The Annual Report of International Seabuckthorn Development for the Year of 2023
国际沙棘发展报告（2023 年度）

International Seabuckthorn Association (ISA)
Management Center for Seabuckthorn Development
Ministry of Water Resources, CHINA
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Preface

Seabuckthorn is a multi-purposes plant known as *Hippophae* in Latin name, Seabuckthorn in English, Shaji in Chinese, Облепиха in Russian, Sanddorn in German, Argousier in French, Espina de Mar in Spanish, Rokitnik zwyczajny in Polish, Tyrni in Finnish, Havtorn in Swedish and Tsestallu/Charma/Bardiphal in India respectively.

International Seabuckthorn Association (ISA) with the Headquarter in Beijing, China, is an academic and industry-based international non-governmental and non-profit organization that is voluntarily formed by enterprises, institutions, individuals and other organizations which are active in the research and development of seabuckthorn around the world. The purpose of the ISA is to give full play to the role of seabuckthorn in facilitating environmental protection, economic development and human health, promote exchanges and global cooperation in seabuckthorn cultivation, scientific research, production, economy and trade, personnel, information, etc., and provide international communication service of seabuckthorn to ISA members and all sectors of the society.

ISA has the following scope of activities:

1. Give play to the self-discipline role of the seabuckthorn industry, formulate industry regulations, standardize industry behaviors, and promote the development of the industry;
2. Investigate and research the developmental dynamics and trends of seabuckthorn at home and abroad, and provide consulting services for the construction and development of seabuckthorn;
3. Undertake international exchange and cooperation projects entrusted or funded by government agencies and other organizations;
4. Build international seabuckthorn information network and database, and promote international exchanges and cooperation of seabuckthorn;
5. In accordance with relevant provisions, edit and publish professional publications, and expand the popularity and publicity of seabuckthorn knowledge;
6. Organize and host exchange activities such as seabuckthorn

academic seminars at home and abroad;
7. Carry out personnel training and exchange visits in the field of seabuckthorn.

For the purpose of information exchange, data sharing among member countries and to improve attraction globally, it is the responsibility and work plan of ISA Secretariat to publish The Annual Report of International Seabuckthorn Development. We fully understand that Country Report of Seabuckthorn Development in the Year of 2023 is the important basic materials. The members of Board/Scientific Committee of ISA are requested to provide with national-wide statistical information in 7 aspects listed in Appendix as in detail as possible. And then kindly submit the document in English and/or in Chinese to Mr. Zhang Bin, Deputy Secretary General of ISA, by email of isahome@126.com.

By October of 2024, we have received the Country Report of China, France, Germany, India, Latvia, Lithuania and Poland respectively. All these reports have been translated into Chinese or English for further bilingual printing with assistance from the Board and Scientific Committee of ISA.

According to the uncompleted statistics, by the end of 2023, seabuckthorn was found in 55 countries of Europe, Asia, South Afica, North America and South America. The global seabuckthorn resource was around 2,570,300 ha (with yearly increase of 49,300 ha in 2023), including 2,254,700 ha in China.

This Report was financially supported by Ministry of Water Resources, the People's Republic of China with joint technical supports from Gansu Agricultural University, Dalian Minzu University and Shanxi Academy of Forestry and Grassland Sciences .

We are looking forward to the better ISA operation and global seabuckthorn development.

The Editing Committee

序 言

沙棘是一种广泛分布在欧亚大陆温带地区的多功能植物资源，在中国西北、华北地区又名：醋柳、酸刺、黑刺、酸溜溜、圪针。其拉丁文：*Hippophae*，英语：Seabuckthorn，俄语：Облепиха，德语：Sanddorn，法语：Argousier，波兰语：Rokitnik zwyczajny，西班牙语：Espina de Mar，芬兰语：Tyrni，瑞典语：Havtorn。在印度不同地区分别称为：Tsestallu, Chharma, Bardiphal。

国际沙棘协会于 1999 年由中国水利部沙棘开发管理中心联合世界各国沙棘专家共同发起，在 2001 年印度会议上同意成立。2011 年 9 月，经国务院批准、民政部注册登记，成为第 27 家总部设在中国的国际组织，其业务主管单位为中华人民共和国水利部。协会由会员代表大会、理事会、专业委员会、秘书处四级组织管理机构组成，秘书处挂靠在沙棘中心。协会理事会成员由全球主要沙棘国家的代表组成，技术委员会成员由世界各国的知名沙棘专家组成。

协会的目标和宗旨是全面发挥沙棘在促进环境保护、经济发展及人类健康等方面的作用，推进中国与世界各国在沙棘种植、科研、生产、经贸以及人员和信息等方面的交流与合作，为会员和社会各界提供沙棘领域的国际交流服务。

协会主要职能是：

一、发挥沙棘行业自律作用，制定行业规章，规范行业行为，推动行业发展；

二、调查研究国内外沙棘发展动态和趋势，提供沙棘建设与开发咨询服务，组织举办全国性、国际性学术会议；

三、承办政府机构等组织委托或资助的国际交流与合作项目，组织举办沙棘专业技术培训和专题考察；

四、建设国际沙棘信息网络和资料库，促进国际沙棘交流与合作；

五、编辑出版专业刊物，加大沙棘知识的普及和宣传力度。

为加强国际沙棘协会各成员之间的信息交流，分享世界各国沙棘发展成功经验，国际沙棘协会秘书处成立了《国际沙棘发展报告》专门工作组，组织邀请了国际知名沙棘专家撰写其所在国家的2023年度沙棘发展报告。截止2024年10月，我们收到来自中国、法国、德国、印度、拉脱维亚、立陶宛和波兰等国家的报告，并组织翻译成中文（或英文）。现将上述7个国家的报告汇编成《国际沙棘发展报告》，用中英文双语出版。

据不完全统计，截止2023年底，沙棘植物分布在全球55个国家，总面积约2,560,000公顷(约合3840万亩),比上一年增加约40,000公顷(约合60万亩)。其中,中国约2,245,300公顷(约合3368万亩)，其他国家约313,000公顷(约合472万亩)。

本报告得到水利部有关司局的大力支持，得到甘肃农业大学、大连民族大学、山西省林业和草原科学研究院等单位的技术帮助。

祝愿国际沙棘协会及全球沙棘事业更好更快发展！

《国际沙棘发展报告》编委会

2024年12月

Appendix:

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1. Country report of China

中国沙棘发展报告

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Seabuckthorn Development of China in 2023

2023 年中国沙棘发展报告

Management Center for Seabuckthorn Development, Ministry of Water Resource
Secretariat of International Seabuckthorn Association (ISA)
水利部沙棘开发管理中心
国际沙棘协会秘书处

1. The national-wide seabuckthorn resources of plantations and the increased areas (including the natural stands and the artificial plantations), estimated yield and harvested qualities of total seabuckthorn berries in the year of 2023

一、中国沙棘资源总面积及当年新增面积（含天然林和人工生态林、经济林）、当年（估算）鲜果总产量及采收量。

China has the richest and largest area of seabuckthorn natural stands and man-made plantation. By the end of 2023, there were nationally in total 2,254,700 ha(33,82,000 mu)of seabutkthorn resources, accounting for 88% of the global resources of 2,570,300 ha(38,550,000 mu). The increased artificial seabuckthorn plantation is about 49,300 ha(74,0000 mu), including 25,300 ha (38,0000 mu) for ecological purposes and 24,000 ha(360,000 mu) for economic purposes.

中国是天然沙棘林和人工种植沙棘林面积最大的国家。截止 2023 年 12 月，全国沙棘资源总面积约 3382 万亩，占世界沙棘资源总面积 3855 万亩的 88%，比上一年增加 74 万亩。

In China, seabutkthorn is distributed naturally and artificially planted in 16 provinces (or autonomous regions, or municipality) e.g. Beijing, Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Henan, Sichuan, Yunnan, Xizang, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang. Currently, seabuckthorn resources are mainly distributed in the "Three Northern Regions" of China. Among them, Inner Mongolia has the largest area in existing seabuckthorn resources with around 436,700 ha (6,550,000 mu) by 2023. The area of seabuckthorn resources in Xinjiang is not the largest in China, but the newly increased

目前全国 16 个省、自治区、直辖市（北京、河北、山西、内蒙古、辽宁、吉林、黑龙江、河南、四川、云南、西藏、陕西、甘肃、青海、宁夏、新疆）有沙棘天然分布和人工种植沙棘。目前沙棘资源主要分布在“三北地区”，其中内蒙古的现存沙棘资源面积最多，达到 655 万亩，从北端的呼伦贝尔一直到最西端的额济纳旗都有分布。新疆的沙棘资源面积虽然不是全国最多的，但

area of seabuckthorn plantation for economic and ecological purposes comes out on top in the national scale with around 150,000 mu and 100,000 mu. And because of the better sunshine, seabuckthorn berries, especially in northern of Xinjiang, is with very high quality both for fresh eating and industry processing.

是新疆现存和每年新增的经济林都是名列前茅的，已有 64 万亩。受光照影响，新疆尤其是北疆地区沙棘品质非常出众。

In 2023, the yields of wild seabuckthorn in China increased by 10%-15% compared to that in 2022, thanks to the favourable climate. And the price of pure fruit of wild seabuckthorn was 20%-20% lower than that of the previous year. On the point of the artificial seabuckthorn fruit production in national scale, the fruit yield of the artificial plantation increased by about 25%-30% compared with in 2022, due to the increase of artificial planting area and the highly fruiting year of seabuckthorn plant, as well as the advantages of Russian varieties with big berry of seabuckthorn. For an example, the total fruit production of seabuckthorn in Xinjiang was up to 100,000 tonnes in 2023, counting for 30%-40% of national purchase market.

2023 年，全国野生沙棘结果情况比去年有所提高，采购成本下降 15%−20% 左右。受种植面积和达盛果期面积增加，以及人工管护的优势发挥，2023 年人工林产果量较 2022 年增加 20% 左右。其中以大果沙棘为主，整体产量增加了 20%−30%。其中，新疆的大果沙棘鲜果产量约 10 万吨，占全国沙棘鲜果销售市场的 30%−40%。

In estimation for the year of 2023, there were around 650,000 to 700,000 tonnes of seabuckthorn berries yield, about 300,000 to 350,000 tonnes of harvesting available, and about 20,000 to 250,000 tonnes be actually harvested for processing.

据估算 2023 年，全国沙棘果实产量在 60 万 −70 万吨之间，可采收约 30 万 −35 万吨，实际采收加工利用约 20 万 −25 万吨，其中野生沙棘果实产量在 40 万 −50 万吨，实际采收在 6 万 −8 万吨，较 2022 年明显增加，主要原因当年沙棘主产区气候适宜。

The fruit production of wild seabuckthorn (Hippophae rhamnoides) forest is about 400,000-500,000 tonnes, but the actual available harvest is only 150,000-200,000 tonnes, which is mainly due to the fact that Chinese natural seabuckthorn is mostly distributed in the remote mountains and valleys areas , and it is inconvenient to harvest, resulting in waste of seabuckthorn resources.

沙棘工业种植园 85% 以上为俄罗斯大果沙棘，果子直径较大，单株结果可达到 20−35 公斤。

In China, more than 85% of economic-purpose industrial seabuckthorn plantation are Russian varieties with large fruit, and the fruit yield of individual plant can reach to 20-35 kg. The total national fruit output of industrial plantation is about 250,000 tonnes, and the actual harvested is between 180,000 and 200,000 tonnes. In 2023, about 100,000 ha (1,500,000 mu) of industrial seabuckthorn plantation gradually entered the highly fruit-bearing period in Xinjiang, Heilongjiang, Jilin, northern Inner Mongolia and Hebei provinces. In the following years, the annual amount of seabuckthorn large fruit will be increased by 50,000-80,000 tons, and the production of berries will grow at an annual rate of 15-20%.

全国沙棘种植园果实产量大约在25万吨左右，实际采收量达到18万-20万吨之间。2023年，位于新疆、黑龙江、吉林、河北、以及内蒙古北部等地人工种植园约150万亩大果沙棘原料林逐渐进入结果期，在接下来的3-5年中，每年大果沙棘果实可采收量将新增5万-8万吨，并且其产量将以每年15-20%速度增长。

The current seabuckthorn resources in China is shown in Table 1.

其现有沙棘资源状况见表1.

Table 1. Total area up to 2023 and the newly increased area of seabuckthorn in 2023 in China (unit: 10,000 mu, 1 ha equal to 15 mu)
表 1. 2023 年中国主要省现有及新增沙棘资源面积 (单位：万亩，1 公顷 =15 亩)

产区 Province	截至 2023 年底 Up to end of 2023	2023 年新增沙棘生态林 New SBT for ecological purpose	2023 年新增沙棘经济林 New SBT for economic purpose
河北 Hebei	136	3	6
山西 Shanxi	601	1	3
内蒙古 Inner Mongolia	655	3	3
辽宁 Liaoning	100	2	2
吉林 Jilin	31	1	2
黑龙江 Heilongjiang	67	1	4
四川 Sichuan	66	1	0
云南 Yunnan	10	0	0
西藏 Xizang	145	3	5
陕西 Shaanxi	380	1	2
甘肃 Gansu	497	2	3
青海 Qinghai	467	1	3
宁夏 Ningxia	97	1	2
新疆 Xinjiang	122	10	15
其他地区（北京、河南） Other provinces	8	0	0
合计 in total	3382	38	36

2.Germplasm resources of seabuckthorn, natural distribution of Hippophae (species, subspecies) , newly bred varieties

Seabuckthorn is found in 55 countries in the world. China has the most abundant natural seabuckthorn germplasm resources in the world. According to the classification by Professor LIAN Yongshan, Chinese taxonomic scientist, there are globally 6 species and 12 subspecies of seabuckthorn. Among them,

二、沙棘种质资源情况，天然分布的种类(种、亚种 ）及新品种培育

全球约有 55 个国家有沙棘分布。中国是世界上天然沙棘种质资源最丰富的国家。按照我国

there are 6 species and 8 sub-species distributed in China, e.g.
Hippophae rhamnoides
Hippophae rhamnoides ssp. sinensis
Hippophae rhamnoides ssp. yunnanensis
Hippophae rhamnoides ssp. turkestanica
Hippophae rhamnoides ssp. mongonica
Hippophae salicifolia
Hippophae tibetana
Hippophae gyantsensis
Hippophae neurocarpa
Hippophae neurocarpa ssp. stellatopilosa
Hippophae neurocarpa ssp. neurocarpa
Hippophae goniocarpa
Hippophae goniocarpa ssp. litangensis
Hippophae goniocarpa ssp.goniocarpa

沙棘植物学家廉永善的分类方法，沙棘属植物分为 6 个种 12 个亚种，其中在中国分布有 6 个种 8 个亚种，分别是鼠李沙棘（种）、柳叶沙棘（种）、西藏沙棘（种）、江孜沙棘（种）、肋果沙棘（种）、棱果沙棘（种）、中国沙棘（亚种）、云南沙棘（亚种）、蒙古沙棘（亚种）、中亚沙棘（亚种）、肋果沙棘（亚种）、理塘沙棘（亚种）和棱果沙棘（亚种）。

Since1990's, better seabuckthorn varieties have been introduced from Russia, Mongolia, Germany, Finland, which are with better economic properties of large berry, reliable yield, high content of seed oil, less thorn or thornless, convenience for harvesting and processing. The national seabuckthorn breeding network led by Management Center for Seabuckthorn Development, Ministry of Water Resource is set up in 2004, in order to do seabuckthorn breeding programme by selection, introduction and crossing, and is expected to achieve the new seabuckthorn varieties with comprehensive advantages such as large fruit, high yield, no thorns or less thorns, strong resistance, rich nutrition, and adaptable for widespread application in the "Three North Regions" of China in recent years.

从上世纪 90 年代开始，我国先后从蒙古、俄罗斯、德国、芬兰等国引进了优良沙棘品种，其特点是果实大，种子含油量高、枝条无刺或者少刺，方便采摘和加工。水利部沙棘开发管理中心 2004 年牵头成立的全国沙棘育种网，正在采用“选、引、育”相结合的科学方法，有望在近几年培育出具有果实大、产量高、无刺或少刺、抗性强、营养成分丰富、适宜在“三北”地区广泛推广应用等综合优势的 20 多个沙棘新品种。

3.The national seabuckthorn industry development, total number of enterprises, total output, total output value and market demand analysis

三、目前中国沙棘产业发展、企业总数、总产量、总产值及市场需求分析

Chinese seabuckthorn industry started in 1980's and be in rapid development in early 21st

中国的沙棘产业起步于 20 世纪 80 年代中后期，在 21 世纪初开始快速发展。近年来，沙棘高

century. In recent years, seabuckthorn high-tech products continue to appear, which covered more than 200 kinds of seabuckthorn products in 8 categories such as drink, food, medicine, health care products and cosmetics. After nearly 40 years of development, there are more than 8,000 seabuckthorn processing enterprises in China, with an annual output value of about 28-30 billion yuan. Many enterprise have achieved good economic and social benefits, like Conseco Seabuckthorn Co., Ltd, Beijing Powdery Health Industrial Co. Ltd, Huiyuan Group□Hebei Shenxing Seabuckthorn Academy, Lvliang Yeshanpo Food Co.Ltd, Shanxi Wutaishan Seabuckthorn Co. Ltd, Shaanxi Haitian Pharmaceutical Co.Ltd, Shaanxi Huanglong Guoshoutang Bioengineering Co. Ltd, Inner Mongolia Yuhangren High-tech Industry Co. Ltd, Inner Mongolia Shamozhihua Bio-industry Tech Co. Ltd, Inner Mongolia Chundian Industry Co. Ltd, and Gansu Aikang Seabuck thron Co. Ltd, Qinghai CommScope Biotechnology Co., Ltd., Xinjiang Kangyuan Bio-tech Co. Ltd, Heilongjiang Shengbaotai Agriculture Co. Ltd, etc.

科技产品不断出现，其产品涵盖了食品、药品、保健品、化妆品等 8 大类 200 多个品种。经过近四十年的发展，全国现有各类沙棘加工企业 8000 余家，年产值达 280-300 亿元。其中北京的高原圣果、宝得瑞、汇源集团，河北的神兴集团，山西的吕梁野山坡、五台山，陕西的海天药业、陕西黄龙国寿堂，内蒙古的宇航人、沙漠之花、淳点实业，以及甘肃艾康、青海康普、新疆康元、黑龙江圣宝泰等沙棘骨干企业都是其中的佼佼者，取得了较好的经济效益和社会效益。

In 2021, there were 3,225 seabuckthorn related enterprises in China. In 2022, this number increased to 5,695, and the number of registered enterprises in 2023 was more than 8000. That is mainly because a lot of seabuckthorn promotion job has done in recent years, and more and more people have realized the healthcare effects of seabuckthorn, the market become more big and popular, and then the consumption increased year by year, leading to more and more enterprises enter to seabuckthorn related field.

2021 年，我国有沙棘企业 3225 家，2022 年增加到了 5695 家，2023 年猛增到 8000 余家。其主要原因是沙棘市场推广发挥重要重用，越来越多的普通百姓认识到沙棘的健康作用，进而使得消耗量大增，进入的企业也越来越多。

In terms of food processing, seabuckthorn can be used as raw materials to make a variety of beverage and wine, such as fruit juice drinks, fruit wine, jam, cakes and dairy products, etc. In the field of medicine and health care, there are preparations for treating cardiovascular and cerebrovascular diseases, expelling phlegm, benefiting lung, nourishing the stomach, strengthening the spleen,

在食品加工方面，以沙棘为原料可制成多种饮料食品和酒类，如：果汁饮品、果酒、果酱、各种糕点及奶制品等；在医药保健方面，有用于治疗心脑血管系统病症、祛痰、利肺、养胃、健脾、活血化瘀、烧烫伤、刀伤及冻伤等方面的制剂；在轻工及其它方面，沙棘也显示了其独特的价值；开发了滋养皮肤、促进细胞代谢、促进上皮组织再生、具有抗过敏、抑菌、强渗

promoting blood circulation and removing blood stasis, burning and scalding, knife injury and frostbite, etc. Seabuckthorn also shows its unique value in light industry and other aspects. Skin care products and toiletries have been developed for nourishing the skin, promoting cell metabolism and epithelial tissue regeneration, and also with the functions of anti-allergy, antibacterial, strong permeability and protecting the skin. Seabuckthorn stems have hard wood and can be used to make plywood and other building materials.

In recent years, seabuckthorn seed oil, fruit oil, juice powder, procyanidin, flavone, dietary fiber and so on are the main extracts of seabuckthorn in the domestic and foreign markets. Seabuckthorn seed oil and fruit oil, as intermediates and raw materials of drugs, cosmetics and functional foods, have a widely application fields and huge market potential. The demand for various natural seabuckthorn extracts and fruit juices, such as seabuckthorn concentrate juice, fruit juice powder, oil, flavonoids, etc., has doubly increased. Some globally well-known enterprises, such as Nestle, P&Gs, etc., have launched or developed a number of seabuckthorn related products. According to statistics, there are more than 200 kinds of seabuckthorn related products such as functional food, beverage, medicine, beauty and skin care products, washing articles, feed, bait and so on.(As shown in Table 2)

透力和保护皮肤自然色泽的护肤用品及洗化用品；沙棘的枝干木质坚硬，可用于制作胶合板等建筑材料的原料。

近年来，国内外市场上的沙棘提取物主要为沙棘籽油、沙棘果油、沙棘果粉、原花青素、沙棘黄酮、沙棘膳食纤维等。沙棘籽油和果油作为药品、化妆品、功能食品的中间体和原辅料，应用领域广阔、市场潜力巨大。对各种天然沙棘提取物和果汁，如沙棘汁浓缩汁、沙棘果粉、沙棘油、沙棘黄酮等的需求成倍增长，一些国内外知名企业如雀巢公司、保洁公司等都已推出或开发了多个沙棘相关产品。据统计，目前市场上已形成销售的沙棘类相关产品有功能食品、饮料、药品、美容护肤产品、洗涤用品、饲料、饵料等八大类约 200 多种产品。（见附表 2）

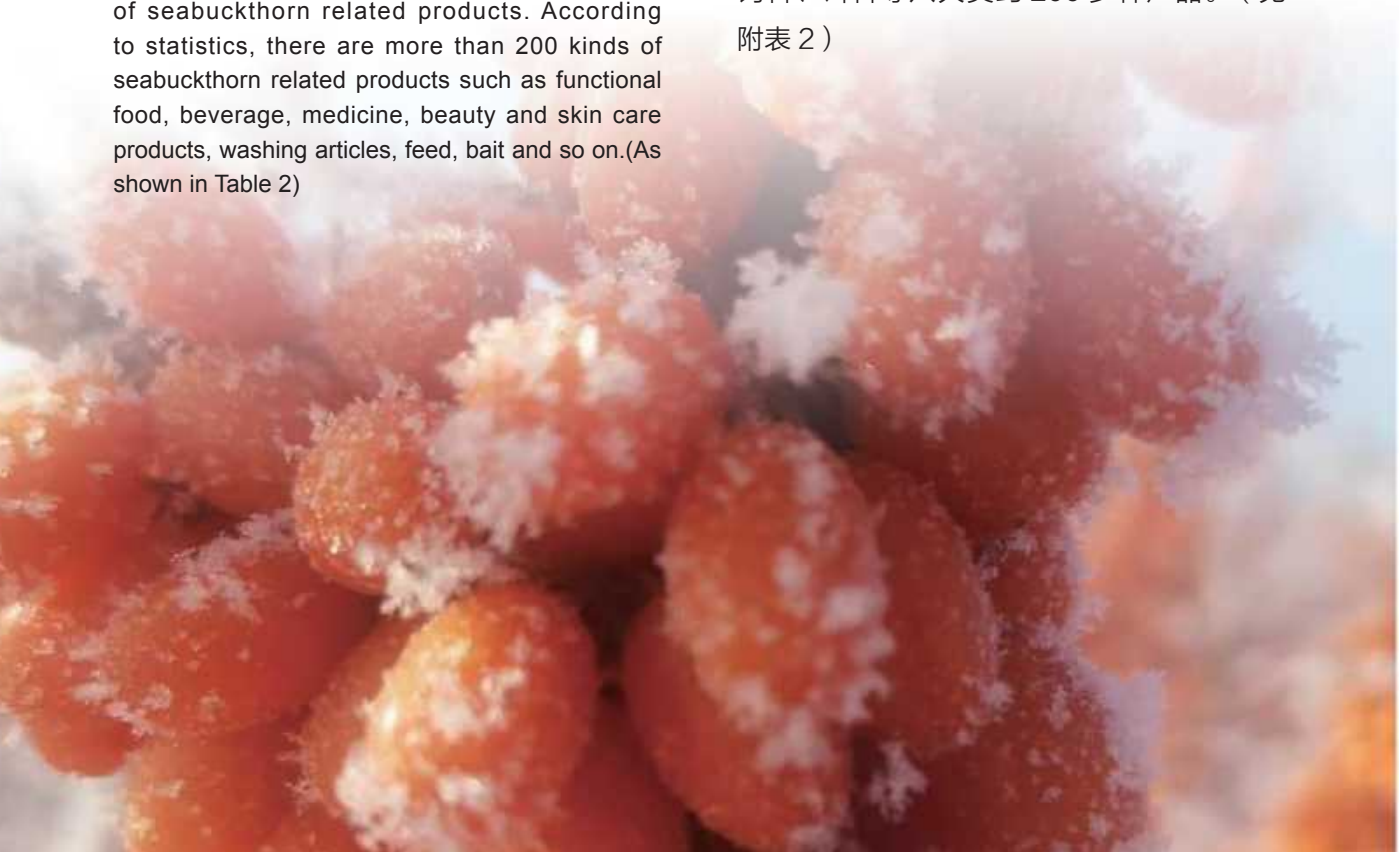

Table 2. The utilization of seabuckthorn in China
表 2. 沙棘应用情况

应用领域 Application sections	应用范围 Application scope	相关产品 Products
食品加工 Food production	饮料、果酒、果醋、果酱、果粉、糕点、奶制品，drink,wine, vinegar, jam, pastry, dairy products, etc.	沙棘醋、沙棘酒、沙棘茶、冻干粉、糖果等食品。seabuckthorn vinegar, wine, tea，freeze-dried powder，candy, etc.
医药保健 Medicine & healthcare product	心脑血管、祛斑、润肺、健脾养胃、宫颈糜烂、外伤 treatment for cardiovascular, gastric ulcer, lung improvement,cervical erosion, scald, burn,etc.	五味沙棘散、参芪沙棘合剂、心达康片、沙棘干乳剂，沙棘籽油栓剂等 Wuwei seabuckthorn power, seabuckthorn compounds with ginseng and jaundicen，Xin Da Kang tablets，etc.
轻工业及其他方面 Daily stuffs processing	化妆品、洗涤用品 cosmetic, detergent etc,	沙棘护肤、洗漱用品、防晒霜 seabuckthorn products for skin care

According to incomplete statistics, from 2016 to 2023, the sales revenue of seabuckthorn extract products alone is 560 million yuan, 940 million yuan, 1.56 billion yuan, 2.1 billion yuan, 2.5 billion yuan, 3.1 billion yuan 4.9 billion yuan and 5.2 billion, respectively. The data show that the seabuckthorn industry has a significant growth every year, and it is expected that the sales revenue will reach about 5.5 billion yuan by 2024.(As in Figure 1)

据不完全统计，2016 年至 2023 年，仅沙棘提取物产品的销售收入分别为 5.6 亿元、9.4 亿元、15.6 亿元、21 亿元、25 亿元，31 亿，49 亿，52 亿元数据显示，沙棘产业每年都有明显的增长，预计到 2024 年销售收入达到 55 亿元左右。

Figure 1. Sales revenue of Seabuckthorn extract products
图 1. 沙棘提取物产品销售收入

It is estimated that the output value of seabuckthorn extracted products corresponding to pharmaceuticals, cosmetics, health care products and other downstream industries is about 1:22.

In 2023, the price of seabuckthorn seeds has been maintained at about 40 yuan /kg, the dried fruits is 80 yuan /kg, the total flavonoids extracted with 10-30% of purity content is 1100-2500 yuan /kg, seabuckthorn seed oil is 1200 yuan /kg. If the seed oil capsulated, the price of per kilogram is about 2000 yuan.

2023 年，沙棘种子的价格一直保持在 40 元 / kg 左右。沙棘药材干果的价格：80 元 /kg；沙棘总黄酮提取物的价格：10–30% 含量的 1100–2500 元 /kg；沙棘籽油：1200 元 / kg，制成沙棘油软胶囊后每公斤沙棘油的价格为 2000 元左右。

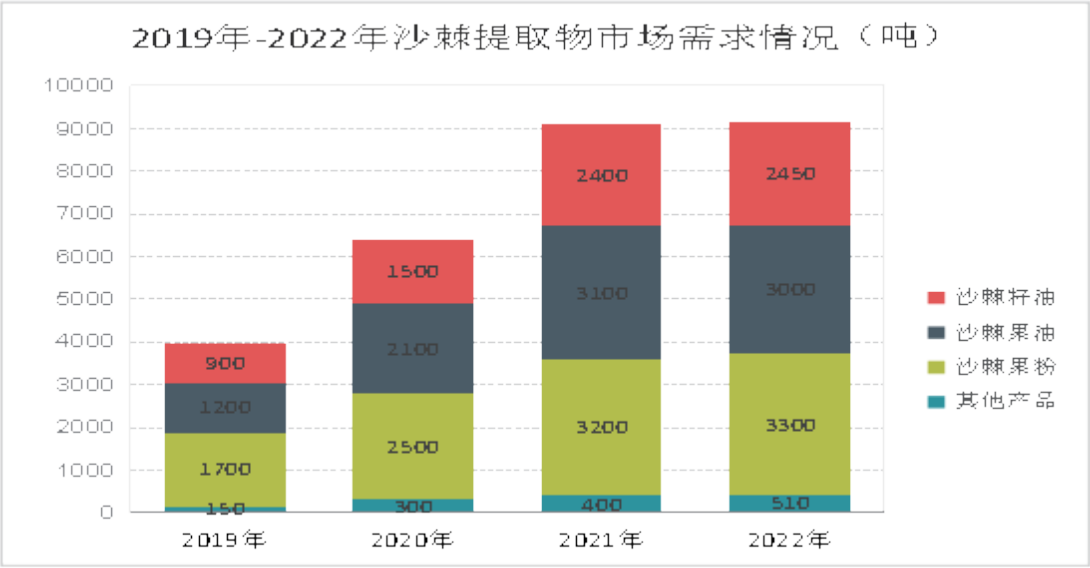

Figure 2. Market demand for seabuckthorn extract from 2019–2022
图 2. 2019–2022 年沙棘提取物市场需求情况

On the base of market analysis and experts predict, the production of seabuckthorn products in China only accounts for 1/5 of the international and domestic market demand, which showed that the market supply and demand of seabuckthorn has a great potential, its demand is still increasing year by year, because of the improvement of people's living conditions. The application of seabuckthorn extractive compounds has also been expanding, and its function has been recognized by the more

据国内市场分析和专家预测，我国生产沙棘产品仅占国际、国内市场需求量的 1/5，这说明沙棘市场供求潜力很大，随着人民生活水平的提高，其需求量还在逐年增加。沙棘提取物应用领域也不断扩大，并被广大消费者所认同，以食品、功能食品、化妆品和其他行业增长最快而药品因沙棘提取物销售技术的不断扩大以及药品申报时间漫长而占比下降。

and more consumers, the demands are growing fast in the fields of food, functional food, cosmetics and other industries. The proportion for drugs requirement decreased due to the continuous expansion of marketing technology of seabuckthorn extract and the long time need for application.

Among the seabuckthorn extracted products, seabuckthorn seed oil is the most demanding one in the market at present, and the market is in short supply. Seabuckthorn fruit powder, as an additive or auxiliary material for emerging functional products, is currently being recognized and accepted by relevant industries and markets,

4.Brief introduction of the scientific research situation of seabuckthorn in China (including universities, research institutes, enterprises), key research units (researchers, research fields, main achievements)

4-1. Management Center for Seabuckthorn Development, Ministry of Water Resources, P.R. CHINA

Management Center for Seabuckthorn Development, Ministry of Water Resource (hereinafter referred to as the Seabuckthorn Center), the predecessor was Seabuckthorn Coordination Office of the National Leading Group for Water Resources and Soil & Water Conservation, established in 1985 (referred to as National Seabuckthorn Office), and was renamed as Management Center for Seabuckthorn Development, Ministry of Water Resources in 1997. It undertakes the coordination and management of the national seabuckthorn on the resources construction, development and utilization. Seabuckthorn Center has a processing enterprise, which has three bases on seabuckthorn breeding or nursery in Dongsheng, Junger and Dalat counties, Inner Mongolia Autonomous Regions. At present, the Seabuckthorn Center has 9 full-time staffs specializing in seabuckthorn research and management.

沙棘提取物产品中，沙棘籽油是目前市场需求最旺盛的产品，市场处于供不应求状态；沙棘果粉作为新兴功能产品添加剂或辅料，目前正在被相关行业和市场认知和接受，图 2 为 2019-2022 年国内相关行业的主要知名企业对沙棘提取物主要产品的市场需求情况。

四、中国沙棘科学研究情况（大学、研究所、企业），重点研究单位（研究人员、研究领域、主要成果）简要介绍

1. 水利部沙棘开发管理中心

水利部沙棘开发管理中心（以下简称沙棘中心）前身是成立于 1985 年的全国水资源与水土保持工作领导小组沙棘协调办公室（简称全国沙棘办），1997 年更名为水利部沙棘开发管理中心，承担着全国沙棘资源建设、开发利用等方面的协调管理工作。沙棘中心下辖一沙棘加工企业，并在内蒙古自治区鄂尔多斯市东胜区、准格尔旗、达拉特旗曾建有 3 处沙棘育种或苗木繁育基地。目前，沙棘中心有专门从事沙棘研究和管理的专职人员 9 人，其中正高级 6 人，副高级 3 人。

Since 1985, Seabuckthorn Center has been responsible for compilation of 21 technical standards related to seabuckthorn seedling, raw material and products, including 8 sector standards of Ministry of Water Resources and 13 standards of International Seabuckthorn Association. And 8 national patents, 9 science and technology progress award have been achieved, including 4 items of provincial and ministerial level, 5 with others level. 8 monographs and 4 anthologies as well as 150 scientific and technological papers have been edited and published. There are 28 seabuckthorn varieties, including 6 hybrid varieties, 10 introduced varieties, and 12 selected varieties, bred by Seabuckthorn Center.

