内蒙古畜产品加工研究会

内蒙古畜产品加工研究会第六届三次学术年会

研究会会刊

Collections

2019 年 11 月 30 号 中国·内蒙古

Research Association of Animal Products Processing of Inner Mongolia
内蒙古畜产品加工研究会

简　　介

内蒙古畜产品加工研究会成立于1988 年，挂靠于内蒙古农业大学食品科学与工程学院。我会现有会员 105 人，其中教授、博士生导师有 7 人，副教授 17 人，企业董事长、总经理等高管 21 人，博士、硕士学位以上人员占比超过了 60%。我会是畜产品加工领域的科技工作者、企业家自愿组成的全区性、学术性、非营利性社会组织，具有社会团体法人资格，是党和政府联系全区畜产品加工业科技工作者及生产企业的桥梁和纽带，是支撑我区畜产品加工业科技发展的主要社会力量。

学会围绕内蒙古自治区“乳与乳制品、肉与肉制品和动物副产品”等畜产品科学研究与产业化开发，以学术研究与交流为主要活动形式，团结和凝聚我区畜产品行业广大科技工作者和企业家，推动产、学、研相结合，努力促进我区畜产品行业科技创新、成果转化和技术推广。

学会网站：
http://xh.imast.org.cn/xcpjg/

第六届内蒙古畜产品加工研究会学术委员会

主任委员：双　全

委　　员：（按姓氏首字母排序）

包小兰、付艳茹、贺银凤、靳　烨、刘　静、宁红梅、双　全、田建军、吴晓彤

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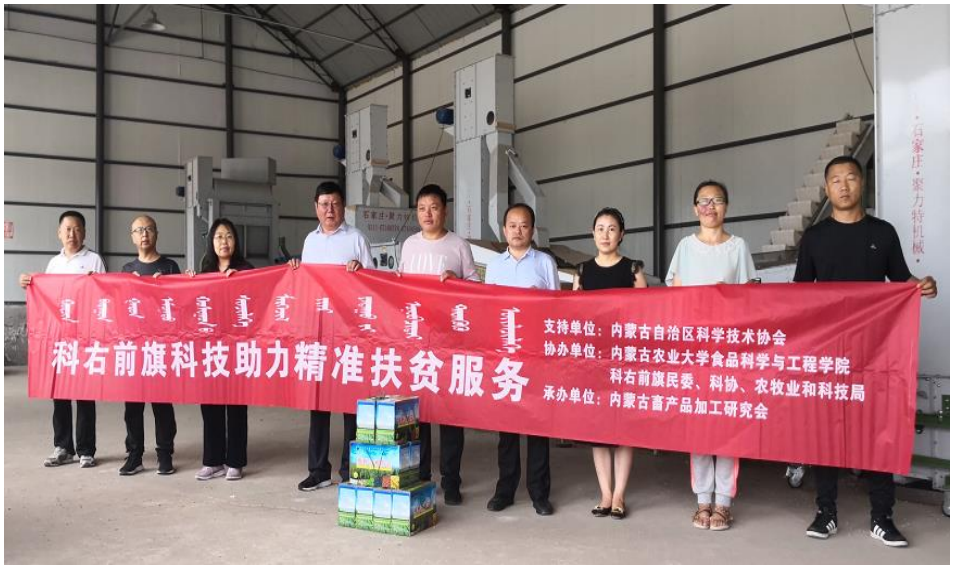
学会风采

内蒙古畜产品加工研究会第六届三次学术年会

内蒙古畜产品加工研究会第六届二次学术年会

2019 年 7 月参加自治区科协组织的科技助力、精准扶贫工程活动



“百名专家走进盟市旗县科普传播行”活动

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一、双全 理事长致欢迎词

尊敬的各位领导、各位来宾、女士们、先生们：

大家上午好!

在“我和我的祖国”的激情歌声中，2019 年内蒙古畜产品加工研究会第六届三次学术年会暨畜产品安全生产关键技术交流与研究会党建工作会议隆重开幕了！来自区内外的 100 多名代表，相聚青城，今天将分别进行 6 个专题报告、8 个研究生论坛及 1 场企业家论坛。在此，我谨代表研究会第六届理事会，向参会的领导、来宾表示热烈欢迎，向为本次会议付出辛勤劳动的筹备组人员表示真诚的感谢!

随着这次会议的举办，我们的研究会会员数不断增加，目前已增加到 137 人，我们坚信，有你们的热情支持，鼎力相助和积极参与，研究会的明天将会更加灿烂!

下边我将内蒙古畜产品加工研究会一年的工作简单总结如下:

内蒙古畜产品加工研究会第六届理事会自成立以来，深入学习贯彻习近平新时代中国特色社会主义思想和党的十九大精神，充分发挥食品科技人才智力优势，

在自治区科协的关怀和正确引领下，围绕自治区乳、肉制品及其副产物研究与产业化，以科学研究与学术交流为主要活动形式，团结和凝聚畜产品行业的广大科技工作者和企业家，推动产、学、研相结合，努力促进我区畜产品行业科技创新、成果转化和技术推广工作。

一、提高政治站位，强化思想引领

我们始终把研究会会员的政治引导放在首位，通过研究会的各项活动，认真学习领会习近平新时代中国特色社会主义思想和“不忘初心、牢记使命”主题教育精神，围绕中心工作，加强研究会党支部的思想、组织、作风和制度建设，团结带领党员，牢固树立“四个意识”，积极参与研究会的重要会议及重大决策，规范和监督研究会各项制度的执行，为研究会的各项工作圆满完成提供了强有力的政治和组织保证。

二、发挥专业优势，助力精准扶贫

内蒙古畜产品加工研究会充分发挥专业优势，积极承担了兴安盟科右前旗的科技助力精准扶贫服务工作。2019 年 7 月 22 日至 26 日，在内蒙古农业大学食品学院的大力支持下，研究会组织了 20 余人与兴安盟科右前旗科协、民委、农科局、市场监管局开展精诚合作，走访食品相关企业及合作社 10 多家，进行了现场技术指导和服务，帮助解决生产中遇到的实际问题。

三、积极参加科普教育与科普活动，提高社会服务水平

我们研究会积极响应自治区科协组织的全区“百名专家走进盟市旗县科普传播行”活动，前后选派了 4 名专家赴呼伦贝尔市、锡林郭勒盟、兴安盟和包头市开展专题授课、座谈及现场指导。

研究会副理事长贺银凤教授担任主编组织编写的《吃出营养-吃出健康》科普丛书（4 册），经自治区科技厅组织评审，荣获 2018 年度自治区优秀科普图书。2019 年学会在精准扶贫期间，向企业与合作社无偿捐赠了近 200 册。

2019 年 5 月和 9 月，研究会派专家分别赴巴彦淖尔市乌拉特后旗和锡盟西乌旗开展了食品质量与安全知识讲座及科普宣传，为一线员工和农牧民普及科学知识。

四、加强国内外学术交流活动，开阔眼界，促进合作

2019 年 8 月，内蒙古畜产品加工研究会和研究会理事单位阿巴嘎旗照富经贸有限责任公司在阿巴嘎旗共同举办了首届“一带一路”酸马奶研讨交流会。自治区科技厅领导、阿巴嘎旗委旗政府领导、蒙古国教育文化科技体育部部长助理以及中蒙企业界代表和专家学者等 60 余人参加会议。会议围绕酸马奶的营养、保健、疗效、文化等领域进行了深入的研讨交流。2019 年 11 月，研究会还邀请了日本冈山大学教授兼日本中四国区域食品先进技术研究会理事长为研究会成员及研究生作了一场学术报告，就有关发酵技术与新型酶制剂探索的前沿研究进行了介绍，与会人员获益匪浅。

五、发挥研究会的优势，促进产学研的合作

我们研究会近几年积极推进产学研结合，为科技工作者、畜产品加工企业服务，研究会主要成员与企业联合申报并获批 6 项自治区科技计划、科技成果转化、创新基金等重大专项或公关项目，累计经费达 1160 多万元，对自治区畜产品开发生产关键技术研究与产业化示范具有重要意义。

六、今后的工作安排

今后我们研究会将按照自治区科协工作部署要求，进一步向“三个扎实”凝心聚力，履行好“四个服务”职责，当好自治区畜产品研究、开发、生产能力提升的排头兵。积极开展学术交流与科技服务工作。积极组织科技人员，把科技论文写在内蒙古大地上。进一步加强研究会自身建设，优化组织结构，完善管理制度，朝着建设标准化学会的目标努力。

各位领导、来宾、同志们，我们的研究会正处在改革发展的新起点，机遇和挑战前所未有。让我们凝心聚力，锐意创新，团结合作，为内蒙古畜产品加工行业的快速健康发展努力奋斗！

谢谢大家！祝会议圆满成功!

二、内蒙科协领导 苏雅来副主席致辞

各位领导，各位专家：

大家上午好！今天，我们在这里隆重举行内蒙古畜产品加工研究会第六届三次学术年会暨畜产品安全生产关键技术交流与学会党建工作会议，在此，我谨代表自治区科协对大会的召开表示热烈的祝贺！对参加本次学术年会的专家学者表示诚挚的问候和崇高的敬意！

近年来，内蒙古畜产品加工研究会不断拓展学术交流领域,加强食品科技交流合作，积极带动学科发展，举办了一系列活动。研究会全面落实了自治区科协的决策部署，开展了科技助力精准扶贫活动，充分发挥食品科技人才智力优势，促成农牧民、食品企业科技需求与研究会资源有效对接，在社会上产生良好反响。

今天举行畜产品质量安全及生产关键技术交流研讨会，在推进畜产品安全生产发展起到了积极作用。促进我区畜产品行业科技创新、成果转化和技术推广工作。借此机会，我讲几点意见，与大家共勉。

一要大力繁荣学会学术交流。组织开展学术交流活动是为会员服务的重要内容，也是学科学术发展的内在需求。要努力促进相关学科之间的科研交流与合作，拓宽会员的学术视野。要关心青年科技工作者的成长，关注他们的学术

需求，营造浓厚的学术氛围。大力弘扬科学精神、普及科学知识、传播科学思想、倡导科学方法，营造坚持真理、诚实守信的学术环境，推进学术研究的健康发展。

二要积极面向公众开展科普。科技创新离不开肥沃的土壤和良好的氛围。面向公众开展科普，提高公众科学素质，是学会重要的社会职能。学会拥有雄厚的专家队伍、丰富的理论和实践经验，具有得天独厚的传播科学知识的独特优势。希望学会要充分利用这一优势，着力服务全民科学素质提高，积极开展实用技术培训和专业性科普宣传，助力精准扶贫和乡村振兴，为打赢三大攻坚战作出积极贡献。

三要不断推动学会创新发展。要加强与国家级学会、盟市级学会的协同发展，从根本上解决学会凝聚力不够、活力不强、组织松散等突出问题，真正把学会做实、做强、做好，推动学会健康有序发展。要完善体制机制，提升管理水平；加强国际合作，提升竞争能力；强化人才建设，提升队伍素质。积极承接政府职能，提升服务社会能力；探索建立学会联合体，促进产学融合协同创新。不断提升科技创新的服务能力，助力我区经济高质量发展。

自治区科协作为党和政府联系科学技术工作者的桥梁和纽带，要发挥职能，积极指导全区学会开展工作，千方百计为会员单位服务。要建立与学会党组织、理事会经常联系和沟通的有效途径，争取对学会在人员、经费、工作条件等方面的支持。积极探索建立适应学会发展、符合科技团体发展规律、满足科技工作者需要的组织体制、运行机制和活动方式，促进学会工作新发展。自治区科协将一如既往地关注、支持内蒙古畜产品加工研究会开展学术交流、活跃学术思想，不断发展壮大。

各位专家、同志们！希望内蒙古畜产品加工研究会进一步发挥职能，把科技工作者更加紧密地团结在以习近平同志为核心的党中央周围，围绕中心、服务大局，推动学会工作实现新发展；也希望内蒙古畜产品加工研究会科技工作者牢记使命、担负责任，潜心钻研、砥砺前行，推动科技创新与科学普及两翼齐飞，为创新内蒙古建设作贡献。

最后，预祝此次大会取得圆满成功！

祝各位领导、专家、代表身体健康，工作顺利！

三、中国畜产品加工研究会刘登勇副秘书长 致辞

尊敬的苏雅来主席、双全理事长、郑培亮书记、董同力嘎院长，各位领导、各位来宾，同学们：

大家上午好！

值此内蒙古畜产品加工研究会第六届三次学术年会召开之际，我谨代表中国畜产品加工研究会对其致以热烈的祝贺！

我们知道，内蒙古自治区幅员辽阔，畜产品资源极为丰富，在畜产品加工尤其是乳、肉制品加工方面具有非常明显的优势。

内蒙古畜产品加工研究会，据我所知，应该是目前唯一的地方性畜产品加工研究会，和中国畜产品加工研究会不仅在法定名称、工作性质、业务领域等诸多方面紧密相连，更是有着悠久的历史渊源、长期的交流合作，尤其是在促进内蒙古自治区畜产品加工行业的科技创新和产业发展等方面，做出了更为直接的贡献。从刚才苏雅来主席和双全理事长的介绍，我们知道，这一届的领导和专家在科技助力、精准扶贫、成果转化、科普宣教等多个方面开展了系列工作，成果显著，得到了自治区科协领导及畜产品行业代表性企业的认可，祝贺你们所取得的成绩！

借此机会，下面也请容许我对中国畜产品加工研究会做个简单介绍：

中国畜产品加工研究会，是由畜产品加工领域的科技工作者、企业家和有关单位自愿组成的全国性、学术性、非营利性社会组织，具有社会团体法人资格，是党和政府联系全国畜产品加工业科技工作者及生产企业的桥梁和纽带，是支撑我国畜产品加工业科技发展的主要社会力量。

中国畜产品加工研究会，是在民政部登记、农业农村部主管的国家一级学会。现任会长是南京农业大学周光宏教授，内蒙古农业大学张和平教授是副会长之一。按照细分研究对象和工作内容，设有肉品加工、乳品加工、蛋品加工、生化工程与综合利用 4 个专业委员会，以及咨询委员会、青年工作委员会、秘书处等分支机构，本人兼任秘书处副秘书长（分管产业技术支持、科普宣教工作）、青年工作委员会召集人。

学术交流和科技合作，是研究会最主要的业务内容，包括：凝聚全国畜产品加工科技力量，组织制（修）订各类标准，主办全国大学生畜产品创新创业大赛，中国肉类科技大会、中国乳业科技大会、中国蛋品科技大会，以及多种形式的学术研讨会，欢迎大家有机会积极参加！

最后，再次感谢内蒙古畜产品加工研究会的邀请，希望我们双方建立更加紧密的交流与合作机制，共同发展。

预祝本次会议取得圆满成功！

谢谢大家！

四、食品科学与工程学院院长董同力嘎（教授） 致辞

尊敬的苏雅来副主席、刘登永博士，尊敬的各位嘉宾、各位代表：

上午好！一场大雪改变了呼和浩特的天气，也温暖了我们的心情。

在此我谨代表内蒙古农业大学食品科学与工程学院全体教职员工对内蒙古畜产品加工研究会第六届三次学术年会与党建工作会议的召开表示热烈的祝贺，向出席会议的各位领导、各位嘉宾、各位代表示衷心地感谢和热烈地欢迎！

当前，我国正处于经济转型和产业结构调整的重要时期，畜产品加工业在这一转型期，一个很重要的任务便是加快产业的转型升级。我们这次会议就是继续围绕产业、政策、研究、合作、发展的主题，宣传我国畜产品加工业新的政策和动态，总结研究会一年来不忘初心、牢记使命在产、学、研技术进步和研究会党建等方面做出的成绩和取得的成功经验，研讨我区畜产品加工业存在的焦点问题、难点问题和相应对策等。

我国的畜产品加工业是一项“朝阳产业”，也是一项系统工程，是中华民族健康的“民心工程”，已经成为农业和农村经济中最具发展活力的重要产业之一。内蒙古作为畜牧业大省，近年来紧紧围绕精准扶贫、富民强区目标，坚持科学发展，大力实施“工业强区、城镇化带动、农业产业化提升”主战略，全面实施“稳一、强

二、进三”总体工作布局，使产业特色更加鲜明，经济发展稳中求进。大力发展畜产品加工业，对打赢精准扶贫攻坚战，加快自治区农牧业和农村牧区经济结构战略性调整，促进地方的二、三产业发展，加快工业化、城市化的进程具有重要的推进作用。

内蒙古虽是畜牧业生产大省，但目前畜产品的加工转化率不高。如肉类转化率仅 3~4%，距先进的兄弟省市还有一定差距，而与发达国家水平相比差距更大。我们的畜产品加工业还存在着诸如加工企业产品科技含量不高，结构不合理，品种单一，高档产品少；畜养不规范，畜产品质量不高，抗生素、重金属等残留严重超标问题。技术进步就成为产业转型升级的关键。随着形势任务的不断发展变化，大力推进科研创新，着力加强理论研究，进一步发挥好由院校、科研单位、企业的学者、专家组成的研究会的人才智力优势，真正使他们的科研成果能够成为党政机关决策的智库，助力企业技术改造、产品研发升级，显得越来越重要和紧迫。依靠技术进步，畜产品加工从低附加值向高附加值升级，从高能耗高污染向低能耗低污染升级，从粗放型向集约型升级。用高新技术改造传统产业这是研究会的一项重要课题。肉类食品产业已被国家纳入智能制造发展规划，作为国家重点支持的产业之一。我希望内蒙古畜产品加工研究会抓住机遇，不辱使命，针对上述问题，进行广泛而深入的分析和研究，为自治区畜产品加工业的提升发展贡献智慧和力量。我深信，在大家的不懈努力下，自治区的畜产品加工业一定能够更快、更健康、更有序地发展。

内蒙古畜产品研究会在 2019 年度，在科学研究，产品推广，科普宣传，科技扶贫等方面取得了突出的成绩，科研能力和社会服务能力方面不断提升；为食品科学与工程学院学科建设做出了突出贡献。在此我代表我院，对内蒙古畜产品研究会的大力支持表示感谢，也对内蒙古科学技术协会多年来对我院科学研究和学科建设方面的关怀和支持表示衷心的感谢。

这次内蒙古畜产品加工研究会第六届三次学术年会与研究会党建工作会议的召开，为我们提供了良好的交流平台和难得的学习机会，必将对自治区畜产品加工业的发展起到很好的推动作用。我们以此为契机，进一步加强沟通与交流，进一步加强和改进党建工作，切实提升会员理论研究水平，为自治区经济社会发展服务。最后，预祝会议圆满成功！祝各位领导、各位嘉宾、各位代表身体健康！

五、田建军秘书长汇报2019年研究会工作总结

2019年，内蒙古畜产品加工研究会在各级主管部门领导下，在各级领导的关心和指导下，在全体会员大力支持积极参与下，坚持民主办会的原则，秉承“服务政府、服务行业、服务会员”的办会宗旨，团结、凝聚全区畜产品行业科技工作者与企业家，积极开展项目研究、学术交流、科技合作、精准扶贫、不断开拓工作思路、创新服务模式、在维护行业利益、促进会员发展、提高研究会影响力等方面取得了一定的成绩。

一、推进产、学、研合作项目，为会员企业提供服务

近几年，研究会积极推进产学研结合，为科技工作者、畜产品加工企业提供服务，产学研合作成绩斐然。

1.自治区科技重大专项

内蒙古蒙元宽食品有限公司与内蒙古畜产品加工研究会（内蒙古农业大学，肉品科学技术研究团队，靳烨教授）共同承担“内蒙古自治区科技重大专项（经费500.00万元，项目执行时间2016－2019年）”内蒙古蒙元特色食品研究开发与产业化示范－－蒙元特色发酵牛肉干的研发与产业化示范，共同研发了发酵牛肉干等系列产品。

2.自治区科技创新奖励基金重大项目

内蒙古畜产品加工研究会（内蒙古农业大学，民族特色食品研究团队，双全教授）与正蓝旗长虹乳制品厂共同承担“自治区科技创新奖励基金重大项目（经费180.00万元，项目执行时间2018－2019年）”传统乳制品的工业化生产关键技术研究与推广应用研究项目,共同开发了各种创新产品。

3.自治区成果转化项目

（1）内蒙古畜产品加工研究会（内蒙古农业大学，食品生物技术研究团队，贺银凤教授）与内蒙古澳特尔乳业等企业共同承担“内蒙古自治区科技成果转化项目（经费75.00万元，项目执行时间2018－2021年）”乳酸菌与酵母菌微生态制剂应用关键技术。

（2）内蒙古畜产品加工研究会（内蒙古农业大学，肉品科学技术研究团队，靳烨教授）与内蒙古蒙羊集团、锡林郭勒盟羊羊牧业等企业共同承担“内蒙

古自治区科技成果转化项目（经费 300.00 万元，项目执行时间 2019－2022 年）”羊肉品质调控和标准化生产技术。

4.自治区科技计划项目

（1）内蒙古畜产品加工研究会（内蒙古农业大学，肉品科学技术研究团队，田建军副教授）承担“内蒙古自治区科技计划项目（经费 30.00 万元，项目执行时间 2017－2019.06 年）”发酵肉制品安全生产关键技术研究。

（2）内蒙古畜产品加工研究会（内蒙古农业大学，肉品科学技术研究团队，赵丽华教授）与内蒙古旺顺食品公司等企业共同承担“内蒙古自治区科技计划项目（经费 50.00 万元，项目执行时间 2018－2020 年）”内蒙古特色发酵食品中乳酸菌分离、鉴定及其应用研究。

（3）内蒙古畜产品加工研究会（内蒙古农业大学，肉品科学技术研究团队，田建军副教授）与内蒙古草原晶鑫食品有限公司等企业共同承担“内蒙古自治区科技计划项目（经费 140.00 万元，项目执行时间 2019－2021 年）”发酵肉制品（风干肉）中生物活性物质分析研究。

二、开展学术交流活动，推动行业科技发展

由研究会和内蒙古布特蒙古文信息化研究中心共同主办，由学会理事单位阿巴嘎旗照富经贸有限责任公司承办的“首届‘一带一路’酸马奶研讨交流会”于 2019 年 8 月 15 日在锡林郭勒盟阿巴嘎旗别力古台镇隆重召开。来自国内外的 60 余名专家、学者、企业家参会，共同探讨“一带一路”沿线国家在畜产品加工业发展中面临的问题、机遇和挑战。会上蒙古国创业科技孵化器有限责任公司、内蒙古农业大学、锡林郭勒盟蒙医医院，我研究会及会员企业分别就“酸马奶系列产品的研发”、“蒙古策格疗法历史演变及现代研究”、“乳酸菌降血压肽的理化特性及功能鉴定”、“阿巴嘎旗黑马酸马奶特性研究及开发利用”等方面做专题报告。我会会员代表积极与国外的专家学者交流讨论，对国际上最新的畜产品加工品技术有了进一步了解，同时提升了我区畜产品加工科学研究的国际影响力。会议在承办方的辛勤付出下，取得圆满成功。

首届“一带一路”酸马奶研讨交流会

首届“一带一路”酸马奶研讨交流会合影

三、开展智力下乡，助力精准扶贫

1.参加自治区科协组织的科技助力、精准扶贫工程活动

为认真贯彻执行党中央关于打赢脱贫攻坚战的战略部署，全面落实自治区科协和内蒙古农大的决策安排，充分发挥研究会科技人才智

力优势，2019 年 7 月 22 日至 26 日，内蒙古农大食品学院院长董同力嘎教授、内蒙古畜产品加工研究会会长双全教授协同当地政府带领“科技助力、精准扶贫”服务团，先后来到科尔沁右翼前旗工业园、内蒙古北峰岭面粉加工有限公司、内蒙古千百味食品有限公司、科右前旗金口味食品有限公司、科右前旗蒙驴畜牧业有限公司、科右前旗原野之精农牧业专业合作社、德伯斯镇五家子嘎查村民委员会、李诺生鲜配送中心、科右前旗柏音食品加工有限公司、爱放牧(兴安盟)生物质新材料有限公司、蒙羊牧业（兴安）有限公司、兴安盟兴粮粮食储备有限公司等 10 多家企业和农村合作社进行走访与科技助力交流活动，在校企技术交流、人才培养；牲畜鉴别、养殖品质；秸秆生物制肥；酿酒养曲；粮食储备等方面进行了深入富有成效的沟通交流，对于生产工艺、新产品的开发等问题提供技术指导。帮助企业解决生产中遇到的技术问题和发展面临的困难。有针对性地对困扰地方经济社会发展和急需解决的食品行业科技问题做出指导，在助力精准扶贫中贡献智慧力量。

科尔沁右翼前旗“科技助力、精准扶贫”服务活动

科右前旗原野之精农牧业专业合作社

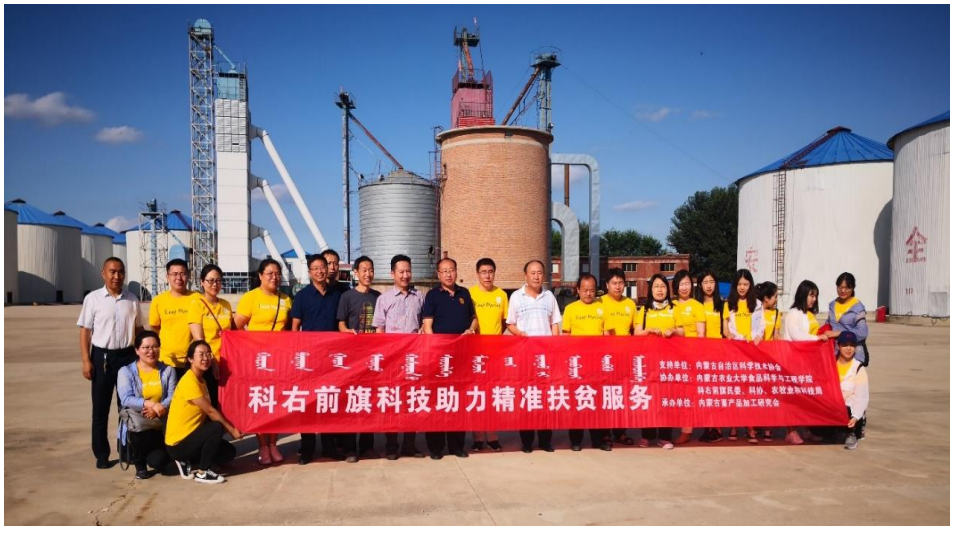
青年红色筑梦之旅百名博士兴安行

蒙羊牧业（兴安）有限公司

董同力嘎院长与公司负责人在生产车间进行交流

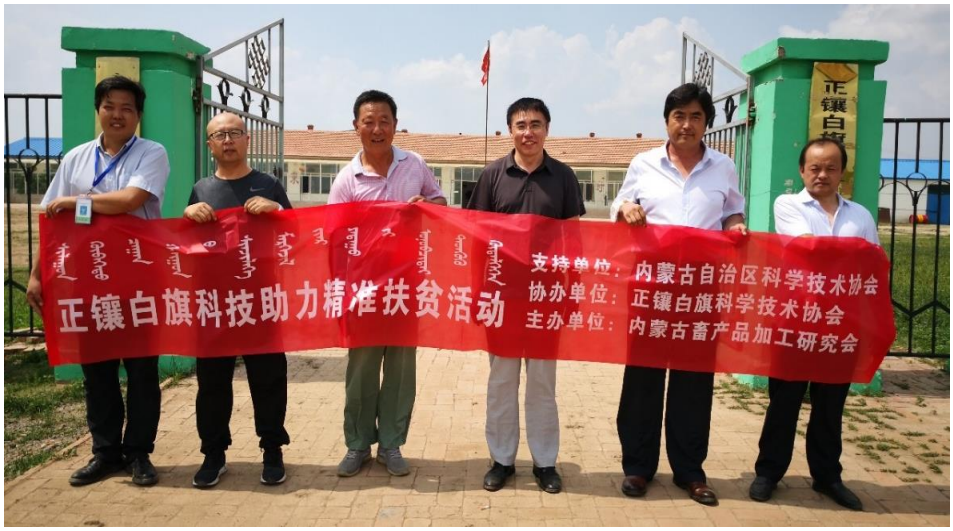
董同力嘎院长向黄宝龙总经理赠送优秀科普图书

兴安盟兴粮粮食储备有限公司



双全教授为农牧民讲解“民族特色乳制品”的加工技术

内蒙古畜产品加工研究会在正镶白旗合作社进行科技服务



科右前旗蒙驴畜牧业有限公司

2.参与自治区科协在全区开展的“百名专家走进盟市旗县科普传播行”活动

2019 年 4 月 13 日至 18 日，研究会理事长双全教授、副理事长靳烨教授、秘书长田建军副教授分别与自治区 30 多名科普专家团的专家们深入呼伦贝尔市、包头市、锡林郭勒盟、赤峰市基层一线，开展自治区科协组织的“百名专家走进盟市旗县科普传播行”活动，为学校、社区、乡镇、嘎查村开展食品质量安全、肉制品科学技术、乳制品科学技术等专题授课、座谈及畜产品加工现场技术指导。

靳烨教授 在兴安盟进行科普知识讲座

靳烨教授在兴安盟针对食品质量安全和肉制品加工为农牧民开展了生动有趣、通俗易懂的食品安全专题讲座以及现场技术指导。靳烨教授从人们关注的“地沟油”、“塑料大米”、“地膜紫菜”等案例入手，从不同的角度对食品安全相关科普知识进行深入浅出的讲解。如食品安全的定义与如何挑选安全的食品；食品的保质期和保存期的区别；

食品添加剂的认知及其危害等，揭秘不良商家制作过程，如何选择安全健康的食品；指导村民科学合理饮食，增强食品安全意识和常识。

田建军副教授在呼伦贝尔市扎赉诺尔区双实肉制品加工厂，对企业规模做实地指导，对肉制品的加工、如何积极申请国家和自治区项目等方面提出了意见和建议。在呼伦贝尔新左旗，田建军副教授结合新左旗特点，以“发酵乳制品及发酵牛肉干”为主题给社区居民、农牧民群众开展丰富多彩的科普讲座和实用技术

培训。在呼伦贝尔新右旗，田建军副教授对畜产品科学技术、食品科学、牧民奶制品、牛肉干等制作、草原牧业等方面进行了现场互动式讲解，受到广大牧民的欢迎和一致好评。在包头市第二十五中、一机二中、东河区公园路小学转龙藏分校、包头市轻工职业技术学校、一机四小五所学校以及昆都仑区鞍山道和东河区和平路两个办事处，为学生和社区居民进行了食品安全科普讲座。

田建军副教授 在呼伦贝尔市新左旗进行科普传播行活动

田建军副教授 在包头市青山区进行科普传播行活动

四、编撰出版科普图书，提升公众文化素养

研究会 2019 年 3 月 22 日成功申报 2019 年内蒙古科学技术协会科普创作出版资助项目，组织研究会专家编著《吃出营养吃出健康》系列科普丛书，已由内蒙古人民出版社出版，每册印刷量 3000 册，印刷量达到了 1.2 万册。

该系列丛书，包括《吃出营养吃出健康：果品的科学吃法》、《吃出营养吃出健康：乳品的科学吃法》、《吃出营养吃出健康：肉类的科学吃法》、《吃出营养吃出健康：粗粮的科学吃法》共 4 册。丛书由内蒙古农业大学贺银凤教授担任主编，内蒙古畜产品加工研究会（内蒙古农业大学、内蒙古商贸职业学院）5 位教师编著。

吃出营养吃出健康系列丛书

该丛书以在全社会大力普及科学知识，进一步提升公众文化素养为目的；以普通农牧民、社区居民等没有太多专业知识背景的人群为阅读对象，以浅显易懂的语言，分别对百姓日常生活中常见的果品、乳品、肉类和粗粮如何科学合理膳食进行通俗易懂的阐述讲解，力求科学膳食，营养平衡。为科技助力、精准扶贫工作持续提供科技服务。

该丛书深受农牧民、社区群众的喜爱，被内蒙古自治区科学技术厅评为“2018 年度内蒙古自治区优秀科普图书”，并向全社会推荐阅读。

内蒙古自治区科学技术厅文件

内科发政字〔2019〕1号

关于公布2018年自治区优秀科普作品名单的通知

各盟市科技局，自治区各委、办、厅、局，高等学校，有关单位：

为深入实施创新驱动发展战略，在全社会大力普及科学知识、弘扬科学精神，提高全民科学素养，自治区科技厅组织开展了2018年优秀科普作品推荐活动。活动得到了各地各部门的重视和积极响应，共收到推荐作品13部78册图书。

自治区科技厅对推荐的作品进行了形式审查，聘请专家组成评议组，进行了独立的评议、推荐工作。经过综合评价，评出《吃出营养吃出健康系类丛书》等5部优秀科普作品（名单附后）。现将这5部作品作为2018年全区优秀科普作品，向全社会推荐阅读，并对获推荐作品颁发荣誉证书。

希望获得全区优秀科普作品荣誉的单位和个人再接再厉，不断创新，为繁荣我区科普创作，提高全民科学文化素质作出更大的贡献。

附件：2018年全区优秀科普作品名单

内蒙古自治区科学技术厅

2019年1月3日

附件

2018年全区优秀科普作品名单

1.《吃出营养吃出健康系类丛书》(4册)，贺银凤、张开屏、田建军、张保军、郭月英编著，内蒙古人民出版社，内蒙古农业大学推荐。

2.《生命之根——遗传密码研究》，孙咏萍编著，北京邮电大学出版社，内蒙古师范大学推荐。

3.《成语典故中的纤维纺织》，中国标准出版社，内蒙古自治区纤维检验局推荐。

4.《内蒙古宜耕沙地科普宣传读本》，闫旭东、吴晓光编著，中国农业大学出版社，内蒙古自治区土地学会推荐。

5.《电纺纳米纤维在环境催化和能量储存中的应用》，郭泽宇、楠顶编著，科学出版社，内蒙古农业大学推荐。

五、加强研究会党建工作，以党的理论统领研究会各项工作

在2018年12月9日召开的“研究会第六届二次学术年会暨绿色畜产品安全生产关键技术交流研讨与党建工作会议”上，审议通过了《内蒙古畜产品加工研究会章程（修订）》，将加强党建工作写入了研究会章程中。明确了研究学习党的中国特色社会主义理论体系，围绕党的重大理论观点、重大战略思想、重大战略部署，解放思想、大胆探索，不断深化对改革开放和社会主义现代化建设中一些全局性、前瞻性和战略性问题的研究学习，深化对共产党执政规律、社会主义建设规律、人类社会发展规律的学习。

内蒙古畜产品加工研究会六届二次会议参加会议的领导和嘉宾

内蒙古自治区社会组织党建办 张德清

组织会员集中学习，统一思想，统一认识，结合各自改革发展实际和本地区、本部门、本企业实际，深入思考、领会党的十九届四中全会精神，从更深和更新角度提高对党的十九大提出的新思想、新战略的理解和认识，从而更好更快提高研究会系统学习研究宣传党的十九大及党的十九届四中全会精神的理论水平和政策水平，发挥好研究会党员教育培训主阵地和理论传播主渠道作用，发挥好在科

研、生产、精准扶贫等方面的主力军作用，推动自治区畜产品加工业的持续健康发展，为建设创新型内蒙古，把祖国北疆这道风景线打造得更加亮丽作出新的贡献。

六、服务会员，做好研究会宣传和信息体系建设

2019 年研究会继续以维护广大会员权益、更好服务会员为根本，积极提升研究会影响力，在研究会宣传、会员管理以及网站建设等方面，取得了显著的成绩。

1.完善会员信息，办理会员入会事宜

为了高效便利地服务会员，及时传达研究会重要信息，研究会秘书处开展了会员信息更新工作，完成了现有会员及会员单位电子邮箱、电话、邮寄地址等基本信息的更新工作，办理了会员入会、信息登记、颁发证书事宜。

2.提升网络平台服务，展示我会风采

研究会秘书处不断完善网站建设与管理工作，及时转发党和国家的大政方针，发布行业热点新闻、科技前沿、企业风采、学会动态等内容。同时开通“内蒙古畜产品加工研究会”微信公众号，形成研究会信息互通、信息发布、信息服务和信息宣传服务平台。欢迎各位会员投递科技新闻稿件。

3. **刊发会讯，加强宣传力度**

研究会秘书处编辑会讯二期，总计约 100 本，方便介绍宣传我会，让更多畜产品加工行业学者、企业家了解认识我会。同时秘书处通过研究会邮箱、电话等方式回答会员提出的各类信息咨询，努力为会员提供优质的信息服务。

4.服务政府、企业，搭建专家与企业交流平台

2019 年，研究会走访调研企业，多方面了解企业对专家的需求，为企业、专家牵线搭桥，共同探讨企业技术难题，承担相应的科技工作。与有关部门、会员企业合作举办研讨会；协助企业签订创新驱动助力扶贫工程合作协议书。充分发挥学会的科技和人才优势，推进科技成果同产业对接，助力企业创新发展。

七、完善组织建设，拓展研究会职能，促进研究会发展

1.召开秘书处工作会议

研究会的日常工作在秘书长田建军副教授的带领下，各位副秘书长明确职责，分工合作，高效有序地发挥秘书处的职能。为了推进研究会各项工作，秘

书处做好了“及时执行、及时总结、及时上报、及时推进”，通过微信平台、座谈会形式，召开了工作会议 3 次，就发展会员、建立社团标准、服务企业、筹备、研讨交流会、年会等议题进行讨论，拿出实施方案。

2.加强与上级部门沟通联系

研究会秘书处按时完成上级领导部门自治区民政厅自治区科协、布置的各项任务，深入基层参加调研学习，加强为政府服务功能。向
自治区科协、自治区民政厅提交了 2018 年年度工作报告、财务审计报告、社会团体调查表及 2019 年工作计划等年检材料，年检结果为合格。按照民政厅社会组织“三证合一”工作要求，办好“三证合一”登记工作。

3.积极参加兄弟行业协会的学术交流活动

2019 年，研究会派人先后参加 2019 中国畜产品加工研究会第十六届年会、2019 年全国农产品加工科技创新推广活动等十余场学术活动，与兄弟学会广泛交流，取长补短，吸取优秀的管理办会经验，认识更多的行业内专家、学者，为推动我会健康有序高速发展积累经验。

