice–wheat rotation in Han-zhong basin
WU Yu-Hong, HAO Xing-Shun, TIAN Xiao-Hong, CHEN Hao, ZHANG Chun-Hui, CUI Yue-Zhen, and QIN Yu-Hang
- 269 Effect of different film-forming agents on the persistence and safety of thiacloprid suspension concentrate for seed coating for maize
YAO Chen-Tao, QIAO Zhi-Hua, SONG Xue-Hui, ZHANG Feng-Wen, SUN Xiao, LI Gang, LI Xiang-Dong, ZHANG Ji-Wang, and JIANG Xing-Yin

280	Influence of long-term fertilizer application on chlorophyll fluorescence characteristics and grain yield of double cropping late rice	HOU Hong-Qian, LIN Hong-Xin, LIU Xiu-Mei, JI Jian-Hua, LIU Yi-Ren, LAN Xian-Jin, LYU Zhen-Zhen, and ZHOH Wei-Jun
290	Critical nitrogen dilution curve and nitrogen nutrition diagnosis of maize with drip irrigation	FU Jiang-Peng, HE Zheng, JIA Biao, LIU Hui-Fang, LI Zhen-Zhou, and LIU Zhi

RESEARCH NOTES

300	Relationship of stage development of cotton bolls with yield and quality in inland cotton	CAO Xin-Chuan, HU Shou-Lin, HAN Xiu-Feng, HE Liang-Rong, and GUO Wei-Feng
307	Revealing the genetic diversity of wheat varieties (lines) in China based on SNP markers	LIU Yi-Ke, ZHU Zhan-Wang, CHEN Ling, ZOU Juan, TONG Han-Wen, ZHU Guang, HE Wei-Jie, ZHANG Yu-Qing, and GAO Chun-Bao

A BRIEF INTRODUCTION OF *ACTA AGRONOMICA SINICA*

Acta Agronomica Sinica (*AAS*, ISSN 0496-3490) is a monthly academic journal co-sponsored by Crop Science Society of China and Institute of Crop Sciences, Chinese Academy of Agricultural Sciences, under the leadership of China Association for Science and Technology and published by Science Press, Chinese Academy of Sciences. *AAS* was firstly published in 1962. The predecessors were *Chinese Journal of Agricultural Research* started in 1950 and *Acta Agriculturae Sinica* started in 1952. As one of the key scientific journals in China, *AAS* has been financially supported by China Association for Science and Technology since 1997 and the National Natural Science Foundation of China since 2000.

The major aims of *AAS* are to report the progresses in the disciplines of crop breeding, crop genetics, crop cultivation, crop physiology, ecology, biochemistry, germplasm resources, grain chemistry, grain storage and processing, biotechnology and biomathematics etc. mainly in China and abroad. *AAS* provides regular columns for Original papers, Reviews, and Research notes. The strict peer-review procedure guarantees the academic level and raises the reputation of the journal. The readership of *AAS* is for crop science researchers, students of agricultural colleges and universities, and persons with similar academic level.

AAS is the leading journal of crop sciences and reflects the latest achievement in all aspects of crop sciences in China. It occupies the first position on the list of Chinese core journals in "Agronomy and Crops" field. The editorial board consists of 150 specialists in the field of crop sciences. Among them, 26 are academicians of Chinese Academy of Sciences or Chinese Academy of Engineering, 22 are from the outside of China, and 2 are from Hong Kong, China.

AAS is a fully Open Access Journal through the independent website (<http://zwxb.chinacrops.org/>) since 2004. Free full texts are published online two months earlier than printing version, and all articles of the journal from 1962 are available freely. Manuscript submission, tracking, and peer review process are completed online. The functions of eTOCs (Table of Contents Alerting), advanced paper search, and paper recommendation are available.

AAS are indexed in some international index systems, such as AGRIS (FAO), CAB Abstracts and Global Health of Centre for Agriculture and Bioscience International, Cambridge Scientific Abstracts, Chemical Abstracts, Food Science and Technology Abstracts, Index of Copernicus, Japan Science and Technology Agency, Scopus, and VINITI Abstracts Journal (Russia). *AAS* is also referenced by many domestic databases and abstract periodicals.

The purposes of *AAS* are to enhance the development of crop science and technology in China, to promote nationwide and worldwide academic exchanges, and to accelerate the modernization of Chinese agriculture. *AAS* is distributed in China and abroad. The editorial office appreciates to establish publication exchange relationship with related institutions, agricultural colleges and universities, and international organizations in China and abroad.