1985 年以来，沙棘中心负责编制有关沙棘方面的标准 21 个，其中水利部行业标准 8 个，国际沙棘协会团体标准 13 个。获得国家专利 8 项，获得各类科技进步奖 9 项，其中省部级 4 项，其他 5 项。主编出版专著 8 部、文集 4 部； 发表科技论文约 150 篇。现有各类沙棘良种 28 个，其中杂交沙棘品种 6 个，引进沙棘良种 10 个，选育沙棘品种 12 个。

Technical Standard of International Seabuckthorn Association were listed as the following:

A. Seabuckthorn flavonoids
B. Seabuckthorn juice
C. Seabuckthorn seed oil
D. Seabuckthorn fruit oil
E. Seabuckthorn seed procyanidins
F. Seabuckthorn fruit powder
G. Seabuckthorn leaf tea
H. Code for evaluation of high-yield seabuckthorn varieties
I. Code for evaluation of eco-economic seabuckthorn cultivars
J. Standard for evaluation of fresh eating type seabuckthorn cultivars
K. Technical regulation of seabuckthorn softwood cutting in alpineplateau regions
L. Technical regulations for cultivation and management of seabuckthorn plantations
M. Standard for raw materials of seabuckthorn leaf

以下是国际沙棘协会已颁布的团体标准：

(1) 沙棘黄酮质量标准
(2) 沙棘原果汁标准
(3) 沙棘籽油标准
(4) 沙棘果油标准
(5) 沙棘籽原花青素标准
(6) 沙棘果粉标准
(7) 沙棘叶茶标准标准
(8) 果实丰产型沙棘品种评价规范
(9) 生态经济型沙棘品种评价规范
(10) 鲜食型沙棘品种评价规范
(11) 青藏高原区沙棘嫩枝扦插技术规程
(12) 沙棘种植园建设与管理技术规程
(13) 沙棘叶原料标准

4-2. Rural Revitalization Science and Technology Institute, Heilongjiang Academy for Agricultural Science

2. 黑龙江省农业科学院乡村振兴科技研究所

Rural Revitalization Institute of Heilongjiang Academy of Agricultural Sciences was founded in 1948, formerly known as Berry Research Institute, located in Suilang County, Heilongjiang Province, engaged in berry resource collection, breeding and related cultivation technology research in the northeast black soil region. From 2019, the name changed to Rural Revitalization Institute and moved to Harbin, the capital city of Heilongjiang Province. The Institute has several research teams including for berry, drupe, caryopsis and seabuckthorn etc. The Seabuckthorn research laboratory has more than 6.7 ha (100 mu) of dedicated scientific research base, 1 greenhouse for seabuckthorn cutting seedlings, 1 piece of box of plant tissue culture, artificial climate box, 752N spectrophotometer, photoelectric leaf surface meter, soil nutrient analyzer, soil moisture meter, conductivity meter, PCR meter, electron microscope and other test facilities and instruments.

Since 1988, the Institute has carried out research on the collection and evaluation of seabuckthorn germplasm resources from both home and abroad, the breeding of new varieties, experimental demonstration and popularization. Up to the end of 2022, the institute has won 15 science and technology awards related to seabuckthorn, including 7 awards with provincial and ministerial level and 8 with other level. The seabuckthorn research team wrote or participated in the compilation and publication of 7 monographs, published more than 40 scientific and technological papers, formulated 2 provincial standards, obtained 1 patent for invention and 1 patent for utility model. Six improved varieties and more than 100 strains of seabuckthorn were selected and bred. After moving from Suileng to Harbin, the Institute built about 70 mu of seabuckthorn test fields and 10 mu of seabuckthron nursery, with an annual output of 200,000 seabuckthorn seedlings. At present, there are 4 full time staffs involved in seabuckthorn related works, including one senior, one intermediate, two others.

黑龙江省农业科学院乡村振兴所成立于 1948 年，原名为浆果研究所，位于黑龙江省绥棱县，面向东北黑土区从事浆果资源搜集、育种及相关栽培技术研究。从 2019 年起更名为现名，并搬迁至黑龙江省哈尔滨市。乡村振兴所下设浆果、核果、颖果、沙棘及乡村振兴等多个研究室，其中沙棘研究室现有专用科研用地 100 余亩，沙棘育苗大棚 1 栋，植物组培实验室 1 个，光照培养箱、人工气候箱、752N 分光光度计、光电叶面仪、土壤养分测定仪、土壤水分测定仪、 电导率仪、PCR 仪、电子显微镜等多种试验设施和仪器。

1988 年起，乡村振兴所开展了国内外沙棘种质资源的搜集整理评价、新品种选育、试验示范及推广等研究工作。截止目前，乡村振兴所已获有关沙棘方面的各类科技奖 15 项， 其中省部级 7 项， 其他 8 项。编写或参编出版专著 7 部； 发表科技论文 40 余篇； 制定省级标准 2 项。获得发明、实用新型专利各 1 项。 选育沙棘良种 6 个，品系 100 余个。在从绥棱搬迁至哈尔滨后，乡村振兴所新建沙棘各类试验场圃 70 亩、苗圃地 10 亩，年产沙棘苗木 20 万株。目前有 4 人参与沙棘相关的各项工作，其中: 正高级 1 人，中级 1 人，其他 2 人。

4-3. Liaoning Provincial Institute for Dryland Agro-forestry Research

Liaoning Provincial Institute for Dryland Agro-forestry Research (hereinafter referred to as Dryland Institute) is located in Chaoyang City, Liaoning Province, under the Liaoning Academy of Agricultural Sciences, and was integrated by the former Liaoning Institute of Soil and Water Conservation and the Liaoning Institute of Afforestation in Arid Areas in November 2018. The main responsibilities are to carry out soil and water conservation, forest cultivation, and restoration technology for degraded ecosystems, and research on the breeding, cultivation and processing technology of new varieties of grains, fruits and vegetables, and etc. The institute has Key Laboratory of Soil Erosion & Soil and Water Conservation with Liaoning provincial level, which has scientific research equipment such as soil mass analyzer, plant runoff meter, photosynthesizer, etc. It can meet the needs of plant physiology, soil erosion and other research work. The institute has four scientific research and production bases, including seabuckthorn germplasm resource nursery, production demonstration garden, cutting orchard and breeding nursery in Chaoyang and Jianping County, with a total area of nearly 60 mu.

Since 1959, the Dryland Institute has started the introduction and cultivation experiment of seabuckthorn, and up to now, it has won 10 awards of various kinds, including 7 at the provincial and ministerial level, and 3 at the municipal level. , participated in the compilation of 2 monographs and published more than 60 scientific and technical papers, obtained 2 utility model patents; Formulate 2 local standards in Liaoning Province. At present, 3 improved varieties and more than 40 strains of seabuckthorn have been selected. Two multi-functional seabuckthorn breeding nurseries were established. There are 5 mu of seabuckthorn nursery garden, and providing 100,000 high-quality seabuckthorn seedlings every year, such as the varieties with big fruit introduced from

3. 辽宁省旱地农林研究所

辽宁省旱地农林研究所（以下简称旱地所）坐落于辽宁省朝阳市，隶属于辽宁省农业科学院，由原辽宁省水土保持研究所和原辽宁省干旱地区造林研究所于 2018 年 11 月优化整合而成。主要工作职责是开展水土保持、 森林培育、退化生态系统恢复技术，及杂粮、果蔬、林木新品种选育、栽培和加工技术研究等，设有辽宁省土壤侵蚀与水土保持重点实验室，拥有土壤团粒分析仪、植物径流仪、光合仪等科研仪器设备，能满足植物生理、土壤侵蚀等研究工作需要。全所建有 4 处科研生产基地，其中在朝阳县柳城、建平县富山两处科研 基地建有沙棘种质资源圃、生产示范园、采穗圃及育苗圃，总面积近 60 亩。

从 1959 年开始，旱地所即开始沙棘引种栽培试验，截止目前，已获有关沙棘方面的各类成果奖 10 项，其中：省部级 7 项，市厅级 3 项。参编专著 2 部， 发表科技论文 60 余篇。获得实用新型专利 2 项；制定辽宁省地方标准 2 项。现 拥有沙棘良种 3 个、品系 40 多个。建立有多功能沙棘育种圃 2 处。有沙棘苗圃地 5 亩，

abroad and hybrid-selected from F1 population between Russian-Chinese. At present, there are 8 researchers involved in seabuckthorn related works, including two senior, two deputy senior and three intermediate and one others.

4-4. Xifeng soil and water conservation scientific experimental station, Yellow River Water Conservancy Commission

Xifeng Soil and Water Conservation Scientific Experimental Station of Yellow River Conservancy Commission (hereinafter referred to as Xifeng Water Conservation Station) is located in Qingyang City, Gansu Province. Founded in 1951, Xifeng Water Conservation Station is one of the "Three Stations" early established in the water conservation system of the Ministry of Water Resources. It is engaged in experimental research, comprehensive control and demonstration and promotion on the soil and water conservation for the Loess Plateau and gully region. Since 1957, the experimental research on seabuckthorn has covered many aspects such as raising seedlings, breeding and planting demonstration. Up to now, Xifeng Water Conservation Station has won 8 scientific and technological progress awards related to seabuckthorn, including 1 at the national level, 3 at the provincial and ministerial level, and 4 others, written or participated in the compilation and publication of 4 monographs, published more than 50 scientific and technological papers. Two multi-functional breeding nurseries were established, about respectively 49 mu and 5 mu, producing 100,000 seedlings annually. At present, the station has 8 full time staffs involved in seabuckthorn related work, including: one senior, two deputy senior, three intermediate and two others.

4-5. Tianshui soil and water conservation scientific experimental station, Yellow River Water Conservancy Commission

Tianshui Soil and Water Conservation Scientific Experimental Station of Yellow River Conservancy

每年可提供引进大果、蒙中杂交等优质沙棘苗木10万株。目前，有8人参与沙棘工作，其中:正高级2人，副高级2人，中级3人，其他1人。

4. 黄河水利委员会西峰水土保持科学试验站

黄河水利委员会西峰水土保持科学试验站（以下简称西峰水保站）坐落在甘肃省庆阳市，成立于1951年，为水利部系统建站悠久的水保“三站”之一，面向黄土高塬沟壑区从事水土保持试验研究、综合治理和示范推广等业务。从1957年开始，有关沙棘的试验研究涵盖了育苗、育种、种植示范等多方面工作。截止目前，已获有关沙棘方面的各类科技进步奖8项，其中，国家级1项，省部级3项，其他4项。编写或参编出版专著4部； 发表科技论文50余篇。建立多功能沙棘育种圃2处49亩，苗圃5亩，年产苗木10万株。目前，全站有8人参与沙棘有关各项工作，其中，正高级1人，副高级2人，中级3人，其他2人。

5. 黄河水利委员会天水水土保持科学试验站

黄河水利委员会天水水土保持科学试验站（以下简称天水水保站）坐落在甘 肃省天水市，成立于1942年，为水利部系统建站最为悠久的

Commission (hereinafter referred to as Tianshui Water Conservation Station) is located in Tianshui City, Gansu Province. Founded in 1942, one of the "Three Stations" early established in the water conservation system of the Ministry of Water Resources. It is engaged in experimental research, comprehensive control and demonstration and promotion on the soil and water conservation for the beam hilly and gully region in Loess Plateau. Up to now, Tianshui Water Conservation Station has won 6 scientific and technological progress awards related to seabuckthorn, including 1 at the national level, 2 at the provincial and ministerial level, and 3 others, published more than 20 scientific and technological papers. There is about 5 mu for seabuckthorn breeding nurseries, producing 100,000 seedlings annually. At present, the station has 12 full time staffs involved in seabuckthorn related work, including: one senior, one deputy senior, two intermediate and eight others.

水保站，面向黄土梁状丘陵沟壑区从事水土保持试验研究、综合治理、示范推广等工作。建站后不久即开始了沙棘有关试验研究。截止目前，已获有关沙棘方面的各类科技进步奖 6 项，其中：国家级 1 项，省部级 2 项，其他 3 项。发表科技论文 20 余篇。有沙棘专用苗圃地 5 亩，年产苗木 10 万株。目前，全站有 12 人参与沙棘有关的各项 工作，其中：正高级 1 人，副高级 1 人，中级 2 人，其他 8 人。

4-6. Research Institute of Qinghai-Tibetan Plateau Wild Plant Resources, Qinghai Academy of Agriculture and Forestry Sciences

Research Institute of Qinghai-Tibetan Plateau Wild Plant Resources is one of the 8 specialized research institutes of Qinghai Academy of Agriculture and Forestry Sciences, which was founded in 1951, located in Xining City, Qinghai Province. The Institute is one of the earliest research organization in China to carry out seabuckthorn research. Before 1982, the research of seabuckthorn in the institute had been in the forefront of relevant research in the country. At that stage, there were 3 translations of foreign information and more than 10 research reports published. The institute has a comprehensive analysis laboratory and biotechnology laboratory. Since the 1950s, the institute began to work on information, resource population, seedling, planting and ecology of seabuckthorn. Up to now, the Institute has won 4 provincial and ministerial

6. 青海省农林科学院青藏高原野生植物资源研究所

青海省农林科学院坐落在青海省西宁市，成立于 1951 年，下设 8 个专业研究所，野生植物研究所于 2001 年从林研所中分出。林研所是我国进行沙棘研究较早的一个研究机构，1982 年之前全所的沙棘研究已经走在了全国相关研究的前列，这一阶段发表的国外情报类译文就有 3 篇，研究报告有 10 余篇。全院设有综合分析实验室和生物技术实验室，综合分析室有青海省技术质量监督局颁发的计量认证合格证书。从上世纪 50 年代 开始，即开始沙棘情报、群落、育苗、种植及生态等多方面工作。截止目前，野生植物所已获有关沙棘方面的省部级科技进步奖 4 项。参编出版专著 3 部； 发表科技论文 60 余篇。制定青海省地方标准 9 项。

science and technology progress awards related to seabuckthorn, participated in the compilation and publication of 3 monographs, published more than 60 scientific and technological papers, formulate 9 local standards of Qinghai province, and obtained one patent, one provincial improved variety. There are 5 mu of nursery base for seabuckthorn, producing about 100,000 high-quality seabuckthorn seedlings annually. At present, there are 7 full time staffs working on seabuckthorn research, including 2 senior, 2 deputy senior and 3 intermediate.

4-7. Desert Forestry Experimental Center , Chinese Academy of Forestry

The Desert Forestry Experimental Center of Chinese Academy of Forestry (hereinafter referred to as the Center), located in Dengkou County, Inner Mongolia Autonomous Region, was established in 1979, which is mainly engaged in the fields of collecting tree species resources, the improving afforestation technology, constructing artificial oasis protection forest and studying on ecological and economic benefits in the Yellow River area. Since 1986, the Center began to study on seabuckthorn. The Center has 2 laboratories, which can be used for routine plant physiology experiment analysis and soil physicochemical experiment analysis; In the first experimental field, there is a plant tissue culture building with an area of 427 m2 and a modern greenhouse with an area of 1200 m2. There is a seabuckthorn nursery house with an area of 480 m2. In 2022, the Center mainly focused on seabuckthorn election and breeding , the production of clonal seedlings and hybrid breeding trials. In 2021, the Center cooperated with the Forestry Research Institute of Chinese Academy of Forestry and three improved varieties passed the national approval, including Hongji No. 1 (S-SV-HR-020-2021), Zhongji No. 3 (S-SV-HR-21-2021) and Zhongji No. 4 (S-SV-HR-022-2021). Relying on the project titled "Construction of National Germplasm Bank of Seabuckthorn", the

获得专利 1 项、省级良种 1 个。有沙棘专用育苗地 5 亩，年可产优质沙棘苗木 10 万株。目前从事沙棘研究的人员有 7 人，其中正高级 2 人、副高级 2 人、中级 3 人。

7. 中国林业科学研究院沙漠林业实验中心

中国林业科学研究院沙漠林业实验中心（以下简称沙林中心） 坐落在内蒙古自治区磴口县，成立于 1979 年，面向黄河河套区主要从事树种资源收集与改良造林技术、人工绿洲防护林营造技术及生态经济效益试验研究，从 1986 年开始沙棘良种选育试验研究。沙林中心有实验室 2 个，可用于常规植物生理学实验分析和土壤理化实验分析；在第一实验场建有植物组培楼 1 座，面积 427 m2 ，现代化温室 1 座，面积 1200 m2；建有沙棘育苗棚 1 座，面积 480 m2。2022 年，中国林业科学研究院沙漠林业实验中心主要围绕沙棘良种选育、沙棘无性系苗木生产和杂交选育试验等方面开展工作。2021 年，与中国林业科学研究院林业研究所合作，通过审核国家级良种 3 个，包括“红棘 1 号”（国 S-SV-HR-020 -2021）、“中棘 3 号”（国 S-SV-HR-21 -2021）和“中棘 4 号”（国 S-SV-HR-022 -2021）。依托《沙棘

seabuckthorn germplasm bank and fine varieties preservation base was carried out on the basis of existing resources, so as to realize scientific conservation and standardized management for seabuckthorn germplasm resources, and 140 mu of seabuckthorn germplasm conservation forest was planted up to now.

4-8. Shanxi Academy of Forestry and Grassland Sciences(Seabuckthorn Engineering Technology Research Center, National Forestry and Grassland Administration)

Shanxi Academy of Forestry and Grassland Sciences (hereinafter referred to as Shanxi Academy of Forestry) is located in Taiyuan City, Shanxi Province, and the base for seabuckthorn breeding experiment is located in Shouyang County, Shanxi province. Shanxi Academy of Forestry was founded in 1959, mainly engaged in economic forest, forest tree breeding and cultivation, forestry ecology and landscape engineering, forest management and service functions, resource protection and utilization, etc. Since 1986, the research on seabuckthorn has covered all aspects as in provenance testing, improved varieties selection and breeding, clonal propagation, high-yield cultivation, extraction of flavonoids and proanthocyanidins, supercritical CO2 extraction of oil, drying of seabuckthorn fruit residue and product development etc. Up to now, it has won 2 provincial and ministerial science and technology progress awards on seabuckthorn, published more than 60 scientific and technological papers, obtained 4 patents, and formulated 2 local standards in Shanxi province. The seabuckthorn germplasm resource nursery of 4 sites with area of 106 mu was established. There are 5 mu of special seabuckthorn nursery, producing more than 100,000 high-quality seabuckthorn seedlings annually. At present, 16 full time staffs involved in sea-buckthorn related work, including 7 senior , 5 deputy senior, 4 intermediate.

国家种质资源库建设》项目，以现有资源为基础，进行沙棘资源库优良品种保存区建设，实现沙棘种质资源的科学保存与资源库规范化管理；完成沙棘种质资源保存林栽植 140 亩。

8. 山西省林业和草原科学研究院（国家林业草原局沙棘工程技术研究中心）

山西省林业和草原科学研究院（以下简称山西省林科院）位于山西省太原市，沙棘育种试验主要基地位于山西省寿阳县。山西省林科院成立于 1959 年，面向山西省主要从事经济林、林木良种培育、林业生态与景观工程、森林经营与服务功能、资源保护及利用等方面试验研究。从 1986 年开始，有关沙棘的试验研究涵盖了种源试验、良种选育、无性繁殖、丰产栽培以及黄酮和原花青素提取、油脂超临界 CO2 萃取、沙棘果渣干燥及产品研发等多方面工作。截止目前，已获有关沙棘方面的省部级科技进步奖 2 项，发表科技论文 60 余篇，获得专利 4 项，制定山西省地方标准 2 项。建立沙棘种质资源圃 4 处、106 亩；有专用沙棘苗圃 5 亩，年可产优质沙棘苗木 10 万余株。目前，山西省林科院有16人参与沙棘有关各项工作，其中：正高级 7 人，副高级 5 人，中级 4 人 。

In 2022, the Seabuckthorn Engineering Center undertook 6 national and provincial scientific research projects, and finished the seabuckthorn scientific research, technical services, academic exchanges and achievement transformation and promotion around the subject research tasks.

In the field of seabuckthorn scientific research, carried out the seabuckthron breeding and selection, high-yield cultivation and processing technology of seabuckthorn fruit. In terms of breeding and cultivation, 43 seabuckthorn clones and 9 hybrid families were introduced from Heilongjiang, Gansu, Qinghai and Xinjiang. A regional trial in 4 different climatic zones was conducted on 120 excellent family seedlings selected from Chinese seabuckthorn (Hippophae rhamnoides ssp. sinensis) in central and northern Shanxi province, and 56 mu of experimental forest was established. Fifty excellent germplasm resources of seabuckthorn were collected from the middle and upper reaches of the Yellow River, and their germplasm resources fingerprints were constructed. The cultivation and management techniques such as fertilization, shaping and pruning, disease and pest control were studied in 180 mu of artificial seabuckthorn cultivation demonstration plantation.

In the seabuckthorn fruit processing, the fermentation technology of seabuckthorn fruit juice was optimized, and the suitable strains and formula for fermentation were determined. The contents of main nutrients in seabuckthorn fruit residue were analyzed, and the fermentation method of biological transformation and suitable microbial fermentation parameters were established, which making the extraction of total flavonoids from seabuckthorn fruit residue was increased by more than 10%.

In innovation aspect, 2 local improved varieties, namely "Jinji No. 3" (Jin S-SC-HR-023-2022) and "Yanji No. 3" (Jin S-SC-HR-024-2022) were approved by related organization, the center published 5 papers, and developed 2 utility model patents as well as.

2022 年，沙棘工程中心共承担国家和省级科研项目 6 项，围绕课题研究任务，开展了沙棘科学研究、技术服务、学术交流和成果转化推广等方面的工作。

在沙棘科学研究方面，分别开展了良种选育、丰产栽培技术及沙棘果品加工工艺等研究。在良种选育及丰产栽培研究方面，从黑龙江、甘肃、青海、新疆引进 43 个沙棘无性系、9 个杂交家系；在山西中北部 4 个不同气候区对 120 份中国沙棘优良家系苗木进行区域试验，建立试验林 56 亩；收集黄河中上游中国沙棘优良种质资源 50 份，并构建 50 份优良种质资源指纹图谱；对 180 亩人工沙棘栽培示范园进行了施肥、整形修剪、病虫害防治等栽培管理技术研究。

在沙棘果品加工工艺研究方面，优化了沙棘果汁发酵工艺，确定了沙棘果汁发酵适宜菌种及配方；分析了沙棘果渣中主要营养成分含量，建立了沙棘果渣总黄酮含量提高的生物转化发酵方式及适宜的微生物发酵工艺参数，使沙棘果渣中总黄酮含量提高了 10% 以上。

在创新成果方面，审定地方良种 2 项，分别为“晋棘 3 号”（晋 S-SC-HR-023-2022）和“雁棘 3 号”（晋 S-SC-HR-024-2022），发表论文 5 篇，研制实用新型专利 2 项。

In the transformation of research results, relying on the national standard "Afforestation Technical Regulations" and the local standard "Seabuckthorn cutting-seedling Technical Regulations", the Seabuckthorn Engineering Center undertook the central govenment financially supported project of 2022 for forestry science and technology promotion demonstration titled "Seabuckthorn selected varieties propagation and afforestation technology demonstration", which produced about 70,000 seedlings of seabuckthorn fine varieties, and cultivated 450 mu of seabuckthorn demonstration afforestation, more than 300 people received technical training. It has greatly promoted the cultivation of improved varieties and the standardization of seabuckthorn orchard establishment, the project achieved a significant ecological and economic as well as social benefits.

在成果转化方面，沙棘工程中心依托国标《造林技术规程》和地方标准《沙棘扦插育苗技术规程》，承担了 2022 年中央财政林业科技推广示范项目“沙棘良种苗木繁育及造林技术示范”，培育沙棘良种苗木 7 万株，完成沙棘示范造林 450 亩，开展技术培训 300 余人次，大大促进了栽培良种化、建园标准化，取得显著的生态、经济、社会效益。

4-9. Gansu Agricultural University

In 2022, relying on projects titled "China-Russia Seabuckthorn Processing Technology Gansu International Science and Technology Cooperation Base" and "China-Russia Seabuckthorn Joint Scientific Research Center", Gansu Agricultural University got the international cooperation project from the Ministry of Science and Technology, "Research on Key Technologies of Seabuckthorn Berry Harvesting Equipment and Non-thermal Processing" (2014DFR31230) and the National Natural Science Foundation project "Study on Mechanism of Quick-frozen seabuckthorn Fruit Removal and Technology of Low-damage Removal in China" (52065006), the following results were obtained.

2022 年度，甘肃农业大学以“中－俄沙棘加工技术甘肃省国际科技合作基地”，“中国－俄罗斯沙棘联合科研中心”为依托，在科技部国际合作项目“沙棘浆果采收设备与非热加工关键技术研究”（2014DFR31230）、国家自然科学基金项目“中国沙棘速冻脱果机理及低损伤脱果技术研究”（52065006）的支持下取得了如下研究成果。

In scientific research aspect, (1) Comparison of nutritional components, functional components and antioxidant activities in different seabuckthorn fruits and leaves, including Chinese seabuckthorn (Hippophae rhamnoides ssp. sinensis), Hippophae

科学研究方面：（1）不同沙棘果实和叶片的营养成份、功能成份和抗氧化活性的比较。比较了中国沙棘、西藏沙棘和“深秋红”沙棘果实和叶片的营养成份、功能成份和抗氧化活性。结果表明，中国沙棘果实的总糖、果糖、总酸、

tibetana and good variety Shenqiuhong. The results showed that the contents of total sugar, fructose, total acid, quinic acid and malic acid, and the contents of total phenol, total flavone, VC and VE in Chinese seabuckthorn (Hippophae rhamnoides ssp. sinensis) fruits were significantly higher than those of other seabuckthorn fruits, the contents of soluble sugar, titrable acid, protein and amino acid of "Shenqiuhong" fruit were significantly higher than those of other seabuckthorn. The contents of total phenol, total flavone, VC, VE (γ-VE, α-VE), total carotenoid and β-carotene in Chinese seabuckthorn leaves were the highest. The contents of total sugar, glucose, fructose, total acid, quinic acid and citric acid in the leaves of "Shenqiuhong" were the highest. The soluble sugar in the leaves of the three kinds of seabuckthorn was mainly glucose, and the organic acid was mainly quinic acid. The contents of VE, carotenoids, polyphenols and flavonoids in leaves were significantly higher than those in fruits; Both leaves and fruits of the three kinds of seabuckthorn all showed better effect of antioxidant activity in vitro and cellular, and the leaves shew stronger. The antioxidant effect of Chinese seabuckthorn was the best among the three kinds of seabuckthorn.

(2)Changes and relationship of quality and dielectric properties of seabuckthorn fruits during freezing period. The effects of different freezing conditions on quality indexes and dielectric parameters of seabuckthorn fruit were evaluated by measuring the changes of quality indexes and electrical parameters of seabuckthorn fruit at different freezing temperatures and freezing times. The results showed that the lower the freezing temperature and the shorter the freezing time, the better the preservation of fruit quality. The dielectric parameter increased with the decrease of freezing temperature and the extension of freezing time. The measurement of dielectric properties is simple and without damaging the fruit, therefore, the quality of seabuckthorn fruit can be predicted by measuring the change of dielectric properties of seabuckthorn fruit during freezing.

奎宁酸和苹果酸含量，及其总酚、总黄酮、VC、VE 含量显著高于其它沙棘。“深秋红”果实的可溶性糖、可滴定酸、蛋白质和氨基酸含量显著高于其它沙棘。中国沙棘叶片的总酚、总黄酮、VC、VE（γ-VE、α-VE）、总类胡萝卜素和 β-胡萝卜素含量最高。“深秋红”叶片的总糖、葡萄糖、果糖以及总酸、奎宁酸和柠檬酸含量最高。三种沙棘叶片的可溶性糖以葡萄糖为主，有机酸以奎宁酸为主。叶片的 VE、类胡萝卜素、多酚和黄酮类物质含量显著高于果实。三种沙棘叶片和果实均呈现良好的体外和细胞抗氧化活性，叶片的抗氧化活性更强。中国沙棘的抗氧化效果在三种沙棘中表现最优。

（2）冷冻期间沙棘果实品质和介电特性的变化及其关系。通过测定沙棘果实在不同冷冻温度和不同冷冻时间条件下的品质指标和电参数变化，评估了不同冷冻条件对果实品质指标和介电参数的影响。结果表明，冷冻温度越低、冷冻时间越短、越有利于果实品质的保存，介电参数值随着冷冻温度降低而增加，也随着冷冻时间延长而增加。由于介电特性的测定较为简便，且不会破坏果实。因此，通过测定冷冻期间沙棘果实介电特性的变化可对果实的品质变化进行预测。

(3) The potential suitable distribution area of Chinese seabuckthorn was analyzed based on MaxEnt model, which was used to analyze the dominant climate factors in the potential distribution area of Chinese seabuckthorn, and to predict its potential distribution area. The results showed that annual rainfall, hydrothermal conditions in the growing season, rainfall in the driest season and the lowest temperature in the coldest month were the main climatic factors, and among which annual rainfall was the most important dominant climatic factor for limiting the distribution of Chinese seabuckthorn. The total suitable area of potential geographical distribution of Chinese seabuckthorn is 1.651 million km2, where it is mainly distributed in western and northern of Hebei, the whole area of Shanxi, northern of Shaanxi and Qinling Mountains, southern of Ningxia, eastern and southern of Gansu and Qilian Mountains, eastern of Qinghai, western of Sichuan and eastern and central of Tibet.

（3）基于 MaxEnt 模型分析中国沙棘的潜在适宜分布区。利用最大熵（MaxEnt）模型对中国沙棘的潜在分布区的主导气候因子进行分析，并预测中国沙棘的潜在分布范围。结果表明，年降雨情况、生长季的水热状况、最干季降雨和最冷月最低温等是限制中国沙棘分布的主要气候因素，其中年降雨是限制中国沙棘分布的主导气候因子。通过模拟得到中国沙棘潜在地理分布的总适生区面积为 165.1 万 km2。 主要集中分布于河北西部、北部，山西全境，陕西北部及秦岭山区，宁夏南部，甘肃东部、南部及祁连山区，青海东部，四川西部和西藏东部及中部地区。

In product development aspect, (1) Device design and pilot plant test for seabuckthorn leaf scales removal and fruit threshing and cleaning. In order to reduce the diffusion of tea particle dust, improve the working environment and enhance the sensory quality of seabuckthorn leaf tea, a device for removing the leaf scales was designed, which showed that this device has remarkable effect on controlling the seabuckthorn leaf milli dust diffusion. In view of the problems such as low stripping rate, high impurity and damage rate as well as the complicated process, a fruit threshing and cleaning machine integrating crushing, fruit-removing and impurity removal was developed and designed, which showed a significant effect on fruit threshing and cleaning.

在产品开发方面：（1）沙棘叶除毫装置和沙棘脱果清选机的设计及中试。为了减少沙棘叶茶加工生产线茶毫粉尘扩散，改善生产人员作业环境及提高沙棘叶茶感官品质，设计了一种除毫装置。中试结果表明，该除毫装置除毫效果显著，可有效控制茶毫粉尘扩散。针对中国沙棘冷冻果枝脱果期间枝果脱净率低，果实含杂率和破损率高，工序复杂等问题。开发设计了一种集破碎、脱果、除杂一体的脱果清选机。中试结果表明，沙棘脱果清选机具有良好的脱果清选效果。

(2) Series beverage development, because of the high content of malic acid in Chinese seabuckthorn fruit, which lead to the taste of its products too sour. The content of total acid and malic acid can be effectively reduced, but much more release

（2）系列饮料开发，中国沙棘果实较高含量的苹果酸会导致其产品口味过酸。通过在沙棘原浆中添加粟酒裂殖酵母，可有效降低沙棘原

of aroma substances in seabuckthorn pulp by adding Schizomyces miliaria in seabuckthorn pulp. The seabuckthorn beverage produced by this method has a moderate sugar-acid ratio and a stronger aroma. The mixed juice was developed by combining Huangguan pear juice or celery juice with seabuckthorn raw pulp, that the flavor, color and aroma of the mixed juice were significantly better than those of pasteurized products, and the active components of seabuckthorn were well preserved. The aging treatment to seabuckthorn honey fermented wine was carried out by means of ultra-high pressure, microwave and ultrasonic wave, the test showed that all treatments could improve the physicochemical properties and aroma quality of the samples, and ultra-high pressure aging is the best for maintaining the aroma, taste and color of the samples, and also preserved the antioxidant capacity stronger.

浆的总酸和苹果酸含量，原浆中更多香气物质的释放。采用该法生产的沙棘饮料糖酸比适中，香气更浓。采用黄冠梨汁或芹菜汁与沙棘原浆复配研发混合果汁，通过超高压对混合果汁进行杀菌处理，制得的复合沙棘果汁饮料风味、颜色和香气显著优于巴氏灭菌产品，且良好保存了沙棘的活性成分。采用超高压、微波、超声波等方法对沙棘蜂蜜发酵酒进行催陈处理。结果显示，处理均可改善样品的理化性质和香气质量，其中超高压催陈样品的香气、口感、酒体和颜色的评价最高，其总酚和类黄酮成分保存更好，抗氧化能力更强。

One Belgian international invention patent was granted with title of "seabuckthorn tea rich in proanthocyanidins for the prevention of alcohol-induced intestinal damage (BE202/5714)" .

论文、专利成果，发表相关论文一篇；授权一项比利时国际发明专利“富含沙棘籽原花青素的能够预防酒精性肠道损伤的沙棘茶”（BE2021/5714）。

4-10. Dalian Minzu University

10. 大连民族大学

Dalian Minzu University is affiliated to the State Ethnic Affairs Commission, the only one university for ethnic minorities located in the open areas of Northeast China and coastal areas on the construction purpose of high-level modern comprehensive university. The university has 2 first-level master's programs in biological engineering and Ethnology, and 6 professional master's degree programs in forestry and etc. It has 12 provincial and ministerial key disciplines, 10 provincial and ministerial key laboratories for biotechnology and resource utilization, and 6 provincial and ministerial engineering (technology) research centers. 2 virtual teaching and research construction pilots approved in the second batch of he Ministry of Education, 14 provincial and ministerial-level practical education bases, 9 of undergraduate experimental teaching demonstration centers and 3 virtual simulation

大连民族大学隶属于国家民族事务委员会，是全国 110 多所中央部属高校之一，是国家唯一设在东北和沿海开放地区、以工科为主多学科协调发展的民族高等学校，学校以铸牢中华民族共同体意识为主线，建设目标为高水平现代化综合大学。学校拥有生物工程、民族学 2 个一级学科硕士点，拥有林业等 6 个硕士专业学

experimental teaching center with provincial and ministerial level. The National Innovation Alliance of Shiny Leaf Yellowhorn (Xanthoceras sorbifolium Bunge) Industry was approved to establish, and won two second prizes of the National Science and Technology Progress Award and two second prizes of the National Teaching Achievement Award. The university has 1305 staff members, of which 70% have a doctor's degree and nearly 95% have a master's degree or above.

Dalian Minzu University has long been engaged in the research of "innovation and utilization of woody oil germplasm resources, including the yield, quality, resistance formation and regulation mechanism analysis, breeding, cultivation and utilization of seabuckthorn and other woody oil plants. It has undertaken 1 European Union Marie Curie IIF project, 12 National Natural Science Foundation projects, 1 National 863 Program, 2 sub-projects supported program of national science and technology and 6 provincial and ministerial key projects. 8 new plant varieties and 4 improved varieties have been cultivated by hybridization and marker-assisted selection breeding methods. The university has a large number of better natural resources like seabuckthorn, shiny leaf yellowhorn and tea-oil tree, especially the seabuckthorn resources with excellent properties. In recent years, the yield, quality, resistance formation and regulation mechanism of woody oil plants have been studied, a series of genes, transcription factors and non-coding RNA associated with important traits were identified, their functions are analyzed, the regulatory network between them is constructed. The University has obtained 15 authorized invention patents, published 72 SCI indexed papers, formulated 5 local standards and 2 group standards, and won 7 provincial and ministerial scientific research awards. The promotion of varieties and technology has reached 18,240 ha (273,600 mu) and the projects have achieved significant economic, ecological and social benefits.