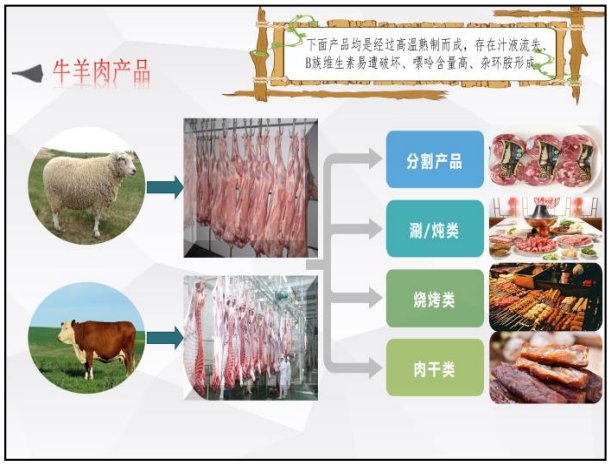
成立于 1988 年的内蒙古畜产品加工研究会已走过三十年的风雨历程，在自治区畜产品加工领域进行了不断地探索，为自治区畜产品加工业的持续健康发展，为建设创新型内蒙古、把祖国北疆这道风景线打造得更加亮丽作出了贡献。

研究会挂靠于内蒙古农业大学食品科学与工程学院，现有会员 137 人，其中教授、博士生导师有 7 人，副教授 17 人，企业董事长、总经理等高管 21 人，博士、硕士学位以上会员占比超过了 70%。内蒙古农业大学博士、博士研究生导师、双全教授为研究会第六届现任理事长。研究会是党和政府联系全区畜产品加工业科技工作者及生产企业的桥梁和纽带，是支撑我区畜产品加工业科技发展的主要社会力量。在习近平新时代中国特色社会主义思想的指引下，充分发 挥食品科技人才智力优势，围绕自治区“乳与乳制品、肉与肉制品和动物副产物” 等畜产品科学研究与产业化开发，以学术研究与交流为主要活动形式，推动产、学、研相结合，努力促进自治区畜产品行业科技创新、成果转化和技术推广。

专题报告

1. 王德宝　发酵肉制品工艺关键点控制

内蒙古农业大学 博士研究生



以发酵肉肠为例加工过程

20-25mm胶原蛋白
低温发酵羊肉肠

腌制条件：T:4℃；
RH:90-95%；
t：12-15h。
发酵条件：T:28-30℃；
RH:90-95%；
t：24-36h。
成熟条件：T:13-15℃；
RH:75-85%；
t：约150h。

part 2

加工过程中存在问题

Existing problems in processing

存在问题

- A. 发酵肉制品表面被霉菌包裹现象
- B. 发酵成熟产品表面散落白霉点
- C. 发酵产品外干内湿问题
- D. 成熟时间选择不当

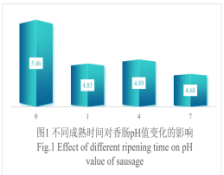
part 3

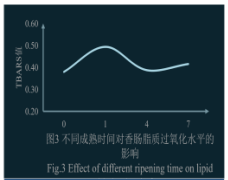
关键技术点控制

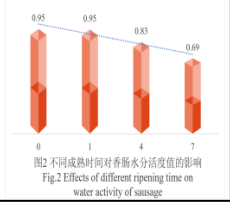
Control of key technical points

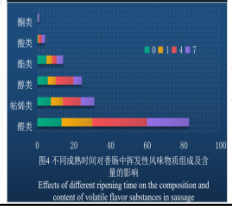
问题	技术突破
A. 发酵肉制品表面被霉菌包裹现象	1. 提高发酵温度，缩短发酵周期 2. 加大接种量，加快产酸
B. 发酵成熟产品表面散落白霉点	3. 发酵结束后，立即低温高风速吹干 4. 发酵结束，减少打开发酵室箱门次数
C. 发酵产品外干内湿问题	5. 发酵结束后，湿度在80-85%至少停留12h 6. 成熟过程，环境湿度与温度呈小幅梯度缓慢下调

D.成熟时间的选择





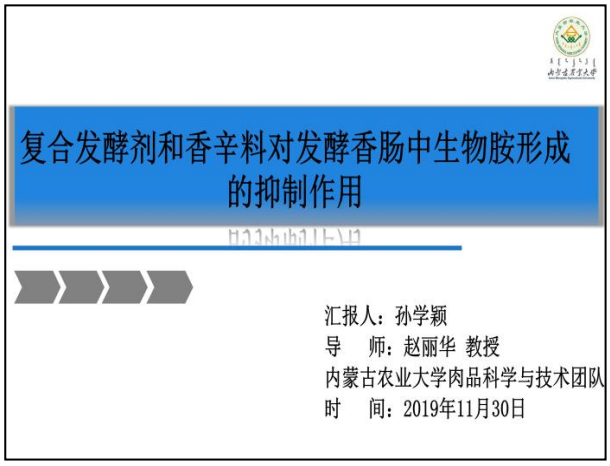


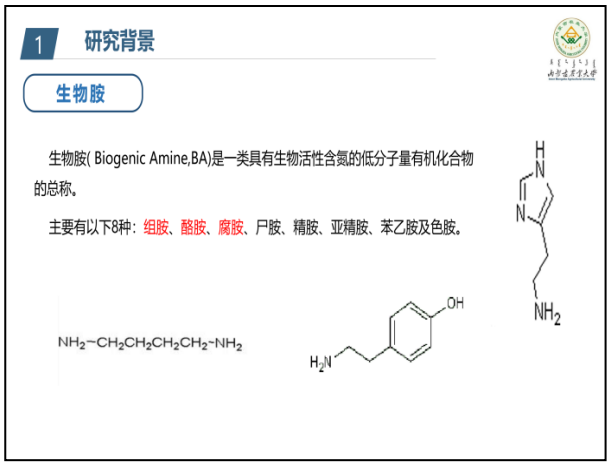


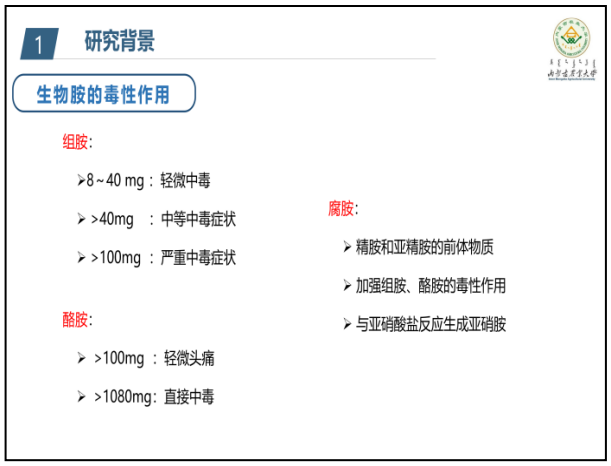
香肠在成熟4天时：
1、pH值为4.89，低于安全酸度5.30；
2、水分活度低于0.85；
3、脂质过氧化降低到0.39 MDA mg/100g与原料肉时差异不显著（$P>0.05$）；
4、具有低阈值、风味好的醛类、萜烯类、醇类含量高于其他阶段。

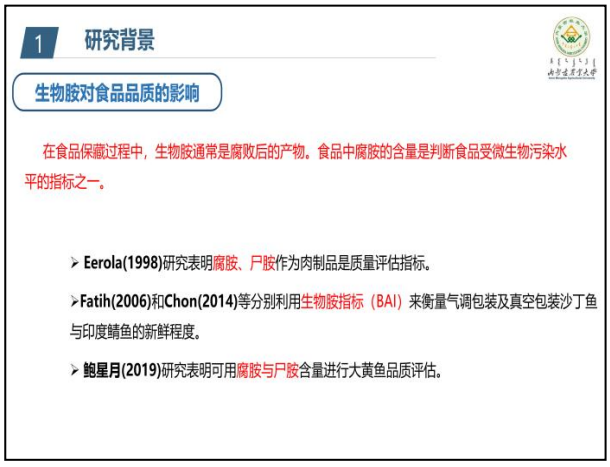
2. 孙学颖　复合发酵剂对发酵香肠中生物胺形成的抑制作用

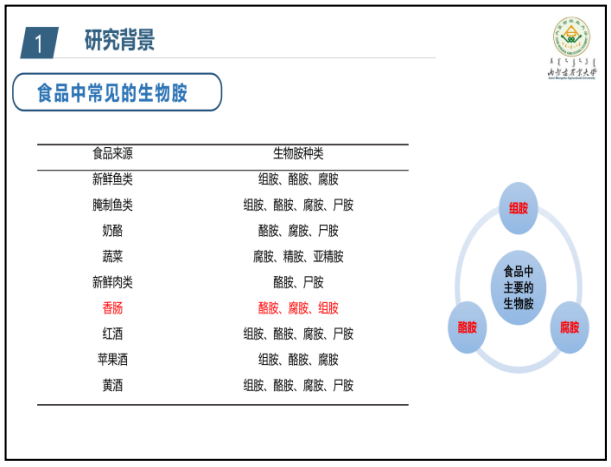
内蒙古农业大学 博士研究生











1 研究背景

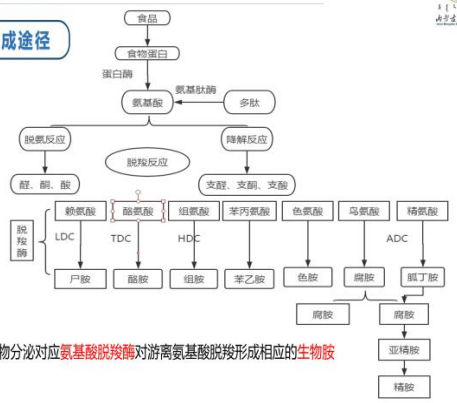
生物胺的限量标准

国家和地区	BA种类	水产品限量/（mg/Kg）	葡萄酒中限量/（mg/Kg）	食品中限量/（mg/Kg）
欧盟	组胺	鲜鱼：200；发酵鱼制品：400	-	100～200
美国	组胺	50	-	50
	酪胺	100	-	-
澳大利亚	组胺	200	-	-
新西兰	组胺	200	-	-
中国	组胺	鲐鱼：400；其他鱼类：200	-	-
德国	组胺	-	2	-
法国	组胺	-	8	-
瑞士	组胺	-	10	-
荷兰	组胺	-	3.5	-

- 美国食品药品监督管理局（FDA）规定食品中生物胺总量不超1000mg/kg。
- 建议肉制品中组胺和酪胺限量值均设为100mg/kg，腐胺安全限量标准为50mg/kg。

1 研究背景

生物胺的形成途径



微生物分泌对应氨基酸脱羧酶对游离氨基酸脱羧形成相应的生物胺

1 研究背景

发酵香肠中的生物胺含量

- Papavergou（2012）检测50个希腊发酵干香肠中生物胺含量，其中酪胺、腐胺、组胺和尸胺的含量范围分别为0～510、0～505、0～515和0～690mg/kg。
- Latorre-Moratalla M L(2013)研究发现在欧式发酵香肠中酪胺、腐胺和尸胺的最高含量可达773.43、648.85、620.96 mg/kg。
- Sun(2016)研究指出，在传统中式香肠中，组胺和酪胺是主要的BA，且含量均超过100mg/kg，此外腐胺、尸胺等其他生物胺均有检出。

1 研究背景

控制生物胺形成的措施

发酵剂：**Essid 等人**通过在发酵香肠中添加优良菌株，结果表明优良的菌株有利于控制发酵和成熟过程中有害微生物的生长和生物胺的形成。

香辛料：**Chasim等**人研究发现，在肉制品中添加香辛料能赋予产品良好色泽，防止脂肪氧化，并减少胺类物质的产生。

1 研究背景

实验目的与意义

目前，食品中生物胺成为世界公认的潜在的食品安全问题。因此，本实验旨在将发酵剂和香辛料应用于发酵香肠，研究发酵香肠在加工过程中理化指标和生物胺含量的变化。为发酵羊肉香肠的生产及安全性提供理论依据，对其它发酵肉制品的研究也具有参考意义。

2 研究内容

实验方法

发酵香肠品质指标的测定：

- pH值：根据GB 5009.238-2016 测定水分活度。
- 水分活度：根据GB 5009.238-2016 测定水分活度。
- 微生物指标：根据GB4789.2-2016的方法测定细菌总数；根据GB4789.35-2016的方法测定乳酸菌数；根据平板菌落计数方法测定葡萄球菌数；根据GB 4789.3-2016的方法测定大肠菌群数。
- 硫代巴比妥酸值（TBARS）：根据马丹[19]文献的方法略作修改。

生物胺含量的测定：参照GB 5009.208-2016进行测定。

2 研究内容

实验菌株

复合发酵剂：戊糖片球菌37x-3、植物乳杆菌37x-6（内蒙古农业大学肉品微生物试验室保存）、木糖葡萄球菌、肉葡萄球菌（分别购买于中国工业微生物菌种保藏中心和广东省微生物菌种保藏中心）。

复合发酵剂菌株比例：戊糖片球菌37x-3：植物乳杆菌37x-6：木糖葡萄球菌：肉葡萄球菌=1：2：1：1

2 研究内容

发酵香肠制作

配方

组别	蔗糖（%）	葡萄糖（%）	食盐（%）	硝酸钠（mg/kg）	亚硝酸钠（mg/kg）	发酵剂（%）	孜然（%）	沙葱（%）
对照	0.5	0.5	2.5	70	70			
发酵剂	0.5	0.5	2.5	70	70	2		
孜然+沙葱	0.5	0.5	2.5	70	70		0.3	0.2
孜然+沙葱+发酵剂	0.5	0.5	2.5	70	70	2	0.3	0.2

工艺流程

加工阶段	温度/℃	时间/h	相对湿度/%
腌制	4	12~15	-
发酵	30	46~48	95
干燥	15	70~72	85
成熟	13	70~72	75

3 结果与分析

复合发酵剂和香辛料对发酵羊肉香肠pH和水分活度的影响

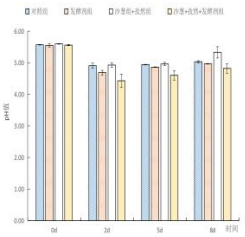


图1 发酵香肠中pH的变化

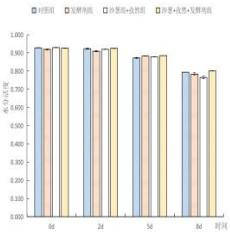
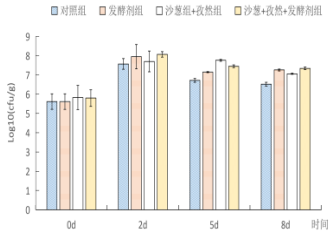


图2 发酵香肠中水分活度的变化

复合发酵剂和香辛料可降低发酵香肠中pH和水分活度含量。

3 结果与分析

复合发酵剂和香辛料对发酵羊肉香肠葡萄球菌的影响

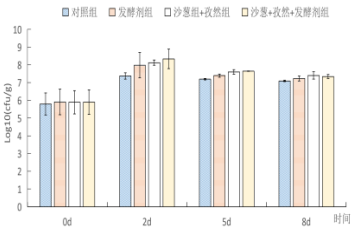


葡萄球菌数整体呈先上升后下降的趋势。

图3 发酵香肠中葡萄球菌的变化

3 结果与分析

复合发酵剂和香辛料对发酵羊肉香肠乳酸菌的影响



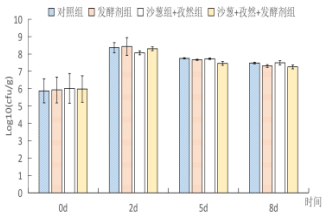
成熟后（8 d）试验组的乳酸菌数显著高于对照组（$P<0.05$）；

乳酸菌含量依次为沙葱+孜然+发酵剂>沙葱组+孜然组>发酵剂组。

图4 发酵香肠中乳酸菌的变化

3 结果与分析

复合发酵剂和香辛料对发酵羊肉香肠细菌总数的影响



成熟后（8 d），沙葱+孜然+发酵剂菌落总数显著低于其他三组（$P<0.05$）。

图5 发酵香肠中细菌总数的变化

3 结果与分析

复合发酵剂和香辛料对发酵羊肉香肠微生物的影响

四组发酵香肠在加工各个阶段的大肠菌群的检测结果均为阴性，说明本实验过程中发酵香肠的加工环境干净无污染，保证了发酵香肠的安全性。

3 结果与分析

复合发酵剂和香辛料对发酵羊肉香肠TBARS的影响

表1 发酵羊肉香肠TBARS值的变化(mg/100g)

时间	对照组	发酵剂组	沙葱组+孜然组	沙葱+孜然+发酵剂组
0d	0.381 ± 0.010^{bA}	0.393 ± 0.005^{bA}	0.294 ± 0.026^{aA}	0.292 ± 0.024^{aA}
2d	0.450 ± 0.012^{cB}	0.415 ± 0.019^{bA}	0.338 ± 0.016^{aB}	0.334 ± 0.005^{aB}
5d	0.496 ± 0.029^{cBC}	0.418 ± 0.013^{bA}	0.385 ± 0.011^{abC}	0.358 ± 0.014^{aB}
8d	0.520 ± 0.046^{cC}	0.479 ± 0.044^{bB}	0.448 ± 0.010^{abD}	0.398 ± 0.012^{aC}

注：同行不同小写字母表示差异显著（$p<0.05$），同列不同大写字母表示差异显著（$p<0.05$）

沙葱+孜然+发酵剂组TBARS值为0.398 mg/100g显著低于发酵剂组和沙葱+孜然组，即发酵剂和香辛料共同作用下对发酵香肠的氧化的抑制作用更好。

3 结果与分析

复合发酵剂和香辛料对发酵羊肉香肠生物胺含量的影响

表2(a) 发酵香肠生物胺的变化

生物胺(mg/kg)	分组	时间（d）			
		0	2	5	8
色胺	对照组	0.801 ± 0.003^{aA}	1.479 ± 0.082^{cC}	1.141 ± 0.001^{b}	1.936 ± 0.110^{dD}
	发酵剂组	0.987 ± 0.002^{aC}	0.745 ± 0.007^{aA}	0.822 ± 0.005^{aB}	-
	沙葱组+孜然组	0.812 ± 0.002^{bB}	0.714 ± 0.036^{aA}	1.677 ± 0.002^{cD}	1.556 ± 0.001^{b}
	沙葱+孜然+发酵剂	0.802 ± 0.002^{aA}	1.316 ± 0.036^{bD}	1.141 ± 0.001^{bC}	0.943 ± 0.004^{aB}
苯乙胺	对照组	1.020 ± 0.002^{bA}	0.461 ± 0.007^{aB}	1.556 ± 0.001^{dC}	1.671 ± 0.020^{cD}
	发酵剂组	0.330 ± 0.001^{aD}	0.244 ± 0.006^{aC}	0.944 ± 0.068^{bC}	0.750 ± 0.006^{aB}
	沙葱组+孜然组	0.324 ± 0.001^{aA}	0.944 ± 0.068^{cC}	0.431 ± 0.001^{cB}	0.426 ± 0.002^{aB}
	沙葱+孜然+发酵剂	0.331 ± 0.017^{aA}	0.750 ± 0.006^{cB}	0.285 ± 0.098^{bA}	0.231 ± 0.001^{dA}
腐胺	对照组	1.404 ± 0.010^{aB}	6.777 ± 0.012^{cD}	4.789 ± 0.008^{bC}	1.515 ± 0.011^{aA}
	发酵剂组	2.414 ± 0.011^{aB}	2.978 ± 0.021^{aC}	8.274 ± 0.002^{bD}	1.134 ± 0.001^{aA}
	沙葱组+孜然组	4.334 ± 0.001^{bB}	3.263 ± 0.382^{aA}	15.088 ± 0.002^{cC}	24.099 ± 0.038^{dD}
	沙葱+孜然+发酵剂	2.66 ± 1.200^{aA}	$24.62470.008^{dC}$	52.859 ± 0.093^{dD}	11.150 ± 0.011^{cB}
尸胺	对照组	3.096 ± 0.702^{aA}	31.478 ± 0.126^{bB}	35.404 ± 0.291^{cC}	34.750 ± 0.040^{cC}
	发酵剂组	25.538 ± 0.008^{bD}	9.793 ± 0.008^{aB}	12.967 ± 0.015^{bC}	0.855 ± 0.001^{aA}
	沙葱组+孜然组	2.669 ± 0.004^{aA}	82.488 ± 4.006^{dD}	65.265 ± 0.001^{dC}	25.732 ± 0.005^{cB}
	沙葱+孜然+发酵剂	2.480 ± 0.020^{aA}	57.536 ± 0.423^{cD}	10.492 ± 0.048^{bC}	8.999 ± 0.076^{bD}

注：同行不同大写字母表示差异显著（$p<0.05$），同列不同小写字母表示差异显著（$p<0.05$）

3 结果与分析

复合发酵剂和香辛料对发酵羊肉香肠苯乙胺含量的影响

表2(b) 发酵香肠生物胺的变化

生物胺(mg/kg)	分组	时间（d）			
		0	2	5	8
组胺	对照组	10.373 ± 0.012^{bC}	9.166 ± 0.025^{bB}	4.037 ± 0.009^{aA}	3.917 ± 0.160^{aA}
	发酵剂组	5.238 ± 0.001^{cB}	9.768 ± 0.019^{bC}	3.376 ± 0.009^{aA}	-
	沙葱组+孜然组	2.023 ± 0.001^{aA}	10.753 ± 1.375^{bC}	7.065 ± 0.019^{aB}	3.844 ± 0.006^{aA}
	沙葱+孜然+发酵剂	2.290 ± 0.077^{bC}	4.492 ± 0.023^{aB}	4.272 ± 0.580^{aA}	3.289 ± 0.003^{aA}
酪胺	对照组	17.408 ± 0.087^{cB}	68.662 ± 0.042^{dD}	50.515 ± 0.156^{dC}	11.642 ± 0.371^{cA}
	发酵剂组	8.151 ± 0.019^{aA}	26.701 ± 0.006^{bD}	18.426 ± 0.117^{bC}	9.746 ± 0.002^{aB}
	沙葱组+孜然组	34.504 ± 0.010^{dB}	51.367 ± 1.362^{cC}	11.118 ± 0.045^{bA}	11.219 ± 0.954^{bcA}
	沙葱+孜然+发酵剂	8.833 ± 0.034^{bA}	16.310 ± 0.085^{bD}	14.695 ± 0.224^{bC}	9.922 ± 0.165^{aB}
亚精胺	对照组	0.914 ± 0.001^{aA}	1.737 ± 0.031^{abB}	10.491 ± 0.026^{cD}	8.491 ± 0.026^{bC}
	发酵剂组	0.910 ± 0.007^{aA}	2.129 ± 0.775^{bA}	13.209 ± 0.006^{dB}	-
	沙葱组+孜然组	1.187 ± 0.001^{cA}	1.527 ± 0.076^{abB}	4.929 ± 0.007^{cD}	1.686 ± 0.007^{aC}
	沙葱+孜然+发酵剂	1.045 ± 0.073^{bB}	1.692 ± 0.012^{aA}	8.530 ± 0.008^{bC}	-

4 结论

- 添加复合发酵剂和香辛料可以抑制发酵香肠加工过程中6种生物胺（酪胺、组胺、腐胺、尸胺、苯乙胺和色胺）的积累，抑制TBARS值、细菌总数的增加，增加葡萄球菌数和乳酸菌数。
- 添加发酵剂和香辛料改善香肠品质。将复合发酵剂和香辛料应用到发酵香肠的生产中，既可抑制发酵香肠中生物胺的积累又可改善发酵香肠品质。

肉品科学与技术团队

3. 张亚琨　超微粉碎对燕麦麸皮营养特性及抗氧化性的影响

内蒙古农业大学 博士研究生

微粉碎对燕麦麸皮营养特性及抗氧化性的影响

Effect of micro powder on nutrition and antioxidation of oat bran

汇报人：张亚琨

导　师：张美莉教授

学　校：内蒙古农业大学

学　院：食品科学与工程学院

时　间：2019.11.30

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04 结论

研究背景

微粉碎

粉碎分为**粗粉碎、中粉碎、微粉碎（细粉碎）**、和**超微粉碎**四种。

粉碎程度的代表尺寸称为粒径（粒度）。

粗粉碎：原料粒度在40-1500mm范围内，成品颗粒粒度约为5-50mm。

中粉碎：原料粒度在10-100mm范围内，成品颗粒粒度约为5-10mm。

微粉碎：原料粒度在5-10mm范围内，成品颗粒粒度约100μm以下。

超微粉碎：原料粒度在0.5-5mm范围内，成品颗粒粒度约为10-25μm。

当食品颗粒达到微米或纳米级时，其表面积的增加会增强水分吸收、风味释放和生物利用度，从而增强食品的生理功能，促进营养物质在身体内的吸收。

注意：对于食品来说，粉碎物的粒度并不是越细越好

研究背景

燕麦麸皮

我国华北地区（内蒙古、河北、甘肃、山西），是种植裸燕麦的主要地区并且燕麦多被作为主食。

燕麦麸皮是燕麦加工的副产物,其中含有丰富的**多酚，膳食纤维，β-葡聚糖**等功能性成分，这些功能性成分被证明在**减肥、抗炎、抗氧化**等方面有重要的作用。

燕麦麸皮的食用品质较低，其中一小部分功能性成分被提取出来，应用于食品中，大部分作为饲料被利用，容易造成资源浪费，环境污染。

研究背景

微粉碎研究进展

李光辉（2019）等人认为微粉碎能显著改善斑马豆粉对O2-·、DPPH·、ABTS+自由基的清除率和还原能力，但是过长的粉碎会导致活性成分损失，抗氧化能力减弱。

唐明明（2019）等人超微粉碎处理极大地提高了黄酮、总酚、可溶性蛋白及多糖的溶出速率，且提高了水芹粉末对 DPPH、羟基、ABTS 自由基清除能力、总还原力及氧自由基吸收能力。

Liu（2016）等人微粉碎处理燕麦多糖，其溶解性、总还原力、DPPH自由基清除和ABTS自由基清除活性显著提高，使燕麦多糖具有更高的抗氧化活性。

陈梦诗（2018）等人微粉碎处理不仅提高了绿茶的水溶性、吸湿性等物理性质，而且可以显著提高DPPH、ABTS自由基清除能力以及在亚油酸体系中的抗氧化能力。

研究背景

目的与意义

本试验以燕麦麸皮为研究对象，粗粉经微粉碎处理过筛，得到三种不同粒径的燕麦麸皮，测定不同粒径燕麦麸皮的主要**营养成分，膳食纤维、多糖**和**总酚**含量以及**抗氧化特性**，以期为燕麦麸皮的深加工提供理论基础。

（1）原材料

燕麦麸皮（产自坝上燕麦）

（2）样品制备

将燕麦麸皮粗粉（80目）用万能粉碎机粉碎，过筛得到150μm（100目）、100μm（155目）、74μm（200目）燕麦麸皮。将燕麦麸皮粗粉和细粉密封，并在-20℃冰箱中贮存备用。

（3）主要营养成分的测定

淀粉含量测定：参考 GB 5009.9-2016的酸水解法进行测定

粗脂肪含量测定：参考 GB 5009.6-2016的索氏抽提法进行测定

蛋白质含量测定：参考 GB 5009.5-2016的凯氏定氮法进行测定

膳食纤维含量测定：参考 GB 5009.88-2014进行测定

水分含量测定：参考 GB 5009.3-2016的直接干燥法进行测定

（4）微粉碎对燕麦麸皮中主要功能性成分的含量影响

可溶性多糖含量的测定：参照刘晓涵等人的苯酚硫酸法，在490 nm的波长处测定吸光度，以葡萄糖含量为横坐标，吸光度值为纵坐标，绘制标准曲线，其线性回归方程为

$y = 8.0674x + 0.1947$　$R^2 = 0.9992$　线性区间为0.02~0.12 mg/ml。

总酚含量的测定：参照Dini等人和卢宇的方法——没食子酸比色法，多酚样液的制备：称取1g样品于锥形瓶中，按料液比1:26加入49%乙醇，73℃下水浴提取62min，待测溶液冷却以后用6000r/min的速度离心20min，经过过滤得到上清液备用。取1ml多酚样液加入1ml福林酚试剂，经过充分震荡后静置5min，再加2ml$NaCO_3$（10%）溶液，用蒸馏水定容，室温放置1h后测OD765nm。

以没食子含量为横坐标，吸光度值为纵坐标，绘制标准曲线，其线性回归方程为

$y = 0.0609x + 0.1387$　$R^2 = 0.9951$

β-葡聚糖含量的测定：采用爱尔兰Megazyme试剂盒进行测定。

（5）微粉碎对燕麦麸皮抗氧化特性的影响

燕麦麸皮水提取物的制备

参考Ozkaya的方法并一定程度上改进。称取3g样品于离心管中，加入30ml蒸馏水，混合制成燕麦麸浆，将离心管置于磁力搅拌器上，连续搅拌40min，样品在5000r/min下离心5min，收集上清液用于抗氧化特性的测定。

总抗氧化能力的测定：利用南京建成试剂盒进行测定。

DPPH 自由基清除率的测定：参考Tohma等人的方法进行测定。

羟基自由基清除率的测定：参考唐明明等人的方法，并进行一定的改进

ABTS自由基清除率的测定：参考Zhu等人的方法进行测定。

TBA值的测定：参考周显青等人的方法进行测定。

亚油酸体系抗氧化：参考Chen等人的方法并进行改进。

03

结果与分析

3.1微粉碎对燕麦麸皮营养成分

微粉碎对燕麦麸皮基本营养成分的影响

Effect of micronization on nutrient composition of oat bran

粉碎粒度	水分g/100g	脂肪g/100g	蛋白质g/100g	淀粉g/100g	总膳食纤维g/100g
178μm	5.02±0.06^a	6.22±0.04^a	19.45±0.05^a	41.38±0.13^a	24.95±0.05^a
150μm	5.76±0.03^b	7.01±0.09^b	19.62±0.04^a	41.41±0.05^a	26.23±0.21^b
100μm	6.34±0.06^c	7.99±0.15^c	17.22±0.63^b	41.54±0.13^a	22.52±0.03^c
74μm	4.80±0.02^d	9.24±0.05^d	17.40±0.09^b	41.42±0.12^a	18.75±0.46^d

注：表中数据为平均值±标准偏差，同列不同字母表示差异极显著（$P<0.01$）

微粉碎对燕麦麸皮基本营养成分的影响如表所示，经微粉碎后，随着粒径的减小，燕麦麸皮中的粗脂肪含量呈现极显著增加（$P<0.01$）趋势，这可能是由于随着燕麦麸皮粒度的减小，更多皮层中的脂肪成分被暴露出来；在149 μm粒径时蛋白质含量达到最大；随着粒径的减小，淀粉含量差异不显著（$P>0.05$）；微粉碎燕麦麸皮中总膳食纤维含量极显著下降（$P<0.01$），这与王玮、唐明明等人的研究结果相一致，其原因可能是麸皮受物理剪切力的作用，其中的大分子物质发生熔融现象或部分结合键断裂，不可溶性物质转化成水溶性物质。

3.2 微粉碎对燕麦麸皮功能性成分的影响

微粉碎对燕麦麸皮功能性成分的影响

Effect of micronization on functional components of oat bran

粉碎粒径	多糖g/100g	总酚mg/100g	β-葡聚糖%
178μm	10.25±0.03^a	9.01±0.54^a	7.63±0.00^a
150μm	10.40±0.31^a	9.46±0.02^a	5.18±0.00^b
100μm	15.75±0.44^b	10.8±0.15^b	3.56±0.01^c
74μm	11.86±0.37^c	10.47±0.06^b	1.68±0.00^d

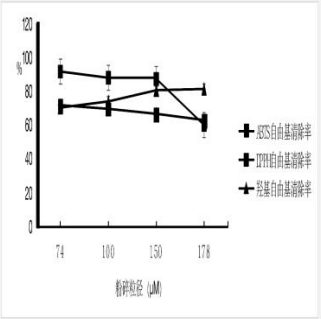
注：表中数据为平均值±标准偏差，同列不同字母表示差异极显著（$P<0.01$）同行不进行比较

微粉碎对燕麦麸皮功能性成分的影响如表所示，经微粉碎后，随着粒径的减小，多糖、多酚含量呈增大趋势，因此微粉碎可以提高燕麦麸皮中多糖和总酚的含量。

随着粒径的减小，β-葡聚糖含量变化显著降低（$P<0.01$），粒径为178 μm的燕麦麸皮中β-葡聚糖含量最高，为7.63g/100g，比150μm、100μm、74μm燕麦麸皮中β-葡聚糖含量分别高出2.44%、3.07%、5.94%，这与Liu等人的结果相一致。可能是因为燕麦麸皮在粉碎过程中没有完全粉碎，在过筛之后有一部分β-葡聚糖成为筛上物，另外粉碎过程中摩擦产热，可能使β-葡聚糖受热分解。

3.3 微粉碎对燕麦麸皮抗氧化特性的影响

3.3.1微粉碎对燕麦麸皮自由基清除率的影响

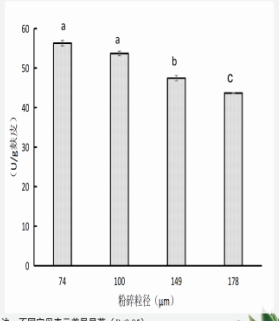


（1）不同粉碎粒径的燕麦麸皮对自由基清除率影响的结果见图1所示。不同粒径的燕麦麸皮提取液对DPPH和ABTS自由基具有一定的清除作用，随着燕麦麸皮粒径的增大，清除率呈现逐渐减小趋势，并在粒径为74μm时其DPPH自由基清除率和ABTS自由基清除率达到最大，分别为92.1 %和71.88 %，比燕麦麸皮粗粉的DPPH自由基清除率和ABTS自由基清除率增加31.62 %、8.8 %。这与杨沫等人的研究结果相一致。

3.3 微粉碎对燕麦麸皮抗氧化特性的影响

3.3.2 微粉碎对燕麦麸皮总抗氧化能力的影响

微粉碎对燕麦麸皮总抗氧化能力的影响由图2可知，燕麦麸皮具有抗氧化能力，并且随着燕麦麸皮粒径的增大，总抗氧化能力显著减小（$P<0.05$）。与燕麦麸皮粗粉（178 μm）相比，149 μm、100 μm、74 μm燕麦麸皮微粉的总抗氧化能力分别提高了3.76%、10.01%、12.61%，因此74 μm燕麦麸皮微粉的总抗氧化能力最好。这可能是因为粉碎使有效的抗氧化物质更好地溶出。



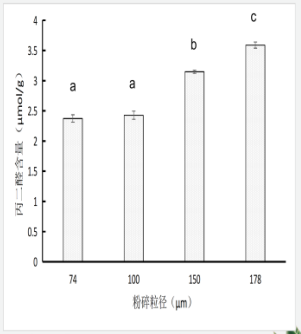
注：不同字母表示差异显著（$P<0.05$）
相同字母表示差异不显著（$P>0.05$）

3.3 微粉碎对燕麦麸皮抗氧化特性的影响

3.3.3 微粉碎对燕麦麸皮TBA值的影响

微粉碎对燕麦麸皮中丙二醛含量的影响由图3可知，随着燕麦麸皮粒径的增大，丙二醛含量呈极显著增大趋势（$P<0.01$），100μm与74μm燕麦麸皮中丙二醛含量差异不显著（$P>0.05$）。74μm丙二醛含量最低，分别比178μm、150μm、100μm中丙二醛含量下降33.88%、24.60%、2.24%。

这与总抗氧化性、DPPH、ABTS自由基清除率的变化趋势正好相反，说明微粉碎可以提高燕麦麸皮的抗氧化能力，减缓脂质过氧化。

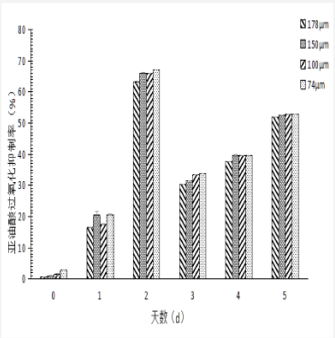


注：不同字母表示差异极显著（$P<0.01$）；相同字母表示差异不显著（$P>0.05$）

3.3 微粉碎对燕麦麸皮抗氧化特性的影响

3.3.4微粉碎对燕麦麸皮亚油酸体系抗氧化性的影响

微粉碎对燕麦麸皮亚油酸体系抗氧化性的影响如图4所示，四种粒径燕麦麸皮均对亚油酸过氧化具有抑制作用。随着天数的增加，除第二天以外，四种粒径燕麦麸皮的亚油酸过氧化抑制率均呈上升趋势。在第二天时，四种粒径的亚油酸过氧化抑制率均达到最大，分别为63.15 %、66.03 %、66.03 %、67.20 %。每天，74μm燕麦麸皮对亚油酸过氧化抑制率均是最大的。



