2021年度重庆市科学技术奖提名公示

**一、项目名称**

新型微生态技术防控果蔬病害的机制研究

**二、提名单位**

重庆市教育委员会

**三、提名等级**

提名该项目申报重庆市自然科学奖二等奖。

**四、项目简介**

化学杀菌剂虽能控制果蔬菜在生产、栽培和储存过程中的病害，但易造成生态污染、食品安全问题。基于益生菌的新型生防菌剂是果蔬生态管理的有效方法。在1项国家重点研发项目和4项国家自然科学基金以及重庆科技项目支持下，经10年研究取得如下成果：（1）阐述了经济作物与内生群落互作机制，发掘了益生菌群，并在苹果、桑树等经济作物上进行应用；（2）阐明了果蔬采后热处理与天然产物的抑菌机理，延长采后货架期；（3）阐明了新型生防酵母菌的抑菌机理。以上研究为新型生防菌剂的开发及在果蔬病害绿色防控等方面的应用提供了理论基础。

项目培养“重庆市百人计划”、“青年拔尖人才”、“巴渝学者”、“巴渝青年学者”各4人次，1篇论文进入农业领域全球ESI 1%行列，3篇论文影响因子大于10。

**具体创新点如下：**

1. **发掘了园艺作物内生菌微生态结构与益生种群：**

解析了苹果内生菌群落具有品种/砧木特异性与亲缘关系的协合性，在苹果内生菌种群发掘了*Bacillus.* Spp等益生菌群，阐明了*Bacillus subtilis* 和*Trichoderma harzianum* 复配的微生态制剂调控苹果微生物群落，降低自然发病的机制；揭示了不同桑树品种的内生微生物群落与季节的相关性，其结构组成影响不同桑树品种对生物和非生物胁迫的抗性，证明了*Pantoea* 具有促进桑树在非生物胁迫中存活与发育的能力；**以上研究为微生物益生菌群促进果树绿色生产提供了理论基础。**

1. **阐明了采后环境管理的抑病机理**

病害的发生需要病原、宿主、环境相互配合。本成果揭示了采后环境使用天然物质（壳聚糖、壳寡糖等）、热处理、紫外等无公害处理技术是果蔬采后病害防控的生态友好方法；阐明了采后环境管理的抑病机理，比如病原菌活性氧物质积累导致蛋白损伤、脂类氧化、细胞壁降解等细胞损伤。

1. **酵母与环境协同作用的抑病机理**

生防酵母与环境生态处理具有部分相似的抑菌机理。生防酵母通过空间占位、营养竞争、抗菌化合物的分泌、生物膜的形成，激活宿主抗氧化系统抑制病原孢子、菌丝萌发、削弱病原菌致病力。本成果进一步在细胞结构、生理生化、和分子蛋白水平上阐明了环境友好处理增强酵母生防效力的相关机制，为酵母与环境生态友好处理协同抑病等新型管理果蔬采后病害技术的集成提供了理论依据。

近年来发表相关研究论文28篇，主要发表在Microbiome，Critical Reviews in Food Science and Nutrition，Computational and Structural Biotechnology Journal等国际知名期刊，其中题目为The impact of the postharvest environment on the viability and virulence of decay fungi 的论文**进入2018年农业科学领域全球ESI 1%行列（引用次数为17次，他引13次）**。项目同时培养重庆市“百人计划”入选者、重庆市青年拔尖人才、巴渝学者特聘教授刘嘉，“巴渝青年学者”隋媛。