位授权点。拥有省部级重点学科 12 个，生物技术与资源利用教育部重点实验室等省部级重点实验室 10 个，省部级工程（技术）研究中心等 6 个。拥有教育部第二批虚拟教研室建设试点 2 个，省部级实践教育基地 14 个，省部级本科实验教学示范中心 9 个，省部级虚拟仿真实验教学中心 3 个。获批组建文冠果产业国家创新联盟，获国家科技进步二等奖 2 项，国家级教学成果二等奖 2 项。学校现有教职工 1305 人，专任教师中有博士学位的占近 70%，有硕士以上学位的教师近 95%。

大连民族大学长期从事“木本油料种质资源创新与利用”，包括沙棘等木本油料产量、品质和抗性形成与调控机制解析、育种、栽培和利用等方面的研究工作，先后承担的欧盟玛丽居里 IIF 项目 1 项、国家自然科学基金 12 项、国家 863 计划 1 项、国家科技支撑计划子课题 2 项及省部级重点项目 6 项。采用杂交和分子标记辅助选择育种方法培育出林木新品种 8 个、良种 4 个；持有大量的沙棘、文冠果和油茶资源，特别是具有优良性状的沙棘资源。近年来致力于木本油料产量、品质和抗性形成与调控机制的研究，鉴定了一系列重要性状相关的基因、转录因子和非编码 RNA 等；分析了它们的功能；构建了它们之间的调控网络；获授权发明专利 15 项，发表 SCI 收录论文 72 篇，制定地方标准 5 项、团标 2 项，获省部级科研奖励 7 项。品种和技术已推广 27.36 万亩，带动 10.76 万人长效致富，取得了显著的经济、生态和社会效益。

5. The situation of seabuckthorn practitioners in China, the main member units of the International Seabuckthorn Association (China) Enterprise Committee

For more than thirty years, China has established a powerful seabuckthorn expert team, with around 15,000 professionals, covering forestry, agriculture, water and soil conservation, gardening, medicine, health and other more than 10 sectors and fields, etc., who are highly qualified and come from major universities and professional research institutes all over the country with a strong advantages over other countries. The international cooperation project on seabuckthorn has achieved good results by joint cooperation of experts.

The Enterprise Committee (China) as a sub-organization of International Seabuckthorn Association。

五、中国沙棘从业人员情况，国际沙棘协会（中国）企业委员会主要会员单位介绍

三十多年来，中国拥有强大的沙棘专家团队，涉及的技术专业领域广泛。沙棘从业人员约15000多人，包括林业、农业、水土保持、园艺、卫生等十多个行业和领域，专家资历深厚，来自全国各大高等院校及专业科研院所，专家力量较其他国家具有很强的优势，通过专家联合，共同开展沙棘国际合作项目，取得了很好的成效。

国际沙棘协会（中国）企业委员会成立于2017年5月，是国际沙棘协会的二级机构。

Table 3. Name list of Enterprise Committee (China) of ISA
表 3. 国际沙棘协会（中国）企业委员会团体会员名单

序号 No	名称 Name of member	备注 Title in Committee	联系人 Contact person	职务 Title
1	高原圣果沙棘制品有限公司 Gaoyuanshengguo Seabuckthorn Co. Ltd	会长单位 Chairman	殷丽强 YIN Liqiang	总经理 General Manager
2	北京宝得瑞健康产业有限公司 Beijing Powder Health Industrial Co. Ltd	副会长单位 Vice Chairman	罗会兵 LUO Huibing	总经理 General Manager
3	河北神兴沙棘研究院 Hebei Shenxing Seabuckthorn Academy	副会长单位 Vice Chairman	苏慧丰 SU HuiFeng	副院长 Vice-President
4	吕梁野山坡食品有限责任公司 Lvliang Yeshanpo Food Co.Ltd	副会长单位 Vice Chairman	牛茂林 NIU Maolin	董事长 Chairman
5	陕西海天制药有限公司 Shaanxi Haitian Pharmaceutical Co.Ltd	副会长单位 Vice Chairman	宋凯乐 Song kaile	董事长助理 Assistan to Chairman
6	吉林吉隆东北沙棘产业有限责任公司 Jilin Jilong Seabuckthorn Industry Co., Ltd	副会长单位 Vice Chairman	刘三利 LIU Sanli	董事长 Chairman
7	上海容邦企业集团有限公司 Shanghai Rongbang Enterprise Group Co., Ltd.	副会长单位 Vice Chairman	李相军 LI Xiangjun	董事长 Chairman
8	内蒙古宇航人高技术产业有限责任公司 Inner Mongolia Yuhangren High-tech Industry Co. Ltd	副会长单位 Vice Chairman	姚玉军 YAO Yujun	业务经理 Manager
9	黑龙江中福沙棘有限责任公司 Heilongjiang Zhongfu Seabuckthorn Co., Ltd	副会长单位 Vice Chairman	杜中元 DU Zhongyuan	董事长 Chairman
10	承德宇航人高山植物应用技术有限责任公司 Chengde Astronaut Alpine Plant Application Technology Co., Ltd.	副会长单位 Vice Chairman	刘春海 Liu Chunhai	董事长 Chairman
11	陕西黄龙国寿堂生物工程有限公司 Shaanxi Huan- glong Guoshoutang Bioengineering Co. Ltd	副会长单位 Vice Chairman	陈家顺 CHEN Jiashun	董事长 Chairman
12	新疆景华天宝科技发展有限公司 Xinjiang Jinghua- tianbao Tech-development Co. Ltd	副会长单位 Vice Chairman	刘佳羽 LIU Jiayu	总经理 General Manager
13	新疆康元生物技术集团股份有限公司 Xinjiang Kangyuan Bio-tech Co. Ltd	理事单位 Board Member	刘宗浩 LIU Zonghao	董事长 Chairman
14	新疆中科沙棘科技有限公司 Xinjiang Zhongke Sea- buckthorn Tech Co. Ltd	理事单位 Board Member	徐均 XU Jun	所长 Director
15	布尔津县松源林果生物科技有限公司 Burjin Songyuan Linguo Biotechnology Co., Ltd	副会长单位 Vice Chairman	靳慧林 JIN Huilin	董事长 Chairman
16	山西献果园生物科技有限公司 Shanxi Xianguoyuan Bio-tech Co. Ltd	副会长单位 Vice Chairman	曹满 CAO Man	董事长 Chairman

17	北京汇源食品饮料有限公司 Beijing Huiyuan Food & Beverage Co., Ltd	副会长单位 Vice Chairman	李生延 Li Shengyan	副总裁 Vice President
18	甘肃艾康沙棘制品有限公司 Gansu Aikang Seabuck- thron Co. Ltd	副会长单位 Vice Chairman	马静 MA Jing	总经理 General Manager
19	阿勒泰太阳石健康产业发展有限公司 Altay Sunstone Health Industry Development Co., LTD	副会长单位 Vice Chairman	邓惠中 DENG Huizhong	总经理 General Manager
20	青海康普生物科技股份有限公司 Qinghai CommScope Biotechnology Co., Ltd.	副会长单位 Vice Chairman	孙允武 Sun Yunwu	总经理 General Manager
21	新疆喀纳斯亿嘉康生物科技有限公司 Xinjiang Kanas Yijiakang Biotechnology Co., Ltd.	副会长单位 Vice Chairman	彭正荣 Peng Zhengrong	总经理 General Manager
22	鄂尔多斯市聚远创意农牧业有限公司 Ordos Juyuan Creative Agriculture and Animal Husbandry Co., Ltd	副会长单位 Vice Chairman	王志伟 WANG Zhiwei	总经理 General Manager
23	延寿县鼎鑫生物工程有限公司 Yanshou Xian Dingxin Bioengineering Co., Ltd	理事单位 Board member	张建东 ZHANG Jiandong	总经理 General Manager
24	山西省林业和草原科学研究院 Shanxi Academy of Forestry and Grassland Sciences	理事单位 Board member	贺义才 He Yicai	所长 Director
25	内蒙古淳点实业有限公司 Inner Mongolia Chundian Industry Co. Ltd	理事单位 Board member	毕书杰 BI Shujie	董事长 Chairman
26	中国内蒙古森林工业集团有限责任公司 China Inner Mongolia Forest Industry Group Co., Ltd	理事单位 Board member	许玉成 XU Yucheng	部门经理 Department Manager
27	内蒙古沙漠之花生态产业科技有限公司 Inner Mongolia Shamozhihua Bio-industry Tech Co. Ltd	理事单位 Board member	胥申 XU Shen	董事长 Chairman
28	大连民族植物研究所 Botalical Institute of Dalian Minzu University	理事单位 Board member	阮成江 Ruan Chengjiang	所长 Director
29	辽宁省旱地农林研究所 Liaoning Provincial Institue for Dryland Agro-forestry Research	理事单位 Board member	张东为 Zhang Dongwei	副所长 Deputy Director
30	黑龙江省八面通林业局 Bamiantong Forestry Bereau of Helonngjian Province	理事单位 Board member	段国庆 DUAN Guoqing	副局长 Deputy Head
31	黑龙江省农业科学院 Heilongjiang Academy for Agricultural Science	理事单位 Board member	单金友 SHAN Jinyou	研究员 Chief Researcher
32	兰州大学药学院 College of Pharmacy, Lanzhou University	理事单位 Board member	杨志刚 Yang Zhigang	副院长 Vice Dean
33	新疆慧华沙棘生物科技有限公司 Xinjiang Huihua Seabuckthorn Bio-tech Co. Ltd	理事单位 Board member	蔡永国 CAI Yongguo	经理 Manager
34	山西五台山沙棘制品有限公司 Shanxi Wutaishan Seabuckthorn Co. Ltd	理事单位 Boder Member	赵志侃 ZHAO Zhikan	董事长 Chairman
35	山西科林生物技术开发有限公司企业 Shanxi Kelin Bio-tech Development Co. Ltd	理事单位 Board Member	宁聚保 NING Jubao	总经理 General Manager

36	山西助农药茶资源开发有限公司 Shanxi Zhunong Hherbal Tea Resources Development Co. Ltd	理事单位 Board member	宫铁军 GONG Tiejun	董事长 Chairman
37	林下产业黑龙江有限公司 Forest Industry Heilongjiang Co., Ltd.	理事单位 Board member	丛志甲 Cong Zhijia	总经理 General Manager
38	新疆戈壁记忆品牌管理有限公司 Xinjiang Gobi Memory Brand Management Co., Ltd.	理事单位 Board member	张文莉 Zhang Wenli	董事长 Chairman
39	新疆昆仑天和国际贸易有限公司 Xinjiang Kunlun Tianhe International Trade Co., Ltd.	理事单位 Board Member	蒋剑飞 Jiang Jianfei	总经理 General Manager
40	江苏奥嘉网络科技有限公司 Jiangsu Aojia Network Technology Co., Ltd	理事单位 Board member	陈芳 CHEN Fang	经理 Manager
41	青海倍力甘草科技发展有限责任公司 Qinghai Beili Licorice Science and Technology Development Co., Ltd	理事单位 Board member	骆俊才 Luo Juncai	董事长 Chairman
42	新疆益中园农业科技开发有限责任公司 Xinjiang Yizhong Park Agricultural Science and Technology Development Co., Ltd	理事单位 Board member	余明会 Yu Minghui	总经理 General Manager
43	南京优乐泉生物科技有限公司 Nanjing Youlequan Biotechnology Co., Ltd	理事单位 Board Member	李晓军 Li XiaoJun	总经理 General Manager
44	甘肃农业大学食品科学与工程学院 Gansu Agricultural University College of Food Science and Engineering	理事单位 Board Member	蒋玉梅 Jiang YUMei	教授 Professor
45	中北大学生物材料与发酵研究所 Institute of Biomaterials and Fermentation, North University of China	理事单位 Board Member	郭建峰 GUO JIAN Feng	教授 Professor
46	新疆丰裕生物科技有限责任公司 Xinjiang Fengyu Biotechnology Co., Ltd.	理事单位 Board Member	曹庆武 Cao Qingwu	总经理 General Manager
47	每日元气（深圳）健康科技有限公司 Daily Genki (Shenzhen) Health Technology Co., Ltd	理事单位 Board Member	张妍 ZHANG Yan	总经理 General Manager
48	内蒙古大兴安岭重点国有林管理局 Inner Mongolia Daxinganling State-owned Forestry Bereau	会员单位 Member	周艳昌 ZHOU Yanchang	总会计师 Chief Accountant
49	内蒙古鄂尔多斯乌兰集团公司 Inner Mongolia Erdos Wulan Group Co.	会员单位 Member	康占义 KANG Zhanyi	副总经理 Deputy General Manager
50	黑龙江圣宝泰农业有限公司 Helongjiang Shengbaotai Agricuture Co. Ltd	会员单位 Member	赵胜臣 ZHAO Shengchen	董事长 Chairman
51	上海沃迪智能装备股份有限公司 Shanghai Wodizineng Equipment Corporation	会员单位 Member	王冲 WANG Chong	业务经理 Manager
52	清华德人西安幸福制药有限公司 Qinghua Deren Xi’an Happiness Pharmaceutical Co. Ltd	会员单位 Member	刘红娜 Liu Hongna	研究员 Researcher
53	新疆疆果四季科技有限公司 Xinjiang Jiangguo Siji technology Co., Ltd	会员单位 Member	步艳东 Bu Yandong	总经理 General Manager
54	山西维仕杰食品饮料有限责任公司 Shanxi Weishijie Food & Drink Co. Ltd	会员单位 Member	赵永卫 ZHAO Yongwei	董事长 Chairman

55	山西金科海生物科技有限公司 Shanxi Jinkehai Bio tech Co. Ltd	会员单位 Member	郭海利 GUO Haili	董事长 Chairman
56	山西恒义生物科技有限公司 Shanxi Hengyi Bio-tech Co. Ltd	会员单位 Member	许张兵 XU Zhangbing	总经理 General Manager
57	山西高原圣果沙棘生物有限公司 Shanxi Gaoyuanshengguo Seabuckthorn Biolod- ical Co. Ltd	会员单位 Member	武国昌 WU Guochang	总经理 General Manager
58	内蒙古万柳生态农业有限责任公司 Inner Mongolia Wangliu Eco-agriculture Co. Ltd	会员单位 Member	郭秋实 GUO Qiushi	董事长 Chairman
59	内蒙古大唐药业股份有限公司 Inner Mongolia Datang Pharmaceutical Co. Ltd	会员单位 Member	梁国栋 LIANG Guodong	总经理 General Manager
60	内蒙古吉文林业局 Inner Mongolia Jiwen Forestry Bereau	会员单位 Member	杨英新 YANG Yingxin	总经理 General Manager
61	内蒙古毕拉河林业局 Inner Mongolia Bilahe Forestry Bereau	会员单位 Member	杨静磊 YANG Jinglei	主任 Director
62	内蒙古库都尔林业局 Inner Mongolia Kuduer Forestry Bereau	会员单位 Member	王获玺 WANG Huoxi	主任 Director
63	内蒙古大杨树林业局 Inner Mongolia Dayangshu Forestry Bereau	会员单位 Member	王元成 WANG Yuancheng	主任 Director
64	内蒙古蒙鑫农林产业科技有限公司 Inner Mongolia Mengxin Agri-forestry Industrial Technical Co. Ltd	会员单位 Member	陈国香 CHEN Guoxiang	副总经理 Vice General Manager
65	内蒙古大沙棘实业（集团）有限公司 Inner Mongolia Big Seabuckthorn Industrial Co. Ltd	会员单位 Member	陈羿达 CHEN Yida	总经理 General Manager
66	内蒙古鄂尔多斯市天骄资源发展有限责任公司 Inner Mongolia Erdos Tianjiao Resource Development Co. Ltd	会员单位 Member	李云飞 LI Yunfei	董事长 Chairman
67	吉林修养堂药业保健品有限公司 Jilin Qiuyangtang Pharmaceutcal & Healthcare Poduct Co. Ltd	会员单位 Member	李晓光 LI Xiaoguang	总经理 General Manager
68	吉林省富智达生态科技发展有限公司 Jinlin Fuzhida Eco-tech development Co. Ltd	会员单位 Member	刘杰 LIU Jie	经理 Manager
69	黑龙江省长乐山大果沙棘开发有限公司 Helongjiang Changleshan Seabuckthorn Development Co. Ltd	会员单位 Member	王忠校 WANG Zhongxiao	董事长 Chairman
70	黑龙江延寿县御禄园茶业有限公司 HeilongjiangYan- shou Yuluyuan Tea Industry Co. Ltd	会员单位 Member	李承捷 LI Chengjie	董事长 Chairman

71	黑龙江盛农食品有限公司 Helongjiang Shengnong Food Co. Ltd	会员单位 Member	姚忠华 YAO Zhonghua	董事长 Chairman
72	黑龙江牡丹江东安区康利果蔬农民专业合作社 Mudanjiang Donganqu Kangli Fruit & Vegetable Farmer Cooperative	会员单位 Member	邵珠宽 SHAO Zhukuan	经理 Manager
73	江苏常州燕和堂商贸有限公司 Changzhou Yanhetang Trade Co. Ltd	会员单位 Member	陈从梅 CHEN Congmei	董事长 Chairman
74	江苏扬州福尔喜果蔬汁机械有限公司 Yangzhou Fuerxi Fruit & Vegetable Juice Machinery Co.Ltd	会员单位 Member	许荣华 XU Ronghua	董事长 Chairman
75	浙江杭州沙美生物科技有限公司 Hangzhou Shamei Bio-tech Co. Ltd	会员单位 Member	李云天 LI Yuntian	经理 Manager
76	宁波元硕生物科技开发有限公司 Ningbo Yuanshuo Bio-tech Co. Ltd	会员单位 Member	赵晓峰 ZHAO Xiaofeng	总经理 General Manager
77	山东科举药业有限公司 Shandong Keju Pharmaceutical Co., Ltd	会员单位 Member	蔚方超 Wei Fangchao	总经理 General Manager
78	山东菏泽中禾健元生物科技有限公司 Shandong Heze Zhongehe Jianyuan Bio-Tech Co. Ltd	会员单位 Member	储文宾 CHU Wenbin	总经理 General Manager
79	河南胜景堂生物科技有限公司 Henan Shengjingtang Bio-tech Co. Ltd	会员单位 Member	韩宜冬 HAN Yidong	董事长 Chairman
80	四川成都川大华西保健品有限公司 Sichuan Chengdu Chuanda Healthcare Product Co. Ltd	会员单位 Member	黄祥芳 HUANG Xiangfang	经理 Manager
81	陕西尔林兔药业有限公司 Shanxi Erlintu Pharmaceutical Co. Ltd	会员单位 Member	李勇建 LI Yongjian	总经理 General Manager
82	甘肃甘农生物科技有限公司 Gabsu Gannong Bio-tech Co. Ltd	会员单位 Member	傅雨萌 FU Yumeng	经理 Manager
83	青海久实虫草生物科技有限公司 Qinghai Jlushichongcao Bio-tech Co. Ltd	会员单位 Member	曾静 ZENG Jing	经理 Manager
84	延安圆方（集团）公司 Yan'an Yuanfang (Group) Company	会员单位 Member	赵志强 Zhao Zhiqiang	总经理 General Manager
85	青海安旭生物科技集团有限公司 Qinghai Anxu Bio-tech Co. Ltd	会员单位 Member	马安成 MA Ancheng	经理 Manager
86	青海伊纳维康生物科技有限公司 Tangut (CHINA) Co Ltd	会员单位 Member	董树林 DONG Shulin	副总经理 Vice General Manager
87	宁夏隆薯闽宁助残商贸中心 Ningxia Longsu Minningzhucan Trade Center	会员单位 Member	辛同宝 XIN Tongbao	总经理 General Manager

88	新疆西域珍品生物科技有限公司 Xinjiang Xiyuzhenpin Bio-tech Co. Ltd	会员单位 Member	李婧 LI Jing	总经理 General Manager
89	新疆吉萃元农业科技有限公司 XinJiang Jicuiyuan Agricultural Science and Technology Co., Ltd	会员单位 Member	陶桐生 TAO Tongsheng	总经理 General Manager
90	新疆金圣果农业专业合作社 Xinjiang Jinshengguo Agricultural Professional Cooperative	会员单位 Member	赵军丰 ZHAO Junfeng	总经理 General Manager
91	黑龙江金科沙棘有限公司 Heilongjiang Jinke Sea-buckthorn Co. LTD	会员单位 Member	王忠国 Wang Zhongguo	董事长 Chairman
92	新疆青河县隆濠生物科技发展有限公司 Xinjiang Qing- he County Longhao Bio-tech Co. Ltd	会员单位 Member	孙文胜 SUN Wensheng	总经理 General Manager
93	新疆一七零团丝路沙棘生物科技有限公司 Xinjiang 170tuan Silk Road Seabuckthorn Biotechnology Co., Ltd.	会员单位 Member	王军扬 WANG Junyang	总经理 General Manager
94	中国农业科学院农业资源与农业区划研究所 Institute of Agricultural Resources and Zoning, CAAS	会员单位 Member	尤飞 YOU Fei	研究员 Rsearcher
95	内蒙古蒙鑫农林产业科技有限公司 Inner Mongolia Mengxin Agriculture and Forestry Industry Technology Co., Ltd.	会员单位 Member	高玉琼 Gao yuqiong	总经理 General Manager
96	中国内蒙古森工集团阿尔山森林工业有限公司 China Inner Mongolia Forest Industry Group Alshan Forest Industry Co. LTD	会员单位 Member	徐成才 Xu Chengcai	总经理 General Manager
97	牡丹江市大棘生物科技有限公司 Mudanjiang Daji Biotechnology Co., Ltd.	会员单位 Member	刘宇航 Liu Yuhang	总经理 General Manager
98	四川星瑞健康产业集团有限公司 Sichuan Xingrui Health Industry Group Co., Ltd.	会员单位 Member	莫勇 Mo Yong	总经理 General Manager
99	纯真时代生物科技（广州）有限公司 Innocence Times Biotechnology (Guangzhou) Co., Ltd	会员单位 Member	关伟 GuanWei	董事长 Chairman
100	成都骏亿丰商贸有限公司 Chengdu Junyifeng Trading Co., Ltd	会员单位 Member	赵大勇 Zhao Dayong	总经理 General Manager
101	新疆汇邦生物科技有限公司 Xinjiang Huibang Biotechnology Co., Ltd	会员单位 Member	李波 Li Bo	总经理 General Manager
102	山西待见生物科技有限公司 Shanxi Waitsee Biotechnology Co., Ltd	会员单位 Member	陈志辉 Chen Zhihui	总经理 General Manager
103	新疆吉克普林沙棘生物科技有限公司 Xinjiang Jiqingprin Seabuckthorn Biotechnology Co., Ltd	会员单位 Member	赵丹 Zhao Dan	总经理 General Manager

104	大山小果生物科技（山西省）有限公司 Dashan Xiaoguo Biotechnology (Shanxi Province) Co., Ltd	会员单位 Member	邢如乐 Xing Rule	总经理 General Manager
105	新疆达尔生物科技有限公司 Xinjiang Dar Biotechnology Co., Ltd	会员单位 Member	张杰 Zhang Jie	总经理 General Manager
106	新乡市新亦兴机械设备有限公司 Xinxiang Xinyixing Machinery Equipment Co., Ltd	会员单位 Member	岳新亮 Yue Xinliang	总经理 General Manager
107	新疆大唐西域农业生态 科技有限公司 Agricultural ecology of Da Tang Xi Yu, Xinjiang Technology Co., Ltd	会员单位 Member	潘玮 Pan Wei	总经理 General Manager
108	新疆甄美西域食品有限公司 Xinjiang Zhenmei Xiyu Food Co., Ltd	会员单位 Member	宗浩 Zong Hao	总经理 General Manager
109	新疆远古戈壁农业科技有限公司 Xinjiang YuanGuGeBi Agricultural Technology Co., Ltd	会员单位 Member	宋鹏 Song Peng	总经理 General Manager
110	山西益健生物科技有限公司 Shanxi Yijian Biotechnology Co., Ltd	会员单位 Member	崔易 CUI Yi	总经理 General Manager
111	山东棘溢生物科技有限公司 Shandong JiYi Biotechnology Co., Ltd	会员单位 Member	王林建 WANG Linjian	总经理 General Manager
112	甘孜州鲜水金谷科技有限公司 Ganzi Zhou Xian Shui Jingu Technology Co., Ltd	会员单位 Member	曹雁飞 CAO YanFei	总经理 General Manager
113	孙吴县聚创科技有限公司 Sunwu Juchuang Technology Co., Ltd	会员单位 Member	齐会滨 Qi HuiBin	总经理 General Manager
114	汾阳汇维果汁饮品有限公司 Fenyang Huiwei Juice Beverage Co., Ltd	会员单位 Member	崔汝智 CUI Ruzhi	总经理 General Manager
115	啊啦膳（吉林省）科技有限公司 Ahlashan (Jilin Province) Technology Co., Ltd	会员单位 Member	胡晓晓 HU Xiaoxiao	总经理 General Manager
116	四川省中梦佳汇泰生物科技有限责任公司 Sichuan Zhongmeng Jiahui Tai Biological Technology Co., Ltd.	会员单位 Member	孔祥瑞 Kong Xiangrui	经理 Manager
117	山西天汁然生物科技有限公司 Shanxi Tianjuran Biotechnology Co., Ltd	会员单位 Member	吕润生 Lv Runsheng	总经理 General Manager

6. Introduction of important activities, major events in 2023

6-1. About the International Cooperation

At present, China has initially established cooperative association with Russia, Germany, France, Greece, Latvia, Romania, Finland, Sweden, Mongolia, Japan, Korea, India, Nepal, Pakistan, Kyrgyzstan, Iran, Canada, the United States, Chile, Peru, Bolivia, and other countries. And once got the technical and financial supports for technology and economic cooperation from the World Bank, the United Nations Development Programme, the European Union, Perot Fund of the Group 77, and International Centre for Integrated Mountain Development , the cooperation on seabuckthorn with other countries have been carried out each year.

Chinese government attaches great importance to ecological progress and has put forward the "Belt and Road Initiatives". Seabuckthorn is a kind of efficient soil and water conservation plant, which can improve ecological environment and promote economic development, with its great ecological value and economic value. It is the good opportunity for seabuckthorn development in conjunction with the "Belt and Road Initiatives", to promote bilateral and multilateral seabuckthorn exchanges and cooperation. Along the Belt and Road there are related to 65 countries and regions globally, more than a dozen countries, including Russia, Mongolia, Kazakhstan, Tajikistan, Uzbekistan, Iran, India, Nepal, Pakistan, Germany, Finland, Latvia, etc. who have already carried out seabuckthorn cultivation and industrial development, and have a solid base for cooperation.

International Seabuckthorn Association as an international non-governmental, non-profit organization, and with members from seabuckthorn

六、2023 年中国有关沙棘的重要活动、重大事项介绍

1. 国际合作开展情况

目前，中国已初步建立了与俄罗斯、德国、英国、法国、希腊、拉脱维亚、罗马尼亚、芬兰、瑞典、蒙古、日本、朝鲜、印度、尼泊尔、巴基斯坦、吉尔吉斯斯坦、伊朗、加拿大、美国、智利、秘鲁、玻利维亚等国家的合作联系，并曾经获得了世界银行、联合国开发署、欧盟、77 国集团佩罗基金、国际山地综合开发中心等国际组织的技术和资金支持，每年与各国开展沙棘科技交流或经济合作。

中国政府高度重视生态文明建设，提出“一带一路”倡议。沙棘是一种高效的水土保持植物，可以改善生态环境，促进经济发展。沙棘具有巨大的生态价值和经济价值。我们必须抓住政策上的重大机遇，特别是与“一带一路”倡议相结合，推动双边和多边沙棘国际交流与合作。在“一带一路”相关的 65 个国家和地区中，有十多个国家（包括俄罗斯、蒙古、哈萨克斯坦、塔吉克斯坦、乌兹别克斯坦、伊朗、印度、尼泊尔、巴基斯坦、德国、芬兰、拉脱维亚等）已经开展沙棘种植和产业发展，具备一定的基础条件。

国际沙棘协会是由中国、德国、俄罗斯、芬兰等国专家于 2001 年发起成立，由全球积极开

enterprises, research institutes and individuals was launched in 2001 by international seabuckthorn experts from China, Germany, Russia, Finland. And in 2011, ISA was approved by the Chinese Ministry of Foreign Affairs and Ministry of Water Resources and then officially certificated by Ministry of Civil Affairs, which is the 27th international organization headquartered in China.

On October 15, 2019, at the General Assembly of International Seabuckthorn Association held in Berlin, Germany, 14 members from 7 countries, including China, Germany, Russia, Finland, Latvia, India and Canada, were elected as the second Board of Directors. Mr. ZHAO Dongxiao, former Director General of Management Center for Seabuckthorn Development, Ministry of Water Resources, and Prof. LU Shunguang, Deputy Director General were elected as Chairman and Secretary General of International Seabuckthorn Association respectively. Mr. Velimarkku Korteniemi from Finland, Dr. Jorg-Thomas Morsel from Germany and Dr. Yury A. Zubarev from Russia were elected as Vice Chairmen respectively. Professor Baoru YANG from Turku University, Finland was elected as the new Chairperson of Scientific Committee of International Seabuckthorn Association. Then at the Board meeting in 2022, Prof. ZHANG Wencong, Director General of Management Center for Seabuckthorn Development, Ministry of Water Resources was elected as the new Chairmrn. (As shown in Table 4)

展沙棘研究与开发的企事业单位、个人和其他组织自愿组成的学术性、行业性国际非政府、非营利组织，是经中国外交部同意、水利部批准，于 2011 年在中国民政部正式注册、第 27 个总部设在中国的国际性社团机构。

2019 年 10 月 15 日，在德国柏林召开的国际沙棘协会会员代表大会上，选举产生了由来自中国、德国、俄罗斯、芬兰、拉脱维亚、印度、加拿大等 7 个国家的 14 名成员组成的第二届理事会。在随后召开的国际沙棘协会第二届理事会第一次会议上，水利部沙棘开发管理中心主任赵东晓、副主任卢顺光分别当选为国际沙棘协会理事会主席、秘书长。来自芬兰的 Veli-Markku Korteniemi、德国的 Jörg-Thomas Mörsel、俄罗斯的 Yury A. Zubarev 分别当选为副主席，芬兰图尔库大学杨宝茹教授当选为新一届国际沙棘协会科技委员会主席。在 2022 年国际沙棘协会理事会年会上，水利部沙棘开发管理中心主任张文聪当选理事会主席，并增补来自德国的多萝西 • 贝克 Dorothee Berger 女士为理事。（详见附表 4）

Table.4 Name-list for Board Members of International Seabuckthorn Association
表 4. 第二届国际沙棘协会理事会成员名单（2019–2024）

序号 Serial NO.	姓名 name	性别 Sex	国家 Country	工作单位 Employed Institution	职 务 Title	在协会的任职 Title in ISA
1	张文聪 ZHANG Wencong	男 M	中 国 China	水利部沙棘开发管理中心 Management Center for Seabuckthorn Development, Ministry of Water Resources	主任 Director General	主席、理事 Chairman
2	维里·马尔库·科特涅米 Veli-Markku Korteniemi	男 M	芬 兰 Finland	Aromtech 有限公司 Aromtech Ltd	总经理 General Manager	副主席、理事 Vice Chairman
3	约尔·托马斯·莫塞尔 Jörg-Thomas Mörsel	男 M	德 国 Germany	UBF 有限公司 UBF Ltd	首席执行官 CEO	副主席、理事 Vice Chairman
4	尤里·祖巴列夫 Yury A. Zubarev	男 M	俄罗斯 Russia	西伯利亚利萨文科园艺研究所 Lisavenko Research Institute of Horticulture for Siberia	高级研究员 Senior Researcher	副主席、理事 Vice Chairman
5	吕荣森 LU Rongsen	男 M	中 国 China	中国科学院成都生物研究所 Biology Institute,Chinese Academy of Science	教授 Professor	理 事 Board member
6	维伦德拉·辛格 Virendra Singh	男 M	印 度 India	喜马偕尔邦农业大学 CSK Himachal Pradesh Agricultural University	教授，印度沙棘协会秘书长 Professor	理 事 Board member
7	莫沫 MO Mo	男 M	中 国 China	水利部水土保持司 Dep.of Soil and Water Conservation	副司长 Deputy Director General	理 事 Board member
8	杨宝茹 YANG Baoru	女 F	芬 兰 Finland	图尔库大学 University of Turku	教授，食品科学系主任 Professor, Head of Dept. of Food Science	理 事 Board member
9	达里加 瑟格丽娜 Dalija Seglina	女 F	拉脱维亚 Latvia	拉脱维亚园艺研究所 Institute of Horticulture, Latvia	加工生化部主任 Head of Unit of Processing and Biochemistry	理 事 Board member
10	纳塔莉亚·杰米多娃 Natalia Demidova	女 F	俄罗斯 Russia	俄罗斯北方林业研究所 Northern Research Institute of Forestry	科学部副主任 Deputy Director on Sciences	理 事 Board member
11	安德烈·布鲁威利斯 Andrejs Bruvelis	男 M	拉脱维亚 Latvia	拉脱维亚沙棘协会 Seabuckthorn Association of Latvia	主 席 Head	理 事 Board member
12	阿尔芬斯·乌提欧 Alphonsus Utioh	男 M	加拿大 Canada	食品研发中心 Center for Food Research and Development	博 士 Senior Researcher	理 事 Board member
13	多萝西·贝克 Dorothee Berger	女 F	Germany 德 国	贝克有限公司 Christine Berger GmbH	首席执行官 CEO	理 事 Board member
14	卢顺光 LU Shunguang	男 M	中 国 China	水利部沙棘开发管理中心 Management Center for Seabuckthorn Development, Ministry of Water Resource	副主任 Deputy Director General	秘书长、理事 Secretary General
15	夏静芳 XIA Jingfang	女 F	中 国 China	水利部沙棘开发管理中心 Management Center for Seabuckthorn Development, Ministry of Water Resource	处 长 Division Chief	副秘书长、理事 Deputy Secretary General

Since the establishment of ISA, 9 times of International Seabuckthorn Conferences have been successfully held in India, Germany, Canada, Russia, China and Greece normally every two years. In August 2023, at the ISA Board meeting the 10th International Seabuckthorn Conference was decided tobe held in 2025 in China.

国际沙棘协会自成立以来，已先后在印度、德国、加拿大、俄罗斯、中国和希腊成功举办了9 届两年一次的国际学术大会。2023 年 8 月理事会决定，第十届届国际沙棘协会大会将于2025 年在中国举办。

On November 1, 2022, H.E. ZHU Chengqing, Vice Minister of Water Resources of China, pointed out when investigating the International Seabuckthorn Association that international seabuckthorn cooperation is very important. As one of the four international organizations managed by the Ministry of Water Resources, the ISA has carried out a series of international cooperation and exchange services, and played a great role as an international platform by sharing seabuckthorn story of China. Entering a new stage, we must strengthen our confidence, and firmly believe that seabuckthorn, initiated by H.E. Madam QIAN Zhengying, former Vice Chairman of CPPCC, must have a glory future. In order to strengthen international cooperation on seabuckthorn, we should be focus on enhancing mutual lexpert exchange and learning from other countries.