结论

（1）微粉碎处理可以提高燕麦麸皮中的脂肪含量，降低蛋白质和总膳食纤维含量

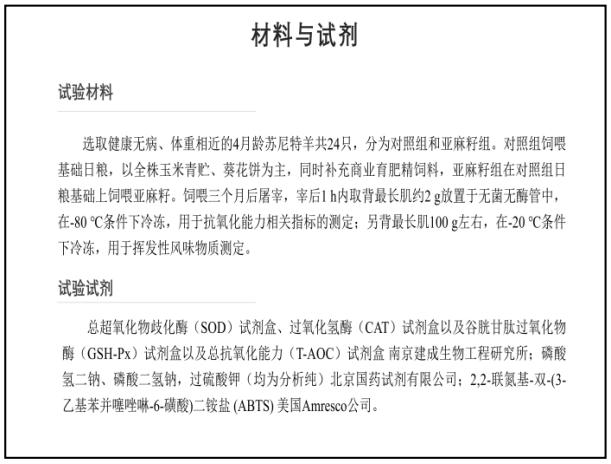
（2）微粉碎处理可以提高多糖、总酚的含量，降低β-葡聚糖的含量。

（3）微粉碎处理可以提高燕麦麸皮的抗氧化能力，以期为燕麦麸皮的资源利用提供理论基础。

内蒙古农业大学粮食、油脂及植物蛋白工程创新团队

4. 刘畅　日粮添加亚麻籽对苏尼特羊肉风味品质的影响

内蒙古农业大学 博士研究生



仪器与设备

PEN3电子鼻 德国Airsense公司；

XHF-DY型高速分散器 宁波新芝生物科技股份有限公司；

5810-R型低温台式冷冻离心机 德国 Eppendorf公司；

TU-1810型紫外/可见光分光光度计 北京普析通用仪器有限公司；

HWS-24电热恒温水浴锅 上海一恒科学仪器有限公司；

Trace 1300、ISQ型GC-MS联用仪 美国赛默飞世尔科技公司；

SPME萃取头 美国Supelco公司。

试验方法

➢ 挥发性风味物质的测定

将样品解冻，切成肉粒（去除筋膜）后称取5 g，放置20 mL采样瓶中，将萃取针插入采样瓶中，60 ℃吸附40 min后取出插入GC进样口，250 ℃解析3 min。GC-MS条件参照罗玉龙等的方法。

➢ 关键风味物质的确定

参照刘登勇等的方法，根据ROAV法确定苏尼特羊肉中的关键挥发性风味物质，并计算其风味贡献度

➢ 电子鼻检测

取5 g肉样放置于50 mL进样瓶中，于60 ℃水浴锅加热40 min，室温平衡1 h。测定条件：清洗时间：80 s，检测时间：120 s，内部流速：400 mL/min，进样流速：400 mL/min。

试验方法

➢ **超氧化物歧化酶（SOD）、过氧化氢酶（CAT）、谷胱甘肽过氧化物酶（GSH-Px）以及总抗氧化能力（T-AOC）的测定**

取0.5 g样品置于离心管中，加入9倍体积的生理盐水，冰浴条件下匀浆30 s（3 500 r/min），然后在4 ℃条件下离心10 min（4 000 r/min），取上清，参照南京建成生物工程研究所试剂盒的说明书测定SOD、CAT、GSH-Px以及T-AOC。

➢ **RSA的测定**

ABTS反应液的制备方法如下：25 mL的 ABTS（14 mmol/L）与过硫酸钾（2.45 mmol/L）等体积混合，在黑暗条件下反应16 h。试验前用磷酸盐缓冲液（pH值为7.4）稀释ABTS反应液，使吸光度值在0.750±0.020（734 nm波长）范围内。在40 μL组织匀浆液中加入4.0 mL的ABTS反应液，然后水浴6 min（30 ℃），用40 μL的双蒸水加入4.0 mL的ABTS稀释的反应液作为空白。然后在734 nm波长处测定吸光度，抑制率计算公式如下：抑制率%=[(A0−A1)/A0]×100，式中 A0为空白吸光度，A1为组织匀浆液吸光度。

GC-MS

01 苏尼特羊肉中挥发性风味物质包括醇类、醛类、酮类、烃类及其他化合物，其中醛类化合物种类最多，其次为醇类。

02 本试验共检测出47种挥发性化合物，其中对照组检测出33种，而亚麻籽组风味物质种类较舍饲组丰富，共检测出38种。

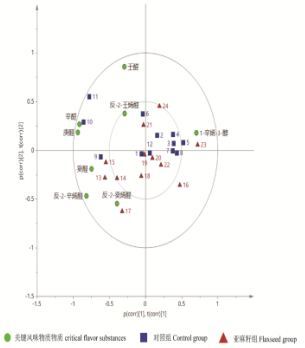
关键风味物质

编号	英文名称	中文名称	分子式	阈值	气味	对照组	亚麻籽组
1	1-Octen-3-ol	1-辛烯-3-醇	$C_8H_{16}O$	1	熟蘑菇	100	42
2	1-Octanol	1-辛醇	$C_8H_{18}O$	126	脂肪、蜡质、坚果	0.4725	0.3114
3	Pentanal	戊醛	$C_5H_{10}O$	12	花香	0.7048	1.7621
4	Hexanal	己醛	$C_6H_{12}O$	10	鲜草	11.4262	0.8516
5	Heptanal	庚醛	$C_7H_{14}O$	3	脂肪、柑橘、花香	13.7922	7.7581
6	2-Octenal, (E)-	反-2-辛烯醛	$C_8H_{14}O$	3	肉、坚果	2.1559	2.2742
7	Octanal	辛醛	$C_8H_{16}O$	0.7	脂肪、柑橘、肥皂	55.0817	28.2028
8	2-Nonenal, (E)-	反-2-壬烯醛	$C_9H_{16}O$	0.19	脂肪、绿色	19.2022	13.2428
9	Nonanal	壬醛	$C_9H_{18}O$	1	脂肪、花香、柑橘	92.2056	37.4032
10	2,4-Decadienal, (E,E)-	(E,E)-2,4-癸二烯醛	$C_{10}H_{16}O$	0.03	肉、烧烤	-	100
11	2-Decenal, (E)-	反-2-癸烯醛	$C_{10}H_{18}O$	0.3	木头	26.5340	17.4194
12	Decanal	癸醛	$C_{10}H_{20}O$	0.1	肥皂、柑橘、脂肪	73.7977	65.3226
13	Undecanal	十一醛	$C_{11}H_{22}O$	5	脂肪、蜡、肥皂	1.2604	-
14	Dodecanal	十二醛	$C_{12}H_{24}O$	0.53	洋葱	-	7.9428
15	Phenol	苯酚	C_6H_6O	3.9	甜香	-	0.8933

◆ 醇类物质中仅1-辛烯-3-醇可对羊肉风味形成起到关键作用，是对照组中贡献最大的风味物质，可赋予羊肉浓厚的熟蘑菇味。

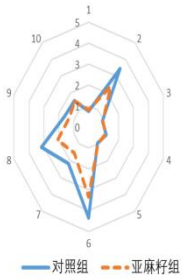
◆ 醛类物质阈值较低，对羊肉风味形成具有重要作用。庚醛、反-2-辛烯醛、辛醛、反-2-壬烯醛、壬醛、反-2-癸烯醛及癸醛在两组羊肉中的ROAV值均大于1，是苏尼特羊肉的关键风味物质。

主成分分析



- 亚麻籽对苏尼特羊肉关键风味的组成及含量影响较大，可通过主成分分析将二者进行区分。
- 对照组与辛醛、庚醛、1-辛烯-3-醇、反-2-壬烯醛和壬醛具有较强的正相关。
- 亚麻籽组与癸醛、反-2-辛烯醛和反-2-癸烯醛具有较强的正相关

电子鼻分析结果

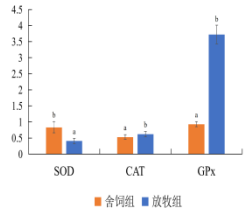


- 利用电子鼻技术可以有效的将两组羊肉进行区分，日粮添加亚麻籽降低了羊肉的风味强度。

抗氧化能力

表2 对照组与亚麻籽组苏尼特羊肉抗氧化能力的差异分析

	对照组	亚麻籽组	P-value
SOD (U/mgprot)	41.86±2.35^a	37.53±3.79^b	**
CAT (U/μgprot)	4.39±1.41^a	4.41±1.60^a	
GSH-PX (U/mgprot)	36.99±10.23^a	38.83±10.10^a	
RSA（%）	44.75±4.34^a	58.09±5.21^b	***
T-AOC (U/mgprot)	0.35±0.12^a	0.53±0.11^b	**



- 亚麻籽显著降低了羊肉中SOD的活力（$P<0.01$），亚麻籽组的CAT和GSH-PX的活力高于对照。
- 亚麻籽组的RSA显著高于对照组（$P<0.001$）。
- 亚麻籽显著提高了苏尼特羊肉的总抗氧化能力（$P<0.05$）。
- 亚麻籽组的SOD基因表达显著低于对照组（$P<0.05$），而CAT和GPX的基因表达显著高于对照组（$P<0.05$）。从分子角度上解释了日粮添加亚麻籽对抗氧化酶系统的影响。

抗氧化能力与关键风味物质的相关性分析

表3 苏尼特羊肉中抗氧化指标与关键风味物质的相关性分析

项目	1-辛烯-3-醇	庚醛	反-2-辛烯醛	辛醛	反-2-壬烯醛	壬醛	反-2-癸烯醛	癸醛
SOD	0.042	0.07	-0.034	-0.043	-0.199	0.237	-0.333	0.135
CAT	0.102	0.094	0.166	0.057	-0.369	-0.304	0.632**	-0.101
GSH-Px	-0.357	0.239	0.372	0.136	-0.462	-0.504*	-0.11	0.436
RSA	-0.579*	0.516*	0.740**	0.431	0.146	-0.654**	0.19	0.552*
T-AOC	-0.3	0.369	0.357	0.315	0.386	-0.069	-0.138	0.316

- ✓ 整体上，肌肉中的抗氧化系统与挥发性风味物质的产生存在相关性。脂质氧化产物增多时，会激活抗氧化系统阻止过氧化反应的发生，及时清除过氧化产物，避免氧化产物的过度累积，减少肉中不良风味的产生。

试验结论

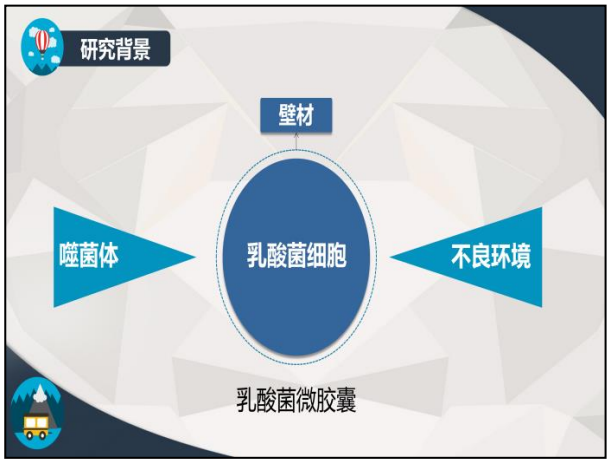
亚麻籽丰富了羊肉中挥发性风味物质的种类，且显著提高了戊醛、反-2-辛烯醛和癸醛的相对含量（P<0.05）。但电子鼻检测的结果显示亚麻籽降低了羊肉的风味强度。

亚麻籽显著降低了羊肉中SOD的活性，但提高了RSA和T-AOC（P<0.05），整体上亚麻籽可提高羊肉抗氧化能力。

抗氧化系统与关键风味物质存在相关关系，抗氧化系统能够抑制过氧化产物的累积，从而减轻肉中不良风味的产生。

5. 贺佳鑫　高吸附重金属铅乳酸菌的研究

内蒙古农业大学 硕士研究生



02 研究内容

研究内容

1 本实验室采集包头尾矿库区、白云鄂博采矿区重金属污染严重区域的土壤样品，对土壤样品中的乳酸菌进行分离、筛选。

2 对上述筛选出乳酸菌菌株进行铅离子耐受实验，筛选出部分高抗铅菌株。

研究内容

3 对高抗铅菌株进行铅离子吸附实验，得到具有高抗铅高吸附铅能力的菌株，研究了不同因素对乳酸菌铅吸附能力的影响，将筛选得到菌株进行16S r RNA 基因片段序列分析。

4 选取具有高耐受高吸附铅能力的戊糖片球菌10-a-1进行微胶囊化

03 结果与讨论

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3.1 耐铅乳酸菌的分离、筛选

在含有100mg/L铅离子浓度的培养基中对所采集的样品进行分离，共分离得到**62**株乳酸菌。

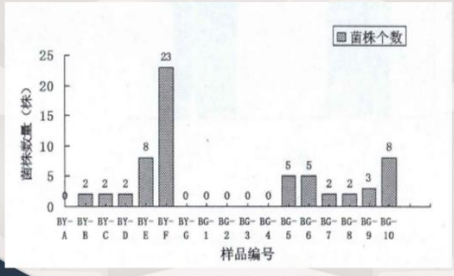

图 1 不同样品分离菌株个数

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3.2 菌株最大耐受铅离子浓度

表 1 乳酸菌对铅的耐受能力

菌株编号	最大耐受Pb²⁺浓度(mg/L)	菌株编	最大耐受Pb²⁺浓度(mg/L)
F-e-2	7200	9-b-1	6800
D-d-2	7200	F-f-3	6800
E-d-2	7200	10-e-1	4800
F-a-1	6000	9-c-1	4800
F-e-4	6000	F-a-5	4800
F-f-2	6000	5-d-1	4800
F-e-2-1	6000	F-e-1	4800
E-a-2	6000	F-f-4	4800
8-b-2	6000	F-a-2	4800
F-e-3	6000	F-e-2-2	4800
6-b-1	6000	5-b-3	4800
10-a-1	6000	F-a-4	4800
F-b-1	6000	F-g-2	3600

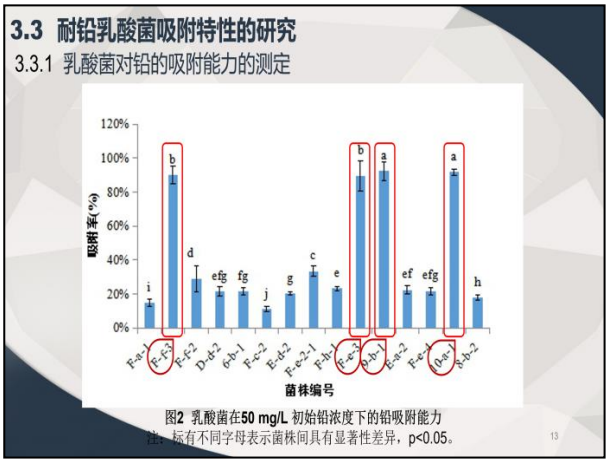


图2 乳酸菌在50 mg/L 初始铅浓度下的铅吸附能力

注：标有不同字母表示菌株间具有显著性差异，p<0.05。

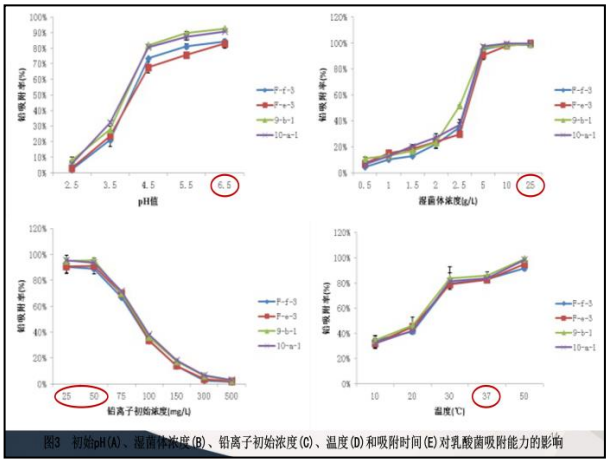


图3 初始pH(A)、湿菌体浓度(B)、铅离子初始浓度(C)、温度(D)和吸附时间(E)对乳酸菌吸附能力的影响

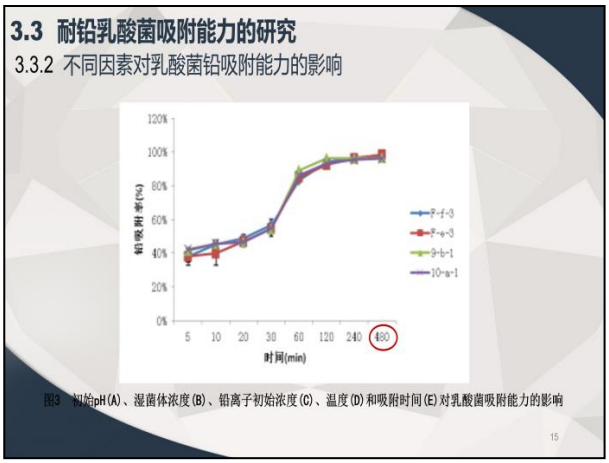


图3 初始pH(A)、湿菌体浓度(B)、铅离子初始浓度(C)、温度(D)和吸附时间(E)对乳酸菌吸附能力的影响

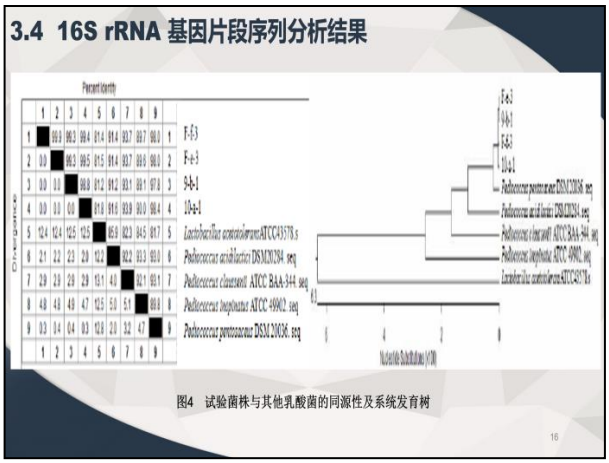


图4 试验菌株与其他乳酸菌的同源性及系统发育树

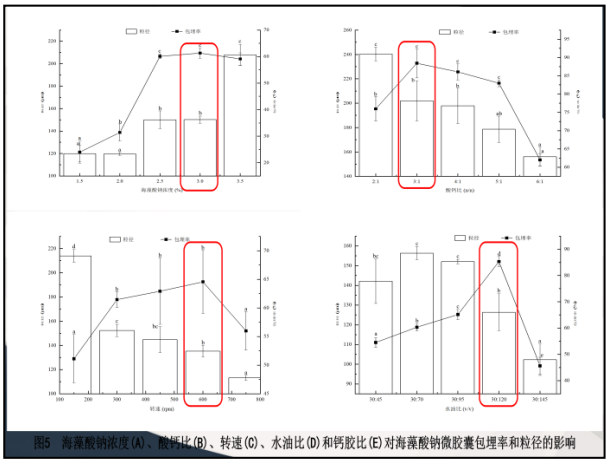


图5 海藻酸钠浓度(A)、酸钙比(B)、转速(C)、水油比(D)和钙胶比(E)对海藻酸钠微胶囊包埋率和粒径的影响

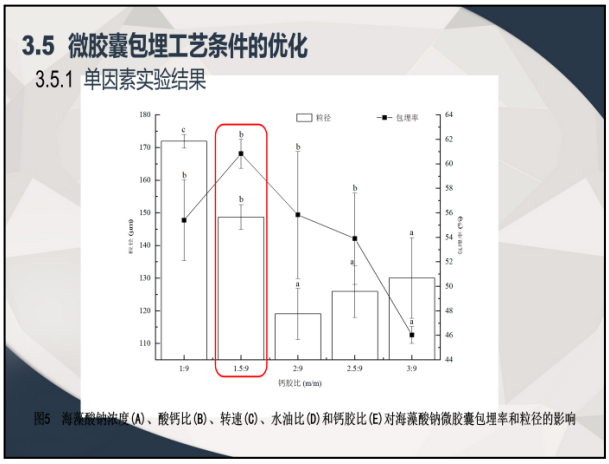


图5 海藻酸钠浓度(A)、酸钙比(B)、转速(C)、水油比(D)和钙胶比(E)对海藻酸钠微胶囊包埋率和粒径的影响

3.5.2 正交试验结果

表 2 正交试验结果

实验序号	A 水油比（v/v）	B 酸钙比（n/n）	C 转速（rpm）	D 钙胶比（m/m）	包埋率（%）
1	1（30:95）	1（2:1）	1（450）	1（1:9）	21.1±2.2
2	2（30:120）	1	2（600）	2（1.5:9）	82.1±0.4
3	3（30:145）	1	3（750）	3（2:9）	51.6±1.2
4	2	2（3:1）	1	3	80.0±1.1
5	3	2	2	1	70.2±1.8
6	1	2	3	2	71.9±1.4
7	3	3（4:1）	1	2	58.4±0.9
8	1	3	2	3	61.0±3.3
9	2	3	3	1	77.4±4.3
均值K1	51.33	51.58	53.16	56.23	
均值K2	79.83	74.05	71.12	70.82	
均值K3	60.08	65.61	66.96	64.19	
极差R	28.50	22.47	17.96	14.59	

各个因素对试验结果影响程度的排序为：水油比（A）>酸钙比（B）>转速（C）>钙胶比（D）

最优组合是：$A_2B_1C_2D_2$，选取组合$A_2B_2C_2D_2$进一步**验证**，包埋率为87.2%±1.6

因此选择：水油比30:120、酸钙比3:1、转速600 rpm、钙胶比1.5:9作为制备条件

3.6 海藻酸钠微胶囊及海藻酸钠-壳聚糖双层微胶囊的特性比较

3.6.1 乳酸菌微胶囊形态观察

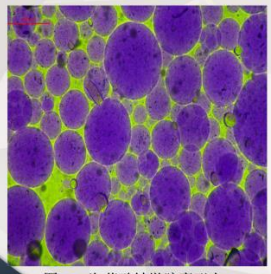


图 6 海藻酸钠微胶囊形态

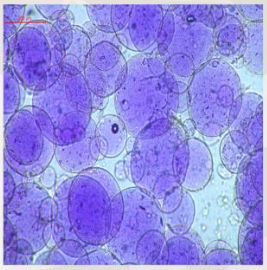


图 7 海藻酸钠-壳聚糖微胶囊形态

3.6.2 乳酸菌微胶囊的粒径分布及包埋率

表 3 海藻酸钠微胶囊和海藻酸钠-壳聚糖微胶囊的包埋率和粒径

微胶囊类型	包埋率（%）	粒径（μm）
海藻酸钠微胶囊	86.3±0.7	139.03±7.97
海藻酸钠-壳聚糖微胶囊	65.6±0.8 ⇩	185.66±9.76 ⇧

3.6.3 微胶囊化乳酸菌10-a-1在连续模拟胃肠液中的存活实验

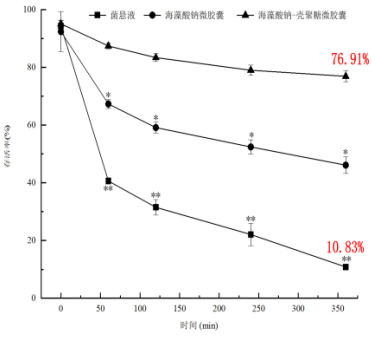


图 8 在连续模拟胃肠液中微胶囊化和未微胶囊化的戊糖片球菌10-a-1的存活率况

注：不同*表示表示经过不同处理的戊糖片球菌10-a-1连续模拟胃肠液中的存活率差异显著(p<0.05)。

3.6.4 微胶囊化戊糖片球菌10-a-1在模拟肠道环境作用下对铅的吸附

表 4 微胶囊化戊糖片球菌10-a-1在模拟肠道环境作用下对铅的吸附

	吸附率（%）	吸附量（mg/g）
菌泥	98.53 ± 0.98^{aA}	9.59 ± 0.42^{aA}
菌泥（经胃肠液处理）	57.09 ± 0.07^{cC}	5.56 ± 0.20^{cC}
海藻酸钠微胶囊	74.74 ± 6.87^{bB}	7.29 ± 0.95^{bB}
海藻酸钠-壳聚糖微胶囊	76.52 ± 3.92^{bB}	7.46 ± 0.66^{bB}

注：不同小写字母表示经过不同处理的戊糖片球菌10-a-1铅吸附能力差异显著（$p<0.05$），不同大写字母表示经过不同处理的戊糖片球菌10-a-1铅吸附能力差异极显著（$p<0.01$）

结论

- 对包头尾矿库和白云鄂博稀土矿区17个土壤样品的分离，共得到62株乳酸菌。
- 对62株乳酸菌进行耐受铅实验，得到26株高耐铅乳酸菌。
- 对26株高耐铅乳酸菌进行吸附铅实验，最终得到F-f-3、F-e-3、9-b-1、10-a-1这4株高抗铅高吸附的戊糖片球菌。
- 内源乳化法制备的海藻酸钠微胶囊和海藻酸钠-壳聚糖微胶囊，能够有效提高戊糖片球菌10-a-1抵御不良环境条件影响的能力，其中海藻酸钠-壳聚糖微胶囊对戊糖片球菌10-a-1的保护效果更好。

6. 李鸿颉　裸燕麦球蛋白提取工艺的优化

内蒙古农业大学 硕士研究生

裸燕麦球蛋白提取工艺的优化

汇 报 人：李泓颉
学科专业：粮食、油脂及植物蛋白工程
指导教师：包小兰

目录

- 引言
- 材料与方法
- 结果与分析
- 结论

一、引言

燕麦是最有价值的禾谷物之一，具有丰富的蛋白质、脂肪和可溶性膳食纤维，其生产成本低，具有较大的社会效益和经济效益。然而目前，国内外对燕麦的研究大部分还停留在燕麦的生理作用及理化性质等方面，且许多研究仅停留在表面，因此对燕麦的研究仍需继续深入。

燕麦起源于我国，是我国人民的主食之一，同时也是内蒙古的优势特色资源。然而目前，燕麦深加工利用率低，深加工产品种类少，产品加工附加值低，因此对燕麦的深加工利用刻不容缓。大量研究证实，燕麦中的球蛋白不仅具有很高的营养价值，还具有抗癌、抗高血压、降血糖等生理活性。因此对燕麦蛋白的提取加工利用十分重要。由于目前提取燕麦蛋白的方法成本高、设备操作复杂、提取速度慢等缺点，所以选此课题探究燕麦球蛋白提取的最适条件。

研究主要内容

(一) 单因素条件对裸燕麦球蛋白提取率的影响

1.NaCl对裸燕麦球蛋白提取率的影响

2.料液比对裸燕麦球蛋白提取率的影响

3.pH对裸燕麦球蛋白提取率的影响

4.提取时间对裸燕麦球蛋白提取率的影响

(二) 运用正交试验设计对Osborne分级法提取工艺条件予以优化

(三)采用 SDS-PAGE电泳技术对获得的裸燕麦球蛋白分子量进行分析

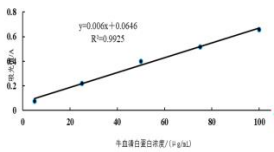
二、材料与方法

裸燕麦去壳、脱毛、磨粉，并在低温下用正己烷浸泡80目裸燕麦粉去除脂肪，得到裸燕麦脱脂粉，于4℃下保存备用。采用Osborne分级法分离提取裸燕麦球蛋白，并对提取蛋白条件进行优化。工艺流程如下：

80目脱脂裸燕麦粉20g→按1：15料液比加10%NaCl溶液→室温水浴锅振荡40min直到充分溶解混匀→离心取上清液→酸沉（用1mol/L的HCl滴定至等电点pH4.4）→静止10min→离心取沉淀物（球蛋白）→溶解（水洗并加NaOH把pH调到中性）真空冷冻干燥（-80℃冰箱冷冻，然后在冷冻干燥机中进行干燥）→分别装进密封袋保存备用。

蛋白含量的测定方法（考马斯亮蓝法）

标准曲线绘制



裸燕麦球蛋白提取率的测定方法

$$\text{蛋白质提取率（\%）} = \frac{CV}{m} \times 100\%$$

式中 C：提取液的蛋白浓度单位

V：提取液体积单位

m：裸燕麦球蛋白质量单位

十二烷基硫酸钠-聚丙烯酰胺凝胶电泳（SDS-PAGE）

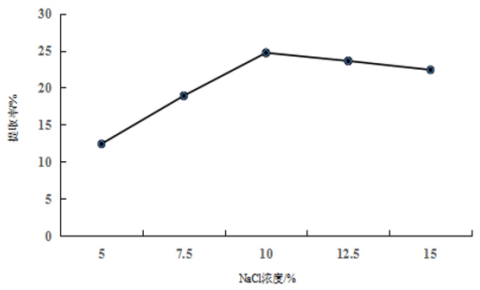
三、结果与分析

（一）单因素条件对裸燕麦球蛋白提取率的影响

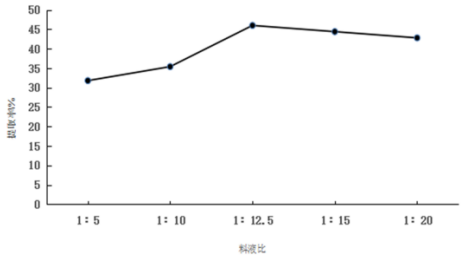
影响裸燕麦球蛋白质提取率的四个主要因素为：

1. 料液比
2. 提取时间
3. pH
4. NaCl浓度

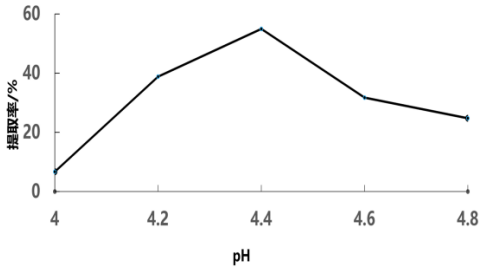
1. NaCl浓度对裸燕麦球蛋白提取率的影响



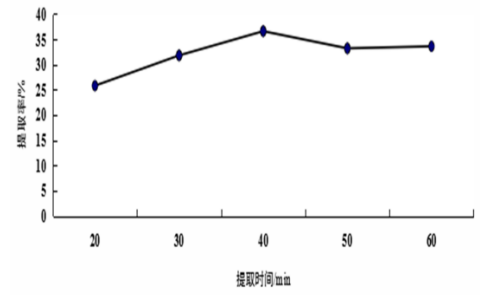
2. 料液比对裸燕麦球蛋白提取率的影响



3. pH对裸燕麦球蛋白提取率的影响



4. 提取时间对裸燕麦球蛋白提取率的影响



（二）正交实验

正交实验是利用排列整齐的正交表来对试验进行整体设计、综合比较、统计分析，实现通过少数的实验次数找到较好的生产条件，以达到最高生产工艺效果。为此，根据单因素试验结果，选择料液比、pH值、提取时间、NaCl浓度进行4因素3水平正交试验。正交试验因素水平见表3，试验结果见表4。

表3 正交试验因素水平表

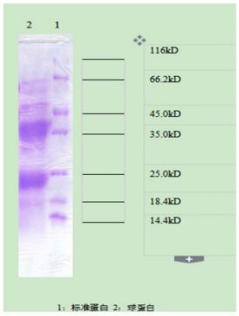
水平	提取时间（min）	pH	料液比	NaCl浓度（%）
1	40	4.4	1∶12.5	10
2	50	4.6	1∶15	12.5
3	60	4.8	1∶20	15

表4 正交试验结果分析表

实验组号	提取时间（min）(A)	pH (B)	料液比 (C)	NaCl浓度（%）(D)	提取率%
1	40	4.4	1：12.5	10	76.64
2	40	4.6	1：15	12.5	70.80
3	40	4.8	1：20	15	66.80
4	50	4.4	1：15	15	62.30
5	50	4.6	1：20	10	71.96
6	50	4.8	1：12.5	12.5	79.30
7	60	4.4	1：20	12.5	69.64
8	60	4.6	1：12.5	15	88.64
9	60	4.8	1：15	10	80.30
k_1	71.41	69.53	81.53	76.30	
k_2	71.19	77.13	71.13	73.25	
k_3	79.53	75.47	69.47	72.58	
R	8.34	7.6	12.06	3.72	

(三)裸燕麦球蛋白SDS-PAGE电泳结果分析

裸燕麦球蛋白SDS-PAGE电泳分析结果如图所示，从图中可以看出，裸燕麦球蛋白在18.4kD~66.2kD上都有条带分布，表明本研究提取的裸燕麦球蛋白的分子量主分布在18.4~45.0kD范围，这与蔺瑞等人研究结果一致。

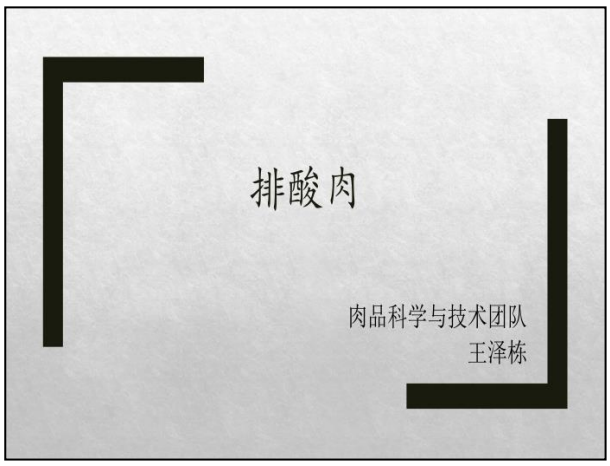


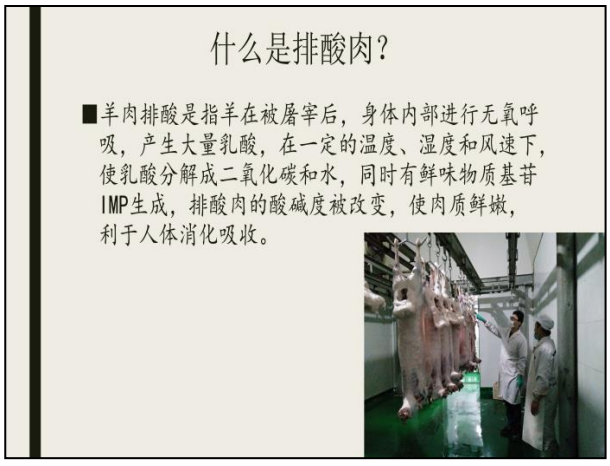
四、结论

本试验以脱脂裸燕麦粉为原料，采用Osborne分级法提取裸燕麦球蛋白，通过单因素试验对提取的工艺条件进行初步探索的基础上，运用正交实验设计对Osborne分级法提取工艺条件予以优化。结果表明对裸燕麦球蛋白提取率的显著影响因素顺序为：料液比>提取时间>pH>NaCl浓度，最佳提取工艺条件为：提取时间为60min，pH值为4.6，料液比为1:12.5，NaCl浓度为15%。在此工艺条件下，裸燕麦球蛋白的提取率为88.64%，获得的裸燕麦球蛋白纯度为90.21%。

7. 王泽栋　排酸肉

内蒙古农业大学 硕士研究生





肉的鲜嫩程度

■肉的鲜嫩程度，指的就是肉在入口咀嚼的时候所能抵抗碎裂的能力，具体涉及肉在咀嚼之后的残渣剩余量、是否容易嚼碎等多个方面，这是评判肉质好坏的一个关键性指标。体现肌肉嫩度的最主要指标是剪切力值。通常来说，剪切力值越小，肌肉就越鲜嫩。

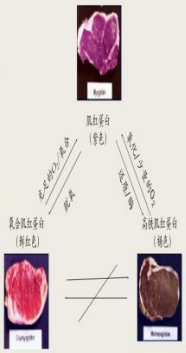
肉的色泽

■肉的色泽通常是由肌红蛋白决定的。

■肌红蛋白是肌肉本身所具有的色素蛋白被宰杀后的肌肉中逐渐失去了氧气的供应，氧气的位置开始慢慢被水所取代，致使肌肉慢慢变成了暗红色。

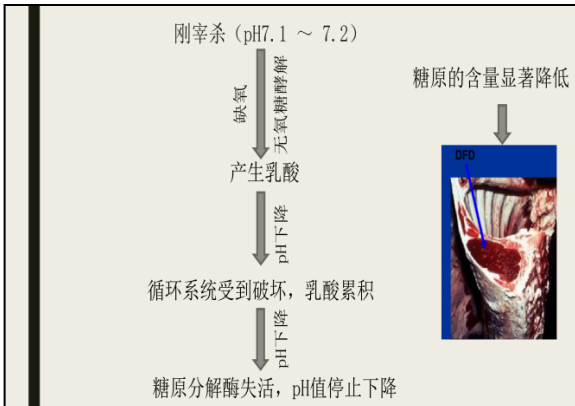
■如果将屠宰后的肉放置于空气之中，则肌肉中水的位置就会再次被氧气取代，从而形成氧合肌红蛋白，呈现出鲜红的颜色。

■若长时间与空气接触，色素之中所含有的铁原子又会发生氧化作用，形成高铁肌红蛋白，呈现出棕褐色。



肉的 pH 值

■羊肉的pH 值，实际上指的就是能体现出羊肉宰杀后肌肉中糖原酵解速度与强度的指标，它是评判肉质变化状况的主要依据，主要涉及肉的成熟情况以及肉中的细菌含量等。



肉的熟肉率、含水量以及系水力

■系水力，实际上指的就是保水力。具体来说，是指肉在加工与存储过程中所能吸收和保持自身水分的能力。

■熟肉率、滴水损失以及系水力共同决定着肉质是否多汁。其中，滴水损失与系水力主要反映的是肉在冷藏、解冻过程中对自身水分的维持能力，熟肉率则主要体现的是肌肉在进行蒸煮操作之后所发生的损失。

pH值与保水性的关系

■肉制品中不易流动水主要存在于肌细胞内、肌原纤维及膜之间，肌肉的系水力主要指的就是这部分水，它取决于肌原纤维蛋白质的网络结构及蛋白质所带静电荷的多少。

■蛋白质处于膨胀胶体状态时，网格空间大，系水力就高，反之处于紧缩状态时，网格空间小，系水力就低。

■pH对肌肉系水力的影响实质上是蛋白质分子的静电荷效应，肌肉pH开始降低时，蛋白质从膨胀状态转变为紧缩状态，网状结构相对的开始变小，肉汁开始流失，肌肉pH接近等电点时（pH5.0-5.4），静电荷数达到最低，这时肌肉的系水力也最低。

排酸方式

- 快速冷却排酸　　将宰后分割并包装好的羊肉先放入－20 ℃低温冰箱进行快速冷却，当羊肉中心温度达 4 ℃时，迅速转移至 4 ℃冰箱成熟至宰后7 d。
- 常规冷却排酸　　将宰后分割并包装好的羊肉放入 4 ℃冰箱进行冷却，当羊肉中心温度达 4 ℃后， 羊肉继续成熟至宰后 7 d。
- 延迟冷却排酸　　将宰后分割并包装好的羊肉先放入 10 ℃冰箱，羊肉中心温度降至 10 ℃时，迅速转移至 4 ℃冰箱，当羊肉中心温度达4 ℃后，羊肉继续成熟至宰后 7 d。

