

# 食品与发酵科技

SHIPIN YU FAJIAO KEJI

食品与发酵科技

中国科技核心期刊  
中国期刊综合评价数据库统计源期刊  
美国《化学文摘》(CA)收录期刊

荣获中国首届《CAJ-CD》规范执行优秀奖  
《中国核心期刊(遴选)数据库》收录  
波兰《哥白尼索引》(IC)收录期刊

1  
2023

第59卷·总第233期

广告

泸州老窖 1952  
时代经典 致敬开创



# 食品与发酵科技

FOOD AND FERMENTATION SCIENCE & TECHNOLOGY

(双月刊)

第 59 卷 第 1 期(总第 233 期)

2023 年 2 月 25 日出版

编委会主任：孙宝国（院士） 陈 坚（院士）

编委会执行主任：陈 功 刘 念

编委会委员：胡永松 金济良 李大和 罗云波  
饶平凡 张和平 李洪军 张 良  
赵 东 沈 毅 王 卫 郜海燕  
励建荣 罗惠波 何 强 李 诚  
陈祥贵 唐善虎 刘学波 雷红涛  
朱克永 游敬刚 王 刚 陈宏毅  
潘建军 张其圣 冯 霞 陈 蓉

主 编：陈 功

副 主 编：沈才洪 陈宏毅（执行）

责任编辑：史 辉

校 对：余文华

英文编辑：张蓓蓓

主管单位：四川省经济和信息化厅

主办单位：四川省食品发酵工业研究设计院有限公司

协办单位：中国轻工业酿酒工程及应用重点实验室

酿酒生物技术及应用四川省重点实验室

泸州老窖股份有限公司

四川省绵阳市丰谷酒业有限责任公司

四川剑南春集团有限责任公司

编辑出版：《食品与发酵科技》编辑部

地 址：中国·四川·成都市温江区杨柳东路中段 98 号  
(四川省食品发酵工业研究设计院有限公司内)

邮 编：611130

电 话：028-82763572

传 真：028-82763572

投稿平台网址：<http://sksf.cbpt.cnki.net>

E-mail：sfaf 8889@163.com

网 址：[www.SC-FFM.com](http://www.SC-FFM.com)

广告发布登记：5100004000309

印 刷：四川煤田地质制图印务有限责任公司

发行范围：国内外公开发行

邮发代号：62-247

发 行：成都市邮政局

中国标准连续出版物号：ISSN 1674-506X  
CN 51-1713/TS

定价：22.00 元/册

## 版权声明

本刊已许可中国学术期刊（光盘版）电子杂志社在中国知网及其系列数据库产品中以数字化方式复制、汇编、发行、信息网络传播本刊全文。该社著作权使用费与本刊稿酬一并支付（已换算为杂志赠阅）。作者向本刊提交文章发表的行为即视为同意我刊上述声明。

## C 目次 CONTENTS

(1973 年创刊)

### 应用研究

- 山药提取物对灰树花液态发酵中生物量和胞外多糖影响的研究 ..... 邓代霞, 吴天祥, 李凤兰, 等 (1)  
*bdhA* 基因敲除及发酵条件优化提高枯草芽孢杆菌四甲基吡嗪含量研究 ..... 王丽丰, 李雯, 谢和 (8)  
传统牦牛酸乳源乳酸菌的发酵性能研究 ..... 赵任强草, 张忠明, 张卫兵, 等 (15)  
基于代谢组学分析刺梨鞣花单宁对 db/db 小鼠的影响 ..... 谭芸芸, 谭书明, 俞露, 等 (22)  
洞口酱香酒第一轮次堆积发酵过程中微生物群落结构及其与理化因子关联性分析 ..... 任婷婷, 苏伟, 母应春, 等 (30)  
燕麦麸皮与红曲粉混合发酵产物的功能成分与理化特性研究 ..... 高宇琪, 廖丽丽, 肖世洪, 等 (39)  
响应面法优化低钠香猪培根的复合盐配方 ..... 张磊, 郑荣美, 张玉龙, 等 (45)  
天然五倍子提取物及其衍生物复合保鲜剂在冷鲜猪肉中的应用研究 ..... 陈依琳, 罗志军, 胡鹏刚, 等 (55)  
传统发酵豆豉粑特征风味物质研究 ..... 王琴, 文安燕, 秦礼康, 等 (62)  
蒸制表面传热系数测定及其对品质动力学的影响 ..... 张熙晨, 李静鹏, 邓夏彬阳, 等 (73)  
耐高温高产酒精酵母菌的筛选鉴定及特性研究 ..... 曹云, 曹文涛, 王晓丹, 等 (83)  
D-最优混料设计优化“贵州三宝酒”配方及品质分析 ..... 李雪, 李立郎, 王瑜, 等 (90)  
基于没食子酸分析的百药煎发酵炮制工艺研究 ..... 李南臻, 王刚, 万玉军, 等 (98)  
高含量 GABA 桑叶茶工艺优化研究 ..... 樊蓉, 陈让芳, 田树林, 等 (103)  
响应面法对极端东方化假单胞菌产嗜铁素发酵条件的优化 ..... 李文孝, 梁建强, 贾俊超, 等 (108)  
富硒酸奶响应面工艺优化研究 ..... 张婉菁, 王汉屏, 唐德剑, 等 (113)