2022 年 11 月 1 日，水利部副部长朱程清调研国际沙棘协会时指出：沙棘国际合作很重要，国际沙棘协会作为水利部管理的四个国际组织之一，开展一系列国际沙棘合作交流业务，用沙棘讲好“中国故事”水利篇章，很好发挥了国际平台作用。进入新阶段，一定要坚定信心，钱正英副主席开创的沙棘事业大有可为！要进一步加强国际间沙棘合作，在与其他国家相互交流借鉴的基础上，着力增强中国的影响力、话语权，主动服务中国大国外交战略，服务“一带一路”建设。

6-2. Major events of seabuckthornin China

2. 2023 年中国重大沙棘事件

(1) In July of 2023, Madam Zhu Chengqing, Vice Minister of Water Resources, sent her letter of high appreciation to the achievement of International Seabuckthorn Association.

(1) 为贯彻落实习近平总书记在内蒙古主持召开关于加强荒漠化综合防治和推进“三北”等重点生态工程建设座谈会上的重要讲话精神，2023 年 7 月，国际沙棘协会向水利部朱程清副部长呈送了“新时代推进沙棘国际合作工作实施方案”的报告，得到了部领导的充分肯定。

(2) In May of 2023, the 9th International Seabuckthorn Association Conference was held in Thessaloniki, Greece. More than 100 participants

(2) 2023 年 5 月 22—26 日， 由 国 际 沙 棘 协 会（International Seabuckthorn

from 16 countries attended this conference, organized by HIPPOPHAE HELLAS S.A. G.P.) and University of Thessaly. More than 30 Chinese researches were present at the conference.

Association，简称ISA）主办、希腊沙棘股份公司（HIPPOPHAE HELLAS S.A. G.P.）和希腊塞萨利大学（University of Thessaly）等机构承办的第九届国际沙棘协会大会（ISA-2023）在希腊古城塞萨洛尼基（Thessaloniki）隆重召开，与会的近100名代表来自16个国家。我国沙棘专家和企业代表30多人参加了两年一度的国际盛会。

(3) In May of 2023, Annual Board Meeting of International Seabuckthorn Association was held in Thessaloniki, Greece. It was decided to organize the 10th International Seabuckthorn Association Conference in China in 2025.

(3) 2023年5月，国际沙棘协会理事会2023年年会在希腊召开，会议决定由中国于2025年举办第十届国际沙棘协会大会。

(4) In January of 2023, Development Plan of 2023-2025 for International Seabuckthorn Association was issued by the Secretariat of ISA.

(4) 2023年1月，国际沙棘协会秘书处组织编制和印发了《国际沙棘协会高质量发展规划（2023年—2025年）》。

(5) In September 2023, the Annual Conference of the International Seabuckthorn Association (China) Enterprise Committee and the National Seabuckthorn Workshop was successfully held in Xinjiang. More than 200 national-wide participants joined the conference.

(5) 2023年9月14日至15日，国际沙棘协会（中国）企业委员会2023年年会暨沙棘学术交流会在新疆布尔津召开。此次会议主题为“立足沙棘资源优势，推进乡村产业发展”，来自全国的政府、企业、科研院所高校230余人参加了此次会议。

(6)In April of 2023, Inner Mongolian Operating Center for Seabuckthorn Intellectual Property was initiated and hosted by Inner Mongolia Yuhangren High-tech Industry Co. Ltd.

(6) 2023年4月20日，在内蒙古自治区举办了产业知识产权运营中心授牌仪式，内蒙古宇航人高技术产业有限责任公司是内蒙古沙棘产业知识产权运营中心的建设主体。

(7) In December of 2023, two seabuckthorn good varieties namely Zayouhong and Zayouhuang selected by researchers from Datong Nursery of Qinghai province, got superb variety certificates issued by Qinghai Provincial Bureau for Forestry and Grassland.

(7) 2023 年 12 月 22 日，由青海省大通县种苗站城关苗圃培养的“杂优红”和“杂优黄”2 个沙棘品种，被青海省林业和草原局品种审定委员会审定为省级良种，并将在全省林业生产中推广使用。

(8) In February of 2023, 2,000 Chinese seabuckthorn (Hippophae rhamnoides ssp. sinensis) seeds flying with Shenzhou-14 spacecraft were turned back to Inner Mongolia Yuhangren High-tech Industry Co. Ltd for further experiments.

(8) 2023 年 2 月，由神舟十四号载人飞船搭载 2000 粒的沙棘“太空种子”在北京市方圆公证处的见证下返还宇航人高技术产业有限责任公司，进行深入研究。

(9) With 57,000,000 Yuan of central governmental budget and organized by Management Center for Seabuckthorn Development, Ministry of Water Resources, 324,000 mu equal to 21,600 ha of seabuckthorn stands were planted in 4 counties of Erdos, Inner Mongolia.

(9) 由水利部沙棘开发管理中心组织实施的中央预算项目“晋陕蒙砒砂岩区十大孔兑沙棘生态减沙工程”，2022–2023 年落实中央投资 5700 万元，在内蒙古鄂尔多斯市 4 个旗（区）种植沙棘 32.4 万亩。

(10) The project with title of “Introduction Trail Research and Breeding of Third generation Russian Variety” organized by Management Center for Seabuckthorn Development, Ministry of Water Resources received the Grade III Prize of 2023 Science and Technology Prize, issued by Chinese Society for Soil and Water Conservation.

(10) 由水利部沙棘开发管理中心联合辽宁省旱地农林研究所等全国沙棘育种网协作单位申报的“俄罗斯第三代沙棘良种引进试验技术创新与应用”获得 2023 年度中国水土保持学会科学技术奖三等奖。

(11) In 2023, International Seabuckthorn Association issued and implemented five new technical standards, namely Code for evaluation of eco-economic seabuckthorn cultivars, Standard for evaluation of fresh eating type seabuckthorn cultivars, Technical regulation of seabuckthorn softwood cutting in alpineplateau regions, Technical regulations for cultivation and management of seabuckthorn plantations, and Standard for raw materials of seabuckthorn leaf.

(11) 2023 年，国际沙棘协会组织编制了《生态经济型沙棘品种评价规范》《鲜食型沙棘品种评价规范》《沙棘叶原料》《青藏高原区沙棘嫩枝扦插技术规程》《沙棘种植园建设与管护技术规范》等 5 项团体标准，目前已累计颁布 13 项团体标准。

7. Published papers on seabuckthorn in 2023 in China

In 2023, 264 scientific papers related to seabuckthorn were published as in Appendix (data source: https://www.cnki.net/), covering several topics of seabuckthorn resources and utilization.

Appendix : Scientific articles/papers/thesis on seabuchthorn published 2023 in China

1. SHI Hui, YAN Wenwen; YIN Dai-ho, et al, Changes of physiological indexes and expression patterns of aquaporin genes of seabuckthorn in China under salt stress [J]. Journal of Fujian Agricultural Sciences, 2023,38(12):1414-1419.

2. LI Xiguang, LI Xiaoting, WANG Lei, et al, Analysis on fruit quality and nutrient composition of seabuckthorn from Xinjiang based on spatial differences [J], Transactions of the Chinese Society of Agricultural Engineering, 2023,39(23):268-275.

3. WANG Ruike, WEN Ting, XU weixian, et al, Comparison of soil physical and chemical properties under different ecological restoration methods in Loess Plateau of northern Shaanxi [J], Northwest Hydropower, 2023, (06): 7-11+17.

4. WANG Yueling, XU Hao; AN Yu, et al, Study on the fractal characteristics of soil particle size distribution and nutrient relationship under typical artificial forest in the Loess region of southern Ningxia [J], Northern Horticulture, 2023, (24): 81-88.

七、2023 年中国发布的沙棘主要技术标准及发表论文

2023 年 , 中国沙棘专家在科技期刊发表沙棘论文 264 篇（数据来源：知网 https://www.cnki.net/），研究领域涵盖育种、育苗、人工造林、栽培管理、病虫害防治、产业政策，沙棘果、沙棘叶、沙棘汁、沙棘黄酮、沙棘多糖加工利用等多个领域。在学科方面包含农业、林业、水利、水土保持、生态环境等学科，经济学、生物学、植物学、动物学、土壤学、食品学、生物化学、医学、中医学、中药学、畜牧与动物医学等（详见附件）。

附件：2023 年度中国学者发表的沙棘科技论文

1 施会 ; 严雯雯 ; 尹代浩 ; 等 , 盐胁迫下中国沙棘生理指标变化及水通道蛋白基因的表达模式 [J], 福建农业学报 ,2023,38(12):1414-1419.

2 李曦光 ; 李萧婷 ; 王蕾 ; 等 , 基于空间差异的新疆沙棘资源果实品质及营养成分分析 [J], 农业工程学报 ,2023,39(23):268-275.

3 王瑞科 ; 文婷 ; 胥维纤 ; 等 , 陕北黄土高原不同生态修复方式下土壤理化性状比较 [J], 西北水电 ,2023,(06):7-11+17.

4 王月玲 ; 许浩 ; 安钰 ; 等 , 宁南黄土区典型人工林下土壤粒径分布分形特征与养分关系研究 [J], 北方园艺 ,2023,(24):81-88.

5. WANG Haiying, Thinking on the development of seabuckthorn industry in Xinzhou City [J], Shanxi Forestry, 2023, (06): 34-35.

6. SUN Yue, GE Na, ZHAO Xue, et al, Effect of arctosolic acid on sciatic nerve injury in rats [J], Journal of Practical Medicine, 2023, 39(24): 3158-3162.

7. CHEN S H, Study on wind and sand control effect of seabuckthorn and cultivation management technology [J], Agricultural Technology and Equipment, 2023, (12): 134-135+140.

8. WANG Shangxiong, Investigation of woody prickly plant resources and research on afforestation technology in Qilian Mountains [J],Qinghai Agro-forestry Science and Technology of , 2023, (04): 32-36+46.

9. MA Yingmei, ZHAO Zihan, ZHANG Na, et al, Effects on seed germination of two seabuckthorn species with different pretreatment, culture temperature and substrate [J], Journal of West China Forestry Science, 2023, 52(06): 22-30.

10. GE Sufen, ZHANG Dongwei, REN Lihua, et al, Comparative study on fruit characteristics and growth rhythm of the third generation Russian seabuckthorn in western Liaoning [C], Proceedings of the 2023 Annual Conference of Liaoning Water Conservancy Society, Liaoning Institute of Agriculture& Forestry in Arid Areas, 2023: 8.

11. CAO Wenxiu, LI Guangying, ZHANG Yanzhen, Optimization on fruit puree process of pumpkin-seabuckthorn composite based on fuzzy mathematical evaluation [J], Journal of Plateau Agriculture, 2023,7(06): 644-650+669.

5 王海英 , 关于忻州市沙棘产业发展的思考 [J], 山西林业 ,2023,(06):34-35.

6 孙悦 ; 戈娜 ; 赵雪 ; 等 , 沙棘熊果酸对大鼠坐骨神经损伤修复作用 [J], 实用医学杂志 ,2023,39(24):3158-3162.

7 陈思航 , 沙棘防风治沙作用及栽培管理技术研究 [J], 农业技术与装备 ,2023,(12):134-135+140.

8 王尚雄 . 祁连山木本具刺植物资源调查及造林技术研究 [J], 青海农林科技 ,2023,(04):32-36+46.

9 马迎梅 , 赵子涵 , 张娜 , 等 . 不同种子预处理、培养温度及基质对两种沙棘种子萌发的影响 [J], 西部林业科学 ,2023,52(06):22-30.

10 戈素芬 , 张东为 , 任丽华 , 等 . 辽西第三代俄罗斯大果沙棘果实特性和生长节律比较研究 [C], 辽宁省水利学会 2023 年学术年会论文集 , 辽宁省旱地农林研究所 ,2023:8.

11 曹文秀 ; 李光英 ; 张艳珍 ; 等 , 基于模糊数学评价法优化南瓜沙棘复合果泥工艺 [J], 高原农业 ,2023,7(06):644-650+669.

12. SHANG Liqiang, Effects on seed yield and quality of seabuckthorn with with different pruning tree shapes [J], Science and Technology of Tianjin Agriculture and Forestry, 2023, (06): 22-24+38.

13. QI Xiaoling, The afforestation technology of seabuckthorn with digging hole in Autumn, watering in winter and planting in spring in arid and semi-arid region [J], Science and Technology of Tianjin Agriculture and Forestry, 2023,(06):25-28.

14. CHEN Xiaona, ZHAO Naqi, YU Xiao et al, Ecological adaptability of seabuckthorn in China [J]. Journal of Temperate Forestry Research, 2023,6 (04): 55-59.

15. YANG Huanhuan, ZHAO Minghui, HU Tao, et al, Study on microwave extraction and purification of flavonoids from seabuckthorn fruit residue [J], Food Industry, 2023,44 (12): 85-90.

16. YU Huan, WEI Tianxing, CHEN Yuxuan, et al, Distribution characteristics of soil organic carbon storage in typical plantation in loess hilly region [J]. Journal of Beijing Forestry University, 2023, 45(12): 100-107.

17. YIN Xianting, XIA Guanghui, SUN Haitao,et al, Study on optimization of suspended beverage formulation of seabuckthorn with black fungus by response surface method [J], Cereal & Food Industry, 2023, 30(06): 45-50.

18. LI Jiaying, ZHAO Xueru, FU Weiqi, et al, Study on the antioxidant activity of Danbei fruit and vegetable granules [J], China Condiment, 2023, 48(12): 39-43.

19. HAN Gaohong, Seabuckthorn afforestation technology in Dacaotan Forest Farm [J], Rural Science and Technology, 2023, 14(23): 95-97.

12 尚利强 , 不同树形的修剪对沙棘采种林种子产量和质量的影响 [J], 天津农林科技 ,2023,(06):22-24+38.

13 齐小玲 , 干旱半干旱区沙棘秋穴冬水春播造林技术 [J], 天津农林科技 ,2023,(06):25-28.

14 陈晓娜 ; 赵纳祺 ; 俞潇 ; 等 , 浅谈我国沙棘属植物生态适应性 [J], 温带林业研究 ,2023,6(04):55-59.

15 杨欢欢 ; 赵明慧 ; 虎涛 ; 等 , 沙棘果渣黄酮微波提取工艺优化及其纯化研究 [J], 食品工业 ,2023,44(12):85-90.

16 于欢 ; 魏天兴 ; 陈宇轩 ; 等 , 黄土丘陵区典型人工林土壤有机碳储量的分布特征 [J], 北京林业大学学报 ,2023,45(12):100-107.

17 尹显婷 ; 夏光辉 ; 孙海涛 ; 等 , 响应面法优化黑木耳沙棘悬浮饮料配方的研究 [J], 粮食与食品工业 ,2023,30(06):45-50.

18 李佳莹 ; 赵雪如 ; 付玮琦 ; 等 , 丹贝果蔬颗粒的研制及抗氧化活性研究 [J], 中国调味品 ,2023,48(12):39-43.

19 韩高红 , 大草滩林场沙棘造林技术 [J], 乡村科技 ,2023,14(23):95-97.

20. ZHOU Youlin, Cultivation techniques of bare-root seedlings of seabuckthorn in Huzhu County, Qinghai Province [J], Agricultural Engineering Technology, 2023, 43(34): 95+98.

20 周有林 , 青海互助县沙棘裸根苗栽培技术 [J], 农业工程技术 ,2023,43(34):95+98.

21. ZHU Enhua, A clinical analysis of the treatment of mycotic vaginitis by the combination of external washing prescription and compound seabuckthorn seed oil supposition [J], The Medical Journal of Industrial Enterprise, 2023, 36(06): 116-117.

21 朱恩华 , 自拟中药外洗方联合复方沙棘籽油栓治疗霉菌性阴道炎的临床分析 [J], 当代临床医刊 ,2023,36(06):116-117.

22. SHEN Haodong, Design and Research of intelligent seabuckthorn planting vehicle [D], Journal of Xijing University, 2023.

22 沈昊东 , 智能沙棘种植车设计研究 [D], 西京学院 ,2023.

23. YU Dandan, Study on water consumption rule and appropriate water demand of seabuckthorn in arid region [D], Journal of Xinjiang Agricultural University, 2023.

23 俞丹丹 , 干旱区沙棘耗水规律及适宜需水量研究 [D], 新疆农业大学 ,2023.

24. HAO Peipei, CAO Yingying, ZOU Huiqiong, et al, Seabuckthorn inhibits CYP2C down-regulation in mice with immune liver injury through PXR/NF-κB pathway [J], Chinese Pharmacology Bulletin, 2023, 39 (12): 2320-2324.

24 郝佩佩 ; 曹盈莹 ; 邹慧琼 ; 等 , 沙棘经 PXR/NF-κB 通路减缓免疫性肝损伤小鼠肝脏 CYP2C 下调 [J], 中国药理学通报 ,2023,39(12):2320-2324.

25. WANG Yueling, XU Hao, AA Yu, et al, Interannual dynamic changes of soil moisture in typical forest and grassland areas in southern Ningxia [J], Northern Horticulture, 2023, (22): 68-75.

25 王月玲 ; 许浩 ; 安钰 ; 等 , 宁南黄土区典型林草地土壤水分年际动态变化特征 [J], 北方园艺 ,2023,(22):68-75.

26. SU Zhonglin, WANG Huiqin, Analysis on water conservation of seabuckthorn in Arsenic sandstone area of Fugu County [J], Heilongjiang Science and Technology of Water Conservancy, 2023, 51(11): 190-192.

26 苏仲林 ; 王慧琴 , 府谷县砒砂岩区沙棘水保建设探析 [J], 黑龙江水利科技 ,2023,51(11):190-192.

27. XU Chunguo, Breeding and high-yield cultivation techniques of seabuckthorn [J], Forestry Prospect and Design, 2023, 52(06): 6-9.

27 徐春国 , 大果沙棘繁育及丰产栽培技术 [J], 林业勘查设计 ,2023,52(06):6-9.

28. YAN Ting, YANG Suzhen, GAO Bin, et al, Study on domestication and cultivation techniques of seabuckthorn 'Sanghuang'in Haidong City [J], Qinghai Agri-Technology Extension, 2023, (04): 28-30.

29. CHANG Junxia, MA Haixia, ZHANG Bailin, et al, Responses of soil and water loss under different land use modes to changes of influencing factors in Anjiagou watershed [J], Grassland and Turf, 2023, 43(06): 73-80.

30. ZHANG Jianian, ZHANG Changyao, LI Zishuai, et al, Effects of drought stress on physiological characteristics and anatomical structure of typical shrubs in semi-arid valley of Tibet [J], Journal of Northeast Forestry University, 2023, 51(12): 81-88.

31. SHANG Yueling, WANG Qing, WU Yanling, et al, Preparation of special seabuckthorn enzyme and its lipid lowering performance in vitro [J], Food Research and Development, 2023, 44(22): 61-67.

32. JIU Gaocao, Research on seedling cultivation and afforestation technology of seabuckthorn [J], Hebei Agricultural Machinery, 2023, (22): 91-93.

33. CHEN Chao, WANG Pengfei, ZHANG Najun, et al, Determination of fatty acids, sterols and flavonoids in seabuckthorn seed oil by GC-MS and HPLC [J]. Journal of Liaoning Traditional Chinese Medicine,2023,50(11):186-190.

34. TONG Xiaodong, YANG Ni, QIN Jiafeng, Prediction of soil bacterial community structure and function in seabuckthorn plantation with different restoration years in coal mine reclamation area [J], Science Technology and Engineering, 2023, 23 (32): 13747-13757.

28 晏婷 ; 杨素贞 ; 高斌 ; 等 , 海东市沙棘桑黄驯化栽培技术研究 [J], 青海农技推广 ,2023,(04):28-30.

29 常军霞 ; 马海霞 ; 张佰林 ; 等 , 安家沟流域不同土地利用方式水土流失对影响因素变化的响应 [J], 草原与草坪 ,2023,43(06):73-80.

30 张喜年 ; 张长耀 ; 李紫帅 ; 等 , 干旱胁迫对西藏半干旱河谷区典型灌木生理特性和解剖结构的影响 [J], 东北林业大学学报 ,2023,51(12):81-88.

31 商曰玲 ; 王清 ; 吴燕铃 ; 等 , 特种沙棘酵素的制备及其体外降脂性能分析 [J], 食品研究与开发 ,2023,44(22):61-67.

32 九高草 , 沙棘育苗与造林技术研究 [J], 河北农机 ,2023,(22):91-93.

33 陈超 ; 王鹏飞 ; 张娜郡 ; 等 , 基于 GC-MS 和 HPLC 测定沙棘籽油中脂肪酸、甾醇和黄酮类成分 [J], 辽宁中医杂志 ,2023,50(11):186-190.

34 同晓冬 ; 杨妮 ; 秦家凤 ; 等 , 煤矿复垦区不同恢复年限沙棘人工林土壤细菌群落结构与功能预测 [J], 科学技术与工程 ,2023,23(32):13747-13757.

35. ZHAO Jun, ZHANG Qiaoxian, DING Kexin, et al, Introduction experiment of three seabuckthorn varieties in Lan County, Shanxi Province [J], Hebei Fruit, 2023, (04): 21-22.

35 赵君；张巧仙；丁珂欣；等，3 个沙棘品种在山西岚县的引种试验 [J], 河北果树，2023,(04):21-22.

36. ZHANG Haokai, WANG Hongjiang, SHEN Yinan, et al, Research progress of seabuckthorn seedling technology [J], Liaoning Forestry Science and Technology, 2023, (06): 53-55+59.

36 张皓凯；王洪江；申逸男；等，沙棘育苗技术研究进展 [J], 辽宁林业科技，2023,(06):53-55+59.

37. WU Nan, Study on fruit quality of introduced and native seabuckthorn in Youyu County, Shanxi Province [J], Inner Mongolia Forestry Investigation and Design, 2023, 46(06): 36-38.

37 吴楠，山西省右玉县引种沙棘与乡土沙棘果实品质研究 [J], 内蒙古林业调查设计，2023,46(06):36-38.

38. KONG Zhiqiang, ZHAO Yuhong, Structural characterization and functional Properties of polysaccharide degraded by seabuckthorn [J], Chinese Journal of Food Science and Technology, 2023, 41(06): 65-74+138.

38 孔志强；赵玉红，沙棘降解多糖结构表征和功能特性研究 [J], 食品科学技术学报，2023,41(06):65-74+138.

39. WANG Wei, CAO Wen, Study on antibacterial activity of polyphenol, polysaccharide and flavone of seabuckthorn fruit residue and its effect on grape preservation [J], China Food Additives, 2023 (11) : 12-18.

39 王薇；曹雯，沙棘果渣多酚、多糖及黄酮抑菌性及对葡萄保鲜研究 [J], 中国食品添加 剂，2023,34(11):12-18.DOI:10.19804/j.issn1006-2513.2023.11.003.

40. LIU Wenhao, LIU Diao, XIE Longlong, et al, And so on, Optimization of seabuckthorn powder spray drying process by response surface method [J], Modern Traditional Chinese Medicine, 2023, 43(6) : 103-108.

40 刘文豪；刘刁；谢龙龙；等，响应面法优化沙棘果粉喷雾干燥工艺 [J], 现代中医药，2023,43(06):103-108.DOI:10.13424/j.cnki.mtcm.2023.06.021.

41. HAN Ying, Seedling cultivation technology of seabuckthorn in greenhouse in northern China [J], Shanxi Forestry, 2023, (S2): 36-37.

41 韩英，北方地区大果沙棘大棚育苗技术 [J], 山西林业，2023,(S2):36-37.

42. ZHAO Lei, YANG Ming, WANG Hao, et al, Investigation and risk assessment of mycotoxins in

42 赵磊；杨铭；王皓；等，沙棘不同采收期与

different harvesting periods and drying processes of seabuckthorn [J], Journal of Chinese Drug Evaluation, 2023,40 (05): 377-383.

不同干燥过程真菌毒素的考察及其风险评估 [J], 中国药物评价 ,2023,40(05):377-383.

43. BAO Wenshan, WEN Feng, HONG Mei, et al. To explore the mechanism of action of Wuwei Seabuckthorn Powder in the treatment to chronic obstructive pulmonary disease based on widely targeted metabolomics technology and network pharmacology [J]. Journal of Chinese Minorities Medicine & Pharmacy, 2023, 29 (10): 36-40.

43 包文山 ; 文峰 ; 红梅 ; 等 , 基于广泛靶向代谢组学技术和网络药理学方法探讨五味沙棘散治疗慢性阻塞性肺病的作用机制 [J]. 中国民族医药杂志 ,2023,29(10):36-40.

44. ZHANG Haiyan, KANG Sanjiang, ZENG Chaozhen, et al, Optimization of multi-strain fermentation of seabuckthorn enzyme by response surface method [J], China Brewing, 2023, 42 (10): 207-213.

44 张海燕 ; 康三江 ; 曾朝珍 ; 等 , 响应面法优化沙棘酵素多菌种发酵工艺 [J], 中国酿造 ,2023,42(10):207-213.

45. WNG Haiyiny, Research on implementation status of improving quality and efficiency of dried fruit economic forest in Xinzhou City -- taking seabuckthorn as an example [J], Shanxi Forestry, 2023, (05): 24-25.

45 王海英 , 忻州市干果经济林提质增效实施现状研究——以沙棘为例 [J], 山西林业 ,2023,(05):24-25.

46. WANG Ningning, GAO Yan, ZHANG Mei, et al. Study on functional components of flavonoids from seabuckthorn leaves based on HPLC fingerprint [J]. Modern Chinese Medicine, 2023, 25 (10): 2078-2083.

46 王宁宁 ; 高岩 ; 张梅 ; 等 , 基于 HPLC 指纹图谱的沙棘叶黄酮类功效成分研究 [J], 中国现代中药 ,2023,25(10):2078-2083.

47. ZHANG Wenjie, YANG Mei, ZHANG Qianglin, et al, Discrete element simulation parameter calibration and experimental verification of seabuckthorn materials [J], Journal of Northeast Agricultural University, 2023, 54 (10):59-69.

47 张文洁 ; 杨梅 ; 张强林 ; 等 , 沙棘物料离散元仿真参数标定与试验验证 [J], 东北农业大学学报 ,2023,54(10):59-69.

48. SHAO Shuxian, WANG Dong, YANG Guanguen, et al., Study on the mechanism of compound of seaBuckthorn seed oil accelerating wound repair after perianal abscess in rats [J], Journal of Chinese Surgery of Integrated Traditional and Western Medicine,2023, 29 (05): 667-671.

48 邵书先 ; 王东 ; 杨关根 ; 等 , 复方沙棘籽油加速大鼠肛周脓肿术后创面修复的作用机制研究 [J], 中国中西医结合外科杂志 ,2023,29(05):667-671.

49. DIN Jin, TIE Fangfang, WANG Honglun, HPLC Determination of phenylpropyl and flavonoids in seabuckthorn leaves [J], Journal of West China Pharmaceutical Sciences, 2023, 38 (05): 548-551.

49 丁金 ; 铁芳芳 ; 王洪伦 ,HPLC 快速测定沙棘叶中的苯丙素与黄酮类成分 [J], 华西药学杂志 ,2023,38(05):548-551.

50. WANG Xiao, BI Yinli, WANG Yi, et al, Effectson on understory plant and soil properties of seabuckthorn forest density and arbuscular mycorrhizal fungus inoculation [J], Scientia Silvae Sinicae, 2023, 59 (10): 138-149.

50 王晓 ; 毕银丽 ; 王义 ; 等 , 沙棘林密度和丛枝菌根真菌接种对林下植物和土壤性状的影响 [J], 林业科学 ,2023,59(10):138-149.

51. LI Jiayi, WEI Jihua, SONG Yating, et al, Effects of Trochostatin A on response to drought and rehydration and related gene expression in cuttings of seabuckthorn [J]. Forestry Research, 2023, 36 (05): 111-120.

51 李佳益 ; 魏继华 ; 宋娅婷 ; 等 , 曲古抑菌素 A 对沙棘扦插苗响应干旱和复水及相关基因表达的影响 [J], 林业科学研究 ,2023,36(05):111-120.

52. LIN Xinzhang, REN Zichao, et al, Analysis of separation and related physical characteristics of seabuckthorn fruits after frozen storage [J], Xinjiang Agricultural Sciences, 2023, 60 (10): 2479-2485.

52 林鑫章 ; 雷金 ; 任子超 ; 等 , 冻藏后沙棘果实的分离力与相关物理特性参数分析 [J], 新疆农业科学 ,2023,60(10):2479-2485.

53. DONG Peng, WANG Xiaobing, LI Qiyan, et al, Determination of 4 kinds of tocopherols in seabuckthorn seed oil soft capsules [J], Journal of Pharmaceutical Research, 2023,42(10):798-800+806.

53 董蓬 ; 王小兵 ; 李启艳 ; 等 , 沙棘籽油软胶囊中 4 种生育酚的含量测定 [J], 药学研究 ,2023,42(10):798-800+806.

54. FANG Guiping, LI Xuan, WANG Ya, et al, Comparative study on quality of two kinds of seabuckthorn powder by different freeze-dried processes [J], Journal of Nuclear Agriculture Sciences, 2023, 37 (11): 2214-2226.

54 方贵平 ; 李旋 ; 王雅 ; 等 , 两种不同工艺冷冻干燥沙棘粉品质对比研究 [J], 核农学报 ,2023,37(11):2214-2226.

55. TANG Ke, Comparison of fruit separation ability of ten different subspecies of seabuckthorn at maturity stage [J], Heilongjiang Agricultural Sciences, 2023, (10): 42-46.

55 唐克 , 十个不同亚种沙棘株系成熟期果实分离力比较 [J], 黑龙江农业科学 ,2023,(10):42-46.

56. CHEN Yixuan, GUO Jiaqi, GUAN Wenqiang, et al, Research progress of comprehensive development and utilization of seabuckthorn [J], Food Research and Development, 2023, 44 (19): 201-207.

56 陈奕璇 ; 郭佳琦 ; 关文强 ; 等 , 沙棘综合开发利用研究进展 [J], 食品研究与开发 ,2023,44(19):201-207.

57. ZHANG Yonglu, Effects of different hormones and substrates on cuttage propagation of seabuckthorn [J], Special Economic Animal and Plant, 2023, 26 (10): 59-61.

57 张永禄 , 不同激素和基质对沙棘扦插繁殖的影响 [J], 特种经济动植物 ,2023,26(10):59-61.

58. TANG Ke, WU Yuxi, WANG Rui, et al, Comparison of fruit characters and nutrient composition of seabuckthorn hybrids in Northeast China [J], Non-wood Forest Research, 2023, 41 (03): 286-295.

58 唐克 ; 吴雨蹊 ; 王蕊 ; 等 , 东北黑土区沙棘杂交品种（系）果实性状及营养成分比较 [J], 经济林研究 ,2023,41(03):286-295.

59. ZHAO Lei, WANg Luhong, SUN Yunlong, et al, Research on the historical origin and flow of multi-ethnic and multi-primitive medicine related to seabuckthorn [J], Specialty Research, 2023, 45 (05): 159-164.

59 赵磊 ; 王路宏 ; 孙云龙 ; 等 , 多民族、多基原药物沙棘的历史源流考证 [J], 特产研究 ,2023,45(05):159-164.

60. ZHANg Xining, YAN Xiaoling, ZHAO Jiaying, Comparative analysis of fruit bearing characteristics of three types of seabuckspine in Loess Plateau gully region [J], Soil and Water Conservation in China, 2023, (10): 65-68.

60 张西宁 ; 闫晓玲 ; 赵嘉莹 , 黄土高塬沟壑区 3 类沙棘结实特征对比分析 [J], 中国水土保持 ,2023,(10):65-68.

61. ZHANG Hang, YAN Xiao, YANG Liping, et al, Effects of seabuckthorn powder in high-sugar diet on growth performance, antioxidant capacity and non-specific immunity of Yellow River Carp [J], Journal of Fisheries of China, 2023, 47 (10): 113-127.

61 张航 ; 闫潇 ; 杨丽萍 ; 等 , 高糖饲料中添加沙棘粉对黄河鲤生长性能、抗氧化能力和非特异性免疫的影响 [J], 水产学报 ,2023,47(10):113-127.

62. ZHAO Xindan, ZHANG Dongwei, GE Sufen, Analysis of phenotypic traits and variation for fruits and seeds of seabuckthorn [J], Seed, 2023, 42 (09): 105-112.

62 赵鑫丹 ; 张东为 ; 戈素芬 ; 等 , 沙棘果实和种子表型性状及变异分析 [J], 种子 ,2023,42(09):105-112.

63. XIANGLI Jiafei, LU Pei, Seabuckthorn effects of different restoration years on soil quality [J], South China Agriculture, 2023, 17 (18): 18-20+58.

63 相里佳菲 ; 路培 , 沙棘不同恢复年限对土壤质量的影响 [J], 南方农业 ,2023,17(18):18-20+58.

64. WANG Jing, LIU Guiyan, YANG Yuyan, et al, Determination and exploration of vitamin C content in seabuckthorn fruit [J], Contemporary Chemical Industry, 2023, (18): 37-39.

64 王晶 ; 刘桂艳 ; 杨玉延 ; 等 , 沙棘果中维生素 C 含量的测定与探究 [J], 当代化工研究 ,2023,(18):37-39.

65. WANG Shengyun, LU Yaling, LIAN Huanhuan,et al, Influencing factors and countermeasures of seabuckthorn industry development in Qinghai Province [J], Science and Technology of Qinghai Agriculture and Forestry , 2023, (03): 33-36+71.

65 王生云 ; 逯亚玲 ; 连欢欢 ; 等 , 青海省沙棘产业发展影响因素及对策 [J], 青海农林科技 ,2023,(03):33-36+71.

66. FENG Zhipeng, LI Luyu, LIU Mengjian, et al, Effects of seabuckthorn fruit extracted residues on growth performance, antioxidant capacity and immune function of yellow feathered broilers under oxidative stress [J], Chinese Journal of Animal Nutrition, 2023, 35 (10): 6374-6386.

66 冯志鹏 ; 李露宇 ; 刘孟健 ; 等 , 沙棘果渣提取物对氧化应激黄羽肉鸡生长性能、抗氧化能力及免疫功能的影响 [J], 动物营养学报 ,2023,35(10):6374-6386.

67. LI Qing, CHEN Limei, ZHANG Hongwei, et al, Observation on the clinical effect of compound seabuckthorn seed oil suppository on improving the satisfaction of postmenopausal women with colposcopy [J], Journal of Fudan University (Medical Edition), 2023, 50 (05): 717-722.

67 李清 ; 陈丽梅 ; 张宏伟 ; 等 , 复方沙棘籽油栓对改善绝经后女性阴道镜满意度的临床疗效观察 [J], 复旦学报 (医学版),2023,50(05):717-722.

68. HE Shunqin, DUAN Aiguo, Ecological economic seabuckthorn improved variety 'Zhongji No. 4' [J], Forestry Science and Technology, 2023, (09): 107-108.