排酸方式对成熟过程中滩羊肉品质和水分变化的影响（宁夏大学农学院）

- 延迟冷却排酸处理组的温度较高，使宰后羊肉的 pH 下降速率增加，加速羊肉进入僵直期， L* 、 a* 显著升高，且冷却失重较大，系水力值较低，不易流动水的含量较低。
- 快速冷却排酸处理组的 pH下降速度较慢，冷却失重较小，系水力值、不易流动水的弛豫时间显著高于其他两组(p <0.05) ，不易流动的水分含量较高;

不同排酸时间对呼伦贝尔肉羊宰后品质的影响（内蒙古农业大学）

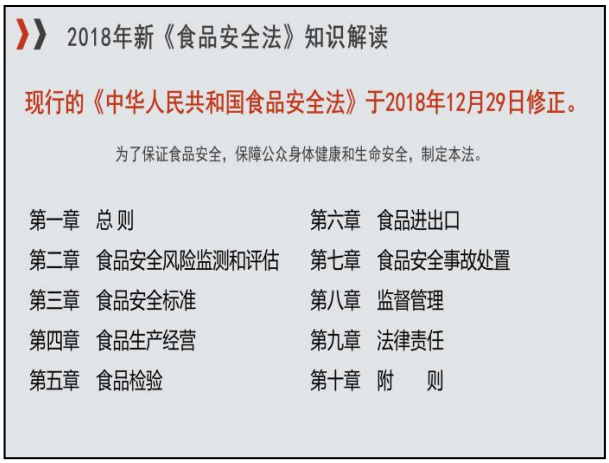
- 陈槟颖等人研究呼伦贝尔羊不同部位肌肉，在排酸库吊挂排酸0、1、2、3、4 d，并分别进行冷冻后肉品质的变化情况，探讨肌肉宰后成熟机理，确定羊肉最佳排酸时间。
- 结果表明,在排酸过程中，羊肉pH值呈先下降再上升的趋势，蒸煮损失率和剪切力则是先上升再下降，排酸第2天的嫩度为最好，排酸第2天的剪切力值最低、蒸煮损失率较低，此时羊肉品质最佳。所以排酸2天羊肉综合指标较好。

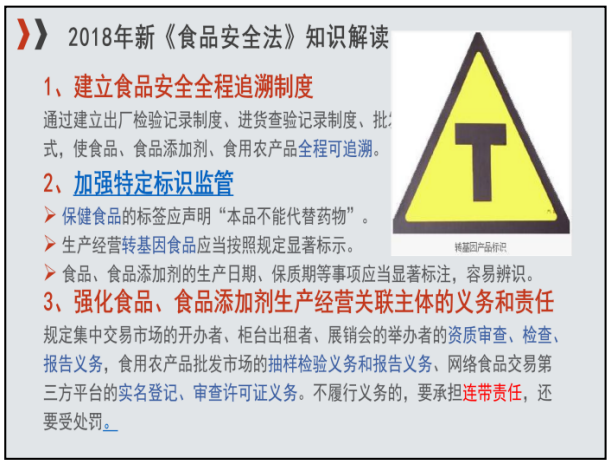
放牧与舍饲对乌拉特山羊肉品质影响的研究（内蒙古农业大学）

- 随着宰后排酸时间延长，羊肉的 pH 值呈折线形变化趋势，pH 值先下降后上升，同时随着排酸时间的延伸有利于改善了羊肉的嫩度，在排酸第 2-3 天蒸煮损失率最小。羊肉中脂肪酸、风味物质 和氨基酸的含量及比值均在排酸第 1-3 天大于排酸前的含量，综合来看， 排酸第 3 天时为羊肉最佳排酸成熟时间。

8. 杜权　食品安全法和食品安全法实施条例解读

内蒙古农业大学 硕士研究生





2018年新《食品安全法》知识解读

4、特殊食品严格监管

保健食品、特殊医学用途配方食品和婴幼儿配方食品纳入特殊食品，严格监管。不得以分装方式生产婴幼儿配方乳粉，同一企业不得用同一配方生产不同品牌的婴幼儿配方乳粉。

5、为赔偿设置最低限额

生产不符合食品安全标准的食品或者经营明知是不符合食品安全标准的食品，消费者除要求赔偿损失外，还可以向生产者或者经营者要求支付价款十倍或者损失三倍的赔偿金；增加赔偿的金额不足一千元的，为一千元。

6、全面加大处罚力度

大部分违法行为的处罚起点由过去的2000元提升到5万元，较严重的违法行为起点为10万元。一年内累计三次违反食品安全法受到处罚的，责令停产停业，直至吊销许可证。

2018年新《食品安全法》知识解读

7、重拳整治虚假广告

发布食品虚假广告要受罚，广告经营者、发布者承担连带责任。社会团体或其他组织、个人在虚假广告或其他虚假宣传中向消费者推荐食品的，承担连带责任。

8、剧毒、高毒农药有禁区

禁止将剧毒、高毒农药用于蔬菜、瓜果、茶叶和中草药材等国家规定的农作物。国家对农药的使用实行严格的管理制度，加快淘汰剧毒、高毒、高残留农药，推动替代产品的研发和应用，鼓励使用高效低毒低残留农药。

9、网络食品交易第三方平台提供者应当对入网食品经营者进行实名登记

消费者合法权益受到损害的，可以向入网食品经营者或者食品生产者要求赔偿。网络食品交易第三方平台提供者不能提供入网食品经营者的真实名称、地址和有效联系方式的，由网络食品交易第三方平台提供者赔偿。

《食品安全法实施条例》知识解读

被称为“史上最严”《食品安全法》的配套法规

《中华人民共和国食品安全法实施条例》

将于12月1日起正式实施

- 食品安全法实施条例是依据食品安全法制定的，是食品安全法的具体细化。
- 区别：食品安全法是全国人大制定的，属于法律；食品安全法实施条例是国务院制定的，属于行政法规。
- 《食品安全法实施条例》不得违背食品安全法，但比食品安全法更具体更具有可操作性。

《食品安全法实施条例》知识解读

1. 进一步明确制定食品安全标准的范围

- 保健食品、特殊医学用途配方食品、婴幼儿配方食品等特殊食品不属于地方特色食品，不得对其制定食品安全地方标准。
- 重申企业标准的备案范围必需严于食品安全国家标准和地方标准。
- 食品行业的企业标准必需经过备案才可使用，其他声明方式不能代替备案。
- 强调企业标准应当公开，供公众免费查阅。（企标问题）

2. 明确规定非食品经营者从事某些食品贮运业务应进行备案

- 明确规定非食品经营者从事对温度、湿度等有特殊要求的食品贮运业务的，应当自取得营业执照之日起30个工作日内向所在地县级人民政府食品安全监管部门备案。

《食品安全法实施条例》知识解读

4.明确回收食品定义并规定相应处置方式

- 禁止使用回收食品作为原料生产食品。
- 对于回收食品等应进行显著标示或者单独存放在有明确标志的场所，及时采取无害化处理、销毁等措施并如实记录。

5.进一步明确易非法添加的非食用物质相关规定

- 依据卫生部六批次易滥用食品添加剂和易非法添加的非食用物质名单。
- 食品生产经营者不得在食品生产、加工场所贮存该名录中物质。

6.明确规定特殊食品的特殊监管要求

- 对保健食品生产企业原料前处理能力的规定。
- 对特殊医学用途配方食品按照标准逐批出厂检验的规定。
- 对特定全营养配方食品广告的规定等。

《食品安全法实施条例》知识解读

7.进一步明确进口无国标食品范围

- 对于食品安全国家标准中通用标准已经涵盖、但尚无专门的产品标准的食品可以按照一般贸易方式进口。
- 进一步促进我国进口食品贸易的发展。

8.首次提出组建食品安全检查员队伍

- 国家建立食品安全检查员制度，依托现有资源加强 职业化检查员队伍建设，强化考核培训，提高检查员专业化水平。
- 首次提出食品安全检查员制度和队伍建设。

9.明确重点监督的行业

- 食品安全监督管理等部门应当将婴幼儿配方食品等针对特定人群的食品以及其他食品安全风险较高或者销售量大的食品的追溯体系建设作为监督检查的重点。

《食品安全法实施条例》知识解读

10.明确食品安全信息发布相关法律责任

- 任何单位和个人不得发布未依法取得资质认定的食品检验机构出具的食品检验信息。
- 不得利用上述检验信息对食品、生产经营者进行等级评定，欺骗、误导消费者。

11.明确利用会议讲座等形式对食品进行虚假宣传的处罚措施

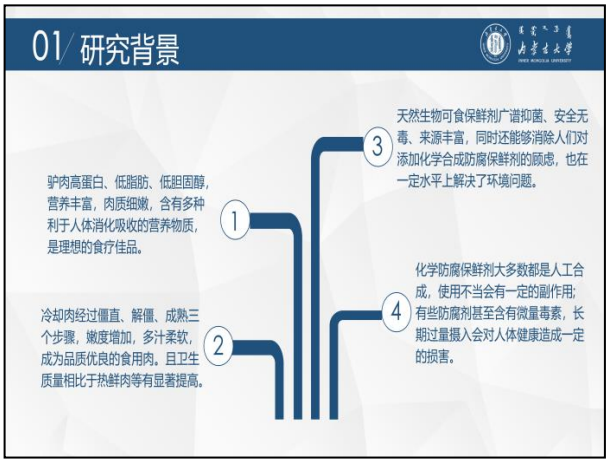
- 禁止利用包括会议、讲座、健康资讯在内的任何方式对食品进行虚假宣传。

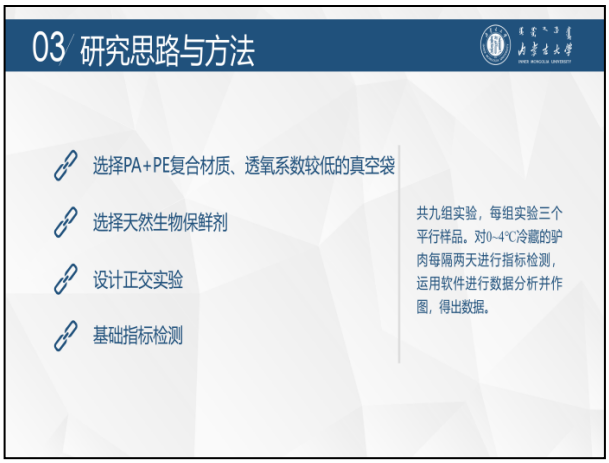
12.明确违法企业负责人员的处罚措施

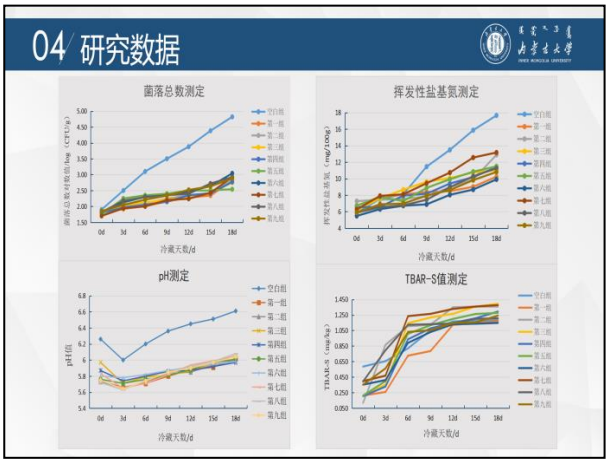
- 针对食品安全法规定的违法情形，对单位的法定代表人，主要负责人、直接负责人的主管人员和其他直接责任人员处以其上一年度从本单位取得收入的1倍以上10倍以下罚款。
- 我国法规首次明确对于违法食品企业的责任人员做出处罚的规定。

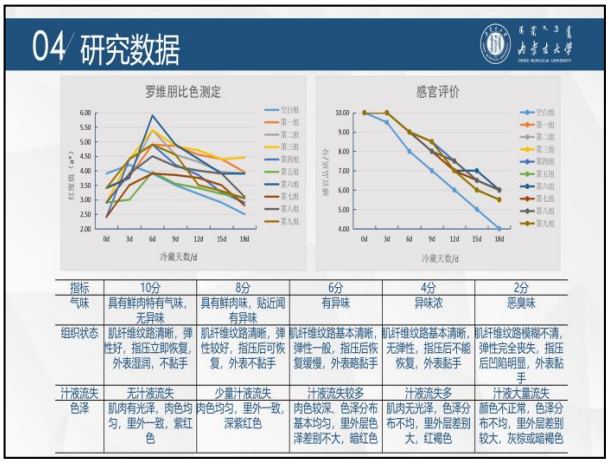
9. 邢智彬　复合天然生物保鲜剂延长冷却驴肉货架期的研究

内蒙古大学 硕士研究生

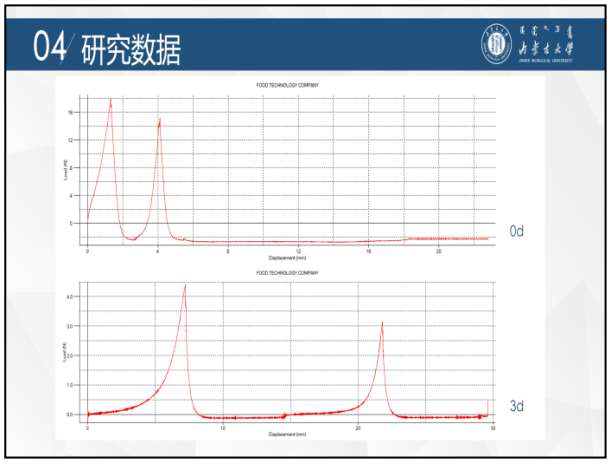








指标	10分	8分	6分	4分	2分
气味	具有鲜肉特有气味，无异味	具有鲜肉味，贴近闻有异味	有异味	异味浓	恶臭味
组织状态	肌纤维纹路清晰，弹性好，指压立即恢复，外表湿润，不黏手	肌纤维纹路清晰，弹性较好，指压后可恢复，外表不黏手	肌纤维纹路基本清晰，弹性一般，指压后恢复缓慢，外表略黏手	肌纤维纹路基本清晰，无弹性，指压后不能恢复，外表黏手	肌纤维纹路模糊不清，弹性完全丧失，指压后凹陷明显，外表黏手
汁液流失色泽	无汁液流失 肌肉有光泽，肉色均匀，里外一致，紫红色	少量汁液流失 肉色均匀，里外一致，深紫红色	汁液流失较多 肉色较深、色泽分布基本均匀、里外层色泽差别不大，暗红色	汁液流失多 肌肉无光泽，色泽分布不均，里外层差别大，红褐色	汁液大量流失 颜色不正常，色泽分布不均，里外层差别较大，灰棕或暗褐色


04 研究数据
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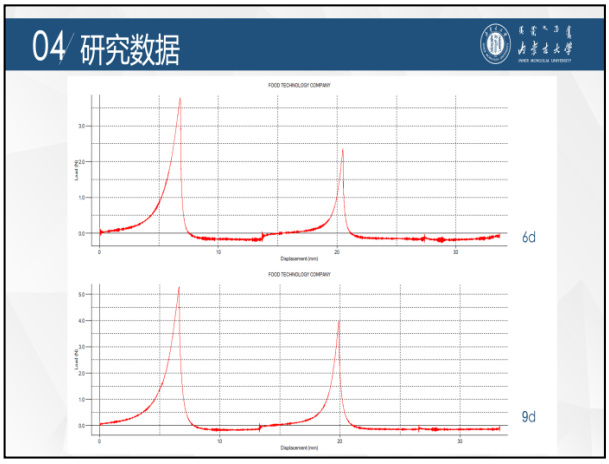
3d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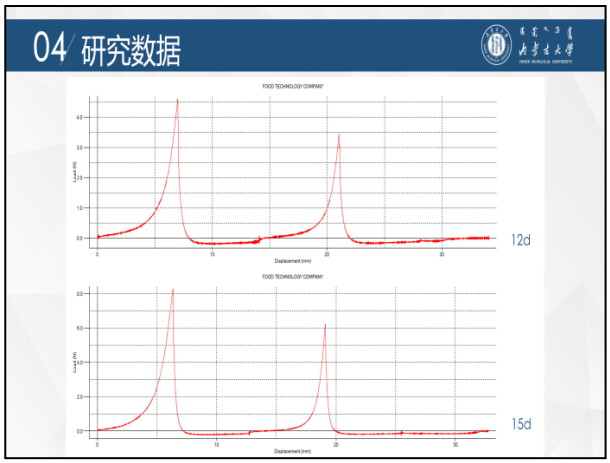
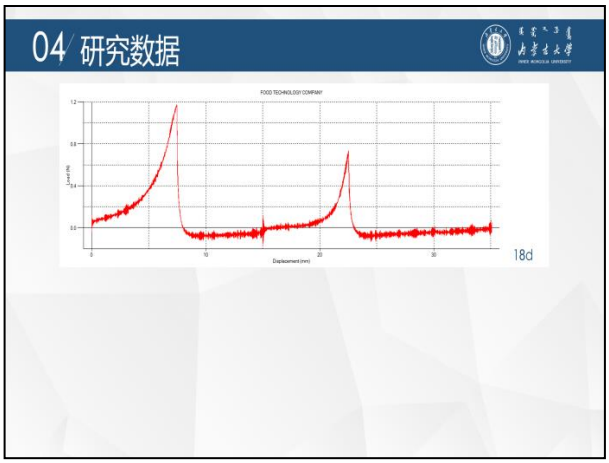
9d


04 研究数据
12d
15d


04 研究数据
18d


05 研究结论及成果
结果发现，复合天然保鲜剂对冷却驴肉能够起到一定的保鲜效果。保鲜天数达到18天，可以有效延长冷却驴肉的货架期。
0d
18d

论 文 摘 要

1.肉制品专题

苏尼特羊、巴美肉羊和乌拉特山羊的肉品质和挥发性风味物质比较

窦露[1]，罗玉龙[1]，孙雪峰[2]，刘畅[1]，李文博[1]，苏琳[1]，赵丽华[1]，田建军[1]，靳烨[1]*

（1.内蒙古农业大学食品科学与工程学院，内蒙古 呼和浩特 010018；2.内蒙古乌拉特中旗家畜改良站，内蒙古 乌拉特中旗 015300）

摘　要：为了探究品种对羊肉品质和风味的影响，选取 12 月龄苏尼特羊、巴美肉羊和二狼山白绒山羊（乌拉特山羊）各 12 只，测定其屠宰性能，再分别取股二头肌测定肉品质和挥发性风味物质并进行比较。结果表明：巴美肉羊的胴体质量，背膘厚、a*值均显著高于苏尼特羊和乌拉特山羊（$P<0.05$），说明其屠宰性能较好，肉色较红；苏尼特羊的 pH 显著高于乌拉特山羊（$P<0.05$），而巴美肉羊与二者之间无明显差别（$P>0.05$）。品种对挥发性成分的相对含量和构成影响很大，电子鼻测定结果表明苏尼特羊、巴美肉羊和乌拉特山羊的气味存在差异，进一步对比挥发性风味物质发现，苏尼特羊肉中醛、醇、酮类化合物含量较高。气相色谱-质谱联用检测出乌拉特山羊肉中风味物质较其他两种丰富，通过相对气味活度值（ROAV）筛选出庚醛、壬醛、反-2-壬烯醛、1-辛烯-3-醇、反-2-癸烯醛和十二醛可作为羊肉的关键风味物质，其中壬醛对苏尼特羊肉风味贡献最大，而巴美肉羊和乌拉特山羊肉中贡献最大的风味物质为 1-辛烯-3-醇。总体上，巴美肉羊的屠宰性能较优良且肉色略红，在风味方面，不同品种的羊肉其关键风味物质存在差异。

Comparison on Meat Quality and Volatile Flavors of Sunit sheep, Bamei sheep and Urad goats

Dou Lu[1], Luo Yulong[1], Sun Xuefeng[2] , Liu Chang[1], Li Wenbo[1], Su Lin[1], Zhao Lihua[1], Tian Jianjun[1], Jin Ye1[*]

(1.College of Food Science and Engineering, Inner Mongolia Agricultural University, Hohhot 010018, China；2.Livestock Improvement Station Of Urad Middle Banner, Inner Mongolia, Wulate Middle Banner 015300, China)

Abstract: In order to explore the effects of breed on the meat quality and flavor, the slaughter performance of Sunit sheep, Bamei sheep and Erlangshan white cashmere goats (Urad goats) (12-month-old, 12 animals for each breed) were investigated, the *Biceps* muscles from these lambs were selected to evaluate the quality and volatile

compounds. The results showed that the carcass quality, back thickness, a*value of Bamei sheep were significantly higher than that of Sunit sheep and Urad goats (P<0.05), which indicated that the slaughter performance was better and the color was redder. The pH of Sunite sheep was significantly higher than that of Urad goats (P<0.05), but there was no significant difference between Bamei sheep and other groups (P>0.05). The variety had a great influence on the relative content and composition of volatile components. The results of electronic nose indicated that there were differences in the odors of Sunit sheep, Bamei sheep and Urad goats. Further comparison of volatile substances found that the content of aldehydes, alcohols and ketones in Sunite lamb were high. The flavor substances in Urad goat detected by gas chromatography-mass spectrometry was more abundant than the others. The helium aldehyde, furfural, trans-2-nonenal, 1-octene 3-alcohol, trans-2-nonenal and dodecanal used as key flavors of lamb were selected by relative odor activity value (ROAV), among them, furfural contributed the most to the flavor of Sunite lamb, while the most contributing substance in Bamei and Urad goat meat was 1-octene-3-ol. In general, the slaughter performance of Bamei sheep was better and the color was slightly red. In terms of flavor, different breeds of lamb had different key flavor substances.

羊肝干与鲜羊肝营养价值及食用品质比较研究

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（内蒙古农业大学食品科学与工程学院，内蒙古 呼和浩特 010018）

摘 要：为研究羊肝干加工前后营养成分的变化，分别测定鲜羊肝和羊肝干的营养品质和理化指标并进行分析。结果表明：鲜羊肝和羊肝干的水分含量分别为67.18%和35.18%，蛋白质含量分别为23.26%和47.13%，脂肪含量分别为5.12%和10.06%；氨基酸总量分别为18.73%和42.69%，其中人体 7 种必需氨基酸总量分别为7.83%和17.71%；鲜羊肝中共检测出27 种脂肪酸，羊肝干中共检测出26 种脂肪酸，其中饱和脂肪酸含量分别为 55.59%和 75.91%，不饱和脂肪酸分别占总脂肪酸的 44.41%和 24.09%，鲜羊肝和羊肝干均富含亚油酸（5.12%～

9.55%）等人体必需脂肪酸；鲜羊肝与羊肝干均富含丰富矿物质，其中镁、铁、钙等矿物质元素含量较高；鲜羊肝和羊肝干 VA 含量分别为 18.84、9.84 mg/100 g。原料鲜羊肝和羊肝干产品的营养价值均较高。

Comparative Evaluation of Nutritional Value and Eating Quality of Sheep Liver Jerky and Raw Sheep Liver

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(College of Food Science and Engineering, Inner Mongolia Agricultural University, Hohhot 010018, China)

Abstract: To study the changes in nutritional components of sheep liver jerky before and after processing, jerky the nutritional qualities and physicochemical indexes of raw sheep liver and sheep liver were determined and compared. The results showed that the moisture contents of raw sheep liver and sheep liver jerky were 67.18% and 35.18%, respectively. Their protein contents were 23.26% and 47.13%, fat contents 5.12% and 10.06%, and total amino acid contents 18.73% and 42.69%, respectively. The total contents of 7 essential amino acids were 7.83% and 17.71% respectively. A total of 27 fatty acids are detected in raw sheep liver and 26 fatty acids in sheep liver jerky, in which saturated fatty acids accounted for 55.59% and 75.91%, and unsaturated fatty acids accounted for 44.41% and 24.09% of the total fatty acids, respectively. Both livers were rich in linoleic acid (5.12%–9.55%) and other essential fatty acids. Additionally, they showed richness in minerals such as magnesium, iron and calcium. The contents of vitamin A in raw sheep liver sheep liver jerky were 18 840 and 9 840 μg/100 g respectively. To sum up, both raw and roast sheep liver have high nutritional value.

日粮亚麻籽对苏尼特羊肉风味品质的影响

刘 畅，罗玉龙，窦露，杨致昊，李文博，赵丽华，苏琳，靳 烨*

（内蒙古农业大学食品科学与工程学院，呼和浩特，010018）

摘　要：为了研究亚麻籽对苏尼特羊肉风味品质的影响，将 24 只四月龄健康无病的苏尼特羊随机分为 2 组，分别饲喂含有 0（对照组）和 8%（亚麻籽组）的亚麻籽日粮。饲喂 3 个月后屠宰，取背最长肌用于后续试验的测定。该试验利用气相色谱质谱利用技术测定挥发性风味物质，采用电子鼻测定羊肉气味强度，此外测定羊肉的抗氧化能力，以探究抗氧化能力与挥发性风味物质的关系。结果表明：亚麻籽提高了羊肉中挥发性风味物质的丰富度，并改变了物质组成及含量。苏尼特羊肉的关键风味物质包括 1-辛烯-3-醇、庚醛、反-2-辛烯醛、辛醛、反 2-壬烯醛、壬醛、反-2-癸烯醛和癸醛。对照组中己醛和壬醛相对含量显著高于亚麻籽组（P＜0.05）；亚麻籽显著提高了戊醛、反-2-辛烯醛和癸醛的含量（P＜0.05）。主成分分析可对 2 组羊肉的风味进行区分，表明日粮添加亚麻籽对羊肉关键风味物质影响较大。电子鼻结果显示亚麻籽影响了羊肉风味轮廓，降低了气味强度。亚麻籽组羊肉中的自由基清除率（radical scavenging ability, RSA）为 58.09%，总抗氧化能力（total antioxidant capacity，T-AOC）为 0.53 U/mgprot，显著高于对照组（P＜0.05）。抗氧化酶基因表达量的变化与酶活性具有一致性，亚麻籽组的 SOD 基因表达量显著低于对照组，但日粮添加亚麻籽显著提高了 CAT 与 GSH-Px 的基因表达量，这从分子角度验证了亚麻籽对抗氧化酶的调控作用。相关性分析结果表明，抗氧化系统与挥发性风味物质存在相关性，其中过氧化氢酶（catalase，CAT）与反-2-癸烯醛呈极显著正相关（P＜0.01）；RSA 与反-2-辛烯醛呈极显著正相关（P＜0.01），与壬醛呈极显著负相关（P＜0.01）。总体上看，与对照组相比，日粮添加亚麻籽可改变羊肉的挥发性风味物质的组成及含量，并提高羊肉的抗氧化能力,亚麻籽可通过调节抗氧化系统来影响羊肉的风味。

Effect of dietary flaxseed supplementation on meat flavor quality of Sunit lambs

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(College of Food Science and Engineering, Inner Mongolia Agricultural University, Hohhot 010018, China)

Abstract: In order to study the effect of flaxseed supplementation on the flavor quality of Sunit lamb , a total of 24 healthy sheep (four months old) were randomly allotted to two experimental groups fed on diets containing flaxseed at 0 (control group) and 8% (flaxseed group), respectively. The sheep were slaughtered after being fed for three months, and the longissimus dorsi muscle was taken for subsequent tests. In this experiment, the volatile flavor substances were determined by gas chromatography mass spectrometry. The electronic nose was applied to determine odor profile of the meat. In addition, the antioxidant capacity of the meat was measured to explore the relationship between antioxidant capacity and volatile flavor substances. The results showed that the growth performance and carcass mass in control group were similar to that of flaxseed group, and the difference was not significant(P>0.05). Flaxseed supplementation increased the richness of volatile flavor substance and affected its composition and content. The critical volatile flavor substances of Sunit lambs include 1-octen-3-ol, heptanal, (E)-2-octenal, octanal, (E)-2-nonenal, nonanal, (E)-2-decenal and decanal. The content of hexanaland nonanal in control group were significantly higher than flaxseed group(P<0.05). Flaxseed significantly increased the content of pentanal, (E)-2-octenal and decanal (P<0.05). Principal component analysis can distinguish the flavor of the two groups of lamb, indicating that the flaxseed supplementation had an effect on the critical flavor substance of the meat between two groups. Electronic nose result showed that flaxseed supplementation affected the overall flavor profile of the Sunit lambs and decreased the odor intensity. The radical scavenging ability (RSA) in flaxseed group was 58.09% and total antioxidant capacity (T-AOC) reached 0.53 U/mgprot， which significantly higher than control group (P<0.05). The effect of flaxseed supplementation on the expression of antioxidase gene is similar to that of enzyme activity. The SOD gene expression of flaxseed group was significantly lower than control group (P<0.05), but the CAT and GSH-Px gene expression of flaxseed group were significantly higher than control group (P<0.05). Correlation analysis showed that antioxidant system has a correlation with volatile

flavor substances. Catalase (CAT) was significantly positively correlated with (E)-2-decenal (P<0.01). RSA was significantly positively correlated with (E)-2-octenal, (P<0.01), but negatively correlated with nonanal (P<0.01). To conclude, flaxseed had an effect on the composition and content of volatile flavor substance, and it can improve the antioxidant ability of Sunit sheep. Flaxseed can affect the flavor of lambs by regulating antioxidant system.

益生菌调控胃肠道菌群微生态改善肉品质研究进展

刘婷,杜瑞,张艳妮,段艳,苏琳,田建军,赵丽华,靳烨*

（内蒙古农业大学 内蒙古自治区 呼和浩特市 010018）

摘 要：胃肠道菌群的稳态有益于动物个体的生长发育。益生菌作为抗生素的替代品应用于畜禽养殖中，可通过调控胃肠道中菌群之间的微生态平衡，影响宿主对营养物质的消化吸收及脂肪的代谢，提高饲料的利用率，促进风味物质形成等途径来改善肉品质。本文综述了不同益生菌调节胃肠道微生态的机理，并通过改善肠道菌群结构来改善畜禽肉的品质，为进一步研究开发以胃肠道菌群为靶点的益生菌饲料提供参考。

Advance in studying the effect of Probiotics on Gastrointestinal Tract Microorganism to improve Meat Quality

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（Inner Mongolia Agricultural University, Hohhot, Inner Mongolia, 010018）

Abstract: The homeostasis of gastrointestinal flora is beneficial to the growth and development of individual animals. Probiotics are used as substitutes for antibiotics in livestock and poultry farming .The application of probiotics in livestock and poultry can regulate intestinal micro-ecological balance, regulate fat metabolism, improve feed utilization and promote the formation of flavor substances. It can improve meat quality, included carcass quality of livestock and poultry.This paper reviews the mechanisms

what regulates gastrointestinal microecology by different probiotics, and improves the meat quality of livestock and poultry by improving the structure of intestinal flora. It can reference for further research and development of probiotic feeds targeting gastrointestinal flora.

植物乳杆菌和干酪乳杆菌对苏尼特羊胃肠道菌群、代谢物及肉品质的影响

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（内蒙古农业大学 内蒙古自治区 呼和浩特市 010018）

摘 要：试验选取 3 月龄的苏尼特羊 12 只（体重 16.72±1.32 kg）随机分为对照组（基础饲粮，6 只）和乳酸菌组（基础饲粮+1.50*109 cfu/g 复合菌，6 只）进行 90 天的饲养实验，屠宰后测定肉羊胃肠道菌群、代谢物、血脂指标及肉品质。结果表明：乳酸菌组的胃肠道菌群结构发生变化，乳酸菌组瘤胃菌群中拟杆菌门(*Bacteroidetes*)、拟杆菌属(*p-Bacteroides*)和 *f-Bacteroidales-BS11-gut-group* 的丰度显著高于对照组（*P<0.05*）；乳酸菌组肠道菌群中毛螺菌（*f-Lachnospiraceae*）和 *Ruminococcaceae-UCG-002* 的丰度显著高于对照组（*P<0.05*）；乳酸菌组胃肠道代谢物的丁酸均低于对照组（*P<0.05*），乳酸菌组血液中的 HDL-C 的浓度显著高于对照（*P<0.05*），LDL-C 浓度显著低于对照（*P<0.05*），乳酸菌组羊肉的 pH_{24} 和剪切力值显著低于对照组（*P<0.05*），乳酸菌组羊肉的 *a**值显著高于对照组（*P<0.05*）；通过相关性分析可知，瘤胃菌群中的拟杆菌门与乙酸、丙酸呈显著正相关（*P<0.05*），肠道菌群的 *Ruminococcaceae-UCG-002* 与异丁酸、异戊酸呈显著正相关（*P＜0.05*），瘤胃菌群的普雷沃菌属-1（*Prevotella-1*）与 HDL-C 呈极显著负相关（*P＜0.01*）；瘤胃菌群的厚壁菌门（*Firmicutes*）与蒸煮损失呈极显著负相关(*P＜0.01*)，肠道菌群的厚壁菌门与 a*呈显著正相关(*P＜0.05*)。饲粮添加植物乳杆菌和干酪乳杆菌能调整肉羊胃肠道菌群结构，改变代谢物和血脂指标，进而改善羊肉品质。

Effect of Lactobacillus plantarum and *lactobacillus casei* on gastrointestinal flora, metabolites, and meat quality in Sunit lamb

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Abstract: The aim of this study was to investigate the effect of probiotics on the abundance of rumen and intestinal flora, metabolites, plasma lipid parameters and meat quality in 12 Sunit lambs aged 3 months randomly dividing into control group (basal diet, 6 lambs) and Lactic acid bacteria group (basal diet + $1.50*10^9$ cfu/g compound probiotics, 6 lambs) for 90 days. The results showed that the structure of rumen and intestinal flora changed in lambs. The abundance of Bacteroidetes, *p-Bacteroides* and *f-Bacteroidales-BS11-gut-group* in rumen flora of Lactic acid bacteria group was significantly higher than those of the control group (P<0.05); The abundance of *f-Lachnospiraceae* and *Ruminococceae-UCG-002* in intestinal flora of Lactic acid bacteria group was significantly higher than control group (P< 0.05). The butyric acid of gastrointestinal metabolites in Lactic acid bacteria group was significantly higher than control group (P<0.05); The plasma concentrations of HDL-C in Lactic acid bacteria group was significantly higher than control group (P<0.05), while the concentrations of LDL-C was significantly lower than control group (P<0.05), the pH_{24} value and shear force of lamb meat in Lactic acid bacteria group were significantly lower than control group (P<0.05), and a* value in Lactic acid bacteria group was significantly higher than control group (P<0.05). Correlation analysis showed that the abundance of Bacteroidetes in rumen flora were positively correlated with acetic acid and propionic acid (P< 0.05); *Ruminococcaceae-UCG-002* in intestinal flora was positively correlated with isobutyric acid and isovaleric acid (P<0.05); *Prevotella-1* in rumen flora was positively correlated with HDL-C (P<0.05), and Firmicutes in rumen flora was negatively correlated with cooking loss (P<0.01), Firmicutes in intestinal flora was positively correlated with a* value (P<0.05). This study concluded that adding Lactobacillus plantarum and lactobacillus casei in diet can change rumen and

intestinal flora, metabolites and plasma lipid parameters to improve meat quality.

日粮添加亚麻籽和乳酸菌对苏尼特羊抗氧化系统的影响

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摘 要：以对照组、亚麻籽组和乳酸菌组三组舍饲方式下的 3 月龄苏尼特羊背最长肌为试验材料，分别测定丙二醛含量（MDA）、抗氧化酶活性和抗氧化性能，抗氧化酶包括 SOD 酶，CAT 酶和 GPx 酶，抗氧化性能包括自由基清除率（RSA）、总抗氧化能力（T-AOC）和降铜离子还原能力（CUPRAC）,同时测定不同饲粮的抗氧化能力。确定了日粮添加亚麻籽和乳酸菌对苏尼特羊抗氧化系统的影响。结果表明：饲粮成分中青贮的抗氧化能力最高，其中 SOD 酶活力显著高于其他成分（$P<0.05$），青贮和乳酸菌的 RSA 值最高（$P<0.05$）；对照组羊肉 MDA 含量显著高于亚麻籽组和乳酸菌组（$P<0.05$），说明其氧化程度最高；在羊肉的抗氧化系统中，亚麻籽组和乳酸菌组的抗氧化酶活力高于对照组，其中 SOD 酶显著高于对照组（$P<0.05$）；亚麻籽组和乳酸菌组的 T-AOC 值、CUPRAC 值显著高于对照组；MDA 与 CAT、T-AOC、RSA 呈显著正相关（$P<0.05$）；T-AOC 与 SOD 酶呈显著正相关（$P<0.05$），SOD 酶与 GPx 酶呈显著负相关（$P<0.01$），说明苏尼特羊肌肉中存在一套氧化稳定性机制，能维持组织的氧化稳定性。

Effects of Adding Flaxseed And Lactobacillus to Ration on Antioxidant System of Sunite Sheep

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Abstract: The longissimus dorsi muscle of 3-month-old Sunit lamb feed with three groups including control group, flaxseed group and lactic acid bacteria group. The content of malondialdehyde（MDA）, antioxidant enzyme activity（SOD enzyme, CAT enzyme and GPx enzyme）and antioxidant properties（free radical scavenging rate,

RSA; total antioxidant capacity, T-AOC; and copper ion reducing capacity, CUPRAC） were measured to research the effect of flaxseed and lactic acid bacteria on the antioxidant system of Sunit lamb. The results showed that the antioxidant capacity of silage was the highest, among which SOD enzyme activity was significantly higher than that of other components（$P < 0.05$）, and the RSA value of silage and lactic acid bacteria was the highest（$P < 0.05$）; the content of MDA in control group was significantly higher than that of flaxseed group and lactic acid bacteria group（$P < 0.05$）, indicating that the antioxidant activity of flaxseed and lactic acid bacteria was the highest in the antioxidant system of meat. Among them, SOD enzyme was significantly higher than the control group（$P < 0.05$）; T-AOC value and CUPRAC value of flaxseed group and lactic acid bacteria group were significantly higher than the control group; MDA was significantly positively correlated with CAT, T-AOC, and RSA（$P < 0.05$）; T-AOC was significantly positively correlated with SOD enzyme（$P < 0.05$）, and SOD enzyme was significantly negatively correlated with GPx enzyme（$P < 0.01$）, indicating that there is a set of oxidative stability mechanism in the muscle of Sunit lamb that can maintain the oxidative stability of the tissue.