### 综 述

- 基因敲除技术及其在白酒酿造中的研究进展 ..... 李秀形, 黄进, 王晓丹, 等 (118)  
白酒陈化挥发性物质含量变化及物理催陈技术研究进展 ..... 曾庆军, 周鸿翔, 邱树毅, 等 (126)  
纳豆制备工艺的改良及其溶栓、整肠功能的研究进展 ..... 杨立娜, 曹淑芳, 解梦汐, 等 (134)  
拉曼光谱在白酒检测中的应用研究 ..... 肖子涵, 王晓丹, 邱树毅, 等 (140)

### 分析与检测

- 基于色谱法测定布福娜不同部位风味成分及代谢物质 ..... 温福丽, 曾超, 叶青青, 等 (146)

### 专业教学与实践

- 思政教育与海洋特色融入《食品生物化学》教学的改革研究与实践 ..... 田方, 蔡路昀, 赵亚东 (154)  
《发酵工程技术》课程教学思政育人的探索与实践 ..... 程仕伟, 冯志彬, 乔洪金, 等 (159)  
创新创业背景下食品营养与检测专业人才培养的研究与实践 ..... 张凤英, 朱克永, 李俊儒, 等 (163)

# FOOD AND FERMENTATION SCIENCE & TECHNOLOGY

(Bimonthly)

First Issue August 1973  
Volume 59 Number 1(Total Number233) February 25, 2023

<b>Director of Editorial Board:</b> SUN Baoguo	CHEN Jian
<b>Executor Director of Editorial Board:</b> CHEN Gong	LIU Nian
<b>Member of Editorial Board:</b> HU Yongsong	JIN Jiliang
LI Dahe	LUO Yunbo
RAO Pingfan	ZHANG Heping
LI Hongjun	ZHANG Liang
ZHAO Dong	SHEN Yi
WANG Wei	GAO Haiyan
LI Jianrong	LUO Huibo
HE Qiang	LI Cheng
CHEN Xianggui	TANG Shanhu
LIU Xuebo	LEI Hongtao
ZHU Keyong	YOU Jinggang
WANG Gang	CHEN Hongyi
PAN Jianjun	ZHANG Qisheng
FENG Xia	CHEN Rong

**Chief Editor:**CHEN Gong

**Associate Editor:**SHEN Caihong CHEN Hongyi(Executor)

**Responsible Editor:**SHI Hui

**English Editor:**ZHANG Beibei

**Started in:**1973

**Been in Charge of By:**Sichuan Provincial Economic and Information Department

**Sponsored by:**Sichuan Food and Fermentation Industry Research & Design Institute Co., Ltd

**Jointly Sponsored by:**Key Laboratory of Brewing Engineering and Application of China National Light Industry Council  
Liquor-making Biotechnology & Application Key Laboratory of Sichuan Province

Luzhou Laojiao Co., Ltd.

Sichuan Mianyang Forgood Distillery Co., Ltd.

Sichuan Jiannanchun Group Co., Ltd.