68 贺顺钦 ; 段爱国 , 生态经济型沙棘良种‘中棘 4 号’[J], 林业科技通讯 ,2023,(09):107-108.

69. HE Shunqin, DUAN Aiguo, Variation of flavonoids in seabuckthorn leaves and its environmental effects [J], Forestry Science and Technology, 2023, (09): 115-117.

69 贺顺钦 ; 段爱国 , 沙棘叶片黄酮变异的品种与环境效应 [J], 林业科技通讯 ,2023,(09):115-117.

70. LUO Huibing, HU Yingying, MA Yuhua, et al, Research progress of comprehensive utilization of seabuckthorn [J], Products Process, 2023, (17): 65-68+73.

71. LIU Qingqing, YANG Kaiyu, MA Yuhua, et al, Amplification and sequence analysis of rbcL gene of seabuckthorn [J], Northern Horticulture, 2023, (21): 42-52.

72. TANG Wenjuan, SHI Hefeng, LI Xiaohua, Application of weighted scoring method and Friedman test in sensory evaluation to seabuckthorn juice [J], Food Safety Guide, 2023, (26): 142-146.

73. WANG Xinxin, CHEN Xiaoyan, LI Sijia, et al, Effect and mechanism of seabuckthorn fruit oil on hormone resistance in mice with atopic dermatitis induced by superantigen [J], China Pharmacy, 2023, 34 (17): 2079-2084.

74. SONG Li, LUO Li, LI Shuncheng, et al, Anoxic tolerance function evaluation of seabuckthorn in Gannan Prefecture [J], Food Industry, 2023, 44 (09): 150-152.

75. NING Zhixue, ZHU Libin, JU Dan, et al, Process optimization and characteristic analysis of acid reduction in seabuckage juice by complex lactic acid bacteria fermentation [J], Science and Technology of Food Industry, 2023, 44 (18): 235-243.

76. LU Mengling, TANG Zhenyue, ZHANG Yusong, et al, Study on the preparation and functional properties of dietary fiber from seabuckthorn fruit residue by ultrasonic-assisted enzymatic method [J], Journal of Chinese Institute of Food Science and Technology, 2023, 23 (09): 149-159.

70 罗会兵 ; 胡莹莹 ; 万方云 ; 等 , 沙棘综合利用研究进展 [J], 农产品加工 ,2023,(17):65-68+73.

71 刘青青 ; 杨开宇 ; 马玉花 ; 等 , 沙棘 rbcL 基因的扩增及序列分析 [J], 北方园艺 ,2023,(21):42-52.

72 唐文娟 ; 士贺丰 ; 李晓华 , 加权评分法和 Friedman 检验法在沙棘汁感官评价中的应用 [J], 食品安全导刊 ,2023,(26):142-146.

73 王欣欣 ; 陈小艳 ; 李思佳 ; 等 , 沙棘果油对超抗原诱导的特应性皮炎小鼠激素抵抗的干预作用及机制 [J], 中国药房 ,2023,34(17):2079-2084.

74 宋礼 ; 罗丽 ; 李顺成 ; 等 , 甘南州沙棘耐缺氧功能性评价 [J], 食品工业 ,2023,44(09):150-152.

75 宁志雪 ; 朱立斌 ; 朱丹 ; 等 , 复合乳酸菌发酵沙棘汁降酸的工艺优化及特性分析 [J], 食品工业科技 ,2023,44(18):235-243.

76 吕孟玲 ; 唐祯玥 ; 张雨松 ; 等 , 超声辅助酶法制备沙棘果渣膳食纤维及其功能特性研究 [J], 中国食品学报 ,2023,23(09):149-159.

77. HUANG Guifang, Effects of drought stress on growth of seabuckthorn seedlings [J], Journal of Agricultural Engineering Technology, 2023, 43 (25): 49-50.

77 黄桂芳 , 干旱胁迫对沙棘苗木生长的影响 [J], 农业工程技术 ,2023,43(25):49-50.

78. WANG Shuqing, Current situation and countermeasure analysis of seabuckthorn industry development in Luliang City, Shanxi Province [J], Shanxi Forestry Science and Technology, 2023, 52 (S1): 56-57.

78 王树青 , 山西省吕梁市沙棘产业发展现状及对策分析 [J], 山西林业科技 ,2023,52(S1):56-57.

79. SHIPeng, Analysis of main nutrients in seabuckthorn (ssp. sinensis) fruits [J], Shanxi Forestry Science and Technology, 2023, 52 (03): 41-43.

79 史鹏 , 中国沙棘果实主要营养物质含量分析 [J], 山西林业科技 ,2023,52(03):41-43.

80. ZHANG Na, WANG Tian, Study on key factors of axillary bud induction in stem segment of seabuckthorn [J], Shanxi Forestry Science and Technology, 2023, 52 (03): 20-22.

80 张娜 ; 王甜 , 沙棘茎段腋芽诱导关键因子研究 [J], 山西林业科技 ,2023,52(03):20-22.

81. ARSE Wengali, Hazards and control measures of Thrillaria seabuckthorn in Altai Area [J], Xinjiang Forestry, 2023, (04): 45-46.

81 阿尔斯 · 翁阿里 , 沙棘绕实蝇在阿勒泰地区的危害及防控措施 [J], 新疆林业 ,2023,(04):45-46.

82. WANG Guilin, Effects of different fertilization methods on under story vegetation diversity of seabuckthorn plantation in open-pit coal mine dump [J], Environmental Engineering, 2023, 41 (S2): 1037-1042.

82 王桂林 , 露天煤矿排土场不同培肥方式对沙棘人工林林下植被多样性的影响 [J], 环境工程 ,2023,41(S2):1037-1042.

83. ZHANG Na, GUO Xuebin, An excellent variety of seabuckthorn for fruit use -- Jinji No. 2 [J], China Fruit News, 2023, 40 (08): 77.

83 张娜 ; 郭学斌 , 果用型沙棘良种——晋棘 2 号 [J], 中国果业信息 ,2023,40(08):77.

84. WANG Huiqin, SU Zhonglin, Study on ecological forest construction of seabuckthorn in wind-blown sand region with Dachang Han as an example [J], Technology of Soil and Water Conservation, 2023, (05): 18-20.

84 王慧琴 ; 苏仲林 , 以大昌汗为例探析风沙区沙棘生态林建设 [J], 水土保持应用技术 ,2023,(05):18-20.

85. RRNLI Chengcheng, LIU Zhenhua, DONG Qi, et al, Research progress of seabuckthorn flavonoids and its pharmacological effects [J], Chinese Journal of Medicinal chemistry , 2023, 33 (08): 598-617.

85 任李成城 ; 刘振华 ; 董琦 ; 等 , 沙棘黄酮类成分及其药理作用的研究进展 [J], 中国药物化学杂志 ,2023,33(08):598-617.

86. ZHANG Haiyan, KANG Sanjiang, YUAN Jing, et al, Effects of different strain combinations on the changes of physicochemical indexes and active substances during seabuckthorn fermentation [J], Journal of Food Safety & Quality, 2023, 14 (16): 268-276.

86 张海燕 ; 康三江 ; 袁晶 ; 等 , 不同菌种组合对沙棘酵素发酵过程中理化指标及活性物质变化的影响 [J], 食品安全质量检测学报 ,2023,14(16):268-276.

87. ZHANG Juntao, Analysis on control technology of main diseases and insect pests of seabuckthorn in Gansu Province [J], South China Agriculture, 2023, 17 (16): 21-23.

87 张俊涛 , 甘肃省沙棘主要病虫害防治技术浅析 [J], 南方农业 ,2023,17(16):21-23.

88. QIU Jing, ZHA Qingshan, LIU Shuping, Clinical effect of Wuwei Seabuckthorn Powder combined with azithromycin in the treatment of phlegm-heat blocking lung syndrome in children with mycoplasma pneumonia and its effects on lung function, serum eosinophil cationic protein and macrophage derived chemokines [J], Journal of Hebei Traditional Chinese Medicine, 2023, 45 (08): 1318-1322.

88 丘婧 ; 查青山 ; 刘书平 , 五味沙棘散联合阿奇霉素治疗小儿支原体肺炎痰热闭肺证临床疗效及对肺功能、血清嗜酸性细胞阳离子蛋白、巨噬细胞衍生趋化因子的影响 [J], 河北中医 ,2023,45(08):1318-1322.

89. GAO Jian, WU Shengnan, WANg Xiaojing, et al, Study on the mechanism of active components of seabuckthorn on non-alcoholic fatty liver based on network pharmacology and molecular docking technique [J], Chinese Nursing Research, 2023, 37 (16): 2853-2861.

89 高健 ; 吴胜男 ; 王晓静 ; 等 , 基于网络药理学和分子对接技术探讨沙棘活性成分对非酒精性脂肪肝作用机制 [J], 护理研究 ,2023,37(16):2853-2861.

90. LIAN Yali, MENG Xintao, YANG Yongxing, et al, Analysis of volatile components of vacuum freeze-dried fruit powder of different varieties of seabuckthorn by GC-IMS technique [J], Xinjiang Agricultural Sciences, 2023, 60(08): 1958-1965.

90 连雅丽 ; 孟新涛 ; 杨永兴 ; 等 , 基于 GC-IMS 技术分析不同品种沙棘真空冷冻干燥果粉挥发性成分 [J], 新疆农业科学 ,2023,60(08):1958-1965.

91. ZHANGg Xiaoling, Application of cutting nursery and afforestation technology of seabuckthorn [J], Forest By-product and Speciality in China, 2023, (04): 41-42.

91 张小玲 , 沙棘扦插育苗及造林技术应用 [J], 中国林副特产 ,2023,(04):41-42.

92. YIN Jiaojiao, ZHANG Zhengjun, REN Jintao, et al, Comprehensive evaluation for three seabuckthorn varieties by membership function method [J], Forestry Science and Technology, 2023, (08): 100-103.

92 殷姣姣 ; 张正军 ; 任锦涛 ; 等 , 隶属函数法综合评价 3 个果用型沙棘品种 [J], 林业科技通讯 ,2023,(08):100-103.

93. MA Chunmei, ZHANG Nana, LIU Cuijun, et al, Surface fur characteristics of seabuckthorn (ssp. turkestanica) [J], Forestry Science and Technology, 2023, (08): 106-107.

93 马春梅 ; 张娜娜 ; 刘翠俊 ; 等 , 中亚沙棘表皮毛特性 [J], 林业科技通讯 ,2023,(08):106-107.

94. LI Zhongmu, NIE Kaihong, TIAN Dengjuan, et al, Ecological stoichiometry of carbon, nitrogen and phosphorus in different components of seabuckthorn premature aging plantation in China [J]. Forest Resources Management, 2023, (04): 62-70.

94 李仲牧 ; 聂恺宏 ; 田登娟 ; 等 , 中国沙棘早衰人工林不同构件碳氮磷生态化学计量特征 [J], 林业资源管理 ,2023,(04):62-70.

95. YAN Yueyue, BIN Liyuan, ZHOU Huiping, Study on preparation process and stability of seabuckthorn complex beverage with orange peel and passion fruit [J], Modern Food, 2023, 29 (15): 59-62.

95 颜月月 ; 宾鲤苑 ; 周慧萍 , 沙棘陈皮百香果复合饮料制作工艺及其稳定性研究 [J,. 现代食品 ,2023,29(15):59-62.

96. LIU Chunhai, YUE Lihua, ZHANG Shaozhuo, et al, Growth characteristics, fruit traits and their correlation analysis of seabuckthorn [J], Modern Horticulture, 2023, 46 (17): 1-4.

96 刘春海 ; 岳丽华 ; 张少卓 ; 等 , 宇璐沙棘生长特性、果实性状及其相关性分析 [J], 现代园艺 ,2023,46(17):1-4.

97. XIN Yanhua, XU Dingyi, WU Shuangquan, et al, Effects of seabuckthorn oil on black aspergillus mitochondrial structure and its function [J], Food Research and Development, 2023, 44 (15): 24-29.

97 辛燕花 ; 徐丁一 ; 吴双全 ; 等 , 沙棘油对黑曲霉线粒体结构及功能的影响 [J], 食品研究与开发 ,2023,44(15):24-29.

98. SI Xiaohui, WANG Yikai, WANG Xiao, et al, Research progress on the development and application of natural plant-derived flavonoids as feed additives for livestock and poultry [J]. Chinese Journal of Animal Science, 2023, 59 (09): 11-18.

98 司晓慧 ; 王奕凯 ; 王潇 ; 等 , 天然植物源黄酮类化合物作为畜禽饲料添加剂的开发应用研究进展 [J]. 中国畜牧杂志 ,2023,59(09):11-18.

99. SONG Dacheng, WANG Lide, WU Hao, et al, Characteristics of soil enzyme activity and nutrient evolution in different artificial seabuckthorn forests in hillock [J], Research of Soil and Water Conservation, 2023, 30 (05): 162-168+174.

99 宋达成 ; 王理德 ; 吴昊 ; 等 , 矸石山不同人工沙棘林土壤酶活性及养分演变特征 [J], 水土保持研究 ,2023,30(05):162-168+174.

100. XU Hui, YAN Li, ZHANG Xuesong, et al, Research progress of the inhibitory mechanism of seabuckthorn flavonoids on asthma based on NF-κB pathway [J], Journal of Modern Medicine & Health ,2023, 39 (14): 2452-2456.

100 徐慧 ; 闫莉 ; 张雪松 ; 等 , 沙棘黄酮基于 NF-κB 通路对哮喘的抑制作用机制的研究进展 [J], 现代医药卫生 ,2023,39(14):2452-2456.

101. TANG Yu, Seabuckthorn forest optimization technology and soil and water conservation system [J], Heilongjiang Science and Technology of Water Conservation, 2023, 51 (07): 118-120.

101 汤宇 , 沙棘林优化技术及水土保持体系 [J], 黑龙江水利科技 ,2023,51(07):118-120.

102. GUAN Songbin, DENG Bin, WANG Chao, et al. Preparation and antioxidant activity evaluation of seabuckthorn solid beverage [J], Guiding Journal of Traditional Chinese Medicine and Pharmacy, 2023, 29 (07): 63-69+73.

102 管松滨 ; 邓斌 ; 王超 ; 等 , 沙棘固体饮料的研制及其抗氧化活性评价 [J], 中医药导报 ,2023,29(07):63-69+73.

103. WANG Hairong, MENG Ke, TEGXI Baiyin, et al, Establishment of microbial limit test method for Mongolian medicine compound of seabuckthorn granules [J], Journal of Chinese Minorities Medicine & Pharmacy, 2023, 29 (07): 30-32.

103 王海荣 ; 孟柯 ; 特格喜白音 ; 等 , 蒙药复方沙棘颗粒剂微生物限度检查法的建立 [J], 中国民族医药杂志 ,2023,29(07):30-32.

104. LU Chengyue, MA Yuhua, WANG Chenzhao, et al, Cloning and expression of HrNHX6 gene in seabuckthorn (ssp. sinensis) under drought stress [J], Journal of Fujian Agricultural Sciences, 2023, 38 (07): 809-816.

104 罗程月 ; 马玉花 ; 王晨兆 ; 等 , 中国沙棘 HrNHX6 基因克隆及其在干旱胁迫下的表达分析 [J], 福建农业学报 ,2023,38(07):809-816.

105. WANG Shanshan, ZHANG Ping, ZHANG Bingbing, et al, Analysis and comprehensive evaluation of fruit quality of seabuckthorn germplasm resources in cold region [J], Transactions of the Chinese Society of Agricultural Engineering, 2023,39(13):281-289.

106. LI Jingjing, TANG Fengxian, ZHAO Xinxin, et al, Effects of different pretreatment on physicochemical properties and volatile flavor compounds of fermented seabuckthorn juice [J], China Brewing, 2023, 42 (07): 196-201.

107. CHEN Lei, Research on the development of seabuckthorn industry in northern Shanxi Province [J], Shanxi Forestry, 2023, (S1): 24-25.

108. ZHU Huan, Promoting effect of seabuckthorn probiotic tablet candy on athletic level of aerobics athletes [J], Food Research and Development, 2023, 44 (14): 233-234.

109. BAO Yanhong, WANG Qiang, ZHANG Wenlong, et al, Effect of ursolic acid on inhibiting hepatocyte apoptosis in rat model of alcoholic liver disease by regulating mitochondria-cytochrome [J], Journal of Clinical Hepatology, 2023, 39 (07): 1617-1626.

110. ZHAO Siyang, RUAN Chengjiang, DING Jian, et al, Cloning and functional verification of key genes GPD1 and DGAT in seabuckthorn lipid synthesis [J], Journal of Central South University of Forestry and Technology, 2023, 43 (08): 149-158+168.

111. WANG Xiaoyu, PEI Longying, LIu Wei, et al, Development and quality analysis of seabuckthorn apple compound beverage [J], Modern Food, 2023, 29 (13): 77-82.

105 王珊珊 ; 张萍 ; 张冰冰 ; 等 , 寒地沙棘种质资源果实品质分析与综合评价 [J], 农业工程学报 ,2023,39(13):281-289.

106 李静静 ; 唐凤仙 ; 赵馨馨 ; 等 , 不同预处理对发酵沙棘汁理化特性及挥发性风味化合物的影响 [J], 中国酿造 ,2023,42(07):196-201.

107 陈磊 , 晋北地区沙棘产业发展探究 [J], 山西林业 ,2023,(S1):24-25.

108 祝欢 , 沙棘益生菌压片糖果对健美操运动员竞技水平的促进作用 [J], 食品研究与开发 ,2023,44(14):233-234.

109 包艳红 ; 王强 ; 张文龙 ; 等 , 沙棘熊果酸通过调节线粒体 - 细胞色素 c 抑制酒精性肝病大鼠模型肝细胞凋亡的作用分析 [J], 临床肝胆病杂志 ,2023,39(07):1617-1626.

110 赵思阳 ; 阮成江 ; 丁健 ; 等 , 沙棘油脂合成关键基因 GPD1 和 DGAT 的克隆及功能验证 [J], 中南林业科技大学学报 ,2023,43(08):149-158+168.

111 王晓雨 ; 裴龙英 ; 刘伟 ; 等 , 沙棘苹果复合饮料的研制及品质分析 [J], 现代食品 ,2023,29(13):77-82.

112. ZHAO Jiaying, GUO Jia, ZHANG Yaoyuan, et al, Breeding technology of seabuckthorn seedlings in greenhouses in Loess Plateau region [J], Agriculture and Technology, 2023, 43 (13): 51-54.

112 赵嘉莹 ; 郭嘉 ; 张耀元 ; 等 , 黄土高塬沟壑区温室沙棘苗木繁育技术 [J], 农业与技术 ,2023,43(13):51-54.

113. HE Qian, YANG Kailin, WU Xinyan, , et al, To explore the quality markers of seabuckthorn leaves and their potential medicinal value based on network pharmacology, content determination and activity evaluation [J], Journal of Chinese Materia Medica, 2023, 48 (20): 5487-5497.

113 何倩 ; 杨凯琳 ; 吴欣艳 ; 等 , 基于网络药理学、含量测定及活性评价探讨沙棘叶质量标志物及其潜在药用价值 [J], 中国中药杂志 ,2023,48(20):5487-5497.

114. ZHANG Li, SHAN Qiuge, WANG Minli, Effect of seabuckthorn dry emulsion combined with Bifidobacterium quadruplex Viable tablet in the treatment of functional dyspepsia in children [J], Journal of Chinese People's Health Medicines, 2023, 35 (13): 113-115+119.

114 张丽 ; 单秋歌 ; 王敏丽 , 沙棘干乳剂联合双歧杆菌四联活菌片治疗儿童功能性消化不良的效果 [J], 中国民康医学 ,2023,35(13):113-115+119.

115. ZHAO Siyang, RUAN Chengjiang, DING Jian, et al, Construction and expression verification of double gene vectors GPD1 and DGAT1 of seabuckthorn [J], Journal of Northeast Forestry University, 2023, 51 (07): 10-14.

115 赵思阳 ; 阮成江 ; 丁健 ; 等 , 沙棘 GPD1 和 DGAT1 双基因载体的构建及表达验证 [J], 东北林业大学学报 ,2023,51(07):10-14.

116. ZHANG Huiqin, The nutritional value of seabuckthorn and its comprehensive development and utilization technology [J], Fruit Growerrs' Friend, 2023, (07): 49-51.

116 张慧琴 , 沙棘的营养价值及综合开发利用技术 [J], 果农之友 ,2023,(07):49-51.

117. WANG Qi, Research on seedling cultivation technology and afforestation of seabuckthorn [J], Fruit Growerrs' Friend, 2023, (07): 45-48.

117 王琦 , 沙棘育苗栽培技术及造林研究 [J], 果农之友 ,2023,(07):45-48.

118. ZHANG Pei, Li Yi, Total flavonoids of seabuckthorn inhibit the proliferation of bladder cancer cell line T24 [J], Basic & Clinical Medicine, 2023, 43 (07): 1122-1126.

118 张培 ; 李义 , 沙棘总黄酮抑制膀胱癌细胞系 T24 增殖 [J], 基础医学与临床 ,2023,43(07):1122-1126.

119. ZHAO Yixuan, QU Ningyi, WANG Lina, et al, Inhibitory effect and mechanism of seabuckthorn alcohol extract on propionibacterium acnes [J]. Journal of Liaoning University of Traditional Chinese Medicine, 2023, 25 (10): 26-31.

119 赵轶轩 ; 屈凝伊 ; 王丽娜 ; 等 , 沙棘醇提取物对痤疮丙酸杆菌抑制作用及机制初探 [J], 辽宁中医药大学学报 ,2023,25(10):26-31.

120. Asif R, HU Jingming, YANG Mei, et al, Design and test of Seabuckthorn quick-freezing warehouse based on CFD [J], Xinjiang Agricultural Mechanization, 2023, (03): 9-11+20.

120 Asif R; 胡靖明 ; 杨梅 ; et al, 基于 CFD 的沙棘速冻库的设计及试验 [J], 新疆农机化 ,2023,(03):9-11+20.

121. WANG Hairong, MENG Ke, TEGXI Baiyin, et al, Study on the antitussive and expectorant effects of Mongolian medicine compound seabuckthorn Granules, Journal of Medicine & Pharmacy of Chinese Minorities, 2023, 29 (06): 49-50+71.

121 王海荣 ; 孟柯 ; 特格喜白音 ; 等 , 蒙药复方沙棘颗粒剂止咳、化痰作用研究 [J], 中国民族医药杂志 ,2023,29(06):49-50+71.

122. SHI Peng, WANG Jucheng, WEI Lu, Research progress on the processing technology of seabuckthorn juice, Food Engineering, 2023, (02): 13-15.

122 史鹏 ; 王巨成 ; 魏璐 , 沙棘果汁的加工工艺研究进展 [J], 食品工程 ,2023,(02):13-15.

123. TIAN Jianhua, Study on there extraction of polyphenols from seabuckthorn leaves and their antioxidant activity, Food Engineering, 2023, (02): 48-50.

123 田建华 , 沙棘叶多酚提取物及其抗氧化活性研究 [J], 食品工程 ,2023,(02):48-50.

124. GUO Jianfeng, QIE Haoran, HU Peiyi, et al, Preparation, structure, and antioxidant activity analysis of oligomeric proanthocyanidins from seabuckthorn seed residues, Journal of Chinese Institute of Food Science and Technology, 2023, 23 (06): 232-245.

124 郭建峰 ; 郤浩然 ; 胡培毅 ; 等 , 沙棘籽粕低聚原花青素的制备及结构与抗氧化活性分析 [J], 中国食品学报 ,2023,23(06):232-245.

125. ZHANG Dongwei, ZHAO Xindan, GE Sufen, et al, Principal component analysis and comprehensive evaluation of seabuckthorn fruit quality, Journal of Chinese Pharmaceutical Economics, 2023, 41 (02): 1-10.

125 张东为 ; 赵鑫丹 ; 戈素芬 ; 等 , 沙棘果实品质的主成分分析及综合评价 [J], 经济林研究 ,2023,41(02):1-10.

126. ZHANG Dan, MA Hongrong, DUAN Xunjun, et al, Spatiotemporal expression patterns of seabuckthorn NAC genes under drought stress, Acta Agriculturae Boreali-occidentalis Sinica, 2023, 32 (06): 878-886.

126 张丹 ; 马红荣 ; 段勋军 ; 等 , 干旱胁迫下沙棘 NAC 基因的时空表达模式 [J], 西北农业学报 ,2023,32(06):878-886.

127. WANG Bingpeng, LEI Jin, QIN Xinyan, et al, Analysis and experiment of double-action knife cutting parameters for seabuckthorn branches, Transactions of the Chinese Society of Agricultural Engineering, 2023, 39 (10): 26-36.

127 王炳棚 ; 雷金 ; 秦新燕 ; 等 , 双动刀沙棘枝条切割参数分析与试验 [J], 农业工程学报 ,2023,39(10):26-36.

128. SU Budao, YAO Jihong, LI Wenjie, A brief analysis of the current status of industrial policies and standardization of seabuckthorn in China and abroad, China Standardization, 2023, (12): 71-76+93.

128 苏布道 ; 姚继红 ; 李文洁 , 浅析中外沙棘产业政策及标准化现状 [J], 中国标准化 ,2023,(12):71-76+93.

129. YIN Xiangdong, LIU Yu, ZHANG Li, et al, The study of seabuckthorn complex juice enzyme beverage based on fuzzy mathematics comprehensive evaluation, Food Industry, 2023, 44 (06): 63-68.

129 尹翔东 ; 刘禹 ; 张莉 ; 等 , 基于模糊数学综合评价研制沙棘复合果汁酵素饮料 [J], 食品工业 ,2023,44(06):63-68.

130. LIU Jie, LI Ruimin, CHU Yanrong, et al, Effect of Wandai Decoction combined with compound sea-buckthorn seed oil supposition on vulvovaginal candidiasis, China Licensed Pharmacist, 2023, 20 (06): 135-140.

130 刘杰 ; 李瑞敏 ; 褚艳蓉 ; 等 , 完带汤联合复方沙棘籽油栓对外阴阴道假丝酵母菌病的影响 [J], 中国合理用药探索 ,2023,20(06):135-140.

131. LI Xiaoqing, LIU Yongqiang, XUE Jingru, et al, Effects of drought and shading on water-carbon balance and flavonoid content in seabuckthorn (ssp. Sinensis), Forestry Research, 2023, 36 (03): 129-137.

131 李晓庆 ; 刘永强 ; 薛静茹 ; 等 , 干旱和遮荫对中国沙棘水碳平衡和黄酮化合物含量的影响 [J], 林业科学研究 ,2023,36(03):129-137.

132. WU Haowen, LI Jiacheng, LI Yizhen, et al, Effect of total saponins of Panax notoginseng combined with polysaccharide of seabuckthorn on reducing blood lipids and protecting liver in mice , Acta Medicinae Sinica, 2023, 36 (03):37-40.

132 伍昊文 ; 李嘉诚 ; 李毅臻 ; 等 , 三七总皂苷联合沙棘多糖对小鼠降血脂和保肝作用的研究 [J], 华夏医学 ,2023,36(03):37-40.

133. ZAHO Dongxu, NIE Yang, MENG Xiangrui, et al, Biological functions of seabuckthorn flavonoids and their application in livestock and poultry production, Modern Animal Husbandry, 2023, 43 (03): 34-36+42.

134. TIAN Jianhua, Effects of origin and harvest time on polyphenol and total flavonoid content in seabuckthorn leaves, Shanxi Forestry Science and Technology, 2023, 52 (02):18-21.

135. ZHANG Tian, Types and control techniques of diseases and pests in seabuckthorn nurseries and forests in Datong City, Shanxi Forestry Science and Technology, 2023, 52 (02): 49-50.

136. QU Yuanyuan, LI Mengyao, XU Xuexuan, et al, Comparison of infiltration capacity between grasslands and seabuckthorn land with different fallow years in Inner Mongolia, Bulletin of Soil and Water Conservation, 2023, 43 (03): 34-40.

137. LI Ziang, ADILI Shata'er, WUSIKANNAYI Aishantu, et al, Effect of fruit coloration and hardness on the oviposition selection of seabuckthorn fly, Journal of Xinjiang Agricultural University, 2023, 46 (03): 240-244.

138. TANG Ke, Comparison of oil and flavonoid content in different parts of seabuckthorn fruit, Heilongjiang Agricultural Sciences, 2023, (06): 55-60.

139. LI Nan, Effect of mixed planting on the growth of seabuckthorn and soil physicochemical properties, Rural Science & Technology, 2023, 14 (11): 87-89.

140. WANG Qi, ZHANG Wenyu, MA He, et al, Effect of steam blasting on extraction and bioactivity of polyphenols from seabuckthorn seed meal, Food Research and Development, 2023, 44(11):121-128.

133 赵冬旭 ; 聂阳 ; 孟祥瑞 ; 等 , 沙棘黄酮的生物学功能及其在畜禽生产中的应用 [J], 当代畜禽养殖业 ,2023,43(03):34-36+42.

134 田建华 , 产地及采集时间对沙棘叶多酚和总黄酮含量的影响 [J], 山西林业科技 ,2023,52(02):18-21.

135 张天 , 大同市沙棘苗圃地和林地病虫害种类及防治技术 [J], 山西林业科技 ,2023,52(02):49-50.

136 屈媛媛 ; 李梦瑶 ; 徐学选 ; 等 , 内蒙古地区不同撂荒年限草地与沙棘地的入渗能力比较 [J] 水土保持通报 , 2023,43(03):34-40. DOI:10.13961

137 李子昂 ; 阿地力 · 沙塔尔 ; 吾斯坎那依 · 艾山吐 ; 等 , 沙棘果实着色度和硬度对沙棘绕实蝇产卵选择的影响 [J], 新疆农业大学学报 ,2023,46(03):240-244.

138 唐克 , 沙棘果实不同部位果油及黄酮含量比较 [J], 黑龙江农业科学 ,2023,(06):55-60.

139 李南 , 混交种植对沙棘生长及土壤理化性质的影响 [J], 乡村科技 ,2023,14(11):87-89.

140 王琪 ; 张文玉 ; 马赫 ; 等 , 蒸汽爆破对沙棘籽粕多酚提取及生物活性的影响 [J], 食品研究与开发 ,2023,44(11):121-128.

141. NA Ren, Clinical study on the intervention of ACI (Sap Disease) blood lipid levels with combined Wuwei Seabuckthorn Powder and western medicine, Inner Mongolia Minzu University, 2023.

141 娜仁 , 沙棘 -5 味散联合西药干预 ACI（萨病）血脂水平的临床研究 [D], 内蒙古民族大学 ,2023.

142. FENG Lidan, HAO Ming, ZHANG Wei, et al, Optimization of deodorization parameters and evaluation of seabuckthorn seed oil, Journal of Chinese Cereals and Oils Association, 2023, 38 (11): 134-140.

142 冯丽丹 ; 郝明 ; 张威 ; 等 , 沙棘籽油脱色参数优化及效果的评价 [J], 中国粮油学报 ,2023,38(11):134-140.

143. MA Fulin, REN Zengzhuoma, WANG Changling, et al, Isolation, identification and growth promoting study of pseudomonas endophytes from seabuckthorn (H. tibetana) root nodules, Journal of Fujian Agriculture sciences, 2023, 38 (05): 624-631.

143 马福林 ; 仁增卓玛 ; 王昌玲 ; 等 , 西藏沙棘根瘤内生假单胞菌的分离鉴定及促生性研究 [J], 福建农业学报 ,2023,38(05):624-631.

144. XIANG Jintian, YAANG Mei, ZHANG Qianglin, et al, Design and optimization of a device for removing fine scales from seabuckthorn leaf in tea processing, Journal of Northeast Agricultural University, 2023, 54 (05): 55-65+76.

144 向金田 ; 杨梅 ; 张强林 ; 等 , 沙棘叶茶除毫装置设计与优化 [J], 东北农业大学学报 ,2023,54(05):55-65+76.

145. DONG Baoxu, Cultivation and management techniques for bare-root seabuckthorn seedlings, Rural Science and Technology, 2023, 14 (10): 104-106.

145 董宝旭 , 沙棘裸根苗栽培管理技术 [J], 乡村科技 ,2023,14(10):104-106.

146. LIU Qingqing, Ma Yuhua, Li Xiongjie, et al, Optimization of SSR-PCR reaction system and primer development for seabuckthorn in China, Genomics and Applied Biology, 2023, 42 (10): 1038-1049.

146 刘青青 ; 马玉花 ; 李雄杰 ; 等 , 中国沙棘 SSR-PCR 反应体系的优化及引物开发 [J], 基因组学与应用生物学 ,2023,42(10):1038-1049.

147. LIU Guoyu, LI Ming, JIANG Long, et al, Screening test on the formulation of Abietia nigroderma with seabuckthorn sawdust as medium, Agricultural Science &Technology and Equipment, 2023, (03): 1-3+6.

147 刘国宇 ; 李明 ; 蒋龙 ; 等 , 以沙棘木屑为培养基的黑皮鸡枞菌配方筛选试验 [J], 农业科技与装备 ,2023,(03):1-3+6.

148. MA Chunmei, ZHOU Jianhui, Han Yamin, et al, Development and utilization of sbuckthorn germplasm resources in Changji Prefecture, Modern Horticulture, 2023, 46 (11): 94-96.

148 马春梅；周建会；韩雅敏；等，昌吉州沙棘属种质资源开发与利用 [J], 现代园艺 ,2023,46(11):94-96.

149. XIE Xusheng, Study on the English translation of health supplement instructions: A case study of seabuckthorn soft capsules, Journal of Chinese Science & Technology Translators, 2023, 36 (02): 12-15.

149 谢旭升，保健品说明书英译研究——以沙棘软胶囊为例 [J]. 中国科技翻译 ,2023,36(02):12-15.

150. CHENG Chunya, MA Yanzhu, ZHANG Wenguang, et al, Nutritional evaluation of the perianth and pollen proteins of male seabuckthorn (ssp. sinensis) flowers, Journal of Food Safety & Quality , 2023, 14 (09): 311-318.

150 成春亚；马艳珠；张文广；等，中国沙棘雄花花被和花粉蛋白质营养评价 [J], 食品安全质量检测学报 ,2023,14(09):311-318.

151. WEI Changliang, Study on formula optimization of compound sports drink with seabuckthorn and wolf-berry, Journal of Yunnan Normal University (Natural Science Edition), 2023, 43 (03): 56-61.

151 危常亮，沙棘枸杞复合运动饮料配方优化研究 [J], 云南师范大学学报（自然科学版),2023,43(03):56-61.

152. TANG Ke, SHAN Jinyou, Wu Yuxi, et al, Breeding of the high-quality and high-yield seabuckthorn variety 'Wanxia', Forestry Science and Technology, 2023, 43 (05): 76-77.

152 唐克；单金友；吴雨蹊；等，优质高产沙棘新品种‘晚霞’的选育 [J], 林业科技通讯 ,2023,(05):76-77.D

153. HUANG Junyue, GUO Yuefeng, SHI Lin, et al, Effects of different cropping patterns of seabuckthorn on microbial community composition of soil in arsenic sandstone region, Inner Mongolia Forestry Investigation and Design, 2023, 46 (03): 93-97.

153 黄俊月；郭月峰；石麟；等，砒砂岩区沙棘不同平茬模式对土壤微生物群落组成的影响 [J], 内蒙古林业调查设计 ,2023,46(03):93-97.