呼和浩特市市售香肠类肉制品亚硝酸盐残留量检测

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摘 要：利用盐酸萘乙二胺法（GB 5009.33-2016）测定 145 件内蒙古自治区呼和浩特市市售香肠类肉制品的亚硝酸盐残留量，亚硝酸盐检出率为 99.94%，平均残留量为 13.284mg/kg,检出范围在 0.0000~70.5266mg/kg，总样本合格率达 90.34%。其中，共有 14 份样品的亚硝酸盐残留量超出国家食品卫生标准，最高超出相关标准的 79.30%。同时，根据样品所属品牌、品种、原料来源和质量等级进行分类，结果表明无明确品牌、熏煮肠类和火腿类、不明来源类和未标识类的样品平均亚硝酸盐残留量最高，依次为 14.17±7.96mg/kg、25.61±17.10mg/kg、19.56±15.52mg/kg 和 16.88±14.82mg/kg。参考世界卫生组织食品添加剂联合专家委员会制定的亚硝酸盐每日允许摄入量 0.07mg/kg （体重），建议呼和浩特市居

民每日摄入少于 300g 的香肠类肉制品。

Determination of Nitrite Residues in Sausage Meat Products in Hohhot Market

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Abstract: Naphthyl ethylenediamine hydrochloride Method (GB 5009.33-2016) was used to determine nitrite residues in 145 sausages sold in Hohhot City, Inner Mongolia Autonomous Region. The detection rate of nitrite was 99.94%, the average residue was 13.284mg/kg, the detection range was 0.0000~70.5266mg/kg, and the qualified rate of total samples was 90.34%. Among them, nitrite residues in 14 samples exceeded the national food hygiene standards, with the highest exceeding 79.30% of the relevant standards. At the same time, the samples were classified according to their brands, varieties, sources of raw materials and quality grades. The results showed that the samples without clear brands, smoked sausages and hams, unknown sources and unlabeled samples had the highest average nitrite residues, which were 14.17±7.96 mg/kg, 25.61±17.10 mg/kg, 19.56±15.52 mg/kg and 16.88±14.82 mg/kg respectively, and should not be eaten too much.According to the World Health Organization Joint Expert Committee on Food Additives, the daily allowable intake of nitrite is 0.07mg/kg (body weight), it is recommended that Hohhot residents consume less than 300g of sausage meat products per day.

不同屠宰方式对蒙古羊应激及羊肉食用品质的影响

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摘 要：以内蒙古的蒙古羊为研究对象，对比分析抹脖子屠宰、掏心式屠宰及电击晕屠宰对蒙古羊应激及食用品质的影响。结果显示：经电击晕后屠宰肉羊血液中乳酸含量、皮质醇浓度、乳酸脱氢酶、肌酸激酶活性显著低于其他两种方式，肉羊在屠宰过程中应激反应也最小。相对抹脖子及掏心式屠宰两组，电击晕熟肉率较低，而嫩度高于抹脖子组且与掏心式组差异不显著，红色度（*a*）高于上述两组，且电击晕组 TBARS 值组中最低。从营养方面，电击晕及掏心式屠宰可提高羊肉中不饱和脂肪酸含量。因此，从肉羊屠宰食用品质及经济效益等方面，电击晕屠宰方式可以减小肉羊应激反应，提高肉羊屠宰企业的经济效益和符合动物福利屠宰要求。

Effects of different slaughter methods on stress and the edible quality of Mongolian sheep

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Abstract: Taking Mongolia sheep as the object of study, the effects of neck slaughter, heart-to-heart slaughter and electric shock stun slaughter on the stress and the edible quality of Mongolian sheep were compared and analyzed. The results showed that the blood indexes such as lactic acid content, cortisol concentration, lactate idehydrogenase and creatine kinase activity were significantly lower than the other two traditional slaughtering methods, and the stress response of sheep during slaughter was also the least. Compared with the two groups, the rate of cooked meat was lower. The tenderness was higher than the neck slaughter group and the difference was not significant with the heart-to-heart slaughter group, the redness (a) was higher, and the TBARS value was the lowest in the electric shock stun slaughter group. In terms of nutrition, electric

shock stun and coring slaughter can increase the content of unsaturated fatty acids in mutton.Therefore, from the aspects of the quality of meat sheep slaughtering and economic benefits, the shock stun slaughtering method can reduce the stress response of meat sheep, improve the economic benefits of meat sheep slaughtering enterprises and meet the requirements of animal welfare slaughtering.

益生菌对苏尼特羊血脂指标和羊肉品质的影响

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摘 要:本研究选取 24 只 3 月龄的苏尼特羊，分为对照组和乳酸菌组，每组 12 只，饲喂 3 个月后分别取背最长肌、股二头肌和血液作为研究材料，研究饲喂乳酸菌后两组肉品质及血液中脂肪酸组成、数量和血脂指标差异。结果如下：乳酸菌组中背最长肌的 pH_0 和 pH_{24} 显著低于对照组($P<0.05$)，而股二头肌的 pH_{24} 显著低于对照组($P<0.05$)；乳酸菌组中背最长肌和股二头肌的红度值(a*)显著高于对照组($P<0.05$)，而背最长肌的黄度值(b*)显著低于对照组($P<0.05$)。乳酸菌组中羊肉的剪切力显著低于对照组($P<0.05$)。乳酸菌组血液中低密度脂蛋白胆固醇、共轭亚油酸(CLA)含量显著低于对照组($P<0.05$)，n-3 系列多不饱和脂肪酸(n-3 PUFA)的含量显著高于对照组($P<0.05$)。因此，饲粮中添加乳酸菌后可增加肉的红度值，降低黄度值，提高了肉的嫩度，进而改善了羊肉品质。同时降低苏尼特羊血液中低密度脂蛋白胆固醇含量，增加血液中 n-3 系列多不饱和脂肪酸(n-3 PUFA)含量，有利于组织中 n-3 系列脂肪酸沉积。

Effect of probiotics on blood lipid index and mutton quality of Sunite sheep

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Abstract: In this study, 24 three-month-old Sunit sheep were selected and divided into control group and lactic acid bacteria group, with 12 sheep in each group. After 3

months of feeding them, we took the longissimus dorsi muscle, biceps femoris and blood as the research materials and investigated the meat quality and the differences in terms of fatty acid composition, quantity and blood lipid index between the two groups after they are feed food containing lactic acid bacteria. The results showed that the pH_0 and pH_{24} of longissimus dorsi in lactobacillus group were significantly lower than those in house control group ($P<0.05$), while the pH_{24} of biceps femoris was significantly lower than that in control group ($P<0.05$); the red value (a*) of longissimus dorsi and biceps femoris in Lactobacillus group was significantly higher than that of control group ($P<0.05$), while the Yellow value (b*) of longissimus dorsi was significantly lower than that of the control group ($P<0.05$). Shear stress of mutton in lactobacillus group was significantly lower than that in control group ($P<0.05$), which indicated that the tenderness of mutton in Lactobacillus group was better than that in control group. Low density lipoprotein cholesterol in blood of lactobacillus group was significantly lower than that of control group ($P<0.05$). The content of n-3 series polyunsaturated fatty acids (n-3 PUFA) in blood of Lactobacillus group was significantly higher than that of the feeding group($P<0.05$), and the content of conjugated linoleic acid (CLA) was significantly lower than that of the feeding group ($P<0.05$). In addition, Therefore, this study shows that it can increase the redness of the meat, reduce the yellowness of the meat; increase the tenderness of the meat, and thus improve the quality of the meet. Also it can reduce the content of low-density lipoprotein cholesterol in the blood of Sunit sheep, and it can also increase the content of n-3 series polyunsaturated fatty acids (n-3 PUFA) in the blood, which is beneficial for the deposition of n-3 series fatty acids in tissues.

复合发酵剂对发酵羊肉香肠脂质分解及风味组成的影响

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摘 要：本试验分为复合发酵剂肉葡萄球菌+木糖葡萄球菌（*S. carnosus* + *S. xylosus*，简称SS）组和清酒乳杆菌+木糖葡萄球菌+肉葡萄球菌（*L. sakei* + *S. xylosus* + *S. carnosus*，简称LSS）组，并以自然发酵为对照组（简称CO）。借助气质及气质联用仪测定香肠不同加工阶段脂肪酸组成、风味变化及脂质分解酶活性，旨在探究LSS、SS复合发酵剂对发酵羊肉香肠脂质分解及风味组成的影响。结果表明：通过添加LSS、SS复合发酵剂有助于提高成熟过程中性脂酶及磷脂酶的活性，显著抑制脂质过氧化（$P<0.05$）。中性脂酶及磷脂酶活性高表达，促进香肠中游离脂肪酸总量显著高于原料肉（$P<0.05$），添加LSS、SS复合发酵剂可促进香肠中饱和及多不饱和脂肪酸释放，提高产品营养价值。相比原料肉，通过添加LSS、SS复合发酵剂可提高香肠风味物质种类、提高特征风味（己醛、庚烯醛等）相对含量，改善发酵香肠风味感官。因此，添加LSS、SS复合发酵剂有助于提高发酵羊肉香肠营养价值及风味感官。

Complex Fermentation Agents on Lipid Decomposition and Flavor Composition of Mutton Sausage Fermented

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Abstract: The experiment was divided into three groups *S. carnosus* + *S. xylosus*（SS for short）, *L. sakei*+ *s. xylosus* + *s. carnosus* （LSS for short）and nature fermentation as the control group（CO for short）. The fatty acid composition, flavor change and lipid decomposition enzyme activity of sausage at different processing stages were determined by GC and GC-MS, in order to explore the effect of LSS and SS complex fermentation agents on lipid decomposition and flavor composition of mutton sausage fermented.The results showed that the addition of LSS and SS starter culture combination could improve the activity of neutral lipase and phospholipaseduring maturation and significantly inhibit lipid peroxidation ($P < 0.05$). The high expression of neutral lipase and phospholipase activity promoted the total amount of free fatty acids in sausage to be significantly higher than that in raw meat ($P < 0.05$). The addition

of LSS and SS complex starter can promote the release of saturated and polyunsaturated fatty acids in sausage and improve the nutritional value of the product. Compared with raw meat, by adding the LSS and SScomplex starter, the flavor substances and relative contents of characteristic flavors (hexanal, heptenaldehyde, etc.) were improved, and the flavor sense of fermented sausage was improved. Therefore, adding the LSS and SS complex starter helps to improve the nutritional value and flavor sense of fermented mutton sausage.

部位因素对苏尼特羊抗氧化系统的影响

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摘 要：以放牧条件下的苏尼特羊臂三头肌和背最长肌两个部位的肌肉为材料，测定其丙二醛(malondialdehyde MDA)、氧合肌红蛋白（oxymyoglobin OMb）、高铁肌红蛋白（metmyoglobin MMb）含量、抗氧化酶活性（超氧化物歧化酶 superoxide dismutase SOD；过氧化氢酶 catalase CAT；谷胱甘肽过氧化物酶 glutathione peroxidase GSH-Px）、抗氧化能力（降铜离子还原能力 cupric reducing antioxidant capacity CUPRAC；自由基清除率 radical scavenging ability RSA）等指标比较分析不同部位之间的差异。结果表明：抗氧化酶和抗氧化性能中，臂三头肌的 SOD 与 GSH-Px 活性较高，而背最长肌中的 CAT 活性、CUPRAC 和 RSA 较高。背最长肌的 MDA 显著低于臂三头肌（$P<0.05$）。苏尼特羊肌肉中的抗氧化酶之间具有协同作用，且抗氧化酶活力的增强能相应提高机体抗氧化性能，降低氧化程度。整体上，苏尼特羊背最长肌中抗氧化物质含量较高，脂质氧化程度低于臂三头肌，抗氧化能力较强。

Effects of Positions factors on the antioxidant system of Sunite sheep

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Abstract: The malondialdehyde (MDA), oxymyoglobin(OMb), metmyoglobin(MMb), antioxidant enzymes activity(superoxide dismutase SOD; catalase CAT; glutathione

peroxidase GSH-Px) and antioxidant ability(cupric reducing antioxidant capacity CUPRAC; radical scavenging ability RSA)were determined to analyze the difference of antioxidant system in triceps brachii muscle (TB)and longissimus dorsi muscles (LD) from Sunit sheep. The results showed that The SOD and CAT in TB were highest, while the CAT, CUPRAC, RSA in LD was highest. The MDA in LD was significantly lower than TB ($P<0.05$). The antioxidant enzymes in the muscles of Sunit sheep have synergistic effects, and the enhancement of antioxidant enzyme activity will improve the antioxidant ability and reduce the oxidation degree. Overall, the antioxidant substances content , the ability to remove free radicalsin and CAT in LD were highest; lipid oxidation degree was lower than TB. Consequently, the LD has higher antioxidant ability than TB.

羊骨多肽的超滤分离及其活性研究

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摘 要：多肽是羊骨蛋白的主要酶解产物，本文研究了不同分子量范围的羊骨多肽的抗氧化、降血压和降胆固醇作用的活性差异。羊骨多肽溶液分别用截留分子量为 10 kd 和 3 kd 的超滤膜进行超滤,得到分子量 10 kd 以上、3 kd~10 kd 和 3 kd 以下的 3 个组分，对各组分进行活性测定。以同浓度的抗坏血酸为对照，评价多肽溶液的抗氧化活性(1，1-二苯基-2-三硝基苯肼（DPPH）自由基清除率、超氧阴离子自由基（$O_2^-\cdot$）清除率、羟自由基（·OH）清除率)；并对多肽溶液的降血压活性和降胆固醇活性进行测定。结果表明:分子量在 3 kd 以下的组分抗氧化活性、降血压活性和降胆固醇活性显著高于其他组分（$P<0.05$），DPPH 自由基清除率、超氧阴离子自由基（$O_2^-\cdot$）清除率、羟自由基（·OH）清除率均达到 60%以上，降血压活性为 43%，降胆固醇活性高达 88%。羊骨蛋白可制备高生物活性的肽类物质。

Ultrafiltration Separation and Activity of Sheep Bone Polypeptide

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Abstract: Polypeptide is the main enzymatic product of sheep bone protein. In this paper, the activity of anti-oxidation, blood pressure lowering and cholesterol-lowering effects of sheep bone polypeptides with different molecular weight ranges were studied.The sheep bone polypeptide solution was ultrafiltrated by ultrafiltration membrane with molecular weight of 10 kd and 3 kd respectively. Three components with molecular weight of above 10 kd, 3 kd ~ 10 kd and below 3 kd were obtained. The activity of each component was determined. Ascorbic acid（VC） with the same concentration as polypeptide was used as the control to evaluate the antioxidant activity of the polypeptide through measuring 1， 1 — diphenyl — 2 — trinitrophenol hydrazine(DPPH)radical，superoxide radical scavenging rate and hydroxyl radical.The antihypertensive activity and cholesterol lowering activity of polypeptide solution were determined.The results showed that the antioxidant activity, antihypertensive activity and cholesterol lowering activity of the components with molecular weight below 3 kd were significantly higher than those of the other components ($P < 0.05$). 1，1—diphenyl — 2 — trinitrophenol hydrazine(DPPH)radical clearance rate， superoxide radical scavenging rate and hydroxyl radical scavenging rate reached more than 60%,the antihypertensive activity was 43%,The scavenging rate of hydroxyl radical (·OH), superoxide anion radical (O_2^-·) and DPPH radical were all over 60%, the antihypertensive activity was 43%, and the cholesterol lowering activity was as high as 88%.Sheep bone protein can produce highly biologically active peptides.

棕色脂肪功能特性对肉品品质的影响

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摘 要：棕色脂肪组织是存在于哺乳动物体内的一种“消耗能量”的特殊脂肪，通过位于其线粒体内膜上 UCP1（uncoupling protein 1）的解偶联作用促进糖脂代谢，改善能量平衡。棕色脂肪功能特性虽已在治疗代谢型疾病方向有深入研究，但对肉品品质的影响研究还处于初期阶段。本文综述了棕色脂肪分化来源、功能特性及激活因素，阐述了棕色脂肪与畜肉肌内脂肪、脂肪酸组成和瘦肉率的关系，为饲养调控家畜生长改善肉品质提供科学参考。

The effect of brown fat functional characteristics on meat quality

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Abstract: Brown adipose tissue is a kind of special fat that "consumes energy" in mammalian body. Through uncoupling UCP1 (uncoupling protein 1) located on the inner membrane of mitochondria, it can promote glycolipid metabolism and improve energy balance. Although the functional characteristics of brown fat have been deeply studied in the treatment of metabolic diseases, the research on the effect of brown fat on meat quality is still in the initial stage. In this paper, the origin, functional characteristics and activating factors of brown fat differentiation were reviewed, and the relationship between brown fat and intramuscular fat, fatty acid composition and lean meat rate of livestock was expounded, which could provide scientific reference for raising and regulating livestock growth and improving meat quality.

巴尔虎羊、短尾羊与杜湖羊屠宰性能、肉用品质和营养成分的比较分析

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摘 要：选择 5 月龄体重相近（30.58±3.34kg）的圈养巴尔虎羊、短尾羊与杜湖羊公羊（n=10）为试验材料，通过测定其屠宰性能，背最长肌、臂三头肌与股二头肌的食用品质与营养成分，研究不同品种肉羊品质的差异。结果表明：杜湖羊的屠宰率和净肉率、背最长肌的红度值（a^*）和灰分含量、背最长肌和臂三头肌的脂肪含量显著大于巴尔虎羊（$p<0.05$），巴尔虎羊背最长肌的嫩度和灰分含量、臂三头肌的蒸煮损失率显著大于短尾羊（$p<0.05$），杜湖羊背最长肌的糖原含量显著大于其他两个品种（$p<0.05$），胴体深反之（$p<0.05$），短尾羊三个肌肉部位的亮度值（L^*），背最长肌与股二头肌的黄度值（b^*）和不饱和脂肪酸所占比例分别显著小于其他两个品种（$p<0.05$），特别是 α-亚麻酸、花生四烯酸（Arachidonic acid;ARA）、二十碳五烯酸(Eocosapentaenoic Acid;EPA)、二十二碳五烯酸(Docosapentaenoic Acid;DPA)和二十二碳六烯(Docosahexaenoic Aciad;DHA)的含量。综上所述，三个品种肉羊在屠宰性能、肉用品质和营养成分方面各有优劣，即杜湖羊的产肉性能和肌肉色泽较好，肌内脂肪和肌糖原含量较高；短尾羊肌肉蒸煮损失较低，而不饱和脂肪酸所占比例较高；巴尔虎羊肌肉的嫩度较好，但矿物质含量较低。

Comparative analysis of Slaughter Performance, Eating Quality and Nutrition of Baerhu Sheep, Short Fat-tailed Sheep and Dorper×Hu Sheep

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Abstract: 5 months old Baerhu sheep(BS),Short fat-tailed sheep(SS) and Dorper×Hu sheep(DS)(n=10) with similar body weight (30.58+3.34 kg) in captivity were compared by testing slaughter performance,eating quality and nutrition of longissimus

dorsi(L),triceps brachii (T) and biceps femoris(B) to study the difference of the three breeds of sheep.The results showed that carcass yield,meat percentage,redness value(a*) and ash content of L,intramuscular fat(IMF) in L and T of DS were significantly higher than those of BS($p<0.05$);Tenderness and ash content of L,cooking loss of T of BS were significantly higher than those of SS($p<0.05$);Glycogen content of L of DS was significantly higher than those of the other two breeds,while carcass depth of it was significantly lower than that of other two breeds($p<0.05$);Respectively,brightness value(L*) of the three muscle tissue sites,yellowness value(b*) and the proportion of unsaturated fatty acids of L and B of SS were significantly lower than those of other two breeds($p<0.05$),especially in α-linolenic acid,ARA,EPA,DPA and DHA.In conclusion,the three breeds of sheep have their own advantages and disadvantage on slaughter performance,eating quality and nutrition,namely,DS has better meat production performance and muscle color,higher IMF and glycogen content,while SS has lower cooking loss,but higher proportion of unsaturated fatty acid and BS has better tenderness,but lower mineral content.

成熟时间对发酵羊肉香肠理化品质及特征风味形成的影响

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摘 要：通过添加清酒乳杆菌及木糖葡萄球菌的复合发酵剂制作发酵羊肉香肠，探究不同成熟时间（0、3、4、5、6 d ）对羊肉香肠食用品质及风味变化规律的影响，利用气质及气质联用仪从发酵羊肉香肠的食用品质及感官方面评定发酵羊肉香肠最佳成熟时间。结果表明：随成熟时间的延长，香肠 pH 值、水分活度（Aw）显著（$P<0.05$）下降，Aw 与失重率呈显著负相关；成熟 3-4 d 乳酸菌及葡萄球菌是香肠中的主要优势菌群，显著抑制肠杆菌的生长繁殖，致使香肠中肠杆菌数量显著低于 1000 CFU/g；成熟 3-4 d 香肠的红度值达到最大；香肠中游离脂肪酸及风味含量呈先上升后下降 趋势，成熟 3-4 d 脂肪酸、风味物质的种类及含量显著高于其他时间（ $P<0.05$）。综上表明：成熟 3-4 d 发酵羊肉香肠感官品质及营养组成优于其他时间。

Effect of ripening time on physicochemical quality and characteristic flavor formation of fermented mutton sausage

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Abstract: Fermented mutton sausage was prepared by adding a composite starter of Lactobacillus sakei and Staphylococcus aureus, and the effects of different ripening time (0, 3, 4, 5, 6 d) on the eating quality and flavor of mutton sausage were explored, and the temperament and the GC/MS measures the best ripening time of the fermented mutton sausage from the edible quality and sensory aspects of the fermented mutton sausage. The results showed that the pH value and water activity (Aw) of the sausage decreased significantly ($P < 0.05$), and Aw was significantly negatively correlated with the weight loss rate. At 3-4 d, lactic acid bacteria and staphylococcus were the dominant bacteria, which significantly inhibited the growth and reproduction of Enterobacter, which resulted in the number of Enterobacteriaceae in sausages being significantly lower than 1000 CFU/g; the redness value of mature 3-4 d sausages was the highest; the free fatty acids and flavor content in sausages increased first. The decline trend, the type and content of fatty acids and flavors in mature 3-4 d were significantly higher than other time ($P<0.05$). In summary, the sensory quality and nutritional composition of the fermented mutton sausages during 3-4 d were better than other times.

饲料中添加甘露醇对肉兔生长及其肉品质的影响

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摘 要：本研究是通过在新西兰白兔的饲粮中添加不同水平的甘露醇探究其对新西兰白兔生长性能、血液指标及肉品质的影响，并与饲用性抗生素喹乙醇进行了对比，旨在确定甘露醇的最适添加量在肉兔饲养上替代饲用性抗生素的可能性。结果表明：(1)高剂量组与对照组相比显著提升肉兔的活体重量和促进器官的发育，高剂量组肉兔的体重达到 1431.51±3.50g。其中肝脏、肾脏和脾脏的重量分

别为 42.66±0.88g、10.6±0.21g 和 0.78±0.05g,均显著高于对照组（P＜0.05)。(2)饲料中添加高剂量的甘露醇不仅可以显著提高血液中 IgA、IgM、IgG 和 NO 的含量，还能有效降低血液中 TC 的含量。高剂量组肉兔的血清中 IgA、IgM 和 IgG 的含量分别为 0.88±0.07g/L 和 0.61±0.05g/L 和 9.15±0.13gL；高剂量组 NO 的含量为 56.24±6.67umol/L;高剂量组 TC 的含量显著低于对照组；低剂量组肉兔血清中 IL-4 含量要显著高于对照组(P＜0.05)。(3)饲料中添加甘露醇可以改善肉兔肉常规营养成分和肌肉品质，高剂量组达到的效果最好，该组肉兔肌肉中蛋白质、水分、脂肪和灰分的含量平均值分别为 20.04%、76.43%、2.02%和 1.21%；其中高剂量组肉兔的背最长肌水分含量显著高于对照组(P＜0.05)；高剂量组肉兔背最长肌 a*为 2.05±0.25,背最长肌和腿肌的系水力分别达到 79.87±1.10%和 78.83±1.01%，背最长肌和腿肌硬度分别为 3597.91±96.90 和 3768.33±86.56，与对照组相比均有显著差异(P＜0.05)。(4)通过对饲料和肉兔肌肉中四环素类抗生素和喹乙醇代谢物的定性检测，结果表明基础饲料中均不存在四环素类抗生素和喹乙醇；肌肉中虽检测出四环素类抗生素，但其含量均低于检出限，该结果进一步说明甘露醇对肉兔生长及其肉品质的改善有着重要的作用。

Effects of Mannitol on Growth and Meat Quality of Meat Rabbits

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Abstract: In this study, compared with the feeding antibiotic quinolone,adding different levels of mannitol into the diet of meat rabbits, the effects of mannitol on growth performance, blood index and meat quality of meat rabbits. In order to determine the possibility of replacing feeding antibiotics with mannitol in the feeding of meat rabbits. The results showed that: (1) The high dose mannitol to the diet can significantly promote the growth of body weight and organ development of meat rabbits. The body weight of meat rabbits in this group reached 1431.51±3.50g; The weight of liver, kidney and spleen of meat rabbits in high dose group were 42.66±0.88g, 10.6±0.21g and 0.78±0.05g, respectively. (2) The high dose of mannitol in feed can not only significantly increase the contents of IgA, IgM, IgG and NO in blood, but also

effectively reduce the TC content in blood. The serum levels of IgA, IgM and IgG in high dose group meat rabbits were 0.88±0.07g/L, 0.61±0.05g/L, 9.15±0.13g/L, respectively. The high dose group had NO content of 56.24±6.67 umol/L, respectively. While the low dose group of rabbits serum IL-4 content was significantly higher than those in control group. (P<0.05). (3) Adding mannitol to the feed can improve the routine nutrient composition of meat rabbits. The average contents of protein, water, fat and ash in muscle of rabbits in high dose group were 20.04%,76.43%,2.02% and 1.21%,respectively. The longissimus dorsi muscle of meat rabbits in high dose group was significantly higher than that of control group (P<0.05).(4) Adding mannitol to the feed could improve the muscle quality of meat rabbit. the high dose group of rabbit has the most significant improvement in muscle quality, the longissimus dorsi muscle a* of meat rabbits was 2.05±0.25; the hydraulics of longissimus dorsi muscle and leg muscle were 79.87±1.10% and 78.83±1.01%, respectively; the stiffness of longissimus dorsi muscle and leg muscle were 3597.91±96.90 and 3768.33±86.56, respectively. (5) Qualitative detection of tetracycline antibiotics and quinolone in feed and muscle of meat rabbits, the results showed that there were no tetracycline antibiotics and quinolone in basic feed, and the content of tetracycline antibiotics in meat was low. The results indicated that mannitol could promote the growth and meat quality of meat rabbits, but had nothing to do with other antibiotics.

复合发酵剂和香辛料对发酵香肠中生物胺形成的抑制作用

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摘 要：本文研究复合发酵剂和香辛料对发酵香肠加工过程中生物胺形成的抑制作用，以及对发酵香肠理化指标和微生物指标的影响。利用复合发酵剂和香辛料制作发酵羊肉香肠，分为对照组、发酵剂组、沙葱+孜然组和沙葱+孜然+发酵剂组。结果表明，复合发酵剂和香辛料共同作用下效果最好，可以有效抑制生物胺（色胺、苯乙胺、腐胺、尸胺、组胺、酪胺）的积累（P＜0.05），促进发酵香肠 pH 和水分活度的降低，减少脂肪氧化产物硫代巴比妥酸值（thiobarbituric

acid,TBA）和菌落总数的生长（P＜0.05），提高葡萄球菌和乳酸菌数的生长，改善产品品质。

Inhibition of Compound Fermentation Agents and Spices on Biogenic Amines Formation in Fermented Sausage

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Abstract: In this study fermented mutton sausage was made with compound starter and spices. It was divided into control group, starter group, Allium mongolicum Regel + cumin group and Allium mongolicum Regel + cumin + starter group. The inhibitory effect of compound starter and spices on biogenic amines formation in fermented sausage processing and the effects on physicochemical and microbial indexes of fermented sausage were studied. The results showed that compound starter and spices had the best effect, which could effectively inhibit the accumulation of biogenic amines (tryptamine, phenylethylamine, putrescine, cadaverine, histamine and tyramine) (P<0.05), promote the decrease of pH and water activity of fermented sausage, reduce the growth of thiobarbituric acid value and total bacterial count of lipid oxidation products (P<0.05), improve the growth of Staphylococcus and Lactobacillus, and improve product quality.

食源性金属螯合肽的生物活性及研究现状

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摘 要：矿物质元素缺乏可引起多种疾病，造成严重的机体功能失调。从健康及饮食偏好角度考虑，食源性矿物质元素补充剂更易被人们所接受，成为近年研究的热点。食源性螯合肽是潜在的能够促进矿物质元素生物利用度的功能成分，具有良好的开发应用前景。本文综述了目前国内外对肽-金属离子螯合物的制备工艺、

分离纯化方法、螯合物的生物活性及其构效关系的研究现状，并对肽-金属离子螯合物的发展前景进行了展望。

Biological Activity and Research Status of Food borne Metal Chelate Peptides

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Abstract: The lack of mineral elements in the diet can cause a variety of diseases, resulting in serious dysfunction of the body. From the perspective of health and dietary preferences, food-source mineral element supplements are more acceptable to people and become a hot spot in recent years. Food-borne chelated peptides are potential functional components that promote the bioavailability of mineral elements and have good prospects for development and application. In this paper, the preparation of peptide-metal ion chelate, the separation and purification methods, the bioactivity of chelate and its structure-activity relationship are reviewed. The development prospects of peptide-metal ion chelate are also discussed.

超声波对冻融羊肉糜凝胶特性的影响

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摘 要：本文旨在探究超声波辅助冻结对冻融羊肉糜凝胶特性的影响。论文以空气冷冻处理（-18℃）的羊肉糜为对照组，以超声波辅助处理后冷冻（-18℃）的羊肉糜为试验组，进行 0、1、3、5、7、9 次冻融处理。超声条件如下：功率 300W；超声处理 10s，间歇 10s；共操作 5min。研究结果表明，羊肉糜的硬度、弹性、内聚性、胶着度、咀嚼性、回复性无显著变化（p＞0.05）；在冻融 3 次时，对照组表面疏水性由 89.76ug 增加至 92.93ug（p＜0.05），蒸煮损失由 15.84%增加到 22.33%（p＜0.05），汁液流失率 6.70%增加至 12.41%（p＜0.05），而试验组表面疏水性增加至 93.40ug（p＜0.05），蒸煮损失增加至 20.06%（p＜0.05），汁液流

失率增加至 11.14%（p＜0.05），超声波处理可降低冻融羊肉糜的汁液流失，这可能是由于超声波提高了羊肉糜冷冻过程的冻结速率，形成的冰晶细小，对肌肉细胞的机械损伤较小；冻融 3 次后，羊肉糜的表面疏水性、蒸煮损失、汁液流失率降低（p＜0.05），实验组与对照组间差异不显著（p＞0.05），这可能是冰晶使细胞膜已经完全破坏，肌肉细胞中水分流失趋于饱和，且超声波对蛋白质的结构有破坏作用，此时超声波对冻融羊肉糜的修复作用较弱。

Effect of Ultrasound on the Gel Properties of Frozen-thaw Mutton Batters

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Abstract：This paper aims to investigate the effect of ultrasonic assisted freezing on the gel properties of freeze-thaw mutton batters. The paper used air-frozen (-18 °C) mutton batters as the control group, and ultrasonic-assisted treatment of frozen (-18°C) mutton batters as the experimental group, the two groups were subjected to 0, 1, 3, 5, 7, and 9 freeze-thaw cycles. The ultrasonic conditions were as follows: power 300 W; sonication for 10 s, intermittent 10 s; total operation for 5 min. The results showed that there was no significant change in hardness, elasticity, cohesiveness, gelation, chewiness and recovery of mutton batters (p>0.05). When frozen and thawed three times, the surface hydrophobicity of the control group increased from 89.76ug to 92.93ug (p<0.05), the cooking loss increased from 15.84% to 22.33% (p<0.05), the juice loss rate increased from 6.33% to 11.14% (p<0.05), The surface hydrophobicity of the test group increased to 93.40ug (p<0.05), the cooking loss increased to 20.06% (p<0.05), and the juice loss rate increased to 12.41% (p<0.05). Ultrasonic treatment can reduce the juice loss of freeze-thaw mutton batters, This may be because ultrasonic wave increases the freezing rate of the mutton batters, and the ice crystals formed are small, the mechanical damage to muscle cells is small.; After freezing and thawing for 3 times, the surface hydrophobicity, cooking loss and juice loss of mutton batters was

decreased ($p<0.05$), and the difference between the experimental group and the control group was not significant ($p>0.05$). This may be the complete destruction of the cell membrane by ice crystals, the water loss in muscle cells tends to be saturated, the ultrasonic has a destructive effect on the structure of protein, at this time, the ultrasonic repair effect on the freeze-thaw mutton batters is weak.

海藻糖对冷鲜肉的保鲜作用

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摘 要：采用真空包装和添加海藻糖相结合的方式，研究海藻糖对冷鲜肉的保鲜作用。测定了运用于真空包装过程中的尼龙/聚乙烯（PA/PE）复合膜的阻隔性，结果显示复合膜的阻氧性和阻湿性随湿度的增加而降低。单纯使用 PA/PE 包材对冷鲜肉进行包装，保质期只有 9 天。并且在试验结束时，肉的色泽较差。用海藻糖配制成不同浓度的保鲜液同真空包装相结合，运用于冷鲜肉的保鲜，测定贮藏期间菌落总数、挥发性盐基氮，pH、高铁肌红蛋白、感官评定等指标，得出保鲜效果 4%＞6%＞8%＞2%＞空白对照；分别达到 23、21、19、15、9 天；4%组的保鲜效果最佳。说明保鲜效果不会随着保鲜液浓度增大而提高。以 1%的醋酸为溶剂溶解海藻糖配制成不同浓度的复合保鲜液，运用于冷鲜肉的保鲜，并测定各项指标的变化。测定结果显示，复合保鲜液 6%s 组最好，保质期长达 25 天，保鲜效果优于空白对照组。综上，海藻糖对冷鲜肉具有较好的保鲜作用；海藻糖浓度为 4%组的保质期达到 23 天，海藻糖复合保鲜液浓度为 6%s 组的保质期达到 25 天。由于复合保鲜液中的醋酸具有一定的气味，从感官评定等综合考虑，在冷鲜肉的贮藏期间可以选择浓度为 4%组的海藻糖溶液为保鲜液。

The Effect of Trehalose in the Preservation of Chilled Meat

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Abstract: To begin with, barrier property of nylon/polyethylene composite membrane

(PA/PE) was tested. Results show that oxygen barrier property and water vapor barrier property decreased with increasing humidity. Chilled meat packaged with PA/PE has a shelf life of only 9 days, and the color of the chilled meat is very poor at the end of the experiment.Secondly, combined with vacuum packaging, different concentrations of trehalose preservation solution was used in chilled meat packaging. During storage, total bacterial counts, total volatile basic nitrogen value (TVB-N), pH, high ironmyoglobin, and sensory functions were tested as an indicator to study the changes in the quality of chilled meat after the treating with different concentration trehalose solution. Results showed that the preservation effect of different concentrations of trehalose preservation solution was different, 4%＞6%＞8%＞2%＞ blank group, and they have a shelf life of 23, 21, 19, 15, 9days respectively. Optimal preservation effect of chilled meat was treated with 4% trehalose preservation solution，it could extend the shelf life of chilled meat to 23 days. And the preservation effect was independent of trehalose concentration.Trehalose has good preservation effect on chilled meat. Chilled meat treated with 4% trehalose preservation solution has a shelf life of 23 days while treated with 6% Compound preservation solution has a shelf life of 25 days. But due to acetate's bad smell, 4% trehalose preservation solution should be chosen for chilled meat preservation.

不同发酵剂对肉干中风味和亚硝酸盐、亚硝胺的影响

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摘 要：通过接种天然乳清和复合发酵剂，以自然发酵为对照，复合发酵剂组（木糖葡萄球菌、肉葡萄球菌、戊糖片球菌和植物乳杆菌比为 1:1:2:1）、乳清组、乳清+发酵剂组。探究不同发酵剂对发酵羊肉干挥发性风味物质形成与亚硝酸盐和亚硝胺残留量的影响。结果表明：乳清+发酵剂组肉干检测出 22 种风味物质，高于对照组 21 种；其风味物质的相对含量也显著高于对照组和乳清组；乳清组的亚硝酸盐含量（1.86 mg/kg）、亚硝胺含量（110.61 ug/kg） 显著低于其它三组（p＜0.05）；亚硝酸盐的存在会产生部分醇类（如 1-辛烯 - 3 - 醇、沉香醇），但其

会抑制醛类物质的产生，对酮类及其他物质影响较小。因此乳清的使用可降低肉干中的亚硝酸盐和亚硝胺残留量，提高肉干的安全性和风味感官品质。

Effect of Different Artificial Starter Cultures on Nitrite, Nitrosamine Residue and Flavor Formation in Mutton Jerky

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Abstract: By inoculating whey and compound fermentation(Staphylococcus xylose, *Staphylococcus aureus*, *Pediococcus pentosaceus* and *Lactobacillus plantarum* ratio: 1:1:2:1), the experiment was divided into compound fermentation group, a whey group, whey + starter group, and control by natural fermentation， the effect of different starter cultures on nitrite, nitrosamine residue and flavor formation in mutton jerky was explored. The results showed that the nitrite content (1.86 mg/kg) and nitrosamine content (110.61 ug/kg) in the whey group were significantly lower than the other three groups (p<0.05), indicating that whey can reduce the residue of nitrite and nitrosamine; Totally 22 kinds of flavor substances were detected in the whey + starter group， which were higher than 21kinds in the control group； the relative content of the flavor substances was also significantly higher than that of the control group and the whey group;The presence of nitrite produces some alcohols (such as 1-octene-3-ol, linalool), but it inhibits the production of aldehydes and has less effect on ketones and other substances. Therefore, whey can reduce the residual amount of nitrite and nitrosamine in jerky, and improve the safety and flavor sensory quality of jerky.