**五、主要论文专著目录**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 序号 | 论文专著名称/  刊名/作者 | 影响  因子 | 年卷页码  （xx年xx卷xx页） | 发表时间  年 月 日 | SCI他引次数 | 他引  总次数 | 是否国内完成 |
| 1 | Apple endophytic microbiota of different rootstock/scion combinations suggests a  genotype-specific influence /Microbiome/  Liu J（刘嘉）, Abdelfattah A, Norelli J, Burchard E, Droby S, Wisniewski M | 14.650 | 2018, 6, 18 | 2018.1.27 | 50 | 59 | 是 |
| 2 | The impact of the postharvest environment on the viability and virulence of decay fungi /Critical Reviews in Food Science and Nutrition/  Liu J（刘嘉）, Sui Y（隋媛）, Wisniewski M, Xie Z, Liu Y, You Y, Zhang X, Sun Z, Li W, Li Y, Wang Q | 11.176 | 2018, 58, 1681-1687 | 2017.6.12 | 13 | 17 | 是 |
| 3 | Chitosan and oligochitosan enhance ginger (*Zingiber officinale Roscoe*) resistance to rhizome rot caused by *Fusarium oxysporum* in storage/Carbohydrate Polymers/ Liu Y, Wisniewski M, Kennedy J, Jiang Y, Tang T, Liu J（刘嘉） | 9.381 | 2016, 151, 474-479 | 2016.10.20 | 22 | 28 | 是 |
| 4 | A microbiome study reveals seasonal variation in endophytic bacteria among different mulberry cultivars  /Computational and Structural Biotechnology Journal/Ou T, Xu X, Wang F, Strobel G, Zhou Z, Xiang Z, Liu J（刘嘉）, Xie J | 7.271 | 2019, 17, 1091-1100 | 2019. 07.31 | 8 | 11 | 是 |
| 5 | Chitosan induces resistance to tuber rot in stored potato caused by *Alternaria tenuissima* /International Journal of Biological Macromolecules/ Liu J(刘嘉), Zhang X, Kennedy J, Jiang M（姜明国）, Cai Q, Wu X（吴学宏） | 6.953 | 2019, 140, 851-857 | 2019.08.27 | 13 | 18 | 是 |
| 6 | Sugar Protectants Improve the Thermotolerance and Biocontrol Efficacy of the Biocontrol Yeast, *Candida oleophila*. /*Frontiers in Microbiology*/ Zheng F, Zhang W, Sui Y(隋媛), Ding R, Yi W, Hu Y, Liu H, Zhu C. | 5.64 | 2019, 10, 187. | 2019.02.08 | 4 | 4 | 是 |
| 7 | Optimization of culture medium enhances viable biomass production and biocontrol efficacy of the antagonistic yeast, *Candida diversa*. /*Frontiers in Microbiology*/Liu J（刘嘉）, Li G, Sui Y（隋媛）. | 5.64 | 2017, 08, 2021 | 2017.10.17 | 2 | 3 | 是 |
| 8 | Responses of yeast biocontrol agents to environmental stress /Applied and Environmental Microbiology /Sui Y（隋媛）, Wisniewski M, Droby S, Liu J（刘嘉）. | 4.792 | 2015,81,2968-75. | 2015.02.20 | 51 | 66 | 是 |
| 9 | Stress tolerance and biocontrol performance of the yeast antagonist, *Candida diversa*, change with morphology transition.  / Environmental Science and Pollution Research/ Li G, Chi M, Chen H, Sui Y（隋媛）, Li Y, Liu Y, Zhang X, Sun Z, Liu G, Wang Q, Liu J（刘嘉） | 4.223 | 2016, 23, 2962-7 | 2015. 12,.5 | 10 | 12 | 是 |
| 10 | Ecofriendly hot water treatment reduces postharvest decay and elicits defense response in kiwifruit./ Environmental Science and Pollution Research/ Chen H, Cheng Z, Wisniewski M, Liu Y, Liu J（刘嘉）. | 4.223 | 2015,22,15037-45 | 205.05.24 | 33 | 38 | 是 |
| 11 | Combining UV-C treatment with biocontrol yeast to control postharvest decay of melon/ Environmental Science and Pollution Research/ Huang K（黄科）, Zou Y, Luo J, Liu Y. | 4.223 | 2015,22,14307-13. | 2015.05.08 | 8 | 8 | 是 |
| 12 | Exposure of *Candida oleophila* to sublethal salt stress induces an antioxidant response and improves biocontrol efficacy. /Biological Control/  Wang Y , Luo Y , Sui Y（隋媛）, Xie Z, Liu Y, Jiang M（姜明国）, Liu J（刘嘉） | 3.687 | 2018, 127, 109–115 | 2018.09.06 | 15 | 16 | 是 |
| 13 | Transcriptome profiling reveals differential gene expression associated with changes in the morphology and stress tolerance of the biocontrol yeast, pichia cecembensis. */*Biological Control*.*/  Liu J（刘嘉）, Sui Y（隋媛）, Xie Z, Chi M. | 3.687 | 2018, 120, 36–42 | 2017.03.23 | 4 | 6 | 是 |
| 14 | Recent advances and current status of the use of heat treatments in postharvest disease management systems: is it time to turn up the heat?. /Trends in Food Science & Technology /  Sui Y （隋媛）, Wisniewski M, Droby S, Norelli J, Liu J （刘嘉）. | 3.687 | 2016,51, 34e40 | 2016.03.15 | 9 | 17 | 是 |
| 15 | Heat shock improves stress tolerance and biocontrol performance of Rhodotorula mucilaginosa/Biological Control/Cheng Z, Chi M, Li G, Chen H, Sui Y（隋媛）, Sun H, Wisniewski M, Liu Y, Liu J（刘嘉） | 3.687 | 2016, 95,49–56 | 2016.01.08 | 18 | 21 | 是 |
| 16 | Increase in antioxidant enzyme activity, stress tolerance and biocontrol efficacy of *Pichia kudriavzevii* with the transition from a yeast-like to biofilm morphology /Biological Control/ Chi M,  Li G, Liu Y, Liu G, Li M, Zhang X, Sun Z, Sui Y（隋媛）, Liu J（刘嘉） | 3.687 | 2015, 90, 113-119. | 2015.06,20 | 24 | 30 | 是 |
| 17 | Combining an antagonistic yeast with harpin treatment to control postharvest decay of kiwifruit /Biological Control /Tang J, Liu Y, Li H, Wang L, Huang K（黄科）, Chen Z. | 3.687 | 2015,89, 61–67 | 2015.05.21 | 28 | 31 | 是 |
| 18 | Effect of glucose on thermotolerance and biocontrol efficacy of the antagonistic yeast *pichia guilliermondii* /Biological Control/ Sui Y（隋媛）, Liu J（刘嘉）. | 3.687 | 2014, 74, 59–64 | 2014.04.23 | 16 | 23 | 是 |
| 19 | Proteomic analysis of the inhibitory effect of oligochitosan on the fungal pathogen, *Botrytis cinerea*/Journal of the Science of Food and Agriculture /Sui Y (隋媛), Ma Z, Meng X. | 3.638 | 2019,99,2622-2628 | 2018.12.24 | 6 | 6 | 是 |
| 20 | Heat-induced oxidative injury contributes to inhibition of *Botrytis cinerea* spore germination and growth/World Journal of Microbiology and Biotechnology/Zhao W, Wisniewski M, Wang W, Liu J（刘嘉）, Liu Y. | 3.312 | 2014 , 30, 951-7 | 2013.10.08 | 20 | 20 | 是 |
| 合 计 | | | | | 354 | 434 |  |

**六、主要完成人**

刘嘉、隋媛、姜明国、黄科、吴学宏

**七、主要完成单位**

重庆文理学院、广西民族大学、中国农业大学