154. ZHOU Chuang, Effects of different cutting times on the growth of seabuckthorn seedlings in cutting propagation, Inner Mongolia Forestry Investigation and Design, 2023, 46 (03): 25-26.

154 周闯，不同扦插期沙棘扦插繁育技术对苗木生长状况的影响 [J], 内蒙古林业调查设计 ,2023,46(03):25-26.

155. SONG Dacheng, WU Hao, WANG Lide, et al, Characteristics of soil heavy metal distribution and its effect on enzyme activity in artificial seabuckthorn forests with different afforestation years in the Shuanglonggou abandoned mining area, Acta Prataculturae Sinica, 2023, 32 (08): 61-70.

155 宋达成 ; 吴昊 ; 王理德 ; 等 , 双龙沟废弃矿区不同造林年限人工沙棘林土壤重金属分布特征及其对酶活性的影响 [J], 草业学报 ,2023,32(08):61-70.

156. LIU Rui, WANG Chenzhao, MA Yuhua, Proline content and HrP5CS gene expression analysis of seabuckthorn under drought stress, Journal of Fujian Agriculture and Forestry University (Natural Science Edition), 2023, 52 (06): 846-852.

156 刘瑞 ; 王晨兆 ; 马玉花 , 干旱胁迫下沙棘脯氨酸含量及 HrP5CS 基因表达分析 [J], 福建农林大学学报 (自然科学版),2023,52(06):846-852.

157. TENG Juntao, GUO Yuefeng, QI Wei, et al, Response of fine root length density to environmental factor changes after seabuckthorn pruning in the arsenic sandstone region, Shandong Agricultural Sciences, 2023, 55 (04): 123-130.

157 滕俊涛 ; 郭月峰 ; 祁伟 ; 等 , 砒砂岩区沙棘平茬后细根根长密度对环境因子变化的响应 [J], 山东农业科学 ,2023,55(04):123-130.

158. ZHANG Shaoze, LIU Yan, GONG Yue, et al, Application of seabuckthorn byproducts in ruminant production, Guangdong Feed, 2023, 32 (04):33-35.

158 张少泽 ; 刘岩 ; 宫玥 ; 等 , 沙棘副产物在反刍动物生产中的应用 [J], 广东饲料 ,2023,32(04):33-35.

159. ZHANG Fang, YAN Xiufang, WANG Wenting, Study on the application of ultra-high pressure (HHP) cold sterilization technology in the processing of seabuckthorn concentrate beverages, Inner Mongolia Petrochemical Industry, 2023, 49 (04): 84-91.

159 张芳 ; 闫秀芳 ; 王文婷 , 超高压 (HHP) 冷杀菌技术在沙棘浓浆饮料加工中的应用研究 [J], 内蒙古石油化工 ,2023,49(04):84-91.

160. LI Junpeng, LI Haibo, WANG Lin, Response of seabuckthorn root tip functional characteristics to slope position and animal browsing, Acta Ecologica Sinica, 2023, 43 (17): 7118-7127.

160 李俊鹏 ; 李海波 ; 王林 , 中国沙棘根尖功能特征对坡位和动物啃食枝叶的响应 [J], 生态学报 ,2023,43(17):7118-7127.

161. TANG Zhenyue, FENG Wenxiao, LU Mengling, et al, The inhibitory effect and its mechanism

161 唐祯玥 ; 冯文晓 ; 吕孟玲 ; 等 , 利用模拟体

of seabuckthorn flavonoids on the formation of acrylamide investigated by simulation system, Science and Technology of Food Industry, 2023, 44 (21): 111-118.

系探究沙棘黄酮对丙烯酰胺生成的抑制作用及其机理 [J], 食品工业科技 ,2023,44(21):111−118.

162. DING Zhaojun, YE Jianwen, MA Jiaqi, et al, Research progress on the chemical components and pharmacological effects of seabuckthorn leaves, World Chinese Medicine, 2023, 18 (05): 714-720.

162 丁肇俊 ; 叶健文 ; 马佳琪 ; 等 , 沙棘叶化学成分及药理作用研究进展 [J], 世界中医药 ,2023,18(05):714−720.

163. LI Zhen, LI Jie, ZHANG Hulin, et al, Quality analysis of seabuckthorn with large-fruit in Altay Region, Beverage Industry, 2023, 26 (02): 48-51.

163 李珍 ; 李杰 ; 张湖林 ; 等 , 阿勒泰地区大果沙棘质量分析研究 [J], 饮料工业 ,2023,26(02):48−51.

164. MA Fulin, WANG Changling, REN Zengzhuoma, et al, Isolation and identification of pseudomonas from the root nodules of seabuckthorn (H. tibetana) , Journal of Gansu Agricultural University, 2023, 58 (03): 76-81+90.

164 马福林 ; 王昌玲 ; 仁增卓玛 ; 等 , 西藏沙棘根瘤内生菌假单胞菌属的分离与鉴定 [J], 甘肃农业大学学报 ,2023,58(03):76−81+90.

165. MA Fulin, MA Xiufang, LIU Rui, et al, Amplification and bioinformatics analysis of the AQP Gene in seabuckthorn (H. tibetana) from Tibet, Qinghai Science and Technology, 2023, 30 (02): 107-111.

165 马福林 ; 马秀芳 ; 刘瑞 ; 等 , 西藏沙棘 AQP 基因的扩增及生物信息学分析 [J], 青海科技 ,2023,30(02):107−111.

166. HE Xiaofan, TIAN Lihui, WANG Haijiao, et al, Spatial and temporal variation of soil water in seabuckthorn community in alpine sandy land, Bulletin of Soil and Water Conservation, 2023, 43 (02): 23-33.

166 何晓帆 ; 田丽慧 ; 汪海娇 ; 等 , 高寒沙地沙棘群落的土壤水分时空变异特征 [J], 水土保持通报 ,2023,43(02):23−33.

167. YAN Xiaoling, Problems and suggestions in the development and utilization of seabuckthorn in the Loess Plateau gully region, Modern Agricultural Science and Technology, 2023, (08): 162-164.

167 闫晓玲 , 黄土高塬沟壑区沙棘开发利用存在的问题及建议 [J], 现代农业科技 ,2023,(08):162−164.

168. TANG Jinchang, Optimization of polyphenol

168 唐进昌 , 低共熔溶剂提取沙棘果渣多酚的

extraction from Seabuckthorn fruit residue with low eutectic solvent and its resistance to exercise fatigue, China Food Additives, 2023, 34(04):228-234.

优化及其抗运动疲劳研究 [J], 中国食品添加剂 ,2023,34(04):228-234.

169. CUI Xiaohan, YE Lihong, JIA Wenlong, et al, Anatomical study of seabuckthorn leaves under different soil moisture levels, Journal of Northern Agriculture, 2023, 51 (02): 74-82.

169 崔晓晗 ; 叶丽红 ; 贾文龙 ; 等 , 不同土壤含水量下沙棘叶片解剖结构研究 [J], 北方农业学报 ,2023,51(02):74-82.

170. JIANG Yanfei, PAN Junda, ZHOU Zhihan, et al, Study on the mechanism of seabuckthorn seed oil cream promoting skin wound healing based on the PI3K/AKT signaling pathway, Journal of Practical Traditional Chinese Internal Medicine, 2023, 37 (07): 32-35+180-182.

170 蒋燕飞 ; 潘俊达 ; 周智涵 ; 等 , 基于 PI3K/AKT 信号通路研究沙棘籽油乳膏促进皮肤创伤修复的作用机制 [J], 实用中医内科杂志 ,2023,37(07):32-35+180-182.

171. HE Changting, ANGQING Caidan, CAIZENG Zhuoma, et al, Overview of seabuckthorn resources, medicinal status, and Its Pharmacological Effects on Cardiovascular Diseases, Chinese Wild Plant Resources, 2023, 42 (04): 1-7+17.

171 何长廷 ; 昂青才旦 ; 才曾卓玛 ; 等 , 沙棘资源、药用状况及其对心血管疾病药理作用概述 [J], 中国野生植物资源 ,2023,42(04):1-7+17.

172. ZHOU Shuai, YANG Yikang, LI Guoying, et al, Comparative study on the root morphology and anatomy of five seabuckthorn species in Tibet, Journal of Plateau Agriculture, 2023, 7 (02): 178-186.

172 周帅 ; 杨依康 ; 李国营 ; 等 , 西藏 5 种沙棘属植物根形态和解剖结构比较研究 [J], 高原农业 ,2023,7(02):178-186.

173. CHEN Limei, CAO Yuankui, ZHANG Hongwei, et al, Clinical study on vaginal local pretreatment before colposcopy in postmenopausal women, Journal of Practical Obstetrics and Gynecology, 2023, 39 (04): 287-291.

173 陈丽梅 ; 曹远奎 ; 张宏伟 ; 等 , 绝经后女性阴道镜检查前阴道局部预处理的临床研究 [J], 实用妇产科杂志 ,2023,39(04):287-291.

174. ZHANG Qiaoxian, WANG Jinhui, Xue Bowen, et al, Effects of adding seabuckthorn fruit residue to feed on the hatchability of broiler breeder eggs, China Feed, 2023, (11):152-156.

174 张巧仙 ; 王金辉 ; 薛博文 ; 等 , 父母代蛋鸡在饲料中添加沙棘果渣对种蛋孵化的影响 [J], 中国饲料 ,2023,(11):152-156.

175. XIA Ying, QU Min, Study on subacute transoral toxicity in rats with proanthocyanidins extract from seabuckthorn seeds, Proceedings of the tenth National Congress of Toxicology, Society of Toxicology, Hubei Key Laboratory of Applied Toxicology, Hubei Center for Disease Control and Prevention, 2023:1. DOI: 10.26914/c.cnkihy.2023.012059.

175 夏莹 ; 曲敏 , 沙棘籽原花青素提取物大鼠亚急性经口毒性研究 [C]// 中国毒理学会 . 中国毒理学会第十次全国毒理学大会论文集 . 湖北省疾病预防控制中心应用毒理湖北省重点实验室 ,2023:1.DOI:10.26914/c.cnkihy.2023.012059.

176. YIN Haishan, MENG Zhixing, ZHANG Na, Economic characteristics and sustainable development strategies of the seabuckthorn processing industry in China, China Fruits, 2023, (04): 126-128+135.

176 殷海善 ; 孟志兴 ; 张娜 , 我国沙棘加工产业的经济学特征与可持续发展对策 [J], 中国果树 , 2023, (04): 126-128+135.DOI:10.16626

177. SONG Meiling, Study on the supercritical CO2 extraction process of seabuckthorn seed oil, Food Engineering, 2023, (01):22-24.

177 宋美玲 , 超临界二氧化碳萃取沙棘籽油的工艺研究 [J], 食品工程 ,2023,(01):22-24.

178. ZHAI Keyao, LIU Juan, DONG Yue, et al, Seabuckthorn shaped the endophytic microbiome in root nodules through independent selection, China Microbiology, 2023, 50(09):3881-3898.

178 翟柯尧 ; 刘娟 ; 董玥 ; 等 , 沙棘通过自主选择塑造根瘤内生微生物组 [J], 微生物学通报 ,2023,50(09):3881-3898.

179. LI Guangying, ZHANG Yanzhen, CAO Wenxiu, Development of complex beverage of seabuckthorn with turnip, Product Processing, 2023, (06): 6-10+16.

179 李光英 ; 张艳珍 ; 曹文秀 , 芜菁沙棘复合饮料的研制 [J], 农产品加工 ,2023,(06):6-10+16.

180. LIU Chenggang, SUN He, WANG Xiaodong, et al, Study on processing technology of seabuckthorn green tea fermented lactic acid beverage, Product Processing, 2023, (06): 46-48+55.

180 柳诚刚 ; 孙鹤 ; 王晓冬 ; 等 , 沙棘绿茶发酵乳酸饮料加工技术研究 [J], 农产品加工 ,2023,(06):46-48+55.

181. WANG Xin, GUO Yuefeng, QI Wei, et al, Effects of different stubble heights on compensatory growth and soil physicochemical properties of seabuckthorn, Journal of Yangzhou University (Agriculture and Life Sciences Edition), 2023, 44 (02): 131-137+146.

181 王鑫 ; 郭月峰 ; 祁伟 ; 等 , 不同留茬高度对沙棘补偿生长和土壤理化性质的影响 [J], 扬州大学学报 (农业与生命科学版),2023,44(02):131-137+146.

182. SUN Xiaoping, XU Fahui, Study on hazard and control of seabuckthorn megaloptera, Forestry of Gansu , 2023, (02): 38-40.

182 孙小平 ; 徐发辉 , 沙棘白眉天蛾发生危害及防治试验研究 [J], 甘肃林业 ,2023,(02):38-40.

183. WANG Chunxi, WANG Bin, NIE Yanjun, Observation of spiraea aphid occurrence in seabuckthorn forest in Kezuozhongqi and preliminary report on screening test of control agents, Forestry Science and Technology, 2023, 48 (02): 33-35.

183 王春喜 ; 王斌 ; 聂彦君 , 科左中旗沙棘林绣线菊蚜发生规律观察及其防治药剂筛选试验初报 [J], 林业科技 ,2023,48(02):33-35.

184. LI Zhifeng, WANG Qian, DONG Yanling, et al, Feasibility analysis report on the forage utilization of seabuckthorn in Ningxia Nongken, Contemporary Animal Husbandry, 2023, (03): 55-57.

184 李治锋 ; 王倩 ; 董燕玲 ; 等 , 宁夏农垦沙棘饲草化利用的可行性分析报告 [J], 当代畜牧 ,2023,(03):55-57.

185. HUANG Congling, Effects of seabuckthorn on proliferation, migration, apoptosis and cycle of human breast cancer MCF-7 cells, Proceedings of the 2022 CCTB ChinaTumor Markers Academic Congress and China Integrative Oncology Conference, Graduate School of Inner Mongolia Medical University, 2023:1.

185 黄聪玲 , 沙棘对人乳腺癌 MCF-7 细胞增殖、迁移、凋亡、周期的影响 [C]//2022CCTB 中国肿瘤标志物学术大会暨中国整合肿瘤学大会论文集 , 内蒙古医科大学研究生院 ,2023:1.

186. LIU Rui, ZHAO Lang, MA Yuhua, Amplification and bio-informatics analysis of the Hr3GT gene in Chinese seabuckthorn, Science and Technology of Qinghai Agriculture and Forestry, 2023, (01): 93-96.

186 刘瑞 ; 赵浪 ; 马玉花 , 中国沙棘 Hr3GT 基因的扩增及生物信息学分析 [J], 青海农林科技 ,2023,(01):93-96.

187. XIANG Huan, CUI Chun, Stability and isolation purification of seabuckthorn meal protein peptide, Food Science, 2023, 44(18):49-57.

187 相欢 ; 崔春 , 沙棘籽粕蛋白肽的稳定性及分离纯化 [J], 食品科学 ,2023,44(18):49-57.

188. TANG Ke, SHAN Jinyou, WANG Rui, et al, Comparison of nutritional components in seabuckthorn leaves, Forestry Science and Technology, 2023, (03):66-69.

188 唐克 ; 单金友 ; 王蕊 ; 等 , 沙棘叶片营养成分比较 [J], 林业科技通讯 ,2023,(03):66-69.

189. WANG Xiaohong, XIANG Dongshan, LI

189 王小红 ; 向东山 ; 李文恒 ; 等 , 响应面法

Wenheng, et al, Optimization of the preparation process for seabuckthorn and grape jelly using response surface methodology, Journal Of Hubei Minzu University(Natural Science Edition), 2023, 41 (01): 33-39.

优化沙棘葡萄果冻的制备工艺 [J], 湖北民族大学学报 (自然科学版),2023,41(01):33-39.DOI:10.13501/j.cnki.42-1908/n.2023.03.006.

190. HU Fangyuan, SHEN Yinan, ZHANG Wenchen, et al, Current status and development strategies of the seabuckthorn industry in Lanxian county, Shanxi province, Shanxi Forestry Science and Technology, 2023, 52 (01): 55-56.

190 胡芳媛 ; 申逸男 ; 张文臣 ; 等 , 山西岚县沙棘产业现状与发展对策 [J], 山西林业科技 ,2023,52(01):55-56.

191. YIN Haishan, MA Huimin, LI Hui, Present situation of seabuckthorn resources and suggestions on its exploitation and utilization in Lanxian county, Shanxi province, Shanxi Forestry Science and Technology, 2023, 52 (01): 63-64.

191 殷海善 ; 马慧敏 ; 李惠 , 山西省岚县沙棘资源现状及开发利用建议 [J], 山西林业科技 ,2023,52(01):63-64.

192. LIU Qingqing, LI Xiongjie, MA Yaqiong, et al, Phenotypic trait diversity analysis of ssp. sinensis from Qinghai, Journal of Plant Genetic Resources, 2023, 24 (04): 1057-1064.

192 刘青青 ; 李雄杰 ; 马亚琼 ; 等 , 青海野生中国沙棘资源表型性状多样性分析 [J], 植物遗传资源学报 ,2023,24(04):1057-1064.

193. LI Hong, WEI Xiaohong, ZHAO Ying, et al, Optimization of germination methods for different seabuckthorn varieties and their mechanisms, Molecular Plant Breeding, 2023, 21(05):1718-1725.

193 李红 ; 魏小红 ; 赵颖 ; 等 , 不同品种沙棘种子萌发方法的优化及其机理 [J], 分子植物育种 ,2023,21(05):1718-1725.

194. PEI Longying, WANG Xiaoyu, XU Heng, et al, Extraction process and properties of pigment extracted from seabuckthorn fruit residue, Bulletin of Fermentation Science and Technology, 2023, 52 (01): 1-7.

194 裴龙英 ; 王晓雨 ; 徐恒 ; 等 , 沙棘果渣中色素的提取工艺及其性质研究 [J], 发酵科技通讯 ,2023,52(01):1-7.

195. QU Baisuo, SHEN Longjun, JU Shaojie, et al, Development and process optimization of seabuckthorn and fig compound beverage, Bulletin of Fermentation Science and Technology, 2023, 52 (01): 45-51.

195 屈佰锁 ; 沈隆俊 ; 巨少杰 ; 等 , 沙棘、无花果复配饮料的研制及工艺优化 [J], 发酵科技通讯 ,2023,52(01):45-51.

196. GE Liang, LI Qi, LI Sen, et al, Optimization of the extraction process and stability study of total polyphenols from seabuckthorn fruit, Chemistry & Bioengineering, 2023, 40 (03): 30-35.

196 葛亮 ; 李琦 ; 李森 ; 等 , 沙棘果总多酚提取工艺的优化及其稳定性研究 [J], 化学与生物工程 ,2023,40(03):30-35.

197. LI Dongxiang, GUAN Rongfa, HUANG Haizhi, et al, Extraction optimization and antioxidant activity comparison of flavonoids from three species of seabuckthorn in Xinjiang, Journal of Chinese Institute of Food Science and Technology, 2023, 23 (04): 157-167.

197 李东香 ; 关荣发 ; 黄海智 ; 等 ,3 种新疆沙棘黄酮的提取优化及抗氧化活性对比 [J], 中国食品学报 ,2023,23(04):157-167.

198. TIAN Dengjuan, NIEKaihong, ZHANg Zengyue, et al, Responses of root and tiller capacity and non-structural carbohydrates to cropping height of seabuckthorn in China, Journal of Northwest A & F University (Natural Science Edition), 2023, 51 (09): 70-83.

198 田登娟 ; 聂恺宏 ; 张增悦 ; 等 , 中国沙棘根蘖能力及非结构性碳水化合物对平茬高度的响应 [J], 西北农林科技大学学报 (自然科学版),2023,51(09):70-83.

199. JIA Min, LI Chengcheng, WANG Leling, et al, Effects and mechanisms of seabuckthorn flavonoids on atherosclerotic plaques and NOD-like receptor protein 3 in mice, China Medicine, 2023, 18 (03): 410-414.

199 贾敏 ; 李城城 ; 王乐玲 ; 等 , 沙棘黄酮对小鼠动脉粥样硬化斑块和 NOD 样受体蛋白 3 的影响及作用机制 [J], 中国医药 ,2023,18(03):410-414.

200. WANg Wei, CAO Wen, Preparation and antibacterial activity of seabuckthorn pomace polysaccharide-nano silver composite particles, Food Research and Development, 2023, 44 (05): 148-154.

200 王薇 ; 曹雯 , 沙棘果渣多糖 – 纳米银复合粒子的制备及其抑菌活性 [J], 食品研究与开发 ,2023,44(05):148-154.

201. SHI Jiaqi, LIANG Guodong, WANG Na, et al, Pharmacodynamic study of seabuckthorn syrup on relieving cough and phlegm and eliminating stagnation in young experimental animals, Journal of North Pharmacy, 2023, 20 (03): 1-5.

201 石佳琦 ; 梁国栋 ; 王娜 ; 等 , 沙棘糖浆对幼龄实验动物止咳化痰与消食化滞的药效学研究 [J], 北方药学 ,2023,20(03):1-5.

202. YIN Haishan, LI Hui, MA Huimin, et al, Discussion on the development strategy of seabuckthorn industry in Shanxi province, China Forestry Economy, 2023, (02): 38-41.

202 殷海善 ; 李惠 ; 马慧敏 ; 等 , 山西省沙棘产业发展战略探讨 [J], 中国林业经济 ,2023,(02):38-41.

203. ZHOU Ya, ZHOU Xuehua, XIE Yubo, et al, Process analysis of seabuckthorn seed oil extraction by super-critical CO2 using dyeing method, Journal of Chinese Cereals and Oils Association, 2023, 38 (08): 184-189.

203 周雅 ; 周雪华 ; 谢雨波 ; 等 , 染色法构建对超临界 CO2 提取沙棘籽油的过程分析 [J], 中国粮油学报 ,2023,38(08):184-189.

204. ZHENG Xiaoning, Key points of seabuckthorn propagation and cultivation techniques in western Liaoning, New Agriculture, 2023, (04): 27-28.

204 郑晓宁 , 辽西地区沙棘繁殖与栽培技术要点 [J], 新农业 ,2023,(04):27-28.

205. YAO Bingnong, LIAO Fuyou, YANG Jiaoyi, et al, Effects of seabuckthorn flavonoids on the indices of growth performance, meat quality, serum biochemical, and immune organ indexes of Guangxi Xiaoma ducks, Journal of Chinese Animal Nutrition, 2023, 35 (03): 1638-1648.

205 姚炳浓 ; 廖富友 ; 杨娇一 ; 等 , 沙棘黄酮对广西小麻鸭生长性能、肉品质、血清生化指标及免疫器官指数的影响 [J], 动物营养学报 ,2023,35(03):1638-1648.

206. DU Xinyu, LIU Mei, LI Jiantao; et al, Effects of seabuckthorn flavonoids on growth performance, slaughter performance, serum biochemical indicators, antioxidant capacity, and immune function in meat rabbits, Journal of Chinese Animal Nutrition, 2023, 35(06): 3910-3920.

206 杜新瑜 ; 刘梅 ; 李建涛 ; 等 , 沙棘黄酮对肉兔生长性能、屠宰性能、血清生化指标、抗氧化能力和免疫功能的影响 [J], 动物营养学报 ,2023,35(06):3910-3920.

207. WAN Pengcong, ZHANg Jun, DU Chenhui, et al, Purification and antioxidant activity of total flavonoids in seabuckthorn Yigong recipe, Food Industry, 2023, 44 (02): 113-117.

207 万鹏聪 ; 张俊 ; 杜晨晖 ; 等 , 沙棘异功方中总黄酮的纯化及抗氧化活性研究 [J], 食品工业 ,2023,44(02):113-117.

208. GUO Wenjuan, Development of fermented seabuckthorn complex juice beverage, Food Industry, 2023, 44 (02): 34-38.

208] 郭文娟 , 发酵沙棘复合果汁饮料的研制 [J], 食品工业 ,2023,44(02):34-38.

209. LI Qiong, Research on the development and HACCP quality control of seabuckthorn complex juice beverage, Food Industry, 2023, 44 (02): 41-45.

209 李琼 , 沙棘复合果汁饮料研制及 HACCP 质量控制研究 [J], 食品工业 ,2023,44(02):41-45.

210. REN Xiangrong, LIn Guocang, Hui Jingtao, et al, Development status and sustainable development suggestions for the small berry

210 任向荣 ; 蔺国仓 ; 回经涛 ; 等 , 新疆地区小浆果产业发展现状及持续发展建议 [J], 北方园

industry in Xinjiang, Northern Horticulture, 2023, (03): 127-132.

艺 ,2023,(03):127-132.

211. ZHAO Manxing, MA Wenquan, ZHANG Xia, et al, Temporal and spatial variation of soluble nitrogen components in soil of Chinese seabuckthorn plantations in northern Shaanxi, Forest Research, 2023, 36 (01): 146-153.

211 赵满兴 ; 马文全 ; 张霞 ; 等 , 陕北不同恢复年限中国沙棘人工林土壤可溶性氮组分时空变化研究 [J], 林业科学研究 ,2023,36(01):146-153.

212. YANG Shihan, LI Zihan, ZHANG Jinshan, et al, Enzyme-assisted microwave extraction of total flavonoids from Yunnan seabuckthorn fruits and evaluation of their antioxidant activity, China Food Additives, 2023, 34(03): 19-26.

212 杨诗涵 ; 李紫菡 ; 张金山 ; 等 , 酶协同微波提取云南沙棘果实总黄酮及其抗氧化活性评价 [J], 中国食品添加剂 ,2023,34(03):19-26.

213. MA Yonglong, ZHU Zhu, WANG Yanl, et al, Sex differences in the physiological tolerance, accumulation, and transport characteristics of Cadmium in Chinese seabuckthorn seedlings, Acta Botanica Boreali-Occidentalia Sinica, 2023, 43 (02): 285-294.

213 马永龙 ; 朱珠 ; 王艳莉 ; 等 , 中国沙棘幼苗对土壤镉生理耐性和富集转运特征的性别差异 [J], 西北植物学报 ,2023,43(02):285-294.

214. ZHOU Qinwen, SUN Lijun, Lu Beibe, et al, Research progress on the bioactive efficacy of polyphenols in small berries (seabuckthorn), Journal of Chinese Wild Plant Resources, 2023, 42 (02): 94-97+102.

214 周勤文 ; 孙力军 ; 卢蓓蓓 ; 等 , 小浆果多酚生物活性功效研究进展 [J], 中国野生植物资源 ,2023,42(02):94-97+102.

215. CUI Xin, HAN Sheng, XIE Yanming, Pharmacoeconomic evaluation of the treatment of senile vaginitis with compound seabuckthorn seed oil supposition based on decision tree model, Journal of China Pharmaceutical Economics, 2023, 18 (02): 26-30.

215 崔鑫 ; 韩晟 ; 谢雁鸣 , 基于决策树模型的复方沙棘籽油栓治疗老年性阴道炎的药物经济学评价 [J], 中国药物经济学 ,2023,18(02):26-30.

216. WANg Kai, CHANG Ping, MANAFU Sayiti, et al, Afforestation technology of Chinese seabuckthorn in the pre-mountain area of northern Tianshan Mountains, Xinjiang Agricultural Sciences, 2023, 60 (02): 368-377.

216 王凯 ; 程平 ; 玛纳甫 · 赛依提 ; 等 , 天山北坡前山带区域中国沙棘造林技术 [J], 新疆农业科学 ,2023,60(02):368-377.

217. MA Xu, ZHAO Ying, HAN Wei, et al, Principal component analysis and comprehensive evaluation of amino acid composition in 14 kinds of seabuckthorn fruits, Xinjiang Agricultural Sciences, 2023, 60 (02): 378-388.

218. GUO Ting, LIU Weiping, WANG Xinjie, et al, Clinical study of seabuckthorn dry emulsion combined with bifidobacterium triad in the treatment of functional dyspepsia for children，Drugs & Clinic, 2023, 38 (02): 373-377.

219. WANG Bolin, ZHAO Ying, HAN Xiaoyan, et al, Effects of different hormone treatments and substrate formulations on the rooting of seabuckthorn micro-cuttings, Journal of Anhui Agricultural Sciences, 2023, 51 (03): 116-118+122.

220. MIAO Lanning, HE Yisen, TANG Tao; et al, Study on the stability of carboxymethylated seabuckthorn polysaccharide calcium chelate, China Food, 2023, (03): 95-97.

221. ZHAO Manxing, YANG Fan, MA Wenquan; et al, Seasonal variation of soil nutrients and enzyme activities in Chinese seabuckthorn plantations in the Loess Hilly Region, Research of Soil and Water Conservation, 2023, 30 (02): 58-66.

222. YU Shui, MEI Li, SIRI Guleng, et al, Study on thin-layer identification of Mongolian medicine Wuwei seabuckthorn capsule, Jurnal of Chinese Minorities Medicine & Pharmacy, 2023, 29 (01): 34-35+39.

223. SI Xia, ZHANg Xin, WANG Chunyao, et al, Application of tartary buckwheat vinegar and seabuckthorn vinegar in juvenile zebrafish with metabolization related fatty liver disease, Chinese Nursing Research, 2023, 37 (02): 302-308.

217 马旭 ; 赵英 ; 韩炜 ; 等 ,14 种沙棘果实中氨基酸组成的主成分分析与综合评价 [J], 新疆农业科学 ,2023,60(02):378-388.

218 郭婷 ; 刘卫平 ; 王新杰 ; 等 , 沙棘干乳剂联合双歧杆菌三联活菌治疗儿童功能性消化不良的临床研究 [J], 现代药物与临床 ,2023,38(02):373-377.

219 王博琳 ; 赵英 ; 韩晓燕 ; 等 , 不同激素处理和基质配方对沙棘微扦插生根的影响 [J], 安徽农业科学 ,2023,51(03):116-118+122.

220 苗兰宁 ; 贺奕森 ; 唐涛 ; 等 , 羧甲基化沙棘多糖钙螯合物稳定性的探究 [J], 中国食品工业 ,2023,(03):95-97.

221 赵满兴 ; 杨帆 ; 马文全 ; 等 , 黄土丘陵区沙棘人工林土壤养分及酶活性季节变化 [J], 水土保持研究 ,2023,30(02):58-66.

222 于水 ; 美丽 ; 斯日古楞 ; 等 , 蒙药五味沙棘胶囊的薄层鉴别研究 [J], 中国民族医药杂志 ,2023,29(01):34-35+39.

223 司霞 ; 张昕 ; 王晨尧 ; 等 , 苦荞醋饮及沙棘醋饮在代谢相关脂肪性肝病斑马鱼幼鱼中的应用 [J], 护理研究 ,2023,37(02):302-308.

224. WANG Chunyao, ZHANG Xin, Si Xia, et al, Preliminary study on the safety of seabuckthorn vinegar, Chinese Nursing Research, 2023, 37 (02): 309-316.

224 王晨尧 ; 张昕 ; 司霞 ; 等 , 沙棘醋饮的安全性初步研究 [J], 护理研究 ,2023,37(02):309-316.

225. LIU Yu, LIN Tong, SU Shanshan, et al, Establishment of fatty acid fingerprint of seabuckthorn seed oil and identification of adulteration, China Port Science & Technology, 2023, 5 (01): 53-60.

225 刘宇 ; 林童 ; 苏姗姗 ; 等 , 沙棘籽油脂肪酸指纹图谱构建及掺假识别 [J], 中国口岸科学技术 ,2023,5(01):53-60.

226. XIE Shuangyu, JING Qiujue, WANG Zhiwei, et al, Preparation and storage stability study of seabuckthorn probiotic tablets, Food Industry, 2023, 44 (01): 16-21.

226 解双瑜 ; 景秋菊 ; 王志伟 ; 等 , 沙棘益生菌压片糖果的制备及储藏稳定性研究 [J], 食品工业 ,2023,44(01):16-21.

227. LIANG Wenzhen, CUI Dongbo, SUN Jia, et al, Research on the brewing process and hypoglycemic effect of seabuckthorn and hawthorn composite vinegar, Journal of Liaoning Agricultural Technical Colloge, 2023, 25 (01): 1-4+43.

227 梁文珍 ; 崔东波 ; 孙佳 ; 等 , 沙棘山楂复合果醋酿造工艺及降糖效果研究 [J], 辽宁农业职业技术学院学报 ,2023,25(01):1-4+43.

228. GAO Pei, GUO Jiahui, HE Yongchao, et al, Isolation, identification, and growth-promoting comparison of four strains of pseudomonas in the rhizosphere of seabuckthorn (ssp. sinensis), Northern Horticulture, 2023, (01): 69-75.

228 高佩 ; 郭佳慧 ; 何永超 ; 等 , 中国沙棘根际四株假单胞菌的分离、鉴定及促生能力的比较 [J], 北方园艺 ,2023,(01):69-75.

229. DING Jie, TENG Weifeng, SHA Rui, et al, Optimization of formulation process of instant granules of seabuckthorn leaves using fuzzy mathematical sensory evaluation, Journal of Gansu Agricultural University, 2023, 58 (01): 235-242.

229 丁洁 ; 滕维锋 ; 沙芮 ; 等 , 模糊数学感官评价法优化沙棘叶速溶颗粒冲剂的配方工艺 [J], 甘肃农业大学学报 ,2023,58(01):235-242.

230. FANG Lihong, YAN Jiejin, QIAN Meifang, Observation on the clinical effect of external application of seabuckthorn fruit in treatment of phlebitis, Journal of Chinese Traditional Medical Science and Technology, 2023, 30 (01): 141-143.

230 方丽红 ; 颜洁津 ; 钱美芳 , 沙棘果捣碎外敷治疗静脉炎的临床疗效观察 [J], 中国中医药科技 ,2023,30(01):141-143.

231. RAN Limei, FAN Xu, ZHAO Hepeng, et al, Flash extraction process of seabuckthorn total flavonoids and its antioxidant activity, Cereals & Oils, 2023, 36 (01): 110-114.

231 冉丽梅 ; 樊旭 ; 赵鹤鹏 ; 等 , 闪式提取沙棘总黄酮工艺及其抗氧化活性研究 [J], 粮食与油脂 ,2023,36(01):110-114.

232. QIAN Wenjing, HUANG Yincho, WANG Xianliu, et al, The feeding value of seabuckthorn stems was improved by steam explosion processing and alkaline storage, Feed Industry, 2023, 44 (01): 18-24.

232 钱文静 ; 黄引超 ; 王先柳 ; 等 , 汽爆加工与碱化贮存提高沙棘枝干的饲用价值 [J]. 饲料工业 ,2023,44(01):18-24.

233. XIE Jingyan, HE Xiaohui, ZHU Li, et al, Potential Geographical Distribution of seabuckthorn (ssp. Yunnanensis) in China under climate change, Protective Forest Science and Technology, 2023, (01): 24-29.

233 谢婧妍 ; 贺晓慧 ; 朱丽 ; 等 , 气候变化背景下云南沙棘在中国的潜在地理分布 [J], 防护林科技 ,2023,(01):24-29.

234. XU Dawei, DIAO Yuling, HUI Lei, et al, Anti-tumor Effects of seabuckthorn polysaccharides on glioma rats and its impact on HMGB1, MGMT, and TLR4 expression, Journal of Chinese Integrative Medicine on Cardio-Cerebrovascular Diseases, 2023, 21 (01): 51-56.