发酵羊肉香肠优势菌群与生物胺形成代谢的相关性研究

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摘 要：近年来，发酵羊肉香肠在成为羊肉加工制品研究新热点的同时，食品安全和质量也逐渐变成了世界各地消费者和卫生机构关注的主要问题之一。本文综述了发酵羊肉香肠微生物菌群结构的研究进展，将发酵羊肉香肠中的微生物群落构成与生物胺分析有机地结合起来，通过体外模拟消化可以明确发酵过程中微生物对最终代谢产物生成的影响。以期为发酵羊肉香肠的安全性调控提供理论基础，提高传统羊肉香肠的食用安全性。

Correlation between the dominant bacteria of fermented mutton sausage and the metabolism of biogenic amines

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Abstract：In recent years, fermented mutton sausage has become a new hot spot in the research of mutton processed products, and food safety and quality have gradually become one of the major concerns of consumers and health institutions around the world. In this paper, the research progress of microbial flora structure of fermented mutton sausage was reviewed. The microbial community composition in fermented mutton sausage was organically combined with biogenic amine analysis. The effect of microbial on the final metabolite production during fermentation was clarified by in vitro simulated digestion. In order to provide a theoretical basis for the safety regulation of fermented mutton sausage, improve the food safety of traditional mutton sausage.

2.乳制品专题

加热酸凝奶豆腐加工工艺及其品质改进研究

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摘 要：本文在加热酸凝奶豆腐传统工艺基础上，以添加酸乳与鲜奶的混合比例、添加酸乳 pH 值、加热温度分别对感官评定、凝乳效果、出品率的影响，进行单因素试验。在此基础上，通过三因素三水平正交试验，确定加热酸凝奶豆腐的最佳工艺。同时对不同包装方法和贮藏温度对产品品质的影响进行了探讨。研究结果如下:（1）以加热酸凝奶豆腐出品率和感官评分为指标，以酸乳与鲜奶混合比例、酸乳 pH 值和加热温度为变量的单因素试验结果表明，最佳酸乳与鲜奶混合比例范围为 1:3～1:5，最佳酸乳 pH 值范围为 3. 2～3.8，最佳加热温度范围为 80～90℃、保温 5 min.（2）通过对加热酸凝奶豆腐正交试验结果的分析得知，各因素对出品率影响的主次顺序为:加热温度>酸乳 pH 值>混合比例，最佳组合为 $A_3B_2C_3$,即酸乳与鲜奶混合比例 1:5，酸乳 pH 值 3.5，加热温度为 90℃，保温 5 min。（3）通过对加热酸凝奶豆腐正交试验结果的分析得知，各因素对感官评分影响的主次顺序为: pH 值>混合比例>加热温度，最佳组合为 $A_2B_3C_3$，即酸乳与鲜奶混合比例 1:4，酸乳 pH 值 3.8，加热温度为 90 C，保温 5 min。综合试验结果来看，加热酸凝奶豆腐出品率在酸乳和鲜奶的混合乳 pH 值 5.3～5.7,加热温度 90℃时产品出品率较高。而在较高的出品率下酸乳 pH 值为 3.5 时，其感官评分最高，可达到 87.49±3.46。（4）经工艺改进后，加热酸凝奶豆腐出品率、营养成分、微生物指标、感官评分指标及消费者问卷调查结果，比工艺改进前的奶豆腐出品率提高了 17.58%， 感官评分提高了 18. 92%。通过消费者问卷调查，改进后工艺消费者色泽满意度、口感满意度、购买意向分别达到 48.2%、53.6%、55. 3%。(5)从不同包装方法、贮存条件对加热酸凝奶豆腐品质的影响结果得知，加热酸凝奶豆腐在真空包装后进行冷藏条件贮藏时，其保质期可达 30d 以上，并且感官评分降低小。但在普通条件下贮藏时只能保质 7～10 d。

Study on Processing Technology and Quality Improvement of Heat-Acid Precipitated Cheese

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Abstract: In this paper, based on the traditional process of Heat-Acid Precipiated Cheese,adding the mixing ratio of yogurt and fresh milk, adding pH value of yogurt and heatingtemperature to sensory evaluation, curd effect and yogurt and heating temperature to sensory evaluation,curd effect and yield rate,based on the single factor experiment,through the three-factor three-level orthogonal test,the best process for heating the Acid Precipitated Cheese is determined.At the same time,the effects of different packaging methods and storage temperature on product quality were discussed.The research results are as follows: (1)The results of single factor test with the ratio of yoghurt to fresh milk, pH value of yogurt and heating temperature were taken as the index of Heat-Acid Precipitated Cheese yield and sensory score.The optimal ratio of yogurt to fresh milk was 1:3～1:5,the optimal yogurt pH range is 3.2～3.8, the optimal heating temperature range is 80～90℃, and the heat preservation is 5 min. (2) Through the range analysis and variance analysis of the orthogonal test results of Heat-Acid Precipitated Cheese.the order of influence of each factor on the yield rate is: heating temperature ＞pH value of the yogurt＞mixing ratio,the best combination is $A_3B_2C_3$,That is,the ratio of yoghurt to fresh milk is 3.5,the heating temperature is 90℃, and the temperature is kept for 5min. (3) Through the range analysis and variancc analysis of the orthogonal test results of Heat-Acid Precipitated Cheese,the order of influence of each factor on sensory score ： $A_2B_3C_3$.The ratio of milk to fresh milk is 1:4,the pH value of yogurt is 3.8,and the heating temperature is 90℃.According to the verification test results, the yield of Heat-Acid Pecipiated Cheese is 5.3-5.7 in yogurt and fresh milk mixing rate, and the product yield is higher when the heating temperature is 90℃. At a higher yield, the pH of the yogurt was 3.5, and the sensory score was the highest, reaching 87.49±3.46. (4)After the improvement of the process,the yield,nutrient composition,microbial index,sensory score index and consumer questionnaire of the acid curd milk tofu were improved, the Precipitated Cheese production rate was 17.58% higher than that before the process improvement,and the sensory score was increased by 18.92%.Through the consumer questionnaire survey,the

improved process consumer color satisfaction,taste satisfaction, and purchase intention reached 48.2%, 53.6%, 55.3%, respectively. (5) From the influence of different packaging methods and storage conditions on the quality of Heat-Acid Precipitated Cheese, it is known that when the acidified Precipitated Cheese is stored in a refrigerator condition after vacuum packaging, the shelf life can be more than 30 days, and the sensory score is reduced less. However, it can only be 7 to 10 days when stored under normal conditions.

贮藏期发酵剂对发酵乳流变特性的影响

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摘 要: 以六种不同发酵剂制备的发酵乳为研究对象，采用流变仪，对样品的表观粘度、滞后环面积、粘滞性及弹性模量等参数进行测定，分析研究贮藏期发酵剂对发酵乳流变特性的影响。结果表明: 6 种发酵乳均随剪切时间的延长而变稀，且属于粘弹性流体。贮存至 18 d 时，样品 3 和 4 表观粘度值较其余四种样品高，分别为 0.202 Pa·s 和 0.229 Pa·s 而且在受力时的稳定性较好，滞后环面积分别为 8340 (Pa·r) /min 和 4335 (Pa·r) /min。

Effect of culture on the rheological properties of fermented milk during refrigeration

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Abstract: In order to study the rheological properties of fermented milk during the storage period, a rheometer was used to measure the apparent viscosity, hysteresis loop area，viscosity and elasticity modulus of samples fermented by six different cultures. The results showed that all six kinds of fermented milk became thinner with

shear time lengthened and were viscoelastic fluid. Sample 3 and 4 not only had higher apparent viscosity also better stability on 18 th day.The apparent viscosity were 0.202 and 0.229 Pa(s，respectively，and hysteresis loop area were 8340 and 4335 (Pa·r) /min.

酸马奶乳清饮料的开发研究

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摘 要：酸马奶乳清饮料是以酸马奶、白砂糖、水等为主要原料，经调配，杀菌，包装等工艺制成的具有蒙古族特色的含乳饮料。本文通过对酸马奶乳清饮料的原料配比进行单因素和正交试验，选出最优配方，并对酸马奶乳清饮料的理化、功能特性进行检测与分析，同时观察酸马奶乳清饮料在贮藏期间各项指标的变化情况。主要结果如下：（1）通过酸马奶乳清饮料的原料选择单因素和正交试验，获得的最佳配方为：酸马奶乳清的添加量为 20%，白砂糖的添加量为 6%，CMC-Na 的添加量为 0.3%，蔗糖酯的添加量为 0.02%，柠檬酸钠的添加量为 0.04%，低聚异麦芽糖的 3%，乳清蛋白粉的添加量为 2%，其余部分为无菌水。（2）酸马奶乳清饮料的蛋白含量 1.13±0.00%，脂肪含量为 0.36±0.02%，pH 值和滴定酸度分别为 4.14±0.00 和 25.00±0.01°T，能量值为 83.53±0.74KJ/100g。酸马奶乳清饮料的能量较低，较适合控制体重的人群饮用。酸马奶乳清饮料的表观黏度较稳定，在第 12s 和第 120s 时分别为 0.00526Pa.s 和 0.00561 Pa.s。从酸马奶、酸马奶乳清饮料，市售卡尔皮斯饮料对比可得出，差异最大的是酸味，其次是甜味和咸味。（3）酸马奶乳清饮料中共检测出 16 种氨基酸，氨基酸的总含量为 0.28%。其中检测出 9 种必需氨基酸，总含量为 0.14%。酸马奶乳清饮料中共检测出 24 种脂肪酸，总含量为 100%，其中不饱和脂肪酸含量占总含量的 34.14%。（4）酸马奶乳清饮料具有一定的抗氧化性、降胆固醇能力以及降解亚硝酸盐的能力。在浓度为 10 mg/mL 时，DPPH 清除率为 9.6±0.33%，还原活性为 0.27±0.01%，羟自由基清除率为 49.03±1.00%，对超氧阴离子清除能力为 22.36±1.00%。降胆固醇能力 0.99±0.01%，亚硝酸盐降解能力为 54.26±2.5%。从此可以推断出酸马奶乳清饮料具有良好的功能特性。（5）酸马奶乳清饮料在贮藏期，其沉淀量和 pH 值变

化均在正常范围之内。在 4℃贮藏条件下，酸马奶乳清饮料中的酸味、咸味和鲜味变化最大。而在 25℃贮藏条件下，酸味的变化较为明显。酸马奶乳清饮料在贮藏期内微生物指标也均在正常范围内，大肠菌群数、酵母及霉菌数均符合相关标准要求。

Development and Research of Koumiss Whey Beverage

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Abstract：The koumiss whey beverage is a milk-containing beverage with Mongolian characteristics made by acid horse milk, white sugar, water, etc.which is prepared by blending, sterilizing and packaging. In this paper, the single-factor and orthogonal tests were carried out on the raw material ratio of the koumiss whey beverage to select the optimal formula, and the physical and chemical properties of the koumiss whey beverage were tested and analyzed, and the acid horse milk was observed. Changes in various indicators of whey beverage during storage. The main results are as follows: (1)The best formula obtained by single factor and orthogonal test of the raw material selection of the koumiss whey beverage is: The amount of koumiss is 20%, the amount of white sugar added is 6%, the amount of CMC-Na added is 0.3%, the amount of sucrose ester added is 0.02%, and the amount of sodium citrate added is 0.04%. 3%of isomaltose, the amount of whey protein powder added was 2%, and the rest was sterile water. (2)The protein content of the koumiss whey beverage is 1.13±0.00%, the fat content is 0.36±0.02%, and the pH and titration acidity are 4.14±0.00 and 25.00±0.01,respectively.T, the energy value is 83.53 ± 0.74 KJ/100g. The koumiss whey drink has lower energy and is more suitable for people who control weight. The apparent viscosity of the koumiss whey beverage was relatively stable, and was 0.00526 Pa.s and 0.00561 Pa.s at 12s and 120s, respectively. From the comparison of koumiss, koumiss whey drink, and commercial Kalpis drink, the most common difference is the sour taste, followed by the sweet and salty taste. (3)A total of 16 amino acids were detected in the koumiss whey beverage, and the total content of amino acids was 0.28%.

Among them, 9 essential amino acids were detected, and the total content was 0.14%. A total of 24 fatty acids were detected in the koumiss whey beverage, with a total content of 100%, of which unsaturated fatty acid content accounted for 34.14% of the total content. (4)The koumiss whey beverage has certain anti-oxidation,cholesterol-lowering ability and ability to degrade nitrite. At a concentration of 10 mg/mL, the DPPH clearance was 9.6±0.33%, the reducing activity was 0.27±0.01%, the hydroxyl radical scavenging rate was 49.03±1.00%, and the superoxide anion scavenging ability was 22.36±1.00%. The cholesterol-lowering ability was 0.99±0.01%, and the nitritedegradation ability was 54.26±2.5%. From this it can be inferred that the koumiss whey beverage has good functional properties. (5)During the storage period, the acid milk whey beverage has a change in sedimentation amount and pH value within the normal range. Under the storage conditions of 4°C, the sour taste, salty taste and umami taste of the koumiss whey drink changed the most. Under the storage conditions of 25°C, the change of sour taste is more obvious. The microbial indicators of koumiss whey beverages were also within the normal range during storage, and the number of coliform bacteria, yeast and mold were in compliance with relevant standards.

不同酸度乳清中乳糖质量分数的检测方法

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摘 要：以契达干酪及内蒙古锡盟传统奶酪加工副产物-乳清为原料，分别通过直接滴定法和碘量法对乳清中乳糖质量分数进行测，研究不同酸度乳清对乳糖质量分数测定方法的影响。试验结果显示：酸度对碘量法的影响极显著（P<0.01），酸度高的乳清用碘量法测定的结果偏低，对于乳酸度高（>45 °T）的乳清，不宜采用碘量法测定乳糖质量分数。

Study on detection method of lactose in whey with different acidity

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Abstract: The experimental materials were whey obtained from the cheddar cheese and the traditional cheese of Inner Mongolia Xilinguole.Through determining content of lactose in the whey by direct titration method and iodometry，the effect of acidity in different whey on determination method were studied. The results showed: The effect of acidity on iodometry was extremely significant ($p<0.01$)，determination results of whey with higher acidity were lower by iodometry. Iodometry is not fit to determine content of lactose in the whey with high acidity(>45 °T).

酸马奶片的制作及其品质功能特性的研究

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摘 要：本文以酸马奶为研究对象，以开发一款酸马奶片为目的，对其主要原料和工艺进行单因素和正交试验，选出最优配比和工艺，并对酸马奶片产品的感官、理化、微生物相关指标以及品质、功能特性进行检测和分析，观察其在贮藏期间的品质变化情况，确定保质期。研究结果如下：（1）酸马奶片中分别添加相同量的全脂乳粉和脱脂乳粉所制成的酸马奶片，其咀嚼度分别是 2802.93±92.61 和 331.17±12.89，与市售牛奶片对照样（2757.47±33.84）相比，添加全脂乳粉的咀嚼度更好；感官评分分别是 15.60±0.12 分和 14.20±0.12 分。故选择全脂乳粉作为原料添加到酸马奶片中。（2）通过不同添加量的酸马奶粉（70%、80%、90%、100%）、全脂乳粉（5%、10%、15%、20%）、葡萄糖粉（1%、3%、5%、7%）对酸马奶片感官评分的影响单因素和正交试验结果得知，酸马奶片的最佳组合为酸马奶粉、全脂乳粉、葡萄糖粉的添加量分别为 80%、15%和 5%。（3）通过搅拌时间、压片速度、压片压力对酸奶片咀嚼度的影响单因素和正交试验结果得知，各因素主次顺序为：压片压力＞搅拌时间＞压片速度，最佳组合为搅拌时间 20min、压片速度 100r/min、压片压力 3.50MPa。（4）对酸马奶片的营养成分检测分析结果得出，蛋白质、脂肪、水分、灰分、酸度值分别为 47.55±0.24%、

19.20±0.70%、4.32±0.05%、4.60±0.01%、102.06±1.03°T；乳酸菌和酵母菌数分别为 8.8×104CFU/g、1.5×105CFU/g；酸马奶片含有的氨基酸种类丰富，总和为27.05g/100g，含有 7 种人体必需氨基酸和 2 种婴幼儿必需氨基酸；酸马奶片的脂肪酸种类丰富，其中亚油酸和亚麻酸含量较其他乳制品高，含量分别为 6.92%和4.10%。（5）当酸马奶片复水浓度为 10mg/mL 时，其 DPPH 清除率、羟基自由基清除率、还原活性、超氧阴离子清除率分别为 30.11±0.16%、50.10±0.18%、0.32±0.01、9.61±0.03%。酸马奶片胆固醇脱除率、ACE 抑制率、亚硝酸盐降解率分别为 41.10±1.64%、59.26±2.02%、55.66±0.80%。结果证明，酸马奶片具有一定的营养及益生功能特性。（6）采用电子舌和电子鼻对酸马奶片的滋味和挥发性风味物质进行分析和评价，结果表明，酸马奶片的滋味物质主要是酸味和涩味，挥发性风味物质主要包括芳香化合物、芳香成分（氨气）、氢气、烷烃和芳香化合物。（7）综合酸马奶片贮藏期间感官和微生物的指标变化情况，可以得出，在冷藏和冷冻条件下贮藏，酸马奶片可贮藏 10 个月以上的时间；在常温条件下贮藏的酸马奶片，1 个月后，颜色由乳黄色变为黄褐色，并且随着时间的延长，颜色逐渐变深，故酸马奶片不宜在常温下贮藏。

Study on Processing Technology and Quality Function Characteristics of Fermented Koumiss Tablets

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Abstract：In this experiment, fermented Koumiss was used as the research object to develop a fermented Koumiss tablet. The main raw materials and processes were tested by single factor and orthogonal test to select the optimal ratio and process. The sensory, physical and chemical, microbiological indicators, quality and functional characteristics were tested and analyzed, and the quality changes during storage were observed to determine their shelf life. The research results are as follows: (1)The same amount of whole milk powder and skim milk powder were respectively added to the fermented Koumiss tablets, and the chewiness was 2802.93±92.61 and 331.17±12.89,

respectively, compared with the commercial milk tablets control sample (2757.47±33.84). The whole milk powder was better. The sensory scores were 15.60±0.12 and 14.20±0.12, respectively. Therefore, the whole milk powder was selected as a raw material and added to the fermented Koumiss tablets. (2)Through different amounts of fermented Koumiss powder (70%, 80%, 90%, 100%), whole milk powder (5%, 10%, 15%, 20%), glucose powder (1%, 3%, 5%, 7%) added to the fermented Koumiss tablets. The single factor and orthogonal test results showed that the best combination of fermented Koumiss tablets was fermented Koumiss powder powder, whole milk powder and glucose powder was 80%, 15% and 5%, respectively. (3)The effects of stirring time, tableting speed and tableting pressure on the chewiness of fermented Koumiss tablets were analyzed by single factor and orthogonal test results. The order of the factors was: tableting pressure > stirring time > tableting speed. The optimum combination, stirring time was 20 min, tableting speed was 100 r/min and tableting pressure was 3.50 MPa. (4)The analysis results of nutrient composition of fermented Koumiss tablets showed that the protein content, the fat content, the moisture content, the ash content and acidity was 47.55±0.24%, 19.20±0.70%, 4.32±0.05%, 4.60±0.01% and 102.06±1.03°T, respectively; the number of *lactic acid bacteria* and *yeast bacteria* was 8.8×10^4CFU/g and 1.5×10^5CFU/g，respectively. The fermented Koumiss tablets contained abundant amino acids, the sum was 27.05 g/100 g, containing 7 kinds of essential amino acids and 2 kinds of essential amino acids for infants. The fermented Koumiss tablets were rich in fatty acids, and the content of essential fatty acids such as Linoleic acid and Linolenic acid were more prominent than other dairy products, which were 6.92% and 4.10%, respectively. (5)When the reconstituted water of the fermented Koumiss tablet was 10 mg/mL, the DPPH clearance rate, the hydroxyl radical scavenged rate, the reducing activity and the superoxide anion removed rate was 30.11±0.16%, 50.10±0.18%, 0.32±0.01 and 9.61 ± 0.03%, respectively.

超高压处理对奶豆腐品质特性的影响

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摘 要：本文对产自锡林郭勒盟正蓝旗的奶豆腐采用不同压力梯度、不同保压时间的超高压处理后，在 4℃进行贮藏，并定期检测分析其菌落总数、酸度、质构、色泽等的变化情况。结果表明，奶豆腐经超高压处理后，菌落总数明显下降，在 400 MPa 压力下，奶豆腐中生菌数从 5.9×10^5 CFU/g 下降到 9.0×10^4 CFU/g，在 500 MPa 超高压处理时下降 5.0×10^3 CFU/g，减少了两个数量级；其杀菌效果明显。在 500 MPa/10 min 时生菌数为 5.0×10^3 CFU/g，保压时间 15 min 时生菌数下降到 2.3×10^3 CFU/g，即保压时间越长，杀菌效果越好；奶豆腐的硬度、咀嚼度和胶着度有明显增大的趋势，但粘聚性和弹性变化不大；奶豆腐的酸度没有明显的变化，但在储藏期 28 d 时，未处理的奶豆腐酸度从 68 °T 增长到 76 °T，而处理后的奶豆腐酸度都有下降趋势，从 70 °T 到 65 °T，减少了奶豆腐胡酸化；超高压处理对奶豆腐的滋味影响不大，除了苦味和苦回味有减小，苦味从 0.52 减小到-15.75，苦回味从 0 减小到-36.35，其它味道都基本没有变化，可以保持奶豆腐原有的风味；超高压处理对奶豆腐的感官和色差影响不明显。

Effect of ultra-high pressure treatment on quality characteristics of milk tofu

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Abstract：In this paper, milk tofu produced in Zhenglan Banner of Xilin Gol League was stored at 4℃ after ultra-high pressure treatment with different pressure gradients and different holding time. The changes of colony count, acidity, texture, color and so on were regularly detected and analyzed. The results showed that the total number of bacterial colonies in milk tofu decreased significantly after ultra-high pressure treatment. Under 400 MPa pressure, the number of bacteria in milk tofu decreased from 5.9×105 CFU/g to 9.0×104 CFU/g, and under 500 MPa ultra-high pressure treatment,

it decreased by 5.0×103 CFU/g, which was two orders of magnitude. Its bactericidal effect is obvious. The number of bacteria was 5.0×103 CFU/g at 500 MPa/10 min, and the number of bacteria decreased to 2.3×103 CFU/g at 15 min of dwell time, i.e. the longer the dwell time, the better the sterilization effect. The hardness, chewiness and gumminess of milk tofu have obvious increasing trend, but the cohesiveness and elasticity have little change. There was no obvious change in the acidity of milk tofu, but the acidity of untreated milk tofu increased from 68 °T to 76 °T at 28 d of storage, while the acidity of treated milk tofu decreased from 70 °T to 65 °T, reducing the acidification of milk tofu. Ultra-high pressure treatment has little effect on the taste of milk tofu, except that the bitter taste and bitter aftertaste are reduced, the bitter taste is reduced from 0.52 to -15.75, and the bitter aftertaste is reduced from 0 to -36.35, all other tastes are basically unchanged, and the original flavor of milk tofu can be maintained; Ultra-high pressure treatment had no obvious effect on the sensory and color difference of milk tofu.

超高压处理对驼奶品质及保质期的影响

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摘 要：本文采用 600 MPa 压力方式、不同保压时间（10min、15min）对驼奶进行超高压处理后检测其感官、生菌数、品质及滋味的变化情况，并选取最佳处理时间的驼奶样品进行 4℃储藏，定期检测分析其菌落总数、酸度、pH、色泽和黏度的变化趋势。主要研究结果如下：驼奶经 600 MPa 10min 超高压处理后，其菌落总数明显减少，从 4.5×10^4 CUF/g 减少到 4.0×10^2 CUF/g，酸度明显降低，从 149°T 降低到 143°T，pH 值有略微的上升，从 6.29 上升到 6.34，并且驼奶的苦味、苦回味减小，咸味、甜味和鲜味增加，滋味得到一定改善。此外色泽的变化不显著。采用 600 MPa 不同时间（10、15min）进行超高压处理后结果显示，随着保压时间的延长驼奶的菌落总数逐渐下降，而酸度、pH、色泽和黏度的变化不明显，10min 与 15min 相比 15min 杀菌效果更好。经 600 MPa 15min 超高压处理

后的驼奶在 4℃储藏 30d 期间，其菌落总数增长缓慢，4℃储藏 30d 时的菌落总数达到 3.7×10^4 CUF/g，比贮藏 1d 时的菌落总数＜10 增加 4 个数量级，但比未处理的对照样品菌落总数 3×10^7CUF/g 减少了 3 个数量级。酸度、pH、色泽和黏度变化不明显，说明超高压处理可以有效的延长货架期。

Effect of ultra-high pressure treatment on quality and shelf life of camel milk

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Abstract: By way of 600 MPa pressure, different pressure maintaining time (10 min, 15 min) after ultra-high pressure treatment on the treat to detect the senses, the number of living bacteria, the changes of the quality and taste, and select the best processing time of the treat samples 4 ℃ storage, regular testing analysis of the total number of colonies, acidity, pH, the tendency of the color and viscosity.The main research results are as follows: After being treated with 600 MPa for 10min under ultra-high pressure, the total number of bacterial colonies decreased significantly, from 4.5×104 CUF/g to 4.0×102 CUF/g, the acidity decreased significantly, from 149° T to 143° T, the pH value increased slightly, from 6.29 to 6.34, and the bitter taste and bitter aftertaste of camel milk decreased, while the salty taste, sweet taste and umpiness increased, and the taste was improved to some extent.In addition, the color change is not significant.The results of ultra-high pressure treatment with 600 MPa for different times (10 and 15min) showed that the total number of bacterial colonies of camel milk decreased gradually with the extension of pressure holding time, while the changes of acidity, pH, color and viscosity were not obvious. The sterilization effect was better in 15min than 10min. The total number of bacterial colonies of the camel milk treated with ultra-high pressure for 15min after 600 MPa grew slowly during the storage period of 30d at 4℃. The total number of bacterial colonies at the storage period of 30d at 4℃ reached 3.7×104 CUF/g, which was 4 orders of magnitude higher than the total number of bacterial colonies at the storage period of 1d < 10, but 3 orders of magnitude

lower than the total number of bacterial colonies of untreated control samples at 3× 107CUF/g.The change of acidity, pH, color and viscosity is not obvious, which indicates that the ultra-high pressure treatment can effectively exten.

3.微生物专题

乳酸菌调控骨骼肌线粒体生物发生的机制研究进展

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摘　要：作为高度动态化的细胞器，线粒体处于持续动态变化中，其生物发生对维持线粒体网络稳态至关重要，亦是调控肌纤维转化的新介质。作为一种微生态制剂，乳酸菌可以通过诱导骨骼肌细胞内激酶活化、增强活性氧的信号诱导作用以及过氧化物酶体增殖物激活受体 ã 共激活因子 1-á（Peroxisome proliferator-activated receptor gamma co-activator 1-alpha，PGC-1á）信号转录促进线粒体生物发生，进而影响肌纤维类型的转化。肌纤维类型与肉品质密切相关，因此，通过添加乳酸菌调控骨骼肌线粒体生物发生从而影响肌纤维类型的转化成为了未来改善肉品质的重要途径。本文综述了乳酸菌调控骨骼肌线粒体生物发生的分子机制，以及线粒体生物发生与肌纤维转化和肉品质之间的关系，以期为今后通过补充乳酸菌调控线粒体生物发生，促进肌纤维类型转化进而改善肉品质提供理论依据。

The Research Progress of Mechanisms of lactic acid bacteria regulating mitochondrial biogenesis in skeletal muscle

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Abstract: Mitochondria are highly dynamic organelles that under continuous dynamic changes, and mitochondrial biogenesis is crucial to maintain mitochondrial network, and it is also a new medium to regulate the transformation of muscle fibers. As a microecological preparation, lactic acid bacteria can promote mitochondrial biogenesis by inducing intracellular kinase activation in skeletal muscle cells, enhancing signal induction of reactive oxygen species and PGC-1á signal transcription, thereby affecting the transformation of muscle fiber types. The type of muscle fiber is closely related to

meat quality. Therefore, the regulation of mitochondrial biogenesis by lactic acid bacteria to affect the transformation of muscle fiber types has become an important way to improve meat quality in the future. This paper reviews the molecular mechanism of lactic acid bacteria regulating mitochondrial biogenesis in skeletal muscle, and the relationship between mitochondrial biogenesis and muscle fiber transformation and meat quality, in order to provide a theory for regulating mitochondrial biogenesis, promoting muscle fiber type transformation and improving meat quality by supplementing lactic acid bacteria in the future.

高吸附铅乳酸菌微胶囊化及其特性的研究

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摘　要：乳酸菌作为人体重要的微生物之一，在肠道内可以发挥益生作用，但由于其不良的环境耐受能力，使得其生长定植受到一定影响，因此，研究乳酸菌的微胶囊化对提高其环境耐受性具有重要的意义。本研究选取具有高耐受和吸附铅能力的戊糖片球菌 10-a-1 为研究对象，对培养条件进行优化以及采用内源乳化法制备海藻酸钠微胶囊并对其进行工艺优化，通过单因素试验和正交试验确定最优工艺参数以及在此基础上利用壳聚糖进行二次包埋，并对两种微胶囊的特性进行了比较。结果表明：在培养时间为 16 小时、外源谷胱甘肽（GSH）添加浓度为 4.8mmol/L 时，戊糖片球菌 10-a-1 的冻干存活率最高。在海藻酸钠浓度 3%、水油比 30:120、酸钙比 3:1、转速 600rpm、钙胶比 1.5:9 条件下的海藻酸钠微胶囊的包埋率最高，可达到 86.3%；海藻酸钠-壳聚糖微胶囊的包埋率为 65.6%。通过对比两种微胶囊的特性，海藻酸钠微胶囊比海藻酸钠-壳聚糖微胶囊释放更快；海藻酸钠-壳聚糖微胶囊耐胃肠液的效果更好，存活率更高；两种微胶囊均可有效增强模拟胃肠液处理中的菌吸附铅的能力，且海藻酸钠-壳聚糖微胶囊对铅的吸附效果更好；在 4°C 和 20°C 条件下分别储藏 28 天后，海藻酸钠-壳聚糖微胶囊中菌的存活率最高。微胶囊化技术可以显著提高戊糖片球菌 10-a-1 对不良环境的耐受能力，并且可以减小模拟胃肠液处理对戊糖片球菌 10-a-1 吸附铅能力的影响。

Microencapsulation and its characteristic analysis of lactic acid bacteria with highly adsorbed ability of lead

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Abstract: As one of the important microorganisms in the human body, lactic acid bacteria (LAB) play a probiotic role in the intestine. However, the growth and colonization of LAB are affected by its poor environmental tolerance. Therefore, It is important to explore the microencapsulation of LAB to improve its environmental tolerance. The strain of *Pediococcus pentosaceus* 10-a-1 with high tolerance and adsorption capacity of lead was used in the research. Influence of culturing conditions to the freeze-drying survival rate of *Pediococcus pentosaceus* 10-a-1 was optimized.Sodium alginate microcapsules were prepared by internal emulsification and the technological conditions were optimized. The optimum technological parameters were determined by single factor test and orthogonal test. On this basis, chitosan was used for secondary embedding. The characteristics of the two microcapsules were compared.The results showed that the freeze-drying survival rate of the *Pentococcus pentosaceus* 10-a-1 was the highest when the culture time was 16 hours and the concentration of the exogenous glutathione (GSH) was 4.8 mmol/ L.The results showed optimum process conditions were determined, sodium alginate concentration was 3%, water-oil ratio at 30:120, calcium acid ratio at 3:1, stirring speed was 600rpm, theratio of calcium and gel was 1.5:9. Under the optimized conditions, the encapsulation rate of the sodium alginate microcapsules reached 86.3%. After the encapsulation of sodium alginate microcapsules by chitosan, the embedding rate of microcapsules decreased to 65.6%. Compared The characteristics of the two microcapsules was compared, alginate microcapsules released more quickly than sodium alginate-chitosan microcapsules. The alginate- chitosan microcapsules showed better tolerance to gastric and intestinal fluids and resulted in the higher survival rate. The adsorption capacity of lead in alginate-chitosan microcapsules was better. The

survival rate of LAB in sodium alginate-chitosan microcapsules was the highest after 28 days of storage at 4°C and 20°C, respectively. The microencapsulation technology could significantly improve the tolerance of *P. pentosaceus* 10-a-1 to adverse environment. Meanwhile, the effect of simulated gastrointestinal fluid treatment on the ability of *P. pentosaceus* 10-a-1 to adsorb lead could be reduced.

酸马奶中产乳糖酶酵母菌的筛选及特性研究

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摘 要:为探索传统发酵乳制品酸马奶中的微生物资源、发酵酸马奶的工艺条件，本研究对实验室前期分离出的 51 株酵母菌，进行产乳糖酶酵母菌的筛选、鉴定，并对优选能发酵 9%乳糖的 6 株酵母菌进行益生特性、发酵特性的研究，选取一株酵母菌 P2 进行酸马奶的发酵。研究结果如下：通过初步筛选，筛选出 20 株可以产乳糖酶的酵母菌，对酵母菌产乳糖酶能力大小进行复筛，通过发酵乳糖试验来进行验证，有 12 株酵母菌可以发酵 3%~9%的乳糖，其中菌株 E16、E1721、E1722、M2、M31、P2 可发酵 9%乳糖，通过对形态学观察及 ITS 基因片段序列分析，12 株酵母菌分为 3 个属：毕赤酵母属、酿酒酵母属和假丝酵母属。其中菌株 E141、E1422、E16、E1721、E1722、F31、G221、M2、M31、M51 为毕赤酵母（*Pichia manshurica*），菌株 P2 为酿酒酵母（*Saccharomyces cerevisiae*），Q2 为假丝酵母（*Candida rugosa*）。通过益生特性研究，6 株酵母菌 E16、E1721、E1722、M2、M31、P2 均对酸性、碱性、高渗和胆盐条件有较好的耐受性，模拟人工胃肠液条件下连续处理后菌株的存活率为 57.28%~80.80%。通过对发酵特性的研究，菌株 P2、M31 在乙醇浓度 14%，菌株 E16、E1721、E1722 在乙醇浓度 12%，菌株 M2 在乙醇浓度 10%有较好的耐受能力。菌株 M31、P2 具有较强的产乙醇、产香和产气能力，但菌株 P2 具有比 M31 更好的产酸能力。选择菌株 P2 与瑞士乳杆菌 P1 共发酵马奶，通过单因素试验结果，针对发酵酸马奶品质的 4 个因素确定正交试验的因素即乳酸菌与酵母菌的接菌比例、发酵温度、发酵时间、接种量，采用 4 因素 3 水平 L9（34）正交试验确定发酵酸马奶的最佳工艺条件。结果表明：乳酸菌与酵母菌接菌比例为 3:1，发酵温度 25℃，发酵时间 30h，接

种量为3%时所得酸马奶的口感、风味最佳。

Screening and Characterization of Lactase-producing yeasts in Koumiss

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Abstract： In order to explore the microbial resources and technological conditions of koumiss fermentation in traditional fermented dairy products, 51 strains of yeast isolated in the early stage of the laboratory were screened and identified for lactase-producing yeast. The probiotic and fermentation characteristics of 6 strains of yeast which could ferment 9% lactose were studied, and a strain of yeast P2 was selected for koumiss fermentation. The results are as follows:Through preliminary screening, 20 strains of yeast which can produce lactase were screened out. The capacity of lactase production of yeast was re-screened. Through fermentation lactose test, 12 strains of yeast could ferment lactose.Among them, strains E16, E1721, E1722, M2, M31 and P2 could ferment 9% lactose. Through morphological observation and sequence analysis of ITS gene fragments, 12 strains of yeast were divided into 3 genus. Genus: Pichia, Saccharomyces and Candida. Among them, strains E141, E1422, E16, E1721, E1722, F31, G221, M2, M31 and M51 were *Pichia manshurica*, strain P2 was *Saccharomyces cerevisiae*, and strain Q2 was *Candida rugosa*.According to the probiotic characteristics, six strains of yeast E16, E1721, E1722, M2, M31 and P2 were well tolerant to acidic, alkaline, hypertonic and bile salt conditions. The survival rate of the strains treated continuously under simulated artificial gastrointestinal juice was 57.28%~80.80%.Through the study of fermentation characteristics, strains P2 and M31 were 14% in ethanol concentration, strains E16, E1721 and E1722 were 12% in ethanol concentration, and strains M2 had better tolerance in ethanol concentration of 10%. Strains M31 and P2 have strong ability to produce ethanol, aroma and gas, but strain P2 has better ability to produce acid than M31. Choose strain P2 and Lactobacillus Switzerland P1 to co-ferment horse milk. According to the four factors of fermented

yoghurt quality, the factors of orthogonal test, including the proportion of lactic acid bacteria to yeast, fermentation temperature, fermentation time and inoculation amount, were determined by single factor test. The optimum technological conditions of fermented yoghurt were determined by L9 (3^4) orthogonal test with four factors and three levels. The results showed that the koumiss had the best taste and flavor when the ratio of lactic acid bacteria to yeast was 3:1, the fermentation temperature was 25℃, the fermentation time was 30 h and the inoculation amount was 3%.

不同化学杀菌剂对乳杆菌噬菌体 P2 的灭活效果

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摘 要：噬菌体污染是乳品工业生产中导致发酵失败的最主要因素。本实验使用不同浓度的化学杀菌剂（乙醇、异丙醇、次氯酸钠、过氧乙酸）灭活噬菌体 P2 并在 3 min 内完成对其灭活效果的评估。结果显示，随化学杀菌剂浓度的增加，其对噬菌体 P2 的灭活效果也呈现增加趋势。其中，100%异丙醇可使 P2 的存活率瞬间下降 2.17 个对数级；100%乙醇溶液可使其降低 1.94 个对数级；800ppm 次氯酸钠可使噬菌体 P2 下降 3.16 个对数级。过氧乙酸对噬菌体 P2 的灭活效果不明显，0.9%的过氧乙酸仅使 13%的噬菌体失活。

Inactivation of *Lactobacillus phage* P2 by different biocide treatments

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Abstract: Bacteriophage infection is considered as the most important factor leading to the failure of fermentation in the dairy industry. In this experiment, bacteriophage P2 was inactivated by different concentrations of chemical biocides (ethanol, isopropanol, sodium hypochlorite, peracetic acid), and its inactivation effect was evaluated within 3

min. The results showed that the inactivation effect was increased along with the increasing of biocide concentration.. 100% isoproponal resulted in a 2.17-log reduction., 100% ethanol caused 1.94-log reduction, whereas treatment with 800 ppm sodium hypochlorite resulted in a 3.16-log reduction. However, peracetic acid expressed little inactivation effect, the highest concentration used (0.9%) resulted in only 13% phage inactivated.

Enterococcusfaecium AS8 及其胞外多糖对发酵乳流变学特性的影响

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摘 要：通过红外光谱、气相色谱-质谱联用和流变仪的检测，探究产自屎肠菌(*Enterococcus faecium*)AS8 的胞外多糖(exopolysaccharide，EPS)(AS8-EPS)的结构组成和流变性能。采用 3 种发酵乳作为样品，分别为 Streptococcus thermophilus+LactobacillusbulgaricusEPS+S.thermophilus+ L.bulgaricus 和 E.faecium AS8。结果表明，在贮藏期间，不同发酵乳样品具有不同的流变学性质。同时，补充添加 EPS 和原位 EPS 对发酵乳流变性能具有不同的影响。通过 SephadexG-100 和 SephadexG-50 的分离纯化，获得 2 种多糖，分别为 AS8-1-EPS 和 AS8-2-EPS。AS8-1-EPS 主要单糖组成为甘露糖、葡萄糖和半乳糖(分别占 59.1%、26.8%、7.9%)，还有含量很少的其他单糖;AS8-2-EPS 主要单糖组成为甘露糖、葡萄糖、半乳糖和鼠李糖(分别占 65.4%、21.3%、8.9%、4.4%)。红外光谱检测结果表明 AS8-1-EPS 和 AS8-2-EPS 均为杂多糖。

Rheological Properties of Fermented Milk as Affected by Addition of Enterococcus faecium AS8 and Its Exopolysaccharides

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Abstract： This study aimed to investigate the structural composition of exopolysaccharides (EPS) from Enterococcus faecium AS8 and the rheological properties of traditional fermented dairy products in Inner Mongolia containing respectively Streptococcus thermophiles + Lactobacillus bulgaricus, EPS + S. thermophiles + L. bulgaricus and E. faecium AS8. Two fractions of EPS, named as AS8-1-EPS and AS8-2-EPS, were obtained by Sephadex G-100 column chromatography and purified by Sephadex G-50 column chromatography. AS8-1 was mainly composed of mannose (59.1%) , glucose (26.8%) and galactose (7.9%) . AS8-2-EPS was mainly composed of mannose (65.4%), glucose (21.3%) , galactose (8.9%) and rhamnose (4.4%) . The results of Fourier transform infrared (FT-IR) spectroscopy revealed that both EPS fractions were heteropolysaccharides.

乳酸菌胞外多糖对发酵乳流变学特性的影响

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摘 要:本文以分离自内蒙古锡盟地区传统发酵奶油制品的 32 株乳酸菌作为试验菌株，测定菌株疏水性和自聚集性，筛选出具有潜在黏附性的菌株，采用苯酚-硫酸法进一步筛选出高产胞外多糖（exopolysaccharide，EPS）的菌株；经染色，显微镜观察菌株产 EPS 的种类；并用 95%冷乙醇对其进行提取，利用葡聚糖凝胶层析法对 EPS 进行分离纯化；采用流变仪检测纯化的 EPS 对发酵乳流变学特性的影响；分别采用红外光谱仪和气相色谱-质谱联用仪对 EPS 的结构和组成进行检测分析。试验结果如下： 1. 筛选出 8 株黏附性较好的菌株，分别为 HS4、HS8、HS10、LX4、LX5、LX6、AS8、AS9；再以苯酚-硫酸法测定其 EPS 的产量，筛选出 3 株 EPS 产量较高的菌株，分别为 HS4、LX5、AS8，其 EPS 产量分别为 123.79±3.02 mg/L、43.60±8.59 mg/L、67.82±1.94 mg/L。由显微镜观察得知，所有菌株所产的 EPS 均为粘液多糖。 2. 菌株 HS4 、 LX5 和 AS8 的 EPS 粗提量分别为 1108.23±18.33 mg/L 、1636.05±54.67 mg/L 和 1655.67±59.37 mg/L；通过葡聚糖凝胶层析法对粗提 EPS 进行两次分离纯化得到的 EPS 纯度

较高，达到 98%以上。 3. 流变学特性检测结果显示，AS8-1-EPS 和 AS8-2-EPS 能够增加发酵乳表观黏度、增加发酵乳的稳定性以及维持发酵乳热稳定性；LX5-2-EPS 能够增加发酵乳贮藏的稳定性；HS4-2-EPS 能够增加发酵乳的稳定性以及维持发酵乳热稳定；LX5-1-EPS 能够维持发酵乳热稳定性。4. 所有 EPS 均含有官能团 C-O-C 和-OH，证明这两种官能团是 EPS 的主要官能团；除了 HS4-2-EPS 和 AS8-2-EPS 以外的 EPS 均含有官能团-CH2-，HS4-1-EPS 以外的 EPS 都含有官能团 C-C-O 和-COOH；只有从菌株 HS4 中分离出的 EPS 含有官能团 -COO，HS4-1-EPS 和 LX5-1-EPS 含有酰胺基，LX5-2-EPS 和 AS8-2-EPS 含官能团 C-C-C，只有 LX5-2-EPS 含氨基。5. HS4-1-EPS 和 LX5-2-EPS 主要由葡萄糖组成，占 80%以上，还含有一些甘露糖和半乳糖；AS8-1-EPS 主要由甘露糖组成，占 59%以上，还包括少量葡萄糖、半乳糖、鼠李糖、阿拉伯糖和木糖；HS4-2-EPS、LX5-1-EPS 和 AS8-2-EPS 主要由葡萄糖和甘露糖两种糖组成，还含有少量的其他成分。本研究结果表明，不同胞外多糖的组成及结构特性影响发酵乳流变学特性。

Effect of Exopolysaccharides Produced by Lactobacillus on Rheological Properties of Fermented Milk

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Abstract: In this paper, 32 strains of lactic acid bacteria isolated from traditional fermented milk in Xilingol League of Inner Mongolia were used as experimental strains. Through determination of hydrophobicity and auto-aggregation, strains with potential adhesion abilities were screened out. And the high yield exopolysaccharides(EPS) strains were furtherly screened out through Phenol-sulfuric acid method. The types of EPS produced by strains were observed by microscope and staining. Then the EPS was extracted by cold 95% ethanol. And it was separated and purified by dextran gel column chromatography. The effect of purified EPS on rheological properties was determined by rheometer. And the structure and composition of EPS were analyzed by IR and GC-MS respectively. The results are as follows: 1. 8

strains with good adhesion were screened out as HS4, HS8, HS10, LX4, LX5, LX6, AS8 and AS9, respectively. And 3 strains with higher EPS yield were screened out through Phenol-sulfuric acid method, as HS4, LX5 and AS8, respectively. And the EPS production of them were 123.79±3.02 mg/L,43.60±8.59 mg/L,67.82±1.94 mg/L, respectively. Through microscopic observation, the EPS produced by all strains of lactic acid bacteria were all cohesive exopolysaccharides. 2. The crude extraction of EPS of HS4, LX5 and AS8 were 1108.23±18.33 mg/L, 1636.05±54.67 mg/L and 1655.67±59.37 mg/L, respectively. After separated and purified by dextran gel column chromatography, the purified EPS was higher,more than 98%. 3. The rheological test results showed that AS8-1-EPS and AS8-2-EPS could increase the apparent viscosity, stability of fermented milk and maintain the thermal stability of fermented milk. LX5-2-EPS could increase the storage stability of fermented milk. HS4-2-EPS can increase the stability of fermented milk and maintain the thermal stability of fermented milk. LX5-1-EPS could maintain the thermal stability of fermented milk. 4. It was found that all EPS contained functional groups C-O-C and–OH, which proved that these two functional groups were the main components of EPS. Except HS4-2-EPS and AS8-2-EPS, all EPS had functional group -CH2-, and except HS4-1-EPS, all EPS had functional group C-C-O and –COOH. Only the EPS separated from strain HS4 had functional groups –COO. HS4-1-EPS and LX5-1-EPS had amidogent. LX5-2-EPS and AS8-2-EPS all had functional group C-C-C, and only LX5-2-EPS had amidogen. 5. It was found that HS4-1-EPS and LX5-2-EPS were mainly composed of glucose which accounted for more than 80%, and also contained mannose and galactose. AS8-1-EPS was mainly composed of mannose which accounted for more than 59%, and included a spot of glucose, galactose, rhamnose, Arabia and xylose. HS4-2-EPS, LX5-1-EPS and AS8-2-EPS were mainly composed of glucose, mannose and some othercomponents. It was indicated that the composition and structural characteristics of different EPS had an influence on the rheological properties of fermented milk.

传统发酵乳、肉食品中细菌微生物多样性的分析

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摘 要：为全面了解内蒙古特色发酵食品中细菌微生物多样性，比较不同发酵食品的细菌群落结构。实验运用高通量测序技术，对发酵乳制品（饼状奶酪、棒状奶酪及奶豆腐）和发酵肉制品（发酵香肠、风干羊肉和风干牛肉）中细菌群落组成和多样性进行分析。本研究中共获得 194568 条有效序列，237 个 OTU。菌群多样性分析表明发酵肉制品中菌群 Shannon 指数较高于发酵乳制品，乳肉制品之间的菌群组成差异较大。发酵乳制品中主要以 Firmicutes（厚壁菌门）为主，而发酵肉制品则以 Firmicutes 和 Proteobacteria（变形菌门）为主；在属水平上，发酵乳制品的优势菌属为 *Lactobacillus*（乳杆菌属），而发酵肉制品中的优势菌属则为 *Pseudomonas*（假单胞菌属），次优势菌属为 *Lactobacillus*；在种水平上，由于未检测到的菌群含量较高，所以不能确定乳肉制品优势菌种，但在发酵乳、肉食品中可检测到的菌群中 *Lactobacillus sakei*（清酒乳杆菌）含量较高。通过 16s 预测功能分析发现发酵乳、肉食品中的绝大部分细菌与转运代谢有关，如脂肪代谢、氨基酸代谢等功能。研究结果对于深入认识传统发酵食品微生物群落结构以及挖掘我国特色发酵食品微生物资源具有一定的学术和应用价值。

Analyzing of bacterial diversity in dairy and meat products

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Abstract: In order to fully explore the bacterial diversity in fermented food with Inner Mongolian characteristics, the bacterial community structure of different fermented food was compared.The composition and structure of bacterial communities in fermented dairy products (Cheese1, Cheese2 and Mike_cake) and fermented meat product (fermented sausage, Mutton_jerky and Beef_jerky) were analyzed based on highthroughput sequencing. A total of 194568 effective sequences and 237 OTUs were obtained. The results showed that the Shannon diversity index for fermented meat

products was higher than that for fermented dairy products. The microbiota of different fermented products were significantly different. Two bacterial phyla, Firmicutes was the predominant phylum in fermented dairy products.while Firmicutes and Proteobacteria dominated the microbiota of fermented meat products;At the genus level, *Lactobacillus* was dominant in fermented dairy products, *Pseudomonas* was the major bacterial population in fermented meat product, *Lactobacillus* was a subdominant genus. At the species level, the dominant strains of dairy and meat products can not be determined because of the high content of undetected bacteria, but *Lactobacillus sakei* has a higher content in fermented dairy and meat products. The 16s predictive function analysis showed that most of the bacteria in traditional fermented food were related to the transport and metabolism function, Such as Lipid transport and metabolism and Amino acid transport and metabolism。The results are helpful for further understanding the microbial community structure of traditional fermented food and exploiting microbial resources of fermented food with Chinese characteristics has certain academic and applied value.

乳酸菌产胞外多糖培养条件的优化

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摘 要:乳酸菌胞外多糖产量较低是限制其发挥作用的关键因素，故可通过优化乳酸菌的培养条件和培养基成分来提高胞外多糖的产量。本试验对前期筛选出的高产胞外多糖的乳酸片球菌 RJ2-1-4 进行探究，通过改变接种量、培养时间、培养基 pH 值、NaCl 浓度，分析得到胞外多糖的变化规律为：在接种量为 3%时，胞外多糖产量达到最大值；随着培养时间(6-36h)的延长和培养基 pH 值(4.5-8.5)的增大，胞外多糖产量呈先增加后减少的趋势；伴随 NaCl 浓度的上升，胞外多糖产量呈现先减小后增加再减小的趋势。最后，对乳酸菌培养基的成分进行优化，通过正交试验得出乳酸片球菌 RJ2-1-4 产胞外多糖的最佳营养基组合为：葡萄糖

浓度为 20g/L，大豆蛋白胨浓度为 20g/L，磷酸氢二钾浓度为 8g/L，产量为 427.828mg/L。

Optimization of culture conditions for extracellular polysaccharide production by lactic acid bacteria

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Abstract: The lower yield of lactic acid bacteria extracellular polysaccharide (EPS) is a key factor limiting its function, so the production of EPS can be improved by optimizing the culture conditions and medium components of lactic acid bacteria. In this experiment, the high-yield EPS of the *Pediococcus lactis* RJ2-1-4 were screened in the previous stage. The changes of the EPS were analyzed by changing the inoculum size, culture time, pH value and NaCl concentration. When the inoculation amount was 3%, the yield of EPS reached the maximum value; with the prolongation of culture time (6-36h) and the increase of the pH value of the medium (4.5-8.5), the yield of EPS increased first and then decreased. The trend of EPS decreased first and then increased with the increase of NaCl concentration. Finally, the composition of the lactic acid bacteria medium was optimized. The optimal nutrient combination of the EPS produced by *Pediococcus lactis* RJ2-1-4 was obtained by orthogonal test: glucose concentration was 20g/L, soy peptone concentration was 20g/ L, the concentration of dipotassium hydrogen phosphate was 8 g/L, and the yield was 427.828 mg/L.

Angiotensin-converting enzyme inhibitory peptides from *Lactobacillus delbrueckii* QS306 fermented milk

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Abstract: Angiotensin-converting enzyme inhibitory peptides were isolated and

identified from milk fermented using *Lactobacillus delbrueckii* QS306. The peptide with the highest angiotensin-converting enzyme inhibitory activity (C5) was purified using ultrafiltration with 10 and 3 kDa molecular mass cut-off membranes, Sephadex G-15 (Sigma-Aldrich, St. Louis, MO) gel filtration chromatography, reversed-phase HPLC, and Orbitrap Elite (Thermo Fisher Scientific Inc., Waltham, MA) liquid chromatography-tandem mass spectrometry. We obtained peptide LPYPY by microbial fermentation, which was derived from κ-casein f (AA 77–81). We synthesized LPYPY using an Fmoc solid-phase synthesis method and explored the secondary structure of the pentapeptide. The half maximal inhibitory concentration for the angiotensin-converting enzyme inhibitory activity of LPYPY was 12.87 μg/mL. The results provide additional information for ongoing research and the development of functional foods having antihypertensive effects.

内蒙古西部地区酸粥真菌群落结构研究及分离菌株对品质影响的评价

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摘 要：本研究首先采用 Illumina MiSeq 高通量测序技术对内蒙古西部地区传统发酵谷物产品酸粥（16 个）样品中的真菌多样性进行解析，继而采用传统微生物手段与分子生物学的方法对各样品中的酵母菌进行分离鉴定。最后选用分离得到的优势酵母菌与优势乳酸菌分别进行单一和复配发酵的酸粥产品，测定其理化指标，同时利用电子舌、电子鼻以及气相色谱-质谱联用（GC-MS）技术对各酸粥产品的滋味和气味品质进行分析评价。研究结果如下：（1）在 16 个酸粥样品中共获得 129760 条有效序列，10895 个操作分类单元（OTU），经生物信息学分析获得，被鉴定为 6 个门，15 个纲，30 个目，52 个科和 85 个属，其中优势真菌门为子囊菌门（*Ascomycota*），平均相对含量为 97.54%，优势真菌属为念珠菌属（*Candida*）和耐碱酵母属（*Galactomyces*），平均相对含量分别为 57.95%和 34.95%。优势 OTU 为 OTU6112 和 OTU3445，且均鉴定为念珠菌属，其平均相对含量分

别为 38.56%和 33.70%。通过加权 UniFrac 聚类分析发现，所有酸粥样品聚为 3 类，其中类型 I 和类型 II 样品间的真菌群落的物种丰富度和多样性存在差异的原因是耐碱酵母属（*Galactomyces*）和念珠菌属（*Candida*）的相对含量。（2）从 16 个酸粥样品中共分离出的 50 株酵母菌，经传统微生物手段与分子生物学的方法分离鉴定结果，其中毕赤酵母属酵母共 19 株，地丝菌属酵母共 11 株，*Kazachstania* 属酵母共 6 株，念珠菌属酵母共 7 株，酿酒酵母属酵母共 2 株，隐球酵母属酵母共 3 株，*Zygoascus hellenicus* 和 *Saturnispora silvae* 各 1 株。进一步得知酸粥中的优势酵母菌为库德毕赤酵母（*Pichia kudriavzevii*），共 14 株。（3）乳酸菌单一发酵酸粥及与毕赤酵母复配发酵酸粥的滋味品质无显著差异（$P>0.05$），而酵母菌单一发酵酸粥与其余两组酸粥的滋味存在极显著差异（$P<0.001$），造成差异的滋味是苦味和咸味，可知毕赤酵母对酸粥的滋味品质无积极作用。酵母菌组与其他两组酸粥的风味品质存在极显著差异（$P<0.001$）。通过 GC-MS 发现 3-甲基-1-丁醇、己醛、乙酸乙酯和乙醇是造成存在差异性的主要挥发性风味物质，可知毕赤酵母对酸粥的风味品质无积极影响。

Diversity of Fungal Microflora of Acidic-gruel in Western Inner Mongolia and Evaluation of the Effect of Isolated Strains on Quality

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Abstract: In this paper, Illumina MiSeq high-throughput sequencing technology was used to analyze the fungal diversity of traditional fermented cereal products in 16 samples acidic-gruel in western Inner Mongolia, and the traditional microbial and molecular biological methods were used to isolate and identify the yeast in acidic-gruel. Then, the isolated and advantageous lactic acid bacteria and yeast were separately used to carry out single and compound fermentation of the acidic-gruel products, and the physical and chemical indicators were determined. At the same time, electronic tongue,electronicnose and gas chromatography-mass spectrometry (GC-MS) techniques wereused to evaluate the taste and odor quality of the acidic-gruel products.

The researchresults are as follows: (1)A total of 129,760 effective sequences and 10,895 OUT were obtained from 16 acidic-gruel samples, which were obtained by bioinformatics analysis and identified as 6 phyla, 15 families, 30 orders, 52 families and 85 genera. The dominant phylum is *Ascomycota*, the average relative abundance is 97.54%, and the dominant genus are *Candida* and *Galactomyces,* with an average relative abundance are 57.95% and 34.95%, respectively. The dominant OTU were OTU6112 and OTU3445, and both were identified as *Candida*, with an average relative abundance are 38.56% and 33.70%, respectively. Through weighted UniFrac cluster analysis, it was found that all the samples were clustered into three categories, and the species richness and diversity of the fungal communities between Type I and Type II samples were due to the relative abundance to *Galactomyces* and *Candida*. (2)A total of 50 strains of yeast isolated from 16 acidic-gruel samples were isolated and identified by traditional microbiological methods and molecular biology methods, including 19 strains of *Pichia* and 11 strains of *Geotrichum*. There are 6 strains of *Kazachstania*, 7 strains of *Candida*, 2 strains of *Saccharomyces*, 3 strains of *Cryptococcus*, and 1 strain of *Zygoascus hellenicus* and *Saturnispora* silvae. It is further known that the dominant yeast in acidic-gruel is *Pichia kudriavzevii*, a total of 14 strains. (3)There was no significant difference in the taste quality between the single fermented acidic-gruel of lactic acid bacteria and the fermented acidic-gruel with *Pichia kudriavzevii* ($P>0.05$), but there was a significant difference between the yeast single fermented acidic-gruel and the other two groups of acidic-gruel ($P <0.001$), the difference between the taste is bitter and salty, it can be seen that *Pichia kudriavzevii* has no positive effect on the taste quality of acidic-gruel. There was a significant difference in the flavor quality between the yeast group and the other two groups of acidic-gruel ($P<0.001$). It was found by GC-MS that 3-methyl-1-butanol, hexanal, ethyl acetate and ethanol were the main volatile flavor substances which caused the difference, and it was found that *Pichia kudriavzevii* had no positive influence on the flavor quality of the acidic-gruel.

高产生物膜乳酸菌的筛选

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摘 要：生物膜是微生物在受到外界环境胁迫时自身为适应外界环境而形成的一种自我保护模式，让乳酸菌以生物膜态生长来发掘新的益生特性从而使其具有更广泛的应用。本试验以菌株高产生物膜为标准，对实验室所保存的 10 株乳酸菌进行筛选和鉴定。先用结晶紫对 0-25h 内培养的乳酸菌从 4h 开始每隔 3h 进行染色，测定 OD_{590nm} 值对生物膜进行定量，通过多次平行比较，选出高产生物膜的乳酸菌。利用细菌基因组 DNA 提取试剂盒对高产生物膜乳酸菌进行 DNA 提取后，进行 16S rDNA 基因序列扩增和同源性分析，经过对比和构建系统发育树，最终筛选出 4 株高产生物膜的乳酸菌。其中试验菌株 TG1-1-10、RJ2-1-4 为乳酸片球菌，试验菌株 RJ1-1-4 为植物乳杆菌，试验菌株 RM1-1-11 是坚韧肠球菌。

Screening of high-yield biofilm lactic acid bacteria

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Abstract：Biofilm is a self-protection mode formed by microorganisms to adapt to the external environment when they are stressed by the external environment. It allows lactic acid bacteria to grow in biofilm state to discover new probiotic characteristics and make it more widely used. In this experiment, 10 strains of lactic acid bacteria preserved in the laboratory were screened and identified based on the high-production membrane of the strain.The lactic acid bacteria cultured in 0-25h with crystal violet were stained every 3h from 4h, and the OD_{590nm} value was determined to quantify the biofilm. Through several parallel comparisons, lactic acid bacteria with high biofilm production were selected. The bacterial genomic DNA extraction kit was used to extract the high-product membrane lactic acid bacteria, and the 16S rDNA gene sequence amplification and homology analysis were carried out. After phylogenetic tree was

constructed and compared, four lactic acid bacteria with high production membrane were screened out. Among them, the test strains TG1-1-10 and RJ2-1-4 are *Pediococcus acidilactic*i, the test strain RJ1-1-4 is *Lactobacillus plantarum*, and the test strain RM1-1-11 is *Enterococcus durans.*

乳酸菌产有机酸能力与抑菌特性相关性分析

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摘 要：本试验以不同株乳酸菌为研究对象，在 TPY 培养基中培养 24 小时后，使用离子色谱仪测定不同株乳酸菌所产有机酸的种类和含量；并且通过抑菌圈法测定排除细菌素干扰后的不同株乳酸菌所产有机酸的抑菌能力。结果表明，6 株乳酸菌在培养 24 小时后，均能产生 10 种以上有机酸，包括乳酸、乙酸、丙酸等，其中 ZF8 和 ZF13 所产有机酸种类最多为 13 种。所有乳酸菌均能产生乳酸和乙酸，但有明显产量差异(p<0.05)，其中 TR1-1-3 在全部 6 株乳酸菌中产乳酸、乙酸量最大，其值分别为 15062.33±4.51ppm 和 257.99±1.25ppm，产乳酸、乙酸能力最强。ZF22、X31 产乳酸、乙酸能力弱于其它四株乳酸菌，其中 X31 产乳酸能力最弱。乳酸菌所产有机酸有一定的抑菌作用，ZF8 对四种致病指示菌都有较好的抑菌性，平均抑制率为 23.94%；ZF6 和 ZF13 所产有机酸抑菌能力较弱。

Correlation analysis of organic acid production ability and bacteriostatic characteristics of *Lactobacillus*

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Abstract: In this experiment, different strains of lactic acid bacteria were cultured in TPY medium for 24 hours, and the kinds and contents of organic acids produced by different strains of lactic acid bacteria were determined by ion chromatography, and the bacteriostatic ability of organic acids produced by different strains of lactic acid

bacteria after eliminating bacteriocin interference was determined by inhibition circle method. The results showed that 6 strains of lactic acid bacteria could produce more than 10 kinds of organic acids, including lactic acid, acetic acid, propionic acid, etc. 24 hours after cultivation, of which 13 kinds were produced by ZF8 and ZF13. All lactic acid bacteria could produce lactic acid and acetic acid, but there was significant difference in yield (p<0.05).TR1-1-3 produced the largest amount of lactic acid and acetic acid in all six strains of lactic acid bacteria, with the values of 15062.33±4.51 ppm and 257.99±1.25ppm respectively. The ability to produce lactic acid and acetic acid was the strongest. ZF22 and X31 were less capable of producing lactic acid and acetic acid than other four strains of lactic acid bacteria,of which X31 was the weakest. Organic acid produced by lactic acid bacteria has certain bacteriostasis. ZF8 has good bacteriostasis to four pathogenic indicator bacteria, with an average inhibition rate of 23.94%. Organic acid produced by ZF6 and ZF13 has weak bacteriostasis.

油酸对植物乳杆菌 LIP-1 生长及冻干存活率的影响及其机理

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摘 要：以植物乳杆菌 LIP-1 为研究对象，在培养基中添加不同浓度油酸，研究油酸对该菌株生长及冻干存活率的影响。结果表明，在 MRS 培养基中添加低浓度（≤0.2g/L）油酸可提高活菌数和冻干存活率，油酸最适添加浓度为 0.1g/L。在此浓度下，与未添加油酸的空白对照组相比，活菌数提高了 9×108CFU/ mL，冻干存活率提高了 8.38%；当培养基中油酸浓度≥0.3 g/L 时，菌株的生长受到抑制。用气相色谱法分析细胞膜脂肪酸构成，结果显示，与空白对照组相比，0.1g/L 组不饱和脂肪酸与饱和脂肪酸比值提高了 0.45%，环丙烷脂肪酸比例上升了 8.35%；相关性分析表明，棕榈酸与环丙烷脂肪脂肪酸之间呈现显著的负相关性，硬脂酸与油酸存在显著的负相关性；荧光显微镜下观察植物乳杆菌 LIP-1 冻干菌体，实验组发出绿色荧光的菌体明显多于对照组，这说明在冷冻干燥过程中实验组细胞膜完整性维持得较好；测定冻干后植物乳杆菌 LIP-1 上清液中 β-半乳糖苷酶的活

性，发现实验组上清液中酶活低于 MRS 组，表明低浓度油酸（≤0.2g/L）能维持细胞膜的完整性，降低 β-半乳糖苷酶的泄漏量。结论：培养基中添加低浓度油酸能促进菌体合成环丙烷脂肪酸，诱导饱和脂肪酸转化为不饱和脂肪酸，提高菌株对冷冻干燥的抗性。

Effect of oleic acid on growth and freeze-drying survival of *Lactobacillus plantarum* LIP-1 and its mechanism

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Abstract: The effects of oleic acid on the growth and freeze-drying survival of *L. plantarum* LIP-1 were studied by adding different concentrations of oleic acid into the culture medium. The results showed that low concentration of oleic acid (< 0.2g/L) could increase the viable count and freeze-drying survival rate in MRS medium. The optimum concentration of oleic acid was 0.1g/L. At this concentration, compared with the blank control group without oleic acid, the viable bacteria count increased by 9×10^8 CFU/mL and the freeze-drying survival rate increased by 8.38%. When the concentration of oleic acid in the medium was more than 0.3 g/L, the growth of the strain was inhibited. The fatty acid composition of cell membranes was analyzed by gas chromatography. The results showed that the ratio of unsaturated fatty acids to saturated fatty acids (UFA/SFA) increased by 0.45% and the ratio of cyclopropane fatty acids increased by 8.35% in the 0.1g/L oleic acid group compared with the blank control group. The correlation analysis showed that the ratio of palmitic acid to cyclopropane fatty acids was increased by 8.35%. There was a significant negative correlation between stearic acid and oleic acid. The number of green fluorescent bacteria in the experimental group was significantly higher than that in the control group, which indicated that the integrity of cell membrane in the experimental group was maintained well during freeze-drying. The activity of β-galactosidase in the supernatant of *L.*

plantarum LIP-1 after freeze-drying was measured. It was found that the activity of β-galactosidase in the supernatant of experimental group was lower than that of MRS group, indicating that low concentration of oleic acid (≤0.2g/L) could maintain the integrity of cell membrane and reduce the leakage of β-galactosidase. CONCLUSION: Adding low concentration oleic acid to the medium can promote the synthesis of cyclopropane fatty acids, induce the transformation of saturated fatty acids into unsaturated fatty acids, and improve the resistance of strains to freeze-drying.

内蒙古锡林郭勒盟地区传统奶油制品中产共轭亚油酸乳酸菌的分离筛选与鉴定

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摘 要：本实验从内蒙古锡林郭勒盟地区传统奶油制品中分离筛选共轭亚油酸（conjugated linoleic acid，CLA）高产乳酸菌。采用紫外分光光度法检测菌株发酵液中 CLA 含量，筛选出高产菌株，分析其菌落特征、细胞形态及生理生化特性，并结合 16S rDNA 全序列分析以及系统发育树，鉴定其种属。结果表明，从样品中共筛出 20 株产 CLA 菌株，当亚油酸（linoleic acid，LA）添加量为 0.06%，接种量为 2%时，分离自镶黄旗酸油的 11 株产 CLA 菌株中，菌株 HS4 产量最高，为 23.586μg/mL，转化率为 7.86%，经鉴定其为干酪乳杆菌（*Lactobacillus casei*）；分离自正镶蓝旗稀奶油的 9 株产 CLA 菌株中，菌株 LX5 产量最高，为 20.508μg/mL，转化率为 6.84%，经鉴定其为副干酪乳杆菌（*Lactobacillus paracasei*）。

Isolation, Screening and Identification of Lactic Acid Bacteria with Conjugated Linoleic Acid-Producing from Traditional Cream Products in Xilingol League of Inner Mongolia

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Abstract: The objective of this study was to isolate lactic acid bacteria (LAB) with high ability to produce conjugated linoleic acid (CLA) from traditional cream products in Xilingol League of Inner Mongolia. CLA content in fermented broth was determined by UV-spectrophotometry, and the strains with the highest CLA-producing ability were identified by analyzing their colony characteristics, cell morphology, biochemical and physiological characteristics, and the phylogenetic tree generated with MEGA 6 software based on 16S rDNA sequence. Twenty CLA-producing strains were isolated from traditional cream products, 11 strains of which were present in samples collected from Xianghuang Banner and the remaining 9 strains were found in samples collected from Zhengxianglan Banner. HS4 with the highest CLA-producing capacity among the strains isolated from cream samples collected from Xianghuang Banner was identified as *Lactobacillus casei*, producing 23.586 ìg/mL CLA with a conversion efficiency of 7.86% when it was cultured at an inoculum size of 2% in the presence of 0.06% linoleic acid; among the strains isolated from cream samples collected from Zhengxianglan Banner, LX5 with the highest CLA-producing capacity was identified as *Lactobacillus paracasei*, producing 20.508 ìg/mL CLA with a conversion efficiency of 6.84% under the same culture conditions as described for HS4.

4.农产品专题

脱酰胺对葵花籽蛋白酶解肽鲜味的影响

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摘 要:鲜味是重要的基本味觉，目前发现具有鲜味的物质包括氨基酸、肽类、核苷酸、有机酸等。其中，肽类不仅呈味功能复杂，还能参与并影响食品风味的形成。本实验采用谷氨酰胺酶对呈鲜味的葵花籽蛋白酶解肽进行脱酰胺，探讨脱酰胺对其鲜味的影响。当鲜味物质的含量相对较高时，鲜味肽的鲜味增强特性明显有效。其结果为：以谷氨酰胺酶为工具酶，在 pH 值为 7.0、样品浓度为 2%、酶添加量为 2%、温度为 50℃的条件下脱酰胺 6h 时，此时制备的脱酰胺葵花籽蛋白酶解肽鲜味值从 10.48 提高到 18.64，与 0.35%的 MSG 协同后，鲜味值从 18.64 增加到 22.70，增鲜效果最好。

Effect of Deamidation on the Freshness of Sunflower Seed Proteolytic Peptides

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Abstract: Fresh taste is an important basic taste. At present, substances with umami taste include amino acids, peptides, nucleotides, organic acids and the like. Among them, peptides not only have complex taste functions, but also participate in and affect the formation of food flavor. In this experiment, glutaminase was used to deamidate the flavonoids of sunflower syrup, and the effect of deamidation on its umami taste was discussed. When the content of the umami substance is relatively high, the umami taste enhancing characteristic of the umami peptide is markedly effective. The result is: deamidation prepared at this time when glutamine enzyme is used as a tool enzyme and deamided for 6 hours under the conditions of pH 7.0, sample concentration 2%, enzyme addition amount 2%, temperature 50 ° C. The umami taste of sunflowerseed proteolytic peptide increased from 10.48 to 18.64. When synergistic with 0.35% of MSG, the umami value increased from 18.64 to 22.70, and the freshening effect was the best.

胡麻油（亚麻籽油）近红外光谱特征研究

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摘 要：胡麻油富含 α-亚麻酸，营养价值很高，不同地区、不同加工工艺和不同品牌市售价是其他大众食用油的 2-36 倍，极易被菜籽油等廉价植物油掺假或冒充。近红外(near infrared，NIR)光谱技术具有操作简便省时、通量高、无化学试剂投入和成本低廉等优点，因而越来越多地用于食物营养成分的定性和定量分析，以及食物真实性的判别。本研究采集 20 种胡麻油、10 种葵花油，5 种菜籽油，5 种大豆油和 5 种调和油在 4000-12000 cm^{-1} 波长范围内进行透射扫描，用化学计量学原理和软件对采集的已知 NIR 透射光谱进行预处理和转换，用主成分分析(PCA)模块进行光谱特征分析，再用偏最小二乘法(PLS)模块建立胡麻油掺假菜籽油量的定量判别模型,以 SEP 值、R 值、RPD 值与 RSD 值作为模型评价指标,并确定 2nd Der 为最佳预处理方法，剔除异常值后模型评价指标 SEP 为 1.1887、R 值为 0.9992、RPD 值为 11.3296、RSD 值为 7.96%；PLS 定量模型的内部验证率达到 100%，外部验证率达到 94.7%。研究结果表明 PCA 模型可明显区分胡麻油、葵花油、菜籽油、大豆油和调和油，PLS 模型可大体估计胡麻油掺假菜籽油程度。

Study on NIR Spectral Characteristics of Linseed/Flaxseed Oil

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Abstract：Linseed oil is rich in α-linolenic acid and has high nutritional value. Its price is 2~36 times than other popular edible oils in different producing area，process and brands，so it is easily adulterated or counterfeit by rapeseed oil and other cheap vegetable oils. Near-infrared (NIR) spectroscopy technology has the advantages of simple and time-saving operation, high fluxes, no chemical reagent input and low cost. Therefore,it is increasingly used for qualitative and quantitative analysis of food components and food authenticity identification.In this study,20 kinds of linseed oil,10

kinds of sunflower oil,5 kinds of rapeseed oil,5 kinds of soybean oil and 5 kinds of blend oil were collected for transmission scanning in the wavelength range of 4000-12000 cm^{-1}, and the collected near-infrared transmission spectrum was pre-processed and converted by chemometrics and software. Spectral characteristics analysis was carried out with principal component analysis (PCA) module, and a quantitative discriminant model of the amount of adulterated linseed oil was established by using the partial least squares method (PLS) module,using SEP value, R value, RPD value and RSD value as the model evaluation index and determining that 2nd Der is the best pretreatment method . After the outlier is removed, the model evaluation index SEP is 1.1887, R value is 0.9992, RPD The value is 11.3296 and the RSD value is 7.96%；The internal verification rate of the PLS quantitative model reached 100%, and the external verification rate reached 94.7%. The Research indicates that PCA model can obviously distinguish linseed oil, sunflower oil,rapeseed oil, soybean oil and blending oil, and PLS model can estimate the degree of adulterated linseed oil.

裸燕麦球蛋白提取工艺的优化

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摘　要：本实验以裸燕麦为原料，采用 Osborne 分级法提取裸燕麦球蛋白。首先通过单因素试验对提取工艺条件进行初步探索，在此基础上采用正交实验对其提取工艺予以优化，并利用十二烷基硫酸钠-聚丙烯酰胺凝胶电泳（Sodium dodecyl sulfate-polyacrylamide gel electrophoresis，SDS-PAGE）电泳对获得的裸燕麦球蛋白进行分析。结果表明：对裸燕麦球蛋白提取率的显著影响主次关系是料液比＞提取时间＞pH＞NaCl 浓度，提取裸燕麦球蛋白的最佳工艺参数为料液比 1:12.5、pH 值 4.6、NaCl 浓度 15%、提取时间 60min，在此条件下裸燕麦球蛋白质的提取率可达 88.64%，获得的裸燕麦球蛋白纯度为 90.21%。

Optimization of extraction process of naked oat globulin

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Abstract: In this experiment, naked oats were used as raw materials to extract naked oat globulin by Osborne classification. Firstly, the extraction process conditions were initially explored by single factor experiment. On the basis of this, the extraction process was optimized by orthogonal experiment, and the obtained naked oat globulin was analyzed by Sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). The results showed that the main influence of the extraction rate of naked oat globulin were the ratio of material to liquid, extraction time, pH, NaCl concentration. And its influence is diminishing. The optimum process parameters for extracting naked oat globulin were 1:12.5, pH 4.6, 15% NaCl concentration and 60 min the extraction time. Under this condition, the extraction rate of naked oatmeal protein can reached 88.64%, and the purity of naked oat globulin obtained was 90.21%.

微粉碎对燕麦麸皮营养特性及抗氧化性的影响

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摘　要：为提高燕麦麸皮的利用率，本试验以燕麦麸皮粗粉为原料，经微粉碎处理过筛，得到三种不同粒径的燕麦麸皮，测定其营养特性和抗氧化能力，探究微粉碎对燕麦麸皮营养成分、功能性成分、抗氧化性的影响。结果表明：随着麸皮粒径的减小，燕麦麸皮中蛋白质含量有所下降，脂肪含量显著增加，多糖含量先增大后减小，膳食纤维和β-葡聚糖含量逐渐减小，多酚含量逐渐增大；微粉碎处理对燕麦麸皮的抗氧化能力影响显著，随着麸皮粒度的减小，总抗氧化能力逐渐增大，羟基自由基清除率和硫代巴比妥酸值（Thiobarbituric acid，TBA）则呈现逐渐减小的趋势；燕麦麸皮为 74μm 时 1,1-二苯基-2-三硝基苯肼（1,1-diphenyl-2-picrylhydrazyl，DPPH）自由基清除率和 2,2'-联氮-双-3-乙基苯并噻唑啉-6-磺酸（2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)，ABTS）自由基清除率达到最大，分别为 92.1%和 71.88％，亚油酸过氧化抑制率最强 。微粉碎处理可以提高燕麦麸皮的抗氧化性 。

The Effect of Micronization on the Nutritional and Antioxidant Properties of Oat Bran

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Abstract: In order to improve the utilization rate of oat bran, three kinds of oat bran with different particle sizes were obtained by micro grinding and screening. The nutritional characteristics and antioxidant capacity of oat bran were measured, and the effects of micro grinding on the nutritional, functional and antioxidant properties of oat bran were explored. The results showed that with the decrease of bran size, protein content in oat bran decreased, fat content increased significantly, polysaccharide content increased first and then decreased, dietary fiber and β-glucan content decreased, polyphenol content increased gradually.With the decrease of the grain size of oat bran, the total antioxidant capacity gradually increased, while the clearance of hydroxyl radicals and TVB value gradually decreased;When oat bran was 74 μ m, DPPH radical scavenging rate and ABTS radical scavenging rate reached the maximum, 92.1% and 71.88% respectively, and linoleic acid peroxidation inhibition rate was the strongest. The antioxidation of oat bran can be improved by micro powder.

限制性酶解结合大孔树脂吸附脱色对葵花籽蛋白功能特性的影响

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摘　要：以低温脱脂葵花籽粕为原料，采用限制性酶解结合大孔树脂对葵花籽蛋白进行吸附脱色提取葵花籽分离蛋白，研究限制性酶解结合大孔树脂吸附脱色对葵花籽蛋白溶解性、乳化性及乳化稳定性、起泡性及泡沫稳定性、持油性及凝胶性等功能特性的影响。结果表明：经限制性酶解结合大孔树脂吸附脱色

处理的葵花籽蛋白绿原酸含量仅为 0.16%，与葵花籽蛋白相比，绿原酸脱除达到了 87.40%，经限制性酶解结合大孔树脂吸附脱色处理的葵花籽蛋白色泽明显改善，亮度值(L^*)由 63.1 提高至 86.3，采用限制性酶解结合大孔树脂吸附脱色葵花籽蛋白的溶解性由 54%提升至 86%，起泡性、乳化性等都均优于葵花籽蛋白和大豆蛋白。持油性、持水性略低于葵花籽蛋白和大豆蛋白,与未脱酚葵花籽蛋白相比，限制性酶解结合大孔树脂吸附脱色处理的葵花籽蛋白具有较好的凝胶性。

The effect of limited hydrolysis combined with macroporous resin adsorption decolorization on the functional characteristics of sunflower seed protein

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Abstract： The sunflower seed protein was extracted from low temperature defatted sunflower seed meal by restriction enzyme digestion combined with macroporous resin. The protein isolated from sunflower seed was extracted by adsorption and decolorization. The effects of enzymatic hydrolysis combined with macroporous resin decolorization on the solubility, emulsification and emulsifying stability, foaming ability, foam stability, oil holding capacity and gelation of sunflower seed protein were studied. The results showed that the chlorogenic acid content of sunflower seed protein was only 0.16% after the treatment of restriction enzyme hydrolysis and macroporous resin adsorption and decolorization. Compared with sunflower seed protein, the chlorogenic acid removal was 87.40%. The color of sunflower seed protein treated by restriction enzyme hydrolysis and macroporous resin adsorption and decolorization was significantly improved, the brightness value (L *) was increased from 63.1 to 86.3, and the adsorption was carried out by restriction enzyme hydrolysis and macroporous resin The solubility of decolorized sunflower seed protein increased from 54% to 86%, and its foaming and emulsifying properties were better than sunflower seed protein and

soybean protein. Compared with non dephenolated sunflower seed protein, oil and water holding capacity were slightly lower than sunflower seed protein and soybean protein. The restriction enzyme hydrolysis combined with macroporous resin decolorization of sunflower seed protein had good gel properties.

亚麻籽肽对高脂血症模型大鼠肝脏组织 ABCG5/ABCG8 及 NPC1L1 的影响

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摘 要: 研究亚麻籽肽对高脂血症大鼠肝脏三磷酸腺苷结合盒转运体 G5（ABCG5）、G8 (ABCG8) 和尼曼-匹克 C1 型类似蛋白 1 (NPC1L1) 表达的影响，初步探讨亚麻籽肽对高脂血症大鼠降胆固醇的作用机理。选用健康雄性 SD 大鼠，随机选取 5 只大鼠为正常对照组，其余 20 只给予高脂饲料建立高脂血症大鼠模型，建模成功后将大鼠随机分为高脂模型组、亚麻籽肽低、中、高剂量组（200，400，800mg/kg）共 4 组，每组 5 只，灌胃给予相应药物 28d。采用免疫组化技术检测各组大鼠肝脏组织中 ABCG5、ABCG8 和 NPC1L1 的蛋白表达，分析亚麻籽肽对胆固醇吸收代谢相关蛋白水平的影响。结果显示，亚麻籽肽显著降低高脂血症模型大鼠血清中总胆固醇 (TC) 、低密度脂蛋白胆固醇 (LDL-C) 、甘油三酯 (TG) 水平（$p<0.05$），且其高密度脂蛋白胆固醇 (HDL-C) 水平显著上升（$p<0.05$）；与正常对照组相比，高脂模型组 ABCG5、ABCG8 和 NPC1L1 表达水平明显升高（$p<0.05$）；与高脂模型组相比，亚麻籽肽各组 ABCG5、ABCG8 的表达水平明显提高，NPC1L1 的表达明显降低，呈剂量依赖性（$p<0.05$）。结论亚麻籽肽能够显著降低高脂血症模型大鼠血清中 TC、TG、LDL-C 水平，其机制可能是通过上调 ABCG5/ABCG8 的表达，下调 NPC1L1 的表达水平，抑制胆固醇的吸收来降低高脂血症模型大鼠胆固醇水平，从而达到降胆固醇目的。

Effects of flaxseed peptide on the expression of ABCG5 / ABCG8 and NPC1L1 in liver tissue of hyperlipidemia model rats

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Abstract： To study the effect of flaxseed peptide on the expression of adenosine triphosphate binding cassette transporters G5 (ABCG5), G8 (ABCG8) and Niemann-Pike C1-like protein 1 (NPC1L1) in the liver of hyperlipidemic rats Mechanism of cholesterol-lowering effect in lipemia rats. Healthy male SD rats were selected. Five rats were randomly selected as the normal control group. The remaining 20 rats were given high-fat diet to establish a hyperlipidemia rat model. After successful modeling, the rats were randomly divided into a high-fat model group and flax. The seed peptide low-, medium-, and high-dose groups (200, 400, 800 mg / kg) consisted of 4 groups, 5 in each group, and the corresponding drugs were administered orally for 28 days. Immunohistochemical methods were used to detect the protein expressions of ABCG5, ABCG8 and NPC1L1 in the liver tissue of rats in each group, and the effect of flaxseed peptide on cholesterol absorption and metabolism-related protein levels was analyzed. The experimental results showed that flaxseed peptide significantly reduced the total cholesterol (TC), low density cholesterol (LDL-C), and triglyceride (TG) levels in the serum of hyperlipidemia model rats ($p<0.05$), and its high density Cholesterol (HDL-C) levels increased significantly ($p<0.05$); compared with the normal control group, the expression levels of ABCG5, ABCG8, and NPC1L1 in the high-fat model group were significantly increased ($p<0.05$); The expression levels of ABCG5 and ABCG8 in the flaxseed peptide groups were significantly increased, and the expression of NPC1L1 was significantly reduced in a dose-dependent manner ($p<0.05$). Conclusion Flaxseed peptide can significantly reduce the levels of TC, TG and LDL-C in the serum of hyperlipidemia model rats. The mechanism may be by increasing the expression of ABCG5 / ABCG8, down-regulating the expression of NPC1L1, and inhibiting the absorption of cholesterol to reduce Cholesterol levels in lipemia model rats, so as to achieve the purpose of lowering cholesterol.

含萜烯类化合物的天然植物精油安全性研究进展

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摘 要：植物精油（Essential oils）是从草本植物的各个部位中提取的天然化合物，因植物的种类、生长情况、地理区域、环境因素的不同，其成分和含量具有显著差异。其主要成分一般含有醇类、酚类、醛类、酮类和萜烯类化合物。植物精油具有增香、杀菌、抗氧化等功效被广泛运用于食品、化妆品、香料、医疗等各个方面。随着植物精油的广泛运用，植物精油的安全性也被更加重视。

Research progress in the safety of natural essential oils containing terpenes

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Abstract： Essential oils are natural compounds extracted from various parts of herbaceous plants. Because of different plant species, growth, geographical areas and environmental factors, their composition and content are significantly different. Its main components generally contain alcohols, phenols, aldehydes, ketones and terpenes. Essential oil is widely used in food, cosmetics, spices, medical treatment and other aspects with the functions of increasing fragrance, sterilization, antioxidant, etc. With the wide use of plant essential oil, the safety of plant essential oil has been paid more attention.

蒲公英饮料的工艺初探

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摘 要：以野生的蒲公英为原料，研制出一款具有蒲公英风味和功效的天然营养

保健饮品。本实验采用单因素试验及正交试验方法，以蒲公英饮料的风味、口感、色泽为指标，得出最佳工艺为：料液比 1:100（w:v），浸提温度 80℃，糖酸比 6:0.02（v:v）。以此工艺条件制得的饮品呈亮黄色，香味醇厚，含蒲公英风味，清凉可口，后味微苦。蒲公英作为一种药食同源的植物，其发展前景非常可观。

Technology of Dandelion Beverage

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Abstract: A kind of nutritional and healthy natural beverage with dandelion flavor and efficacy was developed with wild dandelion. In this experiment, through single factor test and orthogonal test method. The flavor, taste, color of dandelion beverage was taken as the index. The best formula of compound beverage were the addition amount of dandelion juice were liquid ratio 1:100(w:v), and the extraction temperature was 80℃. The ratio of sugar to acid is 6:0.02(v:v). The beverage prepared by this process condition is bright yellow, the flavor is coordinated and rich, and has the scent of dandelion, which is cool and delicious, moderately sweet and sour, and slightly bitter aftertaste. As a plant with the efficacy of medicine and food, dandelion has a very promising future.

巴旦木植物蛋白饮料的研制

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摘 要：本试验以巴旦木为主要原料，以一定比例的羧甲基纤维素钠（CMC）、单甘脂（MAC）、蔗糖酯（SE）、果胶（PT）为复合稳定剂，以感官评分和稳定性为评价指标，通过单因素试验、正交试验、极差分析选取巴旦木乳饮料的最优配方。结果显示巴旦木乳饮料的最佳配方为：0.1%的氢氧化钠煮制 5min，再用 50℃的热水打浆，120 目筛子过滤两遍，加热煮沸杀菌待冷却至 80℃，加

入 6%的蔗糖并且将 0.04%单甘脂、0.08%的果胶、0.02%蔗糖酯、0.1%的羧甲基纤维素钠加入蔗糖中混合快速搅拌待完全溶解。

Development of Padan Wood Plant protein Beverage

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Abstract: In this paper, the main raw materials of this experiment were the Almonds sodium carboxyl methyl cellulose (CMC), monoglyceride (MAC), sucrose ester（SE） and pectin(PT) as the compound stabilizers.The sensory score and stability were used as the evaluation indexes. The single factor test, the orthogonal test and the extreme analysis were used to select the most common milk beverage.The result showed that the best formula of almond milk beverage was 0.1% NaOH was cooked for 5 minutes, then beaten with 50°C hot water, filtered through a 120 mesh sieve twice, heated to boil and sterilized until cooled to 80°C, added 6% sucrose and 0.04% monoglyceride, 0.02% A mixture of sucrose ester, 0.08% pectin, and 0.1% sodium carboxyl methyl cellulose was added while stirring to dissolve completely.

抗性淀粉在发酵乳中的变化及其对凝胶形成过程的影响

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摘 要：选用 RS2 型玉米抗性淀粉（G）和微波-湿热法制备的 RS3 型玉米抗性淀粉（W）作为研究对象，观测它们在发酵乳加工贮藏过程中残留量和形态的变化。同时，以不含抗性淀粉的发酵乳为对照，探究两种抗性淀粉对发酵乳胶凝形成过程的微观结构、流变性质和稳定性的影响。结果表明，在发酵乳加工贮藏过程中，W 和 G 的颗粒形态基本不变，但残留量均有较大程度的降低，依次为初始添加量的 62.75%和 58.76%。通过测定发酵乳的微流变参数和稳定性参数，发现相较于 G，W 与酪蛋白颗粒结合更紧密，更易于形成弹性强、粘度高、凝胶强度好、稳定性高的发酵乳。因此，微波-湿热法制备的 RS3 型玉米性淀粉稳定性

好，有利于发酵乳的凝胶形成，具有更大研究潜力。

Changes of resistant starch in fermented milk and it's effect on gelation

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Abstract: RS2 type maize resistant starch G (a high-amylose corn starch) and RS3 type maize resistant starch W (a physically modified maize starch) were selected as research objects to observe the changes of their residues and morphology during the processing and storage of fermented milk. At the same time, the effects of two kinds of resistant starch on the microstructure, rheological properties and stability of the latex were studied. The results showed that during the processing and storage of fermented milk, the particle morphology of W and G remained unchanged, but the residue decreased to a large extent, which was 62.75% and 58.76% of the initial addition. By measuring the micro rheological parameters and stability parameters of fermented milk, it was found that compared with G, W was more tightly bound to casein particles and easier to form fermented milk with strong elasticity, high viscosity, high gel strength and high stability. Therefore, RS3 type maize resistant starch prepared by microwave hydrothermal method is stable and beneficial to gel formation of fermented milk.

葵花盘醇提物抗氧化活性的研究

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摘　要：内蒙古巴盟地区每年大量产葵花盘，目前多用作牲畜饲料，使得葵花盘未得到充分利用，造成资源浪费。本文以脱胶葵花盘为原料，以 DPPH 自由基清除率、ABTS 自由基清除率、·OH 清除率、总还原力为指标分析了葵花盘醇提物的抗氧化活性。结果发现，葵花盘醇提物对 DPPH 自由基的清除率与其浓度呈线

性关系,随着葵花盘醇提物浓度增大，DPPH 自由基清除率也升高，当葵花盘醇提物浓度为 1mg/ml 时，其 DPPH 自由基清除率为 71.02%；葵花盘醇提物具有一定的 ABTS 自由基清除能力，其 ABTS 自由基清除能力与浓度呈剂量-效应关系,当葵花盘醇 提物浓度为 0.2mg/ml 时，其 ABTS 自由基清除率为 7.05%，当葵花盘醇提物浓度为 1mg/ml 时，其 ABTS 自由基清除率达 36.52%；葵花盘醇提物清除▪OH 的能力随着葵花盘醇提物浓度升高而增加，当葵花盘醇提物浓度为 0.8mg/ml 时，其▪OH 清除率为 21.22%，浓度为 1mg/ml 时，▪OH 清除率为 23.58%；葵花盘醇提物的总还原力低于 Vc，但随浓度升高，葵花盘醇提物的还原力变化趋势与 Vc 相同。以上结果表明，葵花盘醇提物具有一定的抗氧化活性。

Study on antioxidant activity of alcohol extract from sunflower disk

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Abstract： The annual production of sunflower disk in the Inner Mongolia Bameng area is mostly used as livestock feed, which makes the sunflower disk not fully utilized, resulting in waste of resources. In this experiment, the degummed sunflower disk was used as raw material,the DPPH free radical scavenging rate, ABTS free radical scavenging rate, hydroxyl radical scavenging rate and total reducing power were used as indicators to analyze the ethanol extract of sunflower disk'santioxidant activity.The results showed that the DPPH free radical scavenging rate of the ethanol extract of sunflower disk was linear with its concentration. As the concentration increased, the DPPH free radical scavenging rate also increased. When the concentration of the ethanol extract of sunflower disk was 1 mg/ml, The DPPH free radical rate was 71.02%.The ethanol extract ofsunflower disk had certain ABTS free radical scavenging ability, and its ABTS free radical scavenging capacity was dose-effect relationship with concentration. When the concentration of alcohol extract of sunflower disk was 0.2 mg/ml, the ABTS free radical scavenging rate was 7.05%. When the concentration of the alcohol extract of sunflower disk was 1 mg/ml, the ABTS free radical scavenging rate reached 36.52%. The ability to remove ▪ OH is increased with the concentration of

alcohol extract of sunflower disk. When the concentration of alcohol extract in sunflower disk was 0.8 mg/ml, Its ▪OH clearance rate was 21.22%, and when the concentration was 1 mg/ml, the ▪OH clearance rate was 23.58%.The total reducing power of the alcohol extracting material is lower than Vc, but with the increase of the concentration, the reducing power has the same tendency as Vc. The above results indicate that the ethanol extract ofsunflower disk has certain antioxidant activity.

清飘苓茶中黄酮提取工艺优化及功能特性的检测

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摘 要：对清飘苓茶的黄酮提取工艺进行优化，并对其黄酮提取液的功能特性进行探讨。结果表明，清飘苓茶的最优黄酮提取条件是料液比为 1:40 g/mL，乙醇浓度为 60%，提取时间为 1 h，提取温度为 70℃。该提取条件下的黄酮含量为 7.02±0.25%。清飘苓茶的黄酮提取液具有一定的抗氧化活性与降尿酸功能，其黄酮提取液在 10 mg/mL 时 DPPH·清除率（87.91±0.22%）、·OH 清除率（42.07±0.86%）和还原力（1.94±0.05）最强；清飘苓茶黄酮提取液的 XOD 抑制率为 67.38±1.86%，说明清飘苓茶具有较好的抗氧化性及降尿酸功能。

Optimization of Flavonoid Extraction Process and Functional Properties in Qing Piao Ling Tea

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Abstract: In this paper, the flavonoid extraction process of Qing Piao Ling tea was optimized, and the functional properties of its flavonoid extract were discussed. The results are as follows: The ratio of material to liquid is 1:40 g/mL, the concentration of ethanol is 60%, the extraction time is 1 h, and the extraction temperature is 70℃. The flavonoid content under the extraction conditions was 7.02 ± 0.25%. The flavonoid

extract of Qing Piao Ling tea has certain antioxidant activity and uric acid-lowering function. Its flavonoid extract has the strongest DPPH· clearance rate (87.91±0.22%), ·OH clearance rate (42.07±0.86%) and reducing power (1.94±0.05) at 10 mg/mL. The XOD inhibition rate of flavonoid extract of Qing Piao Ling Tea was 67.38±1.86%. The results showed that Qing Piao Ling Tea has better antioxidant and uric acid-lowering functions.

Western-blot 检测降胆固醇合成肽在亚麻籽蛋白中的表达

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摘　要：蛋白免印迹技术（Western blot 技术）用于现代生物学研究中的蛋白质定性和定量分析。本文采用 Western blot 技术对亚麻籽蛋白来源的具有降胆固醇活性的多肽为模板合成肽链 RGGPGAPAPPR、QPPAMKNAPR、KGGLIAFAFVR、CLYLDVSATTR，对其在亚麻籽蛋白中是否存在进行鉴定。首先对四种肽链采用化学固相合成技术进行合成，在此基础上以其作为免疫抗原制备抗体，同时采用 Western blot 技术检测合成肽。结果发现：通过化学固相合成技术合成肽的纯度分别为 98.86%、97.12%、96.54%和 99.25%，分子量分别为 1032.18Da、1109.32Da、1178.45Da 和 1241.44Da 与理论分子量几乎吻合，达到免疫抗原标准。通过体外模拟胆汁胶束溶液测得四种合成肽的胆固醇胶束溶解度抑制率分别为 54.36%、13.68%、75.25%和 29.64%。最后通过 Western blot 技术检测出具有最高降胆固醇活性的合成肽 KGGLIAFAFVR 存在于亚麻籽蛋白的条带中，证明了多肽 KGGLIAFAFVR 的确来源于亚麻籽蛋白。

Western blot detection of the expression of cholesterol reducing synthetic peptide in flaxseed protein

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Abstact：Protein blotting (Western blot) is used for qualitative and quantitative analysis of proteins in modern biological research. In this paper, the peptides with cholesterol-lowering activity derived from flaxseed protein were used as template to synthesize peptide chains RGPPGAPAPPR, QPPAMKNAPR, KGGLIAFAFVR and CLYLDVSATTR, and their presence in flaxseed protein was identified. First, four peptide chains were synthesized by chemical solid phase synthesis. On this basis, antibodies were prepared as immunogenic antigens, and synthetic peptides were detected by Western blot. The results showed that the purity of the synthesized peptides by chemical solid phase synthesis was 98.86%, 97.12%, 96.54% and 99.25%, respectively, and the molecular weights were 1032.18Da, 1109.32Da, 1174.45Da and 1241.44Da, which almost coincided with the theoretical molecular weight, reaching the immune antigen. standard. The inhibition rates of cholesterol micelle solubility of the four synthetic peptides were 54.36%, 13.68%, 75.25% and 29.64%, respectively, by in vitro simulated bile micelle solution. Finally, Western blot analysis showed that the synthetic peptide KGGLIAFAFVR with the highest cholesterol-lowering activity was present in the linseed protein band, which proved that the peptide KGGLIAFAFVR was indeed derived from linseed protein.

植物多酚对动物脂质代谢的影响研究进展

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摘 要：脂肪组织是动物体内的重要组成部分，脂质代谢过程对动物生长性能以及畜禽宰后肉品质有重要影响。植物多酚作为一种天然的活性物质，可以通过调节肠道微生物多样性、激活能量感受器一磷酸腺苷活化蛋白激酶(AMP-activated protein kinase，AMPK)、促进线粒体生物合成等途径发挥其对脂质代谢的调节作用。目前，利用植物多酚来调控动物体脂质代谢，从而改善宰后肉品质的研究已逐步成为各领域研究热点。本文根据国内外对植物多酚调控脂质代谢研究现状，论述了植物多酚的功能作用对动物体内脂质代谢的影响，为提

高畜禽宰后肉品质提供理论基础。

Review: the effects of plant polyphenols on lipid metabolism in animals

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Abstract： Adipose tissue is an important part of animal body. The process of lipid metabolism has an important influence on the growth performance of animals and the quality of meat after slaughter. As a natural active substance, plant polyphenols can exert its regulation on lipid metabolism by regulating intestinal microbial diversity, activating energy receptor AMPK, and promoting mitochondrial biosynthesis. At present, the research on using plant polyphenols to regulate the disorder of lipid metabolism in animals and improve the quality of meat after slaughter has gradually become a research hotspot in various fields. Based on the research status of plant polyphenols regulating lipid metabolism at home and abroad, the effects of plant polyphenols on lipid metabolism in animals were discussed, which provided a theoretical basis for improving meat quality after livestock and poultry slaughter.

微粉碎对燕麦麸皮理化特性及抗氧化能力的影响

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摘 要：燕麦麸皮作为燕麦加工的副产品，主要含有淀粉、膳食纤维、蛋白质等营养成分及功能性成分，并对人体具有一定的保健功能，所以近年来人们对燕麦麸皮的研究日益增多。本实验以燕麦麸皮为原料，探究微粉碎对燕麦麸皮组成成分以及理化特性、抗氧化性的影响。实验结果显示：微粉碎对燕麦麸皮的营养成分有一定的影响，随着麸皮粒度的减小，其中蛋白质含量有所下降，脂肪含量显著增加；微粉碎对燕麦麸皮的水溶性、膨胀力、持油力影响比较显著，37℃条件

下燕麦麸皮持油力优于20℃条件下的，没有经过微粉碎的80目麸皮持油力、持水力、胆固醇吸附力更好，燕麦麸皮对胆固醇的吸附力在酸性条件下比在中性条件下更佳；微粉碎对麸皮功能性成分影响显著，随着麸皮粒度的减小，多糖含量先增大后减小，膳食纤维含量逐渐减小，多酚含量逐渐增大；微粉碎对燕麦麸皮的抗氧化能力影响显著，总抗氧化能力随着麸皮粒度的减小而增大，DPPH自由基清除率则是先增大后减小。

Effects of micro-pulverization on physical and chemical properties and antioxidant capacity of oat bran

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Abstract： As a by-product of oat processing, oat bran mainly contains nutrients and functional ingredients such as starch, dietary fiber and protein, and has certain health care functions for the human body. Therefore, people's research on oat bran has been increasing in recent years. In this experiment, oat bran was used as raw material to explore the effects of micro-grinding on the composition, physicochemical properties and oxidation resistance of oat bran. The experimental results show that the micro-grinding has a certain effect on the nutrient content of oat bran. With the decrease of micro-grinding particle size, the protein content in oat bran decreased, the fat content increased significantly; the micro-crushing had a significant effect on the water-soluble、expansion and oil holding capacity of oat bran. Under the condition of 37℃, the oil holding capacity of oat bran is better than that under 20 °C. The 80 mesh bran without fine pulverization has oil holding capacity, water holding capacity and cholesterol adsorption capacity well, the adsorption of cholesterol on oat bran is better under acidic conditions than under neutral conditions; Micro-pulverization has a significant effect on the functional components of bran. As the grain size of bran decreases, the content of polysaccharide first increases and then decreases, the content of dietary fiber decreases gradually, and the content of polyphenols gradually increases. Micro-pulverization has a significant effect on the antioxidant capacity of oat bran. The total

antioxidant capacity increases with the decrease of bran particle size, and the DPPH free radical scavenging rate increases first and then decreases.

菜芙蓉花总黄酮提取工艺的优化

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摘　要：本文以菜芙蓉花为原料，采用传统的水提取法，单一超声波提取法，单一酶解法提取及超声波协同酶法提取菜芙蓉花的总黄酮；通过单因素实验和正交实验，以黄酮提取率为指标，从而优化菜芙蓉花总黄酮的提取工艺。结果表明：（1）超声波协同酶法>单一超声法>单一酶法>水提法。（2）超声波协同酶法提取菜芙蓉花总黄酮的最优工艺参数为料液比为 1:20，超声波作用时间 25min、酶用量 0.008ml、酶解温度 50℃、酶解时间 2.0h。在此条件下菜芙蓉中黄酮的提取率可达 3.224%。

Optimization of extraction technology of total flavonoids from cauliflower Flower

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Abstract：This article takes the vegetable hibiscus flower as the raw material, the extraction process of total flavonoids in vegetable hibiscus flower was optimized by using the traditional water extraction method, single ultrasonic extraction method, single enzymatic method extraction and ultrasonic synergistic enzymatic extraction of total flavonoids from vegetable hibiscus flower. By single factor experiment and orthogonal experiment, the extraction rate of flavonoids was improved. The results showed: (1) Ultrasonic synergistic enzyme method＞single ultrasonic method＞single enzyme method＞water formulation. (2) The optimum technological parameters of ultrasonic synergistic enzymatic extraction of total flavonoids from vegetable hibiscus flower were the ratio of material to liquid 1:20, ultrasonic action time 25min, enzyme

dosage 0.008ml, enzymatic hydrolysis temperature 50 ℃, and enzymatic hydrolysis time 2.0h. In this condition, the extraction rate of flavonoids in vegetable hibiscus can reach 3.224%.

5.其 他

紫李色素提取及稳定性研究

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摘　要：李子含有丰富的氨基酸、维生素及膳食纤维等营养成分，李子皮中含有的紫李色素属于花色苷的一种，由于花色苷的相对不稳定性，以及较低的提取率，使得对于紫李色素的研究受到限制，近年来由于天然色素的广泛应用，对于紫李色素的研究也开始增多。本文以安哥诺李子为实验材料，采用酸醇提取法研究紫李色素的提取工艺、色素稳定性以及抗氧化性能。本试验研究得到酸醇提取法提取紫李色素的最优工艺条件：乙醇浓度为 40%、柠檬酸浓度为 0.3%、浸提温度为 60℃、浸提时间为 30min。通过研究了光照、温度、酸碱、金属离子等因素对色素稳定性的影响，结果表明紫李色素对光照不敏感，对热敏感，对酸稳定，金属离子 **Cu^{2+}、Fe^{3+}、Al^{3+}、Zn^{2+}及 Fe^{2+}**对色素稳定性影响较大。通过测定紫李色素的抗氧化指标，结果表明紫李色素清除超氧阴离子能力差，清除率仅为 24%，羟基自由基清除率为 56%， DPPH 自由基清除率为 43%，同时也具有螯合亚铁离子的能力。为紫李色素作为新型天然色素的开发与应用提供理论依据。

Study on the extraction and stability of Purple Plum pigment

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Abstract: Plum is rich in amino acids, vitamins, dietary fiber and other nutrients. The Purple Plum pigment contained in plum skin belongs to one of anthocyanins. Due to the relative instability of anthocyanins and the low extraction rate, the research on Purple Plum pigment is limited. In recent years, due to the wide application of natural pigment, the research on Purple Plum pigment is also increasing. Angono plum was used as experimental material to study the extraction process, pigment stability and antioxidant properties of Purple Plum pigment by acid alcohol extraction. In this experiment, the optimum conditions of extracting Purple Plum pigment by acid alcohol extraction were obtained: 40% ethanol concentration, 0.3% citric acid concentration,

60 ℃ extraction temperature and 30 minutes extraction time. The effects of light, temperature, acid and alkali, metal ions on the stability of Purple Plum pigment were studied. The results showed that Purple Plum pigment was not sensitive to light, sensitive to heat and stable to acid. Metal ions Cu^{2+}, Fe^{3+}, Al^{3+}, Zn^{2+} and Fe^{2+} had a great influence on the stability of pigment. The results showed that the scavenging rate of Purple Plum pigment was only 24%, the scavenging rate of hydroxyl radical was 56%, the scavenging rate of DPPH radical was 43%, and it also had the ability of chelating ferrous ion. It provides a theoretical basis for the development and application of Purple Plum pigment as a new natural pigment.

复合天然生物保鲜剂延长冷却驴肉货架期的研究

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摘 要：研究以驴肉为原料，采用真空包装和涂膜保鲜的方式，设计三因素三水平正交实验（$L_9(3^3)$)筛选延长冷却驴肉货架期及保鲜效果的最优浓度配方，同时最大限度地保证感官品质不发生改变。选用ε-聚赖氨酸、乳酸链球菌素（Nisin）、壳聚糖、D-异抗坏血酸钠为保鲜剂，在第 0 天到第 18 天的储藏期内对菌落总数、挥发性盐基氮值（TVB-N)、pH 值、硫代巴比妥酸值(TBAR-s）、红度值、质构特性、感官评分等七个指标进行检测。通过使用 Minitab 17 等软件综合分析实验数据，结果发现，复合天然保鲜剂对冷却驴肉能够起到一定的保鲜效果，在ε-聚赖氨酸浓度为 0.02%，Nisin 浓度为 0.1%，壳聚糖浓度为 1.5%，D-异抗坏血酸钠浓度为 0.1%的条件下，有效抑制微生物的生长，保持驴肉本身的颜色，延缓脂质的氧化，保鲜效果最佳，保鲜天数达到 18 天以上，此时冷却驴肉仍为一级鲜度，有效延长了冷却驴肉的货架期。

Study on extending shelf life of chilled donkey meat with compound natural bio-preservative

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Abstract: In this study, donkey meat was used as raw material, vacuum packaging and coating preservation, three factors and three levels orthogonal experiment (L_9 (3^3)) was designed to select the optimal concentration formula for prolonging the shelflife and preservation effect of chiled donkey meat, and at the same time, the sensory quality was guaranteed not to change to the maximum extent. Seven indexes, such as colony count、TVB-N、pH、TBAR-s、redness、texture and sensory score, were tested during the storage period from day 0 to day 18 with ε-polylysine, nisin, chitosan and D-isoascorbic acid sodium as preservatives. By using Minitab 17 and other software to analyze the experimental data, the results show that the composite natural preservative can effectively inhibit the growth of microorganisms, maintain the color of donkey meat, and delay the lipid under the conditions of ε-polylysine concentration of 0.02%, Nisin concentration of 0.1%, chitosan concentration of 1.5%, and D-isoascorbic acid sodium concentration of 0.1%. The best preservation effect is the oxidation of quality. The preservation time is 18 days. At this time, the chilled donkey meat is still the first-class freshness, effectively extending the shelf life of the chilled donkey meat.

高阻隔性、高选择透过性聚乳酸薄膜的制备及其在冷鲜肉自发气调包装中的应用

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摘　要: 为了延长冷鲜猪肉的保质期，采用等离子体增强化学气相沉积法（Plasma Enhanced Chemical Vapor Deposition, PECVD）在完全可生物降解的聚乳酸（poly (L-lactic acid), PLLA）薄膜表面沉积一层氧化硅（SiOx），制备出具有更高气体阻隔性和气体透过比的 PLLA/SiOx 复合膜。进一步将 PLLA/SiOx 薄膜与茶多酚保鲜垫结合使用，为冷鲜肉构造了合适的自发气调包装。PLLA/SiOx 薄膜的主要包装性能都经过合适的测试方法进行了表征，自发气调包装中的冷鲜肉的品质也经过恰当的测试手段进行了考察。研究结果表明，采用 PECVD 法可以在 PLLA

薄膜表面成功沉积 SiOx 层，制得的一系列 PLLA/SiOx 薄膜中属 PLLA/SiOx60 薄膜的综合包装性能最佳。与纯 PLLA 薄膜相比，PLLA/SiOx60 薄膜的杨氏模量和拉伸强度分别提高了 119.6%和 91.6%。在 5℃时，PLLA/SiOx60 薄膜的氧气（O_2）和二氧化碳（CO_2）透过系数分别降低了 78.7%和 71.7%，而且 CO_2/O_2 透气比从 2.74 提高到 3.63；相比于纯 PLLA 薄膜，当把 PLLA/SiOx60 薄膜应用于冷鲜肉的自发均衡气调包装（EMAP）中时，包装内的气体保持了更长时间的动态平衡：6~11%的 CO_2 和 8~13%的 O_2。结合具有抑菌功能的茶多酚保鲜垫，有效地抑制了微生物的生长，维持了猪肉的新鲜色泽，最终获得 52 天的货架期。

Preparation of High Barrier Property and Permselectivity Poly(L-lactic acid) (PLLA) and Its Application in Equilibrium Modified Atmosphere Packaging (EMAP) of Cold Meat

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Abstract: To extend the shelf-life of chilled meat, a layer of SiOx was deposited on the surface of poly(L-lactic acid) (PLLA) film by plasma enhanced chemical vapor deposition (PECVD) process, to fabricate PLLA/SiOx layered films, which showed higher gas barrier and gas permselectivity, compared with the neat PLLA film. Further, the PLLA/SiOx films and TP pads were combined and applied to the equilibrium modified atmosphere packaging (EMAP) of chilled meat. The main packaging performance of the PLLA/SiOx films were evaluated by appropriate characterization methods, and the results are as follows: A series of PLLA/SiOx films were prepared by PECVD, and the film with a deposition time of 60 minutes (PLLA/SiOx60) has the optimum comprehensive package performance. PLLA/SiOx60 film showed Young's modulus and tensile strength increased by 119.2% and 91.6% respectively, over those of neat PLLA film. At 5 °C, the oxygen (O_2) and carbon dioxide (CO_2) permeability of PLLA/SiOx60 film decreased by 78.7% and 71.7% respectively, and the CO_2/O_2 permselectivity increased by 32.5%, compared to that of the neat PLLA film; When the

PLLA/SiOx60 film was applied to the EMAP of chilled meat, the gas composition in packaging reached a dynamic equilibrium with 6 ~ 11 % CO_2 and 8 ~ 13 % O_2, which was kept longer than that in neat PLLA packaging. Combined with the TP pads which effectively inhibited the microbial growth, the desirable color of meat was maintained and an extended shelf-life of 52 days was achieved for the chilled meat.

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优秀奖 12 名：刘畅，贺佳鑫，孙学颖，何宗柏，张小羽，郭进，王纯玮，牛潇潇，马瑞瑞，李璇，王映璐，刘婷。

科技工作者与企业家共同携手

抒写畜产品加工业的将来

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