**Edited by:**Editorial Department of Food and Fermentation Science & Techology

**Address:** 98# Medium Section, Liuhe Road Wenjiang District, Chengdu City, Sichuan, China

**Postcode:**611130

**Tel:**028-82763572

**Fax:**028-82763572

**Contribution platform website:**<http://sksf.cbpt.cnki.net>

**E-mail:**saf 8889@163.com

**Http:**[www.SC-FFM.com](http://www.SC-FFM.com)

**Printed by:**Sichuan Coalfield Geological Mapping Printing Co., Ltd

**Issue Scope:**Issued Openly at Home and Aroad

**Ordered at:**Local Post Office or the Editorial Department

**Chinese Standard Serial Number:** ISSN 1674-506X  
CN 51-1713/TS

**Fixed Price:**RMB 22.00 Every Issue

## CONTENTS

Effects of Yam Extract on Biomass and Extracellular Polysaccharide of <i>Grifola frondosa</i> in Liquid Fermentation .....	DENG Daixia,WU Tianxiang,LI Fenglan, <i>et al.</i> ( 1 )
Study on Improving the Content of Tetramethylpyrazine in <i>Bacillus subtilis</i> by <i>bdhA</i> Gene Knockout and Optimization of Fermentation Conditions .....	WANG Lifeng,LI Wen,XIE He( 8 )
Study on Fermentation Performance of Lactic Acid Bacteria From Traditional Yak Yoghurt .....	ZHAO Renqiang,CAO Zhongming,ZHANG Weibing, <i>et al.</i> (15)
Effect of Ellagitannin of <i>Rosa roxburghii</i> Tratt on db/db Mice was Analyzed Based on Metabolomics.....	TAN Yunyun,TAN Shuming,YU Lu, <i>et al.</i> (22)
Analysis of Microbial Community Structure and Its Correlation with Physicochemical Properties During the First Round of Stacking Fermentation of the Dongkou Sauce-flavor Baijiu .....	REN Tingting,SU Wei,MU Yingchun, <i>et al.</i> (30)
Study on Functional Components and Physicochemical Properties of Mixed Fermentation of Oat Bran and Red Yeast Rice Powder .....	GAO Yuqi,LIAO Lili,XU Shihong, <i>et al.</i> (39)
Optimization of Low Sodium Complex Salt Formulation for Xiang Pork Bacon by Response Surface Methodology .....	ZHANG Lei,ZHENG Rongmei,ZHANG Yulong, <i>et al.</i> (45)
Application of Natural Gallnut Extract and Its Derivative Compound Preservative in Chilled Fresh Pork .....	CHEN Yilin,LUO Zhiyun,HU Penggang, <i>et al.</i> (55)
Study on Characteristic Flavor Substances in Traditional Fermented Douchiba .....	WANG Qin,WEN Anyan,QIN Likang, <i>et al.</i> (62)
Measurement of Heat Transfer Coefficient between Gas and Solid and Its Effects on Dynamics of Quality Changes .....	ZHANG Xichen,LI Jingpeng,DENG Xiabinyang, <i>et al.</i> (73)
Screening, Identification and Characterization of Thermotolerant Yeast Strains with High-yield of Alcohol .....	CAO Yun,CAO Wentao,WANG Xiaodan, <i>et al.</i> (83)
D-optimal Mixture Design to Optimize the Formula and Quality Analysis of "Guizhou Sanbao Wine" .....	LI Xue,LI Lilang,WANG Yu, <i>et al.</i> (90)
Study on Processing Technology for Fermentation of Baiyaojian Based on Gallic Acid Analysis .....	LI Nanzen,WANG Gang,WAN Yujun, <i>et al.</i> (98)
Process Optimization of High Level of GABA Mulberry Leaf Tea.....	FAN Rong,CHEN Rangfang,TIAN Shulin, <i>et al.</i> (103)
Optimization of the Fermentation Condition for Siderophores Production by <i>Pseudomonas extremorientalis</i> by Response Surface Methodology.....	LI Wenxiao,LIANG Jianqiang,JIA Junchao, <i>et al.</i> (108)
Study on the Optimization of Response Surface Technology for the Processing of Healthy Selenium-rich Yogurt .....	ZHANG Wanjing,WANG Hanping,TANG Dejian, <i>et al.</i> (113)
Research Progress of Gene Knockout Technology and Its Application in Baijiu Brewing .....	LI Xiutong,HUANG Jin,WANG Xiaodan, <i>et al.</i> (118)
Research Progress of Volatile Matter Content Change and Physical Aging Technology in Baijiu Aging .....	ZENG Qingjun,ZHOU Hongxiang,QIU Shuyi, <i>et al.</i> (126)
Research Progress on the Improvement of Natto Processing Technology and its Regulation of Thrombolysis and Intestinal Function .....	YANG Lina,CAO Shufang,XIE Mengxi, <i>et al.</i> (134)
Application of Raman Spectroscopy in the Detection of Baijiu .....	XIAO Zihan,WANG Xiaodan,QIU Shuyi, <i>et al.</i> (140)
Determination of Flavor Components and Metabolic Components in Different Parts of <i>Kadsura coccinea</i> by Chromatography .....	WEN Fulì,ZENG Chao,YE Qingqing, <i>et al.</i> (146)
Exploration on Teaching Reform and Practice of "Food Biochemistry" Course Integrating Ideological and Political Education and Marine Characteristics .....	TIAN Fang,CAI Luyun,ZHAO Yadong(154)
Exploration and Practice of Ideological and Political Education in Fermentation Engineering Technology Course .....	CHENG Shiwei,FENG Zhibin,QIAO Hongjin, <i>et al.</i> (159)
The Research and Practice of Food Nutrition and Detection Professional Training under the Background of Innovation and Entrepreneurship .....	ZHANG Fengying,ZHU Keyong,LI Junru, <i>et al.</i> (163)