234 徐大伟 ; 刁玉领 ; 惠磊 ; 等 , 沙棘多糖对脑胶质瘤大鼠的抑瘤作用及对 HMGB1、MGMT 及 TLR4 表达的影响 [J], 中西医结合心脑血管病杂志 ,2023,21(01):51-56.

235. LI Xiangyan, TANG Jinfeng, GUO Minmin, et al, Research progress on seabuckthorn leaf polyphenols, Shandong Chemical Industry, 2023, 52 (01): 65-67.

235 黎祥研 ; 唐金凤 ; 郭敏敏 ; 等 , 沙棘叶多酚研究进展 [J], 山东化工 ,2023,52(01):65-67.

236. ZHANg Jinshan, YANG Shihan, YANG Hong, et al, Antibacterial activity of three flavonoid compounds from Yunnan seabuckthorn fruits, Science and Technology of Food Industry, 2023, 44 (15): 78-84.

236 张金山 ; 杨诗涵 ; 杨红 ; 等 , 云南沙棘果实 3 种黄酮类化合物的抑菌活性 [J], 食品工业科技 ,2023,44(15):78-84.

237. FENG Jingjing, GUO Jianfeng, MA Xinru, et al, Effect of ultra-micro grinding on particle structure and physicochemical properties of seabuckthorn tea powder, Food and Fermentation Industries, 2023, 49(07): 198-204.

237 冯晶晶 ; 郭建峰 ; 马心茹 ; 等 , 超微粉碎对沙棘茶粉颗粒结构及理化特性的影响 [J], 食品与发酵工业 ,2023,49(07):198-204.

238. ZHAO Zhiqiang, ZHU Xucheng, FENG Zhenying, et al, Physicochemical characteristics and in vitro antioxidant activity of seabuckthorn fruit polysaccharides, Science and Technology of Food Industry, 2023, 44(13): 30-38.

238 赵志强 ; 朱叙丞 ; 冯真颖 ; 等 , 沙棘果多糖的理化特征及其体外抗氧化活性 [J],. 食品工业科技 ,2023,44(13):30−38.

239. MAO Xinliang, WANG Jing, ZHOU Ming, et al, Screening of lactic acid bacteria and optimization of fermentation process of seabuckthorn raw juice, Modern Food Science and Technology, 2023, 39 (09): 106-112.

239 毛新亮 ; 王憬 ; 周明 ; 等 , 发酵沙棘原果汁的乳酸菌筛选及工艺优化 [J], 现代食品科技 ,2023,39(09):106−112.

240. YANG Bingkun, JU Ning, DING Yuhong, et al, GC-IMS characterization of volatile flavor compounds in seabuckthorn yogurt, Science and Technology of Food Industry, 2023, 44 (13): 308-315.

240 杨秉坤 ; 剧柠 ; 丁雨红 ; 等 , 沙棘酸奶挥发性风味物质的 GC−IMS 表征 [J], 食品工业科技 ,2023,44(13):308−315.

241. WANG Zhuangzhuang, ZHU Shiying, HE Kai, et al, Community characteristics and influencing factors of macrosoil fauna in seabuckthorn forest in Nienchu River Basin, Tibet, Journal of Sichuan Agricultural University, 2023, 41 (01): 101-110.

241 王壮壮 ; 朱时应 ; 贺凯 ; 等 , 西藏年楚河流域沙棘林大型土壤动物群落特征及其影响因素 [J], 四川农业大学学报 ,2023,41(01):101−110.

242. ZHENGg Yurong, CHEN Long, WANG Xiao, et al, Protective effect of anthocyanin extracts of seabuckthorn on H1299 cell damage induced by hydrogen oxygen and effect of Nrf2/HO-1 pathway, Science and Technology of Food Industry, 2023, 44 (06): 396-404.

242 郑玉荣 ; 陈龙 ; 王晓 ; 等 , 沙棘花青素提取物对双氧水诱导的 H1299 细胞损伤的保护作用及 Nrf2/HO−1 通路的影响 [J], 食品工业科技 ,2023,44(06):396−404.

243. DING Jian, RUAN Chengjiang, YANG Hong, et al, Analysis of the variation in bio-active components during seabuckthorn fruit maturation using UPLC-MS technology, Food Science, 2023, 44 (22): 276-286.

243 丁健 ; 阮成江 ; 杨红 ; 等 , 基于 UPLC−MS 技术分析沙棘果肉成熟过程中生物活性成分差异 [J], 食品科学 ,2023,44(22):276−286.

244. WANG Xianliu, HUANG Yinch, QIAN Wenjing, et al, Evaluation of steam explosion processing effect of seabuckthorn stems, Journal of Chinese Animal Science, 2023, 59 (03): 234-239.

244 王先柳 ; 黄引超 ; 钱文静 ; 等 , 沙棘枝干汽爆加工效果评价 [J], 中国畜牧杂志 ,2023,59(03):234−239.

245. WANG Yuanyuan, HAO Jingrong, YAN Siying, et al, Preparation process optimization and quality analysis of freeze-dried seabuckthorn powder effervescent tablets, Science and Technology of Food Industry, 2023, 44(10): 235-241.

245 王媛媛 ; 郝璟嵘 ; 闫思颖 ; 等 , 沙棘冻干粉泡腾片的制备工艺优化及其品质分析 [J], 食品工业科技 ,2023,44(10):235−241.

246. WANG Lin, LIHaibo, CHEN Hanxin, et al,Effects of altitude on water-carbon metabolism and growth of seabuckthorn in China: A Case Study in Guandi Mountain Area, Acta Ecologica Sinica, 2023, 43 (05): 1995-2004.

246 王林 ; 李海波 ; 陈汉鑫 ; 等 , 海拔高度对中国沙棘水碳代谢和生长的影响——以关帝山区为例 [J], 生态学报 ,2023,43(05):1995−2004.

247. BO Yongming, WANG Lijie, JIAN Shengqi, Changes of SAP flow of caragana and seabuckthorn in hilly and gully area of Loess Plateau, Acta Ecologica Sinica, 2023, 43 (04): 1553-1562.

247 孛永明 ; 王丽洁 ; 荐圣淇 , 黄土高原丘陵沟壑区柠条和沙棘树干液流的变化特征 [J, 生态学报 ,2023,43(04):1553−1562.

248. YANG Xingjing, IUu Yanru, TANG Zhishu, et al, Rapid determination of 10 mycotoxins in seabuckthorn and food products by ultra-high performance liquid chromatography-tandem mass spectrometry, Journal of Chinese Materia Medica, 2023, 48 (02): 366-373.

248 杨兴晶 ; 刘妍如 ; 唐志书 ; 等 , 超高效液相色谱 − 串联质谱法快速测定沙棘药材及食品制品中 10 种真菌毒素 [J], 中国中药杂志 ,2023,48(02):366−373.

249. WANG Bo, XU Xin, CHEN Yanping, et al, Clinical exploration of seabuckthorn and astragalus granules in treating COVID-19 infection recovery phase based on Swiss population characteristics, Journal of Liaoning University of Traditional Chinese Medicine, 2023, 25 (01): 5-8.

249 王波 ; 徐鑫 ; 陈艳萍 ; 等 , 基于瑞士人群体质特点应用沙棘参芪颗粒加减治疗新型冠状病毒感染恢复期临证探析 [J], 辽宁中医药大学学报 ,2023,25(01):5−8.

250. QIN Nan, WANg Huimin, YANG Jinmei, et al, Effect of complex seabuckthorn stock liquid on lipid-lowering in hyperlipidemia rats, Science and Technology of Food Industry, 2023, 44 (07): 352-358.

250 秦楠 ; 王辉敏 ; 杨金梅 ; 等 , 复合沙棘原液对高脂血症大鼠的降脂作用 [J], 食品工业科技 ,2023,44(07):352−358.

251. YAN Changyu, DING Zhaojun, LI Xiaomin,

251 闫昌誉 ; 丁肇俊 ; 李晓敏 ; 等 , 沙棘叶醇

et al, Study on chemical constituents and hypoglycemic activity of alcohol extracts from seabuckthorn leaves, Acta Pharmaceutica Sinica, 2023, 58(02): 396-404.

提物的化学成分与降糖活性研究 [J], 药学学报 ,2023,58(02):396-404.

252. KOU Jing, SHI Linna, ZHANG Yimin, et al, Effects of seabuckthorn fermented tea on blood lipids and gut microbiota in high-fat diet rats, Food and Fermentation Industries, 2023, 49(09): 49-56.

252 寇静 ; 史琳娜 ; 张怡敏 ; 等 , 沙棘发酵茶对高脂饮食大鼠血脂和肠道菌群的影响 [J], 食品与发酵工业 ,2023,49(09):49-56.

253. SUN Yue, ZHANG Wenlong, LI Nan, et al, Effect of ursolic acid on FXR signaling pathway in liver of alcohol-induced liver injury rats, Science and Technology of Food Industry, 2023, 44 (05): 363-370.

253 孙悦 ; 张文龙 ; 李楠 ; 等 , 沙棘熊果酸对酒精性肝损伤大鼠肝 FXR 信号通路的影响 [J], 食品工业科技 ,2023,44(05):363-370.

254. JIA Xinyu, DONG Baozhu, MENG Huanwen, et al, Identification and biological characteristics of seabuckthorn sphaerospora desiccata, Acta Phytopathologica Sinica, 2023, 53 (03): 522-526.

254 贾鑫宇 ; 东保柱 ; 孟焕文 ; 等 , 沙棘干腐病菌的鉴定及其生物学特性 [J], 植物病理学报 ,2023,53(03):522-526.

255. FANG Ling, LIN Yuhu, HE Yunxiao, et al, Physiological response characteristics of male and female seabuckthorn seedlings under interactive treatment of manganese stress and sex competition, Guangxi Botany, 2023, 43 (06): 1105-1113.

255 方玲 ; 林玉虎 ; 何云晓 ; 等 , 锰胁迫和性别竞争交互处理下沙棘雌雄幼苗生理响应特征 [J], 广西植物 ,2023,43(06):1105-1113.

256. WANg Meng, WANG Zichun, HUANG Jingmei, et al, Progress in extraction, purification, and functional activity of seabuckthorn flavonoids, Science and Technology of Food Industry, 2023, 44 (02): 487-496..

256 王萌 ; 王子纯 ; 黄京美 ; 等 , 沙棘黄酮类物质提取纯化及功能活性研究进展 [J], 食品工业科技 ,2023,44(02):487-496.

257. NIU Zihan, YU Yang, AI Jiang, et al, Intervention of total flavonoids from seabuckthorn on the regression of proliferative scar tissue in rabbit ears, Journal of Chinese Tissue Engineering Research, 2023, 27 (02): 258-263.

257 牛梓晗 ; 余扬 ; 艾江 ; 等 , 沙棘总黄酮干预兔耳增生性瘢痕组织块的消退 [J], 中国组织工程研究 ,2023,27(02):258-263.

258. REN Shuning, SONG Yongcheng, LI Yuan, et al, Effect of ultra-high pressure and heat treatment on the quality of seabuckthorn and hamtaloupe complex juice, Food and Fermentation Industries, 2023, 49 (02): 195-201.

258 任书凝 ; 宋永程 ; 李缘 ; 等 , 超高压和热处理对沙棘 – 哈密瓜复合果汁品质的影响 [J], 食品与发酵工业 ,2023,49(02):195–201.

259. YANG Ni, LI Ying, ZHU Jiawen, et al, Effects of different doses of wolf-berry seabuckthorn on immune function in mice, Food and Fermentation Industries, 2023, 49(02): 159-165.

259 杨妮 ; 李莹 ; 朱嘉文 ; 等 , 不同剂量的枸杞沙棘配伍对小鼠免疫功能的影响 [J], 食品与发酵工业 ,2023,49(02):159–165.

260. WU Haili, DU Jinna, LU Yangyang, et al, Isolation, purification, and activity analysis of seabuckthorn leaf polyphenols, Journal of Shanxi University(Natural Science Edition), 2023, 46 (01): 236-243.

260 武海丽 ; 杜锦娥 ; 路洋洋 ; 等 , 沙棘叶多酚的分离纯化及其活性分析 [J], 山西大学学报 (自然科学版),2023,46(01):236–243.

261. LI Anna, LI He, CHEN Siyu, et al, Cloning and bioinformatics analysis of seabuckthorn PEPCK gene, Molecular Plant Breeding, 2023, 21 (08): 2591-2597.

261 李安娜 ; 李贺 ; 陈思羽 ; 等 , 沙棘 PEPCK 基因的克隆与生物信息学分析 [J], 分子植物育种 ,2023,21(08):2591–2597.

262. LIU Wei, ZHOU Longfei, LI Hui, et al, Extraction and determination of triterpene acids in seabuckthorn, Chinese Journal of Bioprocess Engineering, 2023, 21 (01): 50-56

262 刘伟 ; 周龙飞 ; 李会 ; 等 , 沙棘中三萜酸物质的提取及含量测定 [J], 生物加工过程 ,2023,21(01):50–56.

263. CHEN Xiaona, ZHAO Naqi, HAI Lu, et al, Evaluation on ecological adaptability of superior individual progeny of Mongolic-Chinese hybrid seabuckthorn [J], Journal of Temperate Forestry Research, 2023, 6(04): 15-20.

263 陈晓娜 , 赵纳祺 , 海鹭 , 等 . 蒙中杂交沙棘子代优良单株生态适应性评价 [J]. 温带林业研究 ,2023,6(04):15–20.

264. YIN Hongyao, Development status and countermeasure analysis of seabuckthorn industry in Inner Mongolia-Based on SWOT analysis Method, Modern Business Trade Industry, 2023, 44 (04): 22-24.

264 尹宏瑶 , 内蒙古沙棘产业发展现状及对策分析——基于 SWOT 分析法 [J], 现代商贸工业 ,2023,44(04):22–24.

2. Country Report of France

法国沙棘发展报告

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Seabuckthorn Development of France in 2023
2023 法国沙棘发展报告

This article traces the evolution of sea buckthorn in France and growing adoption in various sectors.

Sea buckthorn, or *Hippophae rhamnoides*, even if still quite confidential, has gained undeniable popularity due to its many health properties. Also known as "thorny willow" or "Siberian pineapple", it is a plant with multiple virtues, native to Eurasia and spontaneously present in France. The plant has gained more popularity in recent decades , because of its many ecological, economic and nutritional benefits.

Both *Hippophae rhamnoides rhamnoides* and *Hippophae rhamnoides sub fluviatilis* are spontaneously present in France. For the first one, it's area of repartition goes from south of region, Bretagne to region, Picardie in the North, to Belgium, and so on, where it grows in sand dunes and sea sides. The largest population we have observed, of *Hippophae rhamnoides rhamnoides*, for now, is located in Baie de Somme region Picardie in the North. (cf Photo)

As *Hippophae sub fluviatilis*, argousier des fleuves in French, it will be found spontaneously in mountainous areas such as the Alps, where a few orchards can be found.Here are the latest observations about our experimental sea buckthorn orchard. This plant that is, both resilient and prodigious, and whose fruits are gaining popularity, for their nutritional and medicinal virtues.

本文追溯了沙棘在法国的发展演变以及在各个领域的日益普及。

沙棘，拉丁文为 *Hippophae rhamnoides*，即使仍然非常神秘，也因其许多健康特性而获得了不可否认的欢迎。它也被称为“带刺柳树”或“西伯利亚菠萝”，是一种具有多种优点的植物，原产于欧亚大陆，在法国自然生长。近几十年来，这种植物因其许多生态、经济和营养效益而越来越受欢迎。

鼠李沙棘和溪生沙棘亚种在法国都是天然存在的。对于第一个，它的重新划分区域从布列塔尼地区的南部到北部的皮卡第地区，再到比利时等等，它生长在沙丘和海边。目前，我们观察到的最大种群，即鼠李沙棘，位于北部皮卡第的 Baie de Somme 地区（见照片）。

作为溪生沙棘亚种 *Hippophae sub-fluviatilis*，法语中的 argousier des fleuves，它可以在阿尔卑斯山等山区找到，那里有一些种植园。以下是对我们实验沙棘园的最新观察。这种植物既坚韧又奇妙，其果实因其营养和药用价值而越来越受欢迎。

I am delighted to announce that our test orchard is doing good. Most of he shrubs, have shown good overall health , are robust and vigorous, and have crossed the seasons with remarkable resilience. Even if as for all orchards, some plants did not survive transplantation.

In spring, flowering was abundant, and will be followed by generous fruiting, testifying to the flourishing health of our plants. The berries are currently ripening and promise a harvest rich in essential nutrients and antioxidant properties.

Sea buckthorn was tested in France mainly in the 1950s and 1960s, for the purpose of soil stabilization and reforestation. Its ability to adapt to poor soil conditions and resist erosion made it an ideal candidate to combat land degradation, especially in mountainous and coastal regions.

It first became known for its ecological properties. As a nitrogen-fixing plant, it enriches the soil and promotes biodiversity. (cf photo of SBT in educational orchard in Ares, Region Gironde) Planting initiatives have been carried out in various regions of France, including the Alps and the Atlantic coast, to prevent erosion and rehabilitate degraded soils.

我很高兴地宣布，我们的试验果园表现良好。大多数灌木整体健康状况良好，健壮有力，四季适应性强。即使对于所有的果园来说，有些植株也没有在移植中存活下来。

春天，花朵盛开，随后将结出丰硕的果实，这反映了我们的植物茁壮成长。浆果目前正在成熟，有望收获富含必需营养和抗氧化特性的果实。

法国主要在 20 世纪 50 年代和 60 年代对沙棘进行了测试，目的是稳定土壤和重新造林。它适应恶劣土壤条件和抵抗侵蚀的能力使其成为防治土地退化的理想候选者，特别是在山区和沿海地区。

它最初因其生态特性而闻名。作为一种固氮植物，它丰富了土壤，促进了生物多样性。（参见吉伦特地区阿瑞斯教育果园中的沙棘照片）法国各地区，包括阿尔卑斯山和大西洋沿岸，都开展了种植活动，以防止侵蚀和恢复退化的土壤。

Agronomy Bulletin: Sea Buckthorn in Our Experimental Orchard

农学公报：我们实验果园中的沙棘

Introduction

Sea buckthorn, or *Hippophae rhamnoides*, is an increasingly popular plant for its exceptional properties and diverse uses, ranging from medicine to food. As a passionate horticulturist, I am glad to share the latest news about our experimental sea buckthorn orchard. While the results on the ground are encouraging, it is regrettable that there have been no major recent developments in cultivation or research on this plant.

导言

沙棘，拉丁文 *Hippophae rhamnoides*，因其独特的特性和从医药到食品的多种用途而越来越受欢迎。作为一名充满热情的园艺家，我很高兴与大家分享我们实验沙棘园的最新消息。虽然实地的结果令人鼓舞，但令人遗憾的是，最近在这种植物的种植或研究方面没有取得重大进展。

Observations on Growth

Sea buckthorn, known for its ability to thrive in poor and well-drained soils, has fully met our expectations. Robust root systems contribute to the improvement of soil structure and the prevention of erosion, thus offering significant ecological benefits. However, despite these successes, the lack of innovations and new cultivation methods remains worrying.

植物增长观察

沙棘以在贫瘠和排水良好的土壤中茁壮成长而闻名，完全符合我们的期望。强健的根系有助于改善土壤结构和防止侵蚀，从而带来显著的生态效益。然而，尽管取得了这些成功，但缺乏创新和新的种植方法仍然令人担忧。

Health and vigour of the Orchard

Our sea buckthorn orchard is doing well. The plants, mostly introduced 5 years ago, and each year, show an excellent adaptation to local conditions. Growth is vigourous, with green and healthy leaves and abundant flowering. Fruits, rich in vitamin C, antioxidants and essential fatty acids, continue to impress with their quality.

We have observed significant resilience to common pests and diseases, a major asset for future crops.

果园的健康和活力

我们的沙棘园经营得很好。这些植物大多是 5 年前引进的，每年都能很好地适应当地条件。生长旺盛，叶子绿色健康，花朵繁茂。水果富含维生素 C、抗氧化剂和必需脂肪酸，其品质继续给人留下深刻印象。

我们观察到，对常见病虫害的抵御能力很强，

However, despite this apparent success on the ground, I must unfortunately note that there have been few major developments in the cultivation or research on sea buckthorn. Cultivation techniques remain unchanged, and scientific advances specific to the improvement of this species have remained limited.

这是未来作物的主要资产。然而，尽管在实地取得了明显的成功，但我必须遗憾地指出，在沙棘的种植或研究方面几乎没有取得重大进展。栽培技术保持不变，针对该物种改良的科学进展仍然有限。

We continue to use the same cultural practices, based on empirical experience and traditional knowledge, without significant innovations or recent technological breakthroughs. This lack of progress is regrettable, especially since sea buckthorn has enormous potential, both agronomically and economically.

我们继续使用基于经验和传统知识的相同文化实践，没有重大创新或最近的技术突破。这种缺乏进展的情况令人遗憾，特别是由于沙棘在农学和经济上都有巨大的潜力。

Its ability to adapt to various soils and climates, as well as its benefits for human health, should encourage increased investment in research and development. Unfortunately, the attention of researchers and institutions is still too often focused on other cultures considered more priority or lucrative.

它适应各种土壤和气候的能力，以及对人类健康的益处，应鼓励增加对研发的投资。不幸的是，研究人员和机构的注意力仍然过于关注其他被认为优先及级更高或更有利可图的方向。

In conclusion, our sea buckthorn orchard prospers and continues to demonstrate the tremendous capabilities of this exceptional plant. Let's hope that the next few years will see a renewed interest in this promising culture and that together we will be able to push the boundaries of our knowledge and know-how in the cultivation of Hippophae rhamnoides.

总之，我们的沙棘园蓬勃发展，并继续展示这种特殊植物的巨大潜力。希望在接下来的几年里，人们可以对这种有前景的文化重拾兴趣并共同推动我们在沙棘种植方面的知识和专有技术的发展。

Our sea buckthorn orchard is healthy and continues to demonstrate the incredible potential of this plant. However, to maximise the agricultural and ecological benefits of sea buckthorn, a renewal of research efforts is essential. The opportunities offered by sea buckthorn deserve increased attention from the scientific community and horticulturists. In the meantime, we continue our work with passion, convinced that the future of this culture still promises beautiful discoveries.

我们的沙棘园十分健康，并继续展示这种植物的巨大潜力。然而，为了最大限度地发挥沙棘的农业和生态效益，必须重新开展研究工作。沙棘提供的机会值得科学界和园艺学家给予更多关注。与此同时，我们将继续满怀激情地工作，相信在未来仍然会有美好的发现。

To fully exploit its potential and promote its development on a larger scale, it is imperative that the scientific community and agricultural professionals engage more in research and innovation around sea buckthorn. Let's hope that the next few years will see a renewed interest in this promising culture and that together we will be able to push the boundaries of our knowledge and know-how in the cultivation of Hippophae rhamnoides.

为了充分挖掘其潜力，促进其更大规模的发展，科学界和农业专业人员必须更多地参与沙棘的研究和创新。希望在接下来的几年里，人们可以对这种有前景的文化重拾兴趣并共同推动我们在沙棘种植方面的知识和专有技术的发展。

I invite researchers and agricultural professionals to join forces to explore new avenues in sea buckthorn culture. Together, we can overcome the current challenges and make this plant a pillar of modern horticulture.

我邀请研究人员和农业专业人士共同探索沙棘文化的新道路。我们可以共同克服当前的挑战，使这种植物成为现代园艺的支柱。

（中英文翻译：卢智超 English- Chinese translated by LU Zhichao）

SBT ochard /photo#1
照片 1：沙棘果园

SBT orchard /photo #2
照片 2：沙棘果园

SBT wild sort / Breizh, France/photo #3
照片 3：位于法国 Breizh 的野生沙棘类型

sbt wild sort/photo #4
照片 4：野生沙棘类型

SBT wild form / photo #5
照片 5：野生沙棘类型

SBT variety test, orange energie / Habego SBT/ photo #6
照片 6：沙棘品种试验 orange energie / Habego SBT

3. Country Report of Germany

德国沙棘发展报告

Drafted by:

PD Dr. Jörg Thomas Mörsel Präsident des Sanddorn e. V.

撰稿人：

Jörg Thomas Mörsel 博士、德国沙棘协会主席

Annual report of Germany in 2023
General situation when growing Seabuckthorn
2023 年德国沙棘发展年度报告

Weather conditions and climate changes in 2023 had less impact on seabuckthorn cultivation compared to previous years. In 2023, the acreage in Germany was stable compared to the years before. At the same time, we had to contend with significant influences from climatic changes in the conditions in the plantations. From the 2018th and 2019th we had to live with a significant lower amounts of precipitation on the one hand and up to 15% more hours of sunshine on the other. Winter were warmer than in years before. Sometimes we didn't have periods with frost. Resulting from this environmental situation the plant systems of SBT were subject to considerable stress. As a result we have considerable lost of plant exceeding the usual amount of less the 5% in plantations what is under normal conditions the average. The dying seabuckthorn populations occur not only in plantations, but also in wild populations on the coast. It is observed in different areas in Germany but mostly in the north- eastern part near the coastline of Baltic coast. On the other hand, there are also regions where no losses are observed. The effect is subject of scientific joint projects that are still going on and has been prolonged until end 2024. Results will be presented within the report 2024. Consultation with Polish Growers and scientists (Prof. Stanislaw Pluta, Mr Trzonkowski) shows that it seems to be a local problem and not belonging to other areas along Baltic sea. This dying of SBT plants cannot be explained by conditions of the location or the varieties. It seems to be a combination of different reasons. The Hergo variety is particularly affected, whereas the Leikora variety is less affected. This is the same as we already reported years ago. In the discussion about reasons we see different possible reasons:

与前几年相比，2023 年的天气条件和气候变化对沙棘种植的影响较小。2023 年，德国的种植面积与前几年相比保持稳定。与此同时，我们不得不应对种植园区气候变化的重大影响。在 2018 年和 2019 年，我们不得不面对降水量显著减少、日照时间增加 15%。冬天比往年更暖和，有时我们没有经历有霜期。由于这种环境条件，沙棘植物系统受到了相当大的胁迫。因此，我们有相当多的植株损失，明显超过正常情况下种植园平均 5% 的死亡率。濒临死亡的沙棘种群不仅出现在种植园中，也出现在沿海的野生种群中。这一现象发生在德国的不同地区，但主要在靠近波罗的海沿岸的北部。另一方面，也有一些地区没有观察到损失。这种影响是科学联合项目的主题，这些项目仍在进行中，并已延长至 2024 年底。研究结果将在 2024 年的报告中公布。经过咨询波兰种植者和科学家（Stanislaw Pluta 教授、Trzonkowski 先生），这似乎是一个局部问题，不涉及波罗的海沿岸的其他地区。这一沙棘植物死亡现象不能用种植区地区环境条件或品种差异来解释，这似乎是不同因素的组合。Hergo 沙棘品种受影响尤其严重，而 Leikora 品种受影响较小。这和我们几年前报道的一样。关于原因讨论，我们分析有以下可能的原因：

- genetical age of plants
- diseases (viral as well as bacterial)
- dry climate (water stress)
- warm winter – sometimes no frost during wintertime
- missing dormancy resulting from missing frost
- non optimal management of plantation in compared to time before

- 沙棘植株的遗传年龄
- 病害（病毒性的细菌性）
- 干旱气候（水胁迫）
- 暖冬，有时冬天无霜
- 由于冬季无霜导致的休眠缺失
- 与以前相比，缺乏优化的种植园管理

Mostly all results indicates that plant diseases seems not to be the reason. No special bactera or viruses have be found until now. However, there are also inland plantations, i.e. not near the Baltic Sea, where such observations can be made. Detailed observation showed that plantations were partly irrigated, but partly operated without and there was no direct correlation. So a direct correlation to the water supply cannot be determined directly. As a consequence we lost one complete plantation of about 50 ha with more than 80% died plants.

大多数结果表明，植物病害似乎不是原因。到目前为止，还没有发现特殊的细菌或病毒。然而，也有内陆种植园，即不靠近波罗的海地区也发生这一现象。详细观察表明，种植园部分灌溉与部分不灌溉没有直接相关性。因此，不能明确与供水的直接关系。为此，我们完全损失一个约 50 公顷的沙棘种植园，超过 80% 的植株死亡。

The observation of faded berries (already mentioned in the past) was observed only in small percentage of the total plantes plantations area. The fact that the berries on the sunny side show clear traces of fading of color is in our explanation also a result of higher light radiation.

过去已经提到过的沙棘果褪色的观察仅发现于种植园总面积的一小部分区域中。我们解释为，阳光一侧的沙棘浆果显示出明显的褪色痕迹这一事实也是较高光辐射的结果。

In winter 2022/2023 as well as in the year before we had periods with frost. We observe actually in 2024 a reducing mortality of SBT plants. In summary, it can be stated that the phenomenon of dying sea buckthorn populations cannot be reduced to a single influencing factor. A joined project of several institutes focus on several strategies to locate the reason. Microbiological, genetical, technological are included. We are waiting for results in end of 2024.

在 2022/2023 年冬季以及前一年，我们经历了霜冻期。实际上，我们在观察到 2024 年沙棘植物的死亡率下降。综上所述，沙棘种群死亡的现象不能归结为单一因素影响。为集中应对上述战略问题，几个机构联合开展了一个研究项目，涉及微生物学、遗传学和技术学。我们正在等待 2024 年底的研究成果。

1 Research work 关于研究性工作

The main research focus was on horticulture. As described above, an attempt was made to determine the causes of the death of Seabuckthorn plants. Beside this the question of plant diseases took an essential role. In two projects the infestation with bacteria and possibly viruses was taken into account. Final results are still not available. There is also no correlation to the known problems (Verticillium).

In processing technology, research work focuses on the used of waste and by-products in the production of Seabuckthorn juice. One actual question is the use of leaves for tea production. It is not finally decided weather this is to be registered as a novel food or not. Data situation is difficult.

The use of pomace for extraction of valuable substances is still of interest. There are different directions of research. For example, the development of tea or the utilization of extracts from leaves should be a possible option. The novel food legislation in EC in this case seems to be one main hindering circumstance as a possibly resulting approval procedure is time and money consuming. Such procedures are usually not affordable for small businesses. That is a certain barrier. In the case of tea, the problem is simple, as it is now recognized that Seabuckthorn already has been used in the past to make tea. There are also enough sources showing use in human nutrition in other non-EC countries. Extracts from leaves, expeller of seed processing of seabuckthorn are, however, a little more difficult to classify.

Medical studies on the effects of Seabuckthorn products, extracts and other products that can be produced on the basis of Seabuckthorn have only been carried out to a limited extent.

主要的研究重点是沙棘园艺栽培。如上所述，我们希望确定沙棘植物死亡的原因。除此之外，植株病害问题也至关重要。在两个项目中，都考虑到了细菌和可能的病毒感染，目前还没有最终的结果。这与已知的问题（枯萎病 Verticillium）也没有关联。

在加工技术方面，研究工作集中在沙棘汁加工中产生的废物和副产品的利用。一个实际的问题是利用沙棘叶生产加工沙棘茶叶。目前的基础数据还很缺乏，我们还没有最终决定是否要注册为一种新食品。

使用沙棘果渣来提取有价值的物质仍然是一个有趣的问题，这里有不同的研究方向。例如，直接开发茶叶，或从沙棘叶提取有效成分，应该是一种可能的选择。在这种情况下，欧盟的新食品立法似乎是一个主要的障碍，因为其批准程序很消耗时间和金钱，对小企业来说通常负担不起的，这是个具体的障碍。就茶而言，问题要简单一些，因为现在人们认识到，历史上沙棘在已经被用来制茶了。在其他非欧共体国家，也有足够的资料来源表明沙棘在人类营养应用。然而，沙棘种子加工和沙棘叶提取物的分类却比较困难。

目前，以沙棘医学疗效研究为基础生产沙棘产品、提取物和其他等产品所开展的工作还十分

Last year, further studies were carried out on the in-vitro propagation of seabuckthorn. The aim was to achieve virus-free production of plants. Plants of the Hergo and Leikora varieties were successfully propagated, rooted and released into the wild. The starting material was branch buds (root myrist cemes are not suitable due to the germ contamination, leaf tips produce plants of both sexes). We expect the first berries in 2024 in order to continue analytical work.

有限。我们在去年对沙棘的体外繁殖进行了进一步的研究，目的是实现植物的无病毒生产。Hergo 和 Leikora 品种的植物成功繁殖、生根并移植到野外。初始材料是分枝芽（由于细菌污染，肉豆蔻根不适合，叶尖产生两性植物）。我们预计 2024 年得到第一批沙棘果实，以便继续进行后续分析工作。

2 Situation in cultivation 栽培现状

The of harvested Seabuckthorn has to be divided divided into wild stocks and plantations. The wild stocks are mainly found on the coasts of the North Sea and the Baltic Sea (on the coast line and on the islands.. They cover around 100-200 ha. The population along the coasts of North Sea has not been influenced by the problems with mortality. Other the situation along the Baltic Sea coastline. Of course, large amounts of only thinly planted areas must be taken into account.

德国可采收的沙棘分为野生种群和人工沙棘种植园。野生种群主要分布在北海和波罗的海海岸（在海岸线上和在岛屿上），总面积约为 100–200 公顷。北海沿岸的人口没有受到死亡问题的影响，波罗的海海岸线也有类似情况。当然，一大部分属于是稀疏分布的林地。

Since these stocks are used, among other things, to stabilize the dunes on the coast,they are subject to special protection. Not all of these areas can be harvested. Thus the use of cutting technology is only possible to a very limited extent. Plantation facilities are currently around 800 ha in Germany. The areas are slowly but steadily increasing. Due to the problems with the death of Seabuckthorn plants in the last year the number of newly planted fields has been somewhat reduced. Farmers are insure weather to plant or not. The annual increase should be in the order of 50-100 ha in 2023. A lot of planting material was needed to reforest damaged plantations. It should be noted that in principle there is no statistical recording of the plantations planted with Seabuckthorn. Such areas are only recorded when farmers access public subsidies. As a result, it is not possible to make a final statement about how much area is actually built on with Seabuckthorn.

由于这些种群除了其他用途外，主要用于稳定海岸沙丘，它们受到特殊的保护，并不是所有的野生沙棘林都可以采收。因此，沙棘剪枝采收只能限定在非常有限的范围内。目前，德国的沙棘种植园面积约为 800 公顷，目前在缓慢而稳步地增长。由于去年沙棘植株死亡影响，新种植的面积有所减少，农民对发展沙棘种植园犹豫不决。到 2023 年，年增幅应为 50–100 公顷。需要注意的是，原则上我们还没有沙棘种植园的统计记录，只有那些获得公共补贴的沙棘种植户才会有记录。因此，我们还无法明确实际的最终沙棘种植面积。

3 Use of Seabuckthorn 沙棘加工利用

The processing capacities have grown further and doubled compared to 2018. Actually there is an imbalance between selling juice and selling oil when there is an excess of oil. Such fluctuations are not new to us and usually changes shortly. About 40% of the processed quantities of Seabuckthorn come from Germany, the rest of the amount is purchased internationally. The main supplier countries are Romania, Hungary, the Czech Republic and the Baltic states. In addition, purchases are made from Asian countries, for example Mongolia. There is actually no import of berries or juice directly from Russia. But nevertheless we observed imports over third countries.

There is practically no processing that uses only one component. As a rule, both the juice and the oil are primarily obtained. The remaining pomace is processed to a large extent and the seeds obtained are used for oil production. There are applications for the recycling of the shells or the press residues from the extraction of seed oil. However, these are only estimated for around a third of the biomass. The remaining residues are usually used to generate energy, i.e. sold to appropriate companies for the production of bio-gas.

Activity of the German Seabuckthorn Association
Our organization held various events in 2023. This also included very interesting lecture conferences dealing with Seabuckthorn as well as other wild plants. Greece conference as one of the highlights. We held special events for farmers to get the latest information. (as in many other areas of the world many growers does not speak foreign languages and we need to bring the news to them)
In addition, excursions were carried out. Some of our members have organized events themselves, including celebrations with high publicity and the like.

与 2018 年相比，加工能力进一步增长，增长了一倍。实际上，当沙棘油过剩时，沙棘果汁和沙棘油销售之间存在着不平衡。这种波动对我们来说并不新鲜，通常很快就会改变。沙棘加工的原料 40% 来自德国国内，其余来自国际购买，主要的供应国是罗马尼亚、匈牙利、捷克共和国和波罗的海国家。此外，也从亚洲国家采购，例如蒙古。实际上，德国虽然没有直接从俄罗斯进口沙棘果或果汁，但我们还是观察到了通过第三国的进口。

我们实际生产加工中，并不是只利用单一沙棘组份的。通常，沙棘果汁和油是主要的产品，剩余的果渣经过进一步加工，种子用于沙棘油提取，种子油提取压榨后的种皮或残渣还可循环利用。然而，这些利用估计只占约三分之一的生物量，剩余的残留物通常用于生产能源，即出售给某些公司用于生产沼气。

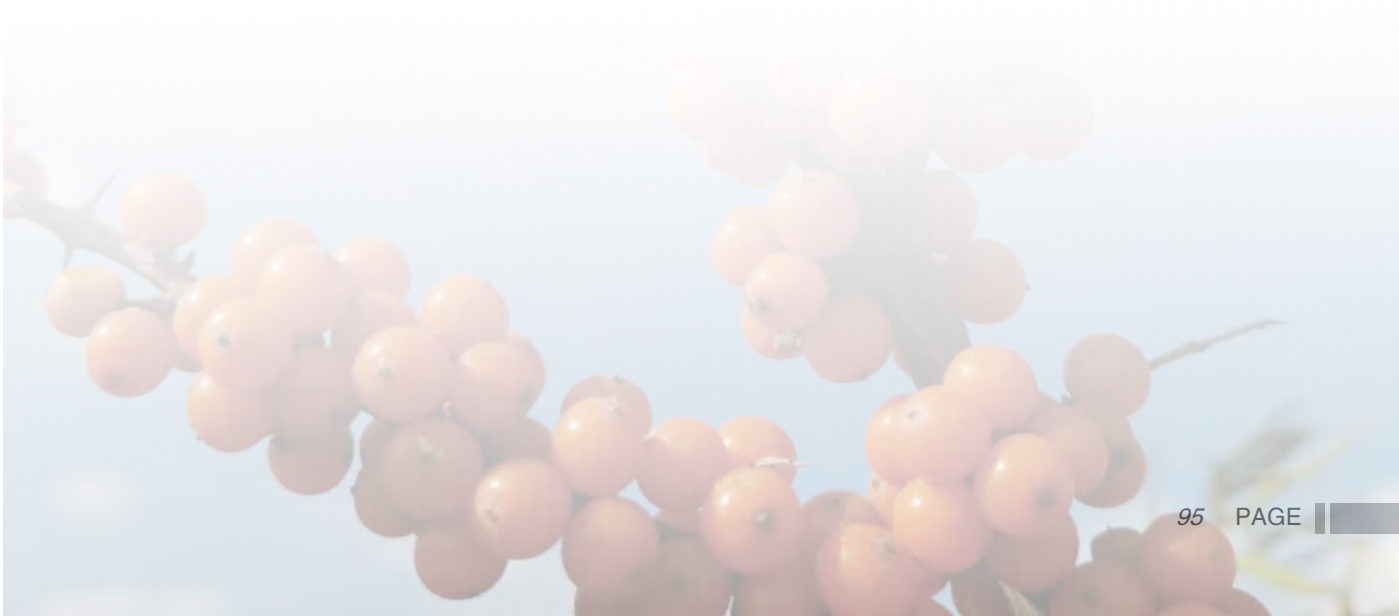
德国沙棘协会于 2023 年举办了一系列活动，包括关于沙棘和其他野生植物的非常有趣的学术会议和讲座。希腊会议是亮点之一。我们为种植者举办了特别活动，以获取最新信息。就像世界上许多其他地区一样，许多种植者不会说外语，我们需要把消息告诉他们。
此外，协会的一些成员自己也组织了活动，包括深度宣传的庆祝活动等。

4 Summary 总结

Overall, the development in the area of Seabuckthorn is steady and points in one direction of an increase in production and consumption. In our estimation, the development speed is in a normal range. There is no excessive growth associated with the risk of loss. The aim is to develop the product Seabuckthorn and all of its derivatives in a stable manner. Compared to other fruits, Seabuckthorn will remain a niche product here in the future. Even if it might be interesting at first glance to develop it into a mass-produced item, from the producers' point of view it is much more interesting, because it is more profitable, to produce niche products. Such products are rewarded with high prices in the market and are therefore economically interesting for both growers and processors. Seabuckthorn also plays an important role in Germany for agricultural businesses in what is known as the “sideline” . So these are crops that are not grown as the main task of agriculture. Some of these plantations are also operated by people who have completely different commissions in their main occupation. Nevertheless, the quantities produced on these areas are considerable.

总体而言，德国的沙棘开发稳步发展，沙棘产品生产和消费持续增长。据我们估计，沙棘开发速度是在一个正常的范围内，没有与损失风险相关的过度增长。我们的目标是以一种稳定的方式开发沙棘产品及其所有衍生物。与其他水果相比，沙棘在欧洲仍将是的一个小众产品。即使乍一看，把沙棘开发成一种规模化生产的产品可能会很有趣，但从生产商的角度来看，对沙棘会更有兴趣，因为生产小众而有特色的产品更有利可图。这类产品在市场上获得了高价格的回报，因此对种植者和加工者来说都是经济上有积极性的。沙棘尽管不是德国农业生产的主要栽培作物，它在德国的农业产业中也扮演着重要的角色，被称为“辅助性产业”。其中一些沙棘种植园由那些其主要职业有完全不同的人所经营。然而，其沙棘果实产量却相当可观。

（中文翻译：卢智超）



Participant to ISA2023 in Greece
希腊 ISA 2023 的会议代表

4. Country Report of India

印度沙棘发展报告

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Research and Development on Seabuckthorn of India in 2023

2023 年印度沙棘研究与开发

Research findings and Technologies 印度沙棘研究成果和技术

1.Application of seabuckthorn against periodontitis

1. 沙棘在牙周炎中的应用

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The aim of present study was to evaluate the effect of seabuckthorn (H. rhamnoides spp. turkestanica) (SBT) on clinical parameters (plaque index [PI], gingival bleeding index [GBI], pocket depth, clinical attachment level [CAL]) in periodontitis patients, evaluate the effect of SBT on microbiological parameters, i.e., anaerobic culture for Aa levels before and after nonsurgical therapy in chronic periodontitis patients and compare the efficacy of SBT as an adjunct to nonsurgical therapy and nonsurgical therapy alone on Aa. A total of 24 patients were randomly allocated to control group (12 patients) that underwent scaling and root planing (SRP alone) and test group (12 patients) that underwent SRP along with intrasulcular SBT thixotropic solution delivery as local drug delivery (SRP + SBT). Clinical and microbial parameters are assessed at baseline and after 1 month. SBT berries were obtained from Spiti Valley, Himachal Pradesh. An extract was prepared from these berries.

本研究旨在评估沙棘 (H. rhamnoides spp. turkestanica) (SBT) 对临床参数（牙菌斑指数 [PI]、牙龈出血）的影响，以及牙周炎患者的牙周指数 [GBI]、牙周袋深度、临床附着水平 [CAL]，SBT 对慢性牙周炎患者非手术治疗前后微生物学参数即厌氧培养 Aa 水平的影响，并比较 SBT 作为非手术治疗的辅助手段和单独非手术治疗对 Aa 的疗效。共 24 例患者随机分为对照组（12 例），接受洁治和根面平整术（单独 SRP）和测试组（12 例），接受 SRP 联合龈沟内 SBT 触变溶液输送作为局部给药（SRP+SBT）。在基线和 1 个月后评估临床和微生物参数。沙棘浆果来自喜马偕尔邦的斯皮提谷，这些浆果被提取制成了研究用的溶液。

Fig. 1. (a) Local drug delivery of seabuckthorn thixotropic solution, (b) periodontal pack placement.
图 1. (a) 沙棘触变溶液局部给药 , (b) 牙周填塞术

Fig. 2: Translucent colony of Aggregatibacter actinomycetemcomitans in TSBV agar medium.
图 2 TSBV 琼脂培养基中伴放线菌聚集杆菌

（Aggregatibacter actinomycetemcomitans, Aa）的半透明菌落

Screening of patients was done, and 30 patients were selected. The chosen subjects were randomly allocated to control group (Group 1) and test group (Group 2). Each group contained 15 subjects. Subgingival plaque samples were collected from all the subjects using a universal curette, followed by which the clinical parameters were recorded. Collected subgingival plaque samples were subjected to anaerobic culture to find the number of colonies of Aa. Subjects that showed no growth of Aa were excluded from the study. All the subjects from both the groups then underwent ultrasonic SRP, after which Group 2 (test group) underwent placement of the thixotropic solution of SBT berry in the region of the deepest pocket (Fig. 1) following which periodontal pack was placed. Every patient (Group 1 and Group 2) was given oral hygiene instructions. The subjects in Group 2 were recalled after 1 week for pack removal.

选出 30 名患者，选定的受试者被随机分配到对照组（第 1 组）和测试组（第 2 组）。每组包含 15 名受试者。使用通用刮匙从所有受试者身上采集龈下菌斑样本，然后记录临床参数。对收集的龈下菌斑样本进行厌氧培养以确定 Aa 菌落的数量。没有 Aa 生长的受试者被排除在研究之外。两组的所有受试者随后均接受了超声波 SRP，之后第 2 组（测试组）在最深的牙周袋区域放置 SBT 浆果的触变溶液（图 1），然后放置牙周填塞物。每位患者（第 1 组和第 2 组）都接受了口腔卫生指导。第 2 组的受试者在 1 周后被召回以拆除填塞物。

All the subgingival plaque samples were carefully collected from the base of the pocket using a

使用无菌刮匙从牙周袋底部小心收集所有龈下菌斑样本，立即将样本转移到运输培养基

sterile curette. These samples were immediately transferred to transport media (reduced transport fluid [RTF). These samples in the transport media were first vortexed and then diluted in RTF 1:10 proportion and inoculated in the blood agar with hemin and Vitamin K (enriched medium) and tryptic soya agar with vancomycin and bacitracin (TSBV) (selective medium) [Fig. 2]. Following which it was incubated in CO2 jar for 48-72°C. After completion of incubation, the plates were removed, the colony characters of the required organism were noted, and the colony count was done for quantification.

（还原运输液 [RTF]）。首先将运输培养基中的这些样本旋涡，然后以 1:10 的比例稀释在 RTF 中，并接种在含有血红素和维生素 K 的血琼脂（富集培养基）和含有万古霉素和杆菌肽（TSBV）的胰蛋白酶大豆琼脂（选择性培养基）中 [图 2]。然后在 48–72° C 的 CO2 罐中孵育。孵育完成后，取出培养皿，记录所需生物的菌落特征，并进行菌落计数以进行量化。

A total of 30 patients in the age group of 25–45 years were selected initially, out of which 15 were in the control group and 15 in the test group. Six patients were removed from the study as there was no growth of Aa at baseline sample of subgingival plaque. Hence, a total of 24 patients were taken for the study. 12 subjects were allocated randomly in each group. It shows the intragroup comparison of microbial parameters, i.e., the colony forming units (CFUs) of Aa; there was a significant decrease in the CFU in both the groups during follow-up. However, the test group shows statistically significant reduction compared to the control group. There is statistically significant improvement in all the clinical parameters recorded (i.e., PI, GBI, PPD, and CAL) in both the groups from baseline to 1 month (P > 0.05). However, the improvement in PI and GBI was similar in both the groups. However, PPD and CAL improvement was statistically more significant in Group 2 than in Group 1 (P < 0.05). On follow-up at 1 month, a marked reduction in the clinical parameters (PI, GBI, PPD, and CAL) in both the groups was observed. However, on comparing the two groups, test group showed slightly higher reduction in the clinical parameters and significantly higher reduction in the microbial parameter (CFU count of Aa); this could be attributed to the antibacterial and antioxidant activity of SBT.

最初选择了 30 名年龄在 25–45 岁之间的患者，其中 15 名属于对照组，15 名属于测试组。由于基线龈下牙菌斑样本中没有 Aa 生长，因此 6 名患者被排除在研究之外。因此，总共选取 24 名患者进行研究。每组随机分配 12 名受试者。它显示了微生物参数的组内比较，即 Aa 的菌落形成单位 (CFU)；在随访期间，两组的 CFU 均显著下降。然而，与对照组相比，测试组显示出统计学上显著的减少。从基线到 1 个月，两组记录的所有临床参数（即 PI、GBI、PPD 和 CAL）均有统计学上显著改善（P > 0.05）。然而，两组的 PI 和 GBI 的改善相似。然而，第 2 组的 PPD 和 CAL 改善情况在统计学上比第 1 组更显著 (P < 0.05)。在 1 个月的随访中，两组的临床参数 (PI、GBI、PPD 和 CAL) 均显著降低。然而，比较两组后，测试组的临床参数降低程度略高，微生物参数 (Aa 的 CFU 计数）降低程度显著；这可能归因于 SBT 的抗菌和抗氧化活性。

Based on the above findings, seabuckthorn can be successfully used as an adjunct to treat periodontitis patients as it improves both clinical parameters such as PPD, CAL, and reduction in microbial load of Aa, considerably better than SRP alone.

上述结果表明，沙棘可成功用作治疗牙周炎患者的辅助药物，因为它可以改善 PPD、CAL 等临床参数，并减少 Aa 的微生物负荷，效果明显优于单独使用 SRP。

Source: Santosh, Susmitha; Babitha, GA; Holla, K Shashanka; Prakash, Shobha; Suresh, K1; Bhat, G Kishore 2022. Seabuckthorn against periodontitis-A clinical and microbiological study. International Journal of Oral Health Sciences 12 (2): 73-78.
资 料 来 源：Santosh, Susmitha; Babitha, GA; Holla, K Shashanka; Prakash, Shobha; Suresh, K1; Bhat, G Kishore 2022. Seabuckthorn against periodontitis-A clinical and microbiological study. International Journal of Oral Health Sciences 12 (2): 73-78.

2.Valorization of seabuckthorn seed protein to hydrolysates

2. 沙棘籽蛋白水解物的增值利用

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Increasing concerns about nutritional deficiency, food security, and sustainability have emphasized work on exploring alternative and sustainable sources of protein. In this study, an initiative to extract and utilize protein concentrates, and hydrolysates from seabuckthorn seed, otherwise a waste material, is undertaken. The effect of hydrolysis using various enzymes namely pepsin (pH 2.0 and 37°C), trypsin (pH 7.0 and 37°C), and protamex (pH 7.0 and 50°C), for different time durations, namely, 30, 60, 90, and 120 min, on the structural and functional properties of sea buckthorn seed protein concentrate (SSPC), was elucidated. The emulsifying activity index and solubility of pepsin-hydrolysed SSPC increased significantly and were higher than those of trypsin and protamex hydrolysed SSPC samples. A Fourier transformation infrared study revealed that the enzyme hydrolysis treatment reduced the peak intensity in amide I, II, and III bands. A significant change was found in the β-sheet, β-turn and random coiling of the secondary structure of SSPC protein by enzymatic hydrolysis. The particle size ranged from 295.8 to 440, 388 to 713.6, 399 to 890 nm for pepsin, trypsin, and protamex, respectively. The microstructure of pepsin-treated samples showed a more porous and loose structure than native, trypsin and protamex. Antioxidant activity increased significantly for all the samples with enzyme treatments carried out for different periods. The results indicate that

由于对营养缺乏、粮食安全和可持续性的担忧日益增加，人们更加重视探索替代和可持续的蛋白质来源。在本研究中，我们着手从沙棘籽（通常为废弃物）中提取并利用蛋白质浓缩物和水解物。研究了使用不同酶（即胃蛋白酶（pH 2.0，37 ° C）、胰蛋白酶（pH 7.0，37 ° C）和 Protamex（pH 7.0，50 ° C））在不同时间段（30、60、90 和 120 min）水解对沙棘籽蛋白浓缩物（SSPC）结构和功能特性的影响。结果显示，胃蛋白酶水解的 SSPC 的乳化活性指数和溶解度显著增加，且高于胰蛋白酶和 Protamex 水解的 SSPC 样品。傅里叶变换红外光谱研究表明，酶水解处理降低了酰胺 I、II 和 III 带的峰强度。酶促水解显著改变了 SSPC 蛋白二级结构中的 β－折叠、β－转角和无规卷曲结构。颗粒大小分别为：胃蛋白酶水解样品为 295.8 至 440 nm，胰蛋白酶水解样品为 388 至 713.6 nm，Protamex 水解样品为 399 至 890 nm。胃蛋白酶处理的样品显微结构显示出比天然样品、胰蛋白酶和 Protamex 处理样品更多孔和松散的结构。酶处理样品在不同时间段的抗氧化活性显著

the protein-rich hydrolysates could create new opportunities for the development of effective techno-functional additives for use in a wide range of food formulations.

增加。结果表明，富含蛋白质的水解物有可能为开发多种食品配方中的高效技术功能性添加剂创造新的机会。

Source: Z. S. Khan, N. S. Sodhi, S. Fayaz, R. A. Bakshi, R. A Siddiqi, B. N. Dar, H. N. Mishra and B.Dhillon 2023. Valorization of seabuckthorn seed protein to hydrolysates: Impact on morphological, structural, functional, and antioxidant properties. JSFA Reports 3 (5): 222-232.

资料来源 : Z. S. Khan, N. S. Sodhi, S. Fayaz, R. A. Bakshi, R. A Siddiqi, B. N. Dar, H. N. Mishra and B.Dhillon 2023. Valorization of seabuckthorn seed protein to hydrolysates: Impact on morphological, structural, functional, and antioxidant properties. JSFA Reports 3 (5): 222-232.

3.Seabuckthorn for the synthesis of copper nanoparticles for use in cancer treatment

3. 沙棘用于合成铜纳米粒子以用于癌症治疗

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Green synthesis of nanoparticles has drawn huge attention in the last decade due to their eco-friendly, biocompatible nature. Phyto-assisted synthesis of metallic nanoparticles is widespread in the field of nanomedicine, especially for antimicrobial and anticancer activity. Here in the present research work, investigators have used the stem extract of the Himalayan plant Hippophae rhamnoides L, for the synthesis of copper nanoparticles (CuNPs). The synthesized of CuNPs were analyzed by using sophisticated instruments, i.e., Fourier transform infrared spectroscopy (FTIR), UV-Vis spectroscopy, X-ray diffraction (XRD), high-performance liquid chromatography (HPLC), and scanning electron microscope (SEM). The size of the synthesized CuNPs was varying from 38 nm to 94 nm which were mainly spherical in shape. Further, the potential of the synthesized CuNPs was evaluated as an anticancer agent on the Hela cell lines, by performing an MTT assay. In the MTT assay, a concentration-dependent activity of CuNPs demonstrated the lower cell viability at 100 µg/mL and IC50 value at 48 µg/mL of HeLa cancer cell lines.

In addition to this, apoptosis activity was evaluated by reactive oxygen species (ROS), DAPI (4′,6-diamidino-2-phenylindole) staining, Annexin V, and Propidium iodide (PI) staining, wherein

由于绿色合成纳米粒子具有环保和生物相容性，在过去十年中备受关注。植物辅助金属纳米粒子的合成在纳米医学领域广泛应用，尤其是在抗菌和抗癌活性方面。在本研究中，研究人员使用了喜马拉雅地区的沙棘（Hippophae rhamnoides L.）的茎提取物来合成铜纳米粒子（CuNPs）。通过使用傅里叶变换红外光谱（FTIR）、紫外－可见光光谱（UV-Vis）、X 射线衍射（XRD）、高效液相色谱（HPLC）和扫描电子显微镜（SEM）等分析了合成的 CuNPs。合成的 CuNPs 大小在 38 纳米到 94 纳米之间，主要呈球形。

此外，研究人员通过 MTT 试验评估了合成的 CuNPs 作为抗癌剂对 HeLa 细胞系的潜力。在 MTT 试验中，CuNPs 表现出浓度依赖性活性，在 100 µg/mL 时细胞存活率较低，HeLa 癌细胞系的 IC50 值为 48 µg/mL。此外，通过活性氧（ROS）、DAPI（4′,6-二脒基 -2- 苯基吲哚）染色、Annexin V 和碘化丙啶（PI）染色评估了 CuNPs 的细

the maximum ROS production was at a dose of 100 µg per mL of CuNPs with a higher intensity of green fluorescence. In both DAPI and PI staining, maximum nuclear condensation was observed with 100 µg/mL of CuNPs against HeLa cell lines.

胞凋亡活性，其中在100 µg/mL剂量的CuNPs条件下产生的ROS量最大，且绿色荧光强度最高。在DAPI和PI染色实验中，针对HeLa细胞系，在100 µg/mL的CuNPs条件下观察到最大程度的细胞核凝集。

Source: Pooja Dadhwal, Harish Kumar Dhingra, Vinay Dwivedi, Saud Alarifi, Haresh Kalasariya, Virendra Kumar Yadav and Ashish Patel. Hippophae rhamnoides L. (seabuckthorn) mediated green synthesis of copper nanoparticles and their application in anticancer activity. Front. Mol. Biosci., 24 August 2023
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4.Bioactive compounds in seabuckthorn byproducts　4. 沙棘副产品中的生物活性化合物

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Seabuckthorn (*Hippophae rhamnoides* L.) has recently gained interest for its nutritional and medicinal values. Fruits and leaves are considered to be good source of large number of bioactive substances such as vitamins, trace elements, amino acids, β-carotene, zeaxanthin, lycopene, flavonoids, folic acid, fatty acid, tannic acid etc. Chemoprofiling (Total phenols, total flavonoids, vitamin C, vitamin E, lycopene and β-carotene contents) of various seabuckthorn byproducts has been done and it was found that among all the seabuckthorn byproducts, leaf extract contained significantly highest amounts of total phenols (332.49±7.45 mg/g), total flavonoids (271.56±5.41 mg/g), vitamin C (399.49±4.90 mg/100g) and lycopene content (8.50±2.92 mg/100g). The proximate analysis of nutritive contents of Seabuckthorn byproduct was determined. The ash content which is an index of mineral contents, ranged from 1.3 to 4%. The moisture content was significantly highest in seedcake. The crude protein contents ranged from 13.89 to 23% and recorded highest in leaves (22.09%) and seedcake (23%). Ether and crude fibre contents were recorded highest in pomace with seeds. High concentrations of sodium (Na) were present, ranging from 40 to 160 mg/g. Among all the byproducts; leaves contained high concentration of all the minerals estimated.

沙棘（*Hippophae rhamnoides* L.）因其营养和药用价值而备受关注。沙棘的果实和叶片被认为是大量生物活性物质的良好来源，如维生素、微量元素、氨基酸、β－胡萝卜素、玉米黄质、番茄红素、黄酮类化合物、叶酸、脂肪酸、鞣酸等。对各种沙棘副产品进行了化学成分分析（总酚类、总黄酮类、维生素 C、维生素 E、番茄红素和 β－胡萝卜素含量）。结果表明，在所有沙棘副产品中，叶片提取物含有显著最高的总酚类（332.49±7.45 mg/g）、总黄酮类（271.56±5.41 mg/g）、维生素 C（399.49±4.90 mg/100g）和番茄红素含量（8.50±2.92 mg/100g）。还对沙棘副产品的营养成分进行了初步分析，灰分含量（矿物质含量的指标）范围为 1.3% 到 4%，含水量在籽粕中最高。粗蛋白含量范围为 13.89% 至 23%，在叶片（22.09%）和籽粕（23%）中最高。果渣（带种子）中的乙醚提取物和粗纤维含量最高。钠（Na）的浓度很高，范围为 40 到 160 mg/g。在所有副产品中，叶片的所有矿物质浓度最高。

Seabuckthorn byproducts were screened for the presence of antioxidant potential for inhibiting the different in vitro free radicals. The inhibition of the

沙棘副产品被筛选以评估其抑制不同体外自由基的抗氧化潜力。结果表明，所有副产品

free radicals i.e. ABTS, DPPH, superoxide, hydroxyl and nitric oxide radicals by all the byproducts was found in concentration dependent manner. The IC50 values for different radicals were determined and from the IC50 values, it was observed that among the seabuckthorn byproducts, leaves had lowest IC50 value for all the free radicals and was better scavenger of these radicals. The reducing power of the extracts was also in dose dependent manner. The leaves showed better reducing power ability as compared to other extracts.

对 ABTS、DPPH、超氧化物、羟基和一氧化氮自由基的抑制作用呈现浓度依赖性。通过测定不同自由基的 IC50 值，发现沙棘副产品中，叶片对所有自由基的 IC50 值最低，显示其具有更好的自由基清除能力。提取物的还原能力也呈剂量依赖性，叶片相较其他提取物表现出更好的还原能力。

Source: Arti Ghabru, C Varshneya, Neerja Rana, Geeta Verma and Shivani Chauhan, 2023. Assessment of bioactive constituents present in seabuckthorn byproducts and their in vitro antioxidant potential. Pharma Innovation Journal 12(6): 227-235.
资 料 来 源 : Arti Ghabru, C Varshneya, Neerja Rana, Geeta Verma and Shivani Chauhan, 2023. Assessment of bioactive constituents present in seabuckthorn byproducts and their in vitro antioxidant potential. Pharma Innovation Journal 12(6): 227-235.

5. Growth and biochemical evaluation of seabuckthorn stands in Lahaul-Spiti district

5. 拉豪尔－斯皮蒂地区沙棘林地的生长与生化评估

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The growth of seven years conserved stands of Hippophae salicifolia D. at two different locations viz. Tandi (3044 masl) and Ribling (3440 masl) in Lahaul Valley were compared. The lower altitude of Tandi stand showed higher growth in terms of plant standing volume (1112.5 cm3/plant) as compared to the Ribling stand. In general, the Tandi stand recorded with plant height varies from 44 - 336 cm, and circumference of 14-17 cm. Similarly, the Ribling stand recorded plant height varies from 208-236 cm, and circumference of 17-27 cm. Management practices and climate have shown a considerable effect on the growth and development of the Hippophae salicifolia.

The collected samples were quantified for the polyphenols, β-carotene, Tocopherol, and L-Ascorbic acid. Active contents of fruits like Isoquercetin (mg/g), Rutin (mg/g), Gallic acid (mg/g), EGCG (mg/g), β-carotene (mg/g), Tocopherol (mg/g), L-Ascorbic acid (mg/g) were analyzed. Identification and quantification of molecules in seed oil (%) of the metabolites like Methyl myristate, Methyl pentadecanoate, Methyl palmitoleate, Methyl palmitate, Methyl linoleate, Methyl oleate, Methyl sterate were also analyzed.

本文比较了拉豪尔山谷两个不同地点——Tandi（海拔 3044 米）和 Ribling（海拔 3440 米）——七年生的柳叶沙棘（Hippophae salicifolia D.）林地的生长情况。结果表明，较低海拔的 Tandi 林地在植物的站立体积（1112.5 cm³/ 株）方面表现出较高的生长率，优于 Ribling 林地。总体而言，Tandi 林地的植物高度为 44 至 336 cm，周长为 14 至 17 cm。同样，Ribling 林地的植物高度为 208 至 236 cm，周长为 17 至 27 cm。管理实践和气候对柳叶沙棘的生长和发育有显著影响。

研究还分析了收集样品中的多酚、β－胡萝卜素、维生素 E（生育酚）和 L－抗坏血酸的含量。分析了果实中的活性成分，如槲皮苷（mg/g）、芦丁（mg/g）、没食子酸（mg/g）、表没食子儿茶素没食子酸酯（EGCG，mg/g）、β－胡萝卜素（mg/g）、维生素 E（mg/g）、L－抗坏血酸（mg/g）。以及籽油中的代谢物如甲基肉豆蔻酸酯、甲基十五烷酸酯、甲基棕榈油酸酯、甲基棕榈酸酯、甲基亚油酸酯、甲基油酸酯、甲基硬脂酸酯等成分的含量（%）。

6. Seabuckthorn-based functional beverage for protection against intestinal inflammation

6. 基于沙棘的功能性饮料用于预防肠道炎症

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The aim of the current study was to develop probiotic-fortified, sea buckthorn-based functional beverage that would effectively eliminate or render protection against intestinal inflammation. The effects of malt supplemented sea buckthorn juice (SBT+M), on the protective and in vivo anti-inflammatory effect of Lacticaseibacillus rhamnosus GG (LR) against intestinal inflammation using the trinitrobenzene sulfonic acid (TNBS) induced colitis models were investigated in zebrafish (Danio rerio).Fishes were fed with the standard fish pellets coated with the experimental beverages twice a day for 30 days. Intra rectal administration of 170mM of TNBS was conducted to develop TNBS-induced colitis. The zebra fishes were sacrificed and intestinal tissues were stored for further assessment.

本研究的目的是开发一种添加了益生菌的沙棘功能性饮料，以有效消除或预防肠道炎症。研究探讨了补充麦芽的沙棘汁（SBT+M）对益生菌 Lacticaseibacillus rhamnosus GG（LR）在三硝基苯磺酸（TNBS）诱导的结肠炎斑马鱼模型中的保护和体内抗炎效果。实验中，斑马鱼每天两次喂食涂有实验饮料的标准鱼饲料，持续 30 天。为了诱发 TNBS 诱导的结肠炎，通过直肠注射 170mM TNBS。随后，斑马鱼被处死，肠道组织被储存以供进一步评估。

Administration of the test beverages attenuated several effects of TNBS-induced colitis, including disrupted intestinal barrier integrity, impaired tissue anti-oxidant status and expression of colitis associated pro-inflammatory markers. The results reveal that SBT+M+LR had a significant protective effect against mucosal damage, as demonstrated by a reduction in histopathological score. SBT+M+LR exhibited remarkable anti-oxidant properties by increasing the activity of the CAT, SOD, GPx, and GSH enzymes, which were impaired due to TNBS administration. SBT+M+LR treatment substantially prevented toll-like receptor (TLR)-2, TLR-4, and TLR-5 expression in the colon. Inflammatory mediators (NF-κB, TNF-α, IL-1β, IL-6, IL-8, CCL20, MPO and MMP9) as well as anti-

结果表明，饮料的摄入减轻了 TNBS 诱导的结肠炎的多种影响，包括破坏的肠道屏障完整性、受损的组织抗氧化状态以及结肠炎相关的促炎标志物的表达。结果显示，SBT+M+LR 在减少组织病理评分方面对黏膜损伤具有显著的保护作用。SBT+M+LR 通过增加由于 TNBS 注射而受损的抗氧化酶 CAT、SOD、GPx 和 GSH 的活性，表现出了显著的抗氧化性能。此外，SBT+M+LR 治疗显著抑制了结肠中 TLR-2、TLR-4 和 TLR-5 的表达。

inflammatory cytokine (IL-10) were measured in colonic tissue.

Administration of the test beverage resulted in a decrease of NF-κB, TNF-α, IL-1β, IL-6, IL-8, CCL20, MPO and MMP9 and an increase of IL-10 expression. The protective impact of SBT+M+LR confirms that SBT phenolics play a supporting role in improving the immunomodulatory activities of LR in vivo. These findings providesinsight into the mechanisms involved in modulating inflammatory cytokines by synergistic probiotic-phenolic combinations vs individual components in the treatment of experimental colitis. In addition, the current study emphasizes the importance of SBT+M as a carrier matrix for LR in order to retain and enhance its functional potential against experimentally induced colitis.

Future research efforts should be focused on designing tailored and technologically possible non-dairy products that target specific diseases along with meeting market needs.

测量了结肠组织中的促炎介质（NF-κB、TNF-α、IL-1β、IL-6、IL-8、CCL20、MPO 和 MMP9）以及抗炎细胞因子（IL-10）。实验饮料的摄入显著降低了 NF-κB、TNF-α、IL-1β、IL-6、IL-8、CCL20、MPO 和 MMP9 的表达，同时增加了 IL-10 的表达。SBT+M+LR 的保护作用证实了沙棘多酚在提高 LR 的免疫调节活性方面的支持作用。研究结果为益生菌与多酚协同作用在实验性结肠炎治疗中的抗炎机制提供了见解，并强调了 SBT+M 作为 LR 的载体矩阵的重要性，以保留和增强其对实验性结肠炎的功能潜力。

未来的研究应集中于设计针对特定疾病的非乳制品，以满足市场需求并实现技术可行性。

7. Biochemical evaluation of seabuckthorn oil and its efficacy against wound healing

7. 沙棘油的生化评估及其对伤口愈合的功效

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This research presents a comprehensive investigation into seabuckthorn (SBT) fruit oil. Initially, a quantitative nuclear magnetic resonance (qNMR) method was developed for the quantitative analysis of triacylglycerols (TAGs) within SBT oil. Subsequently, NMR was employed to determine the fatty acyl composition of TAGs, complemented by gas chromatography-mass spectrometry (GC-MS) and Fourier-transform infrared (FTIR) spectroscopy. Commercial SBT oil samples were analyzed, revealing discrepancies between labelled content and actual composition. Concurrently, we evaluated the efficacy and safety of topical nanoemulsion-loaded cream and gel formulations of SBT fruit oil for wound healing. These formulations exhibited remarkable wound healing potential, with significant wound contraction. Importantly, they demonstrated a favourable acute dermal toxicity profile, indicating their safety for therapeutic applications.

本研究对沙棘（SBT）果油进行了全面的调查。首先，开发了一种定量核磁共振（qNMR）方法，用于沙棘油中三酰甘油（TAGs）的定量分析。随后，结合气相色谱－质谱（GC-MS）和傅里叶变换红外光谱（FTIR），通过 NMR 确定了 TAGs 的脂肪酰基组成。通过对商业沙棘油样品的分析，发现其标示成分与实际成分之间存在差异。同时，我们评估了纳米乳剂载体的沙棘果油面霜和凝胶配方在局部应用中的伤口愈合效果及安全性。这些配方显示出显著的伤口愈合潜力，并且伤口收缩明显。更重要的是，它们表现出良好的急性皮肤毒性特征，表明其在治疗应用中的安全性。

In conclusion, this study highlights the importance of employing a multifaceted analytical approach for SBT oil assessment. Moreover, the topical formulations of SBT fruit oