

# 西南农业学报

SOUTHWEST CHINA JOURNAL OF AGRICULTURAL SCIENCES

中文核心期刊 | 中国科技核心期刊 | 中国农林核心期刊 | RCCSE中国核心学术期刊 | 中国科学引文数据库 (CSCD) 来源期刊

2022

第35卷 第6期  
Vo1.35 No.6

二〇二二年 第三十五卷 第六期

二〇二二年六月



ISSN 1001-4829

CN 51-1213/S  
CODEN XNXUEF

《西南农业学报》编辑委员会  
2022年6月

## 目 次

### 作物遗传育种·种质资源

- 1233 水稻 EMS 诱变根系突变体的筛选及其农艺性状分析 ..... 陈 开,陈宇峰,封昱均,唐 瑭,杨 超,华 夏,张冬平,陈 云,吕 冰  
1243 不同果肉厚度苦瓜转录组比较分析 ..... 裘波音,郑 旋,李大忠,林 琿,张前荣,刘建汀,朱海生,温庆放  
1252 芋全长转录组测序分析及淀粉生物合成相关基因挖掘 ..... 何芳练,刘莉莉,蒋慧萍,韦绍龙,邱祖杨,董伟清  
1261 基于八角转录组序列的 SSR 分子标记引物开发 ..... 余兴华,杨艳梅,李玉祥,陶永宏,孟凡来,滕 娟  
1269 红肉火龙果 *HpCYP76AD1* 基因克隆与表达分析 ..... 郑乾明,王小柯,马玉华  
1274 番茄泛素结合酶变体基因鉴定及表达分析 ..... 赵秋芳,马海洋,马智玲,魏长宾,陈 曙  
1282 冠突曲霉 *Ac-nsdD* 基因鉴定分析及抗盐胁迫功能分析 ..... 余春芳,曹广鑫,张亭笛,吴灵臻,杨 靖,谭玉梅,刘永翔,刘作易,位秀丽

### 生理生化

- 1289 低磷胁迫条件下大豆磷高效近等基因系相关酶活性的变化 ..... 董蓉娇,彭进乔,尹元萍,王天明,梁 坤,杨晓菲,董文汉,张雅琼,梁 泉  
1295 甘薯提取物对 3 种杂草种子萌发和幼苗生长的化感作用 ..... 马光宗,徐高峰,杨韶松,杨云海,张付斗,温丽娜,陶 琼,申时才,叶 敏  
1303 外源氨基酸硒肥对黄瓜幼苗生长及抗氧化物指标的影响 ..... 蒋月喜,陈 琴,张 力,张润卿,陈振东,周生茂,李 洋,宋焕忠,文俊丽,蒋 哲,郭元元  
1310 施氮量及基肥比对烤烟碳代谢产物及关键酶的影响 ..... 陈发元,胡 锦,周俊成,彭三喜,张 恒,朱 迪,李金星,郭亚利  
1318 灯笼花中灯笼乙素生物合成相关基因转录组分析 ..... 闫亚哲,闻 豪,杜 江,杨 勇,刘正杰,林 春,文国松,毛自朝

### 植物保护·土壤肥料

- 1325 转运蛋白 MoMfs2 对稻瘟病菌细胞壁完整性和杀菌剂外排的调控 ..... 齐中强,杜 艳,潘夏艳,文友义,于俊杰,张荣胜,俞咪娜,曹慧娟,宋天巧,李连伟,刘永锋  
1333 低纬高原甘蔗锈病病原菌鉴定及系统进化分析 ..... 王晓燕,李文凤,张荣跃,单红丽,李 婕,李银炯,黄应昆  
1340 广西香花油茶炭疽病病原菌鉴定及生物学特性 ..... 廖旺姣,韦 维,邹东霞,钟雅婷,罗 辑,叶 航  
1348 喜树叶斑病病原菌鉴定及其防治药剂筛选 ..... 宁 平,黄艳花,黄 微,邢政杰,陈 婵,王小欣  
1355 化肥优化减施芒果园磷钾养分平衡与环境风险 ..... 吴 昊,葛梅红,王烁衡,范声浓,王 瑞,林一凡,林 电

- 1365 云南旱地小麦新品种产量和品质对减量施氮的响应 ..... 乔祥梅,王志龙,蒋欣彤,王志伟,高仕兰,程加省,李灶福,于亚雄,杨红

## 园 艺

- 1371 火龙果的抗旱生长及生理响应 ..... 李莉婕,赵泽英,黎瑞君,冯恩英,岳延滨,袁玲,聂克艳
- 1378 叶面喷施钙、镁肥对‘妃子笑’荔枝果肉有机酸跨膜运输的影响 ..... 廖海枝,林晓凯,杨成坤,杜婧加,彭俊杰,周开兵
- 1386 不同基质配比对江户彼岸樱容器苗生长和生理的影响 ..... 罗钱,欧静,杨小燕,张燕莎,张智叶

## 农业生态环境·农业工程

- 1393 荒漠矿区琵琶柴重金属富集特征及污染评价 ..... 唐梦迎,夏楠,陈丽
- 1401 不同钝化材料对白及吸收累积镉的影响 ..... 刘桂华,吴科堰,秦松,柴冠群,吴正卓,范成五
- 1407 重金属铜、锌对火炬树幼苗生长及生理指标的影响 ..... 杜雪,彭玉兰,张新彤,张新锐,李美玄,罗合一,陈国伟,曲同宝
- 1415 适宜贵州中度镉污染烟田安全生产的烤烟品种筛选 ..... 柴冠群,范成五,刘桂华,杨娇娇,文雄,秦松
- 1422 厌氧氨氧化反应的启动和生物燃料乙醇废水反应条件优化 ..... 林肖月,王凡梅,韩雪梅,谢琳,陆浩洋,李玉英
- 1432 基于系统动力学的民勤绿洲农业系统碳排放仿真模拟研究 ..... 陈军娟,燕振刚,李薇,李广

## 畜牧·兽医·水产·资源昆虫

- 1441 绵羊体外胚胎高效利用的研究 ..... 陈莹,鲁凤霞,田文丽,仇春娟,梅荣,范利宏,陈大勇,吴阳升,林嘉鹏,黄俊成,刘明军,汪立芹
- 1448 兔 BMP4 基因对毛囊发育相关基因表达的影响 ..... 张琛,李佳丽,靳荣帅,白少成,姚凡,赵博昊,陈阳,吴信生
- 1455 基于微卫星标记的不同地区乌鳢和白化乌鳢群体遗传多样性研究 ..... 张露,樊威,苏建,焦晓磊,周剑,黄志鹏,赵瀚,赵仲孟,段元亮,李强,杜军,卓婷,苏全森,吴俊,罗煜
- 1462 双棘黄姑鱼源致病发光杆菌的分离与鉴定 ..... 黄婷,陈福艳,张彬,黎铭,林勇,李莉萍,童桂香,唐瞻杨,韦信贤,蒋伟添
- 1470 基于 CO I 基因标记的云南人工养殖金环胡蜂遗传多样性分析 ..... 刘鑫阳,宋忠云,杨晨,和秋菊,易传辉,朱恩骄

## Contents

### CROP GENETICS & BREEDING · GERMPLASM RESOURCE

- 1233 Screening of root mutants induced by EMS and analysis of agronomic traits in rice  
 ..... CHEN Kai, CHEN Yu-feng, FENG Yu-jun, TANG Tang, YANG Chao,  
 HUA Xia, ZHANG Dong-ping, CHEN Yun, LYU Bing
- 1243 Comparative analysis of bitter melon (*Momordica charantia* L.) with different flesh thickness by transcriptome sequencing  
 ..... QIU Bo-yin, ZHENG Xuan, LI Da-zhong, LIN Hui, ZHANG Qian-rong, LIU Jian-ting, ZHU Hai-sheng, WEN Qin-fang
- 1252 Full-length transcriptome sequences and the identification of putative genes for starch biosynthesis in *Colocasia esculenta*  
 ..... HE Fang-lian, LIU Li-li, JIANG Hui-ping, WEI Shao-long, QIU Zu-yang, DONG Wei-qing
- 1261 Development of SSR molecular markers based on transcriptome sequencing of *Illicium verum*  
 ..... YU Xing-hua, YANG Yan-mei, LI Yu-xiang, TAO Yong-hong, MENG Fan-lai, TENG Juan
- 1269 Cloning and expression analysis of *HpCYP76AD1* gene from *Hylocereus polyrhizus*  
 ..... ZHENG Qian-ming, WANG Xiao-ke, MA Yu-hua
- 1274 Identification and expression analysis of ubiquitin E2 enzyme variant gene family in tomato  
 ..... ZHAO Qiu-fang, MA Hai-yang, MA Zhi-ling, WEI Chang-bin, CHEN Shu
- 1282 Appraisal analysis and salt stress resistance function analysis of *Ac-nsdD* gene in *Aspergillus cristatus*  
 ..... YU Chun-fang, CAO Guang-xin, ZHANG Ting-di, WU Jiong-zhen, YANG Jing,  
 TAN Yu-mei, LIU Yong-xiang, LIU Zuo-yi, WEI Xiu-li

### PHYSIOLOGY & BIOCHEMISTRY

- 1289 Changes of enzyme activities of near isogenic lines with high phosphorus-use efficiency under low phosphorus stress in soybean ..... DONG Rong-jiao, PENG Jin-qiao, YIN Yuan-ping, WANG Tian-ming, LIANG Kun, YANG Xiao-fei,  
 DONG Wen-han, ZHANG Ya-qiong, LIANG Quan
- 1295 Allelopathy of sweet potato (*Ipomoea batatas*) extracts on seed germination and seedling growth of three weeds  
 ..... MA Guang-zong, XU Gao-feng, YANG Shao-song, YANG Yun-hai, ZHANG Fu-dou,  
 WEN Li-na, TAO Qiong, SHEN Shi-cai, YE Min
- 1303 Effects of exogenous amino acid selenium fertilizer on growth and antioxidant indexes of cucumber seedlings  
 ..... JIANG Yue-xi, CHEN Qin, ZHANG Li, ZHANG Run-qing, CHEN Zhen-dong, ZHOU Sheng-mao, LI Yang,  
 SONG Huan-zhong, WEN Jun-li, JIANG Zhe, GUO Yuan-yuan
- 1310 Effects of nitrogen application amount and base topdressing ratio on carbon metabolites and key enzymes in flue cured tobacco  
 ..... CHEN Fa-yuan, HU Jin, ZHOU Jun-cheng, PENG San-xi, ZHANG Heng, ZHU Di, LI Jin-xing, GUO Ya-li
- 1318 Transcriptome analysis of genes involved in scutellarin biosynthesis in *Erigeron breviscapus*  
 ..... YAN Ya-zhe, WEN Hao, DU Jiang, YANG Yong, LIU Zheng-jie, LIN Chun, WEN Guo-song, MAO Zi-chao

### PLANT PROTECTION · SOIL FERTILIZER

- 1325 Regulation of MFS transporter MoMfs2 on cell wall integrity and discharge of fungicides of *Magnaporthe oryzae*  
 ..... QI Zhong-qiang, DU Yan, PAN Xia-yan, WEN You-yi, YU Jun-jie, ZHANG Rong-sheng, YU Mi-na,  
 CAO Hui-juan, SONG Tian-qiao, LI Lian-wei, LIU Yong-feng
- 1333 Identification of sugarcane rust pathogens and their phylogenetic analysis in low latitude plateau of Yunnan  
 ..... WANG Xiao-yan, LI Wen-feng, ZHANG Rong-yue, SHAN Hong-li, LI Jie, LI Yin-hu, HUANG Ying-kun
- 1340 Identification and biological characteristics of the pathogen of *Camellia osmantha* Ye CX, Ma JL et Ye H anthracnose in Guangxi ..... LIAO Wang-jiao, WEI Wei, ZOU Dong-xia, ZHONG Ya-ting, LUO Ji, YE Hang



- 1348 Pathogen identification and screening fungicide of leaf spot of *Camptotheca acuminata*  
 ..... NING Ping, HUANG Yan-hua, HUANG Wei, XING Zheng-jie, CHEN Chan, WANG Xiao-xin
- 1355 Effects of reduction and optimization of chemical fertilizer application on nutrient balance and environmental risk of phosphorus and potassium in mango orchard  
 ..... WU Hao, GE Mei-hong, WANG Shuo-heng, FAN Sheng-nong, WANG Rui, LIN Yi-fan, LIN Dian
- 1365 Responses of yield and quality of new dryland wheat varieties to reduce application rate of nitrogen in Yunnan  
 ..... QIAO Xiang-mei, WANG Zhi-long, JIANG Xin-tong, WANG Zhi-wei, GAO Shi-lan,  
 CHENG Jia-sheng, LI Zao-fu, YU Ya-xiong, YANG Hong

## HORTICULTURE

- 1371 Growth and physiological response of *Hylocereus polyrhizus* to drought stress  
 ..... LI Li-jie, ZHAO Ze-ying, LI Rui-jun, FENG En-ying, YUE Yan-bin, YUAN Ling, NIE Ke-yan
- 1378 Effects of spraying foliar calcium and magnesium fertilizer on transmembrane transport of organic acids in 'Feizixiao' litchi  
 ..... LIAO Hai-zhi, LIN Xiao-kai, YANG Cheng-kun, DU Jing-jia, PENG Jun-jie, ZHOU Kai-bing
- 1386 Effects of different substrate ratios on growth and physiology of container seedlings of *Cerasus spachiana* var. *spachiana*  
 ..... LUO Qian, OU Jing, YANG Xiao-yan, ZHANG Yan-sha, ZHANG Zhi-ye

## AGRICULTURAL ECO-ENVIRONMENT · AGRICULTURAL ENGINEERING

- 1393 Enrichment characteristics and pollution evaluation of heavy metals in *Reaumuria soongorica* in desert mining area  
 ..... TANG Meng-ying, XIA Nan, CHEN Li
- 1401 Effects of different passivation materials on the absorption accumulation of cadmium in *Bletilla striata*  
 ..... LIU Gui-hua, WU Ke-yan, QIN Song, CHAI Guan-qun, WU Zheng-zhuo, FAN Cheng-wu
- 1407 Effects of heavy metals copper and zinc on growth and physiological indexes of *Rhus typhina* seedlings  
 ... DU Xue, PENG Yu-lan, ZHANG Xin-tong, ZHANG Xin-rui, LI Mei-xuan, LUO He-yi, CHEN Guo-wei, QU Tong-bao
- 1415 Screening of tobacco varieties for safe production in tobacco fields with medium risk of Cd pollution in Guizhou  
 ..... CHAI Guan-qun, FAN Cheng-wu, LIU Gui-hua, YANG Jiao-jiao, WEN Xiong, QIN Song
- 1422 Start-up of ANAMMOX and optimization of reaction conditions for biofuel ethanol wastewater  
 ..... LIN Xiao-yue, WANG Fan-mei, HAN Xue-mei, XIE Lin, LU Hao-yang, LI Yu-ying
- 1432 Simulation study on carbon emission of Minqin oasis agricultural system based on system dynamics  
 ..... CHEN Jun-juan, YAN Zhen-gang, LI Wei, LI Guang

## ANIMAL SCIENCE · VETERINARY · FISHERY · RESOURCE INSECT

- 1441 Efficient utilization of sheep embryos produced in vitro  
 ..... CHEN Ying, LU Feng-xia, TIAN Wen-li, QIU Chun-juan, MEI Rong, FAN Li-hong,  
 CHEN Da-yong, WU Yang-sheng, LIN Jia-peng, HUANG Jun-cheng, LIU Ming-jun, WANG Li-qin
- 1448 Effect of rabbit BMP4 gene on expression of genes related to hair follicle development in dermal papilla cells and its functional analysis  
 ..... ZHANG Chen, LI Jia-li, JIN Rong-shuai, BAI Shao-cheng, YAO Fan, ZHAO Bo-hao, CHEN Yang, WU Xin-sheng
- 1455 Genetic diversity of northern snakehead (*Channa argus*) and Albino northern snakehead from different regions unveiled by the microsatellite markers  
 ..... ZHANG Lu, FAN Wei, SU Jian, JIAO Xiao-lei, ZHOU Jian, HUANG Zhi-peng,  
 ZHAO Han, ZHAO Zhong-meng, DUAN Yuan-liang, LI Qiang, DU Jun, ZHUO Ting, SU Quan-sen, WU Jun, LUO Yu
- 1462 Isolation and identification of a pathogenic *Photobacterium* luminescent bacterium from *Protonibea diacanthus*  
 ..... HUANG Ting, CHEN Fu-yan, ZHANG Bin, LI Ming, LIN Yong, LI Li-ping,  
 TONG Gui-xiang, TANG Zhan-yang, WEI Xin-xian, JIANG Wei-tian
- 1470 Genetic diversity analysis of domesticated *Vespa mandarinia* in Yunnan province based on *CO I* gene marker  
 ..... LIU Xin-yang, SONG Zhong-yun, YANG Chen, HE Qiu-ju, YI Chuan-hui, ZHU En-jiao

# 《西南农业学报》编辑委员会

主 任 ( Director of the editorial board ) : 牟锦毅

副主任 ( Vice directors of the editorial board, 按姓氏笔画排序 ) :

邓国富 刘剑飞 赵德刚 黄 平

主 编 ( Editor-in-chief ) : 牟锦毅

副主编 ( Associate editors-in-chief, 按姓氏笔画排序 ) :

王家银 冯 卫 林正雨 ( 常务 )

欧 毅 覃泽林

编 委 ( Members of the editorial board, 按姓氏笔画排序 ) :

|     |     |     |     |      |     |     |     |     |     |
|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|
| 王 云 | 王文峰 | 王勇德 | 王家银 | 巴桑旺堆 | 邓国富 | 冯 卫 | 朱永清 | 任光俊 | 向青云 |
| 刘 旭 | 刘永红 | 刘作华 | 刘剑飞 | 刘海平  | 江国良 | 汤永禄 | 孙 健 | 牟锦毅 | 杜 军 |
| 杜才富 | 李成云 | 杨武云 | 杨荣仲 | 何 鹏  | 何永坤 | 何庆才 | 何新华 | 张 勇 | 张 鸿 |
| 张仲凯 | 张述宽 | 陈泽辉 | 陈晓汉 | 林正雨  | 欧 毅 | 罗廷荣 | 金 涛 | 郑家奎 | 参木友 |
| 赵泽英 | 赵德刚 | 胡凤益 | 贺德华 | 黄 平  | 梁国鲁 | 谌爱东 | 隋启君 | 蒋开锋 | 覃泽林 |
| 番兴明 | 曾兴权 | 曾秀丽 | 曾卓华 | 雷 波  |     |     |     |     |     |

西南农业学报 ( 月刊 )

Xinan Nongye Xuebao

2022年6月28日出版

2022年第35卷第6期

Southwest China Journal of

Agricultural Sciences (Monthly)

Vol.35 No.6 2022

Published on June 28, 2022

主 管: 四川省农业农村厅

主 办: 四川、云南、贵州、广西、西藏及  
重庆市 ( 区、市 ) 农科院

编辑出版: 《西南农业学报》编辑部

地 址: 成都市锦江区净居寺路20号附101号

邮 编: 610066

电 话: 028-84504192

邮 箱: Jxuebao@sina.com

投稿网址: www.xnnyxb.com

印 刷: 成都市新都华兴印务有限公司

国内发行: 四川省报刊发行局

国外发行: 中国国际图书贸易集团有限公司  
( 北京399信箱, 100044 )

ISSN 1001-4829 CN 51-1213/S CODEN XNXUEF

Supervised by Sichuan Provincial Department of Agriculture and Rural Affairs

Sponsored by Sichuan, Yunnan, Guizhou, Guangxi, Tibet and Chongqing Academies of Agricultural Sciences

Edited and Published by Editorial Department of Southwest China Journal of Agricultural Sciences

Add: 20-101, Jingjusi Road, Jinjiang District, Chengdu, Sichuan 610066, China

Tel: 028-84504192

E-mail: Jxuebao@sina.com

Website: www.xnnyxb.com

Printed by Chengdu Xindu Huaxing Printing Co., Ltd.

Distributed by Sichuan Provincial Bureau of Newspapers and Periodicals

Foreign: China International Book Trading Corporation  
( P. O. Box 399, Beijing 100044, China )

国内邮发代号: 62-152

国外发行代号: M2912

国内订价: 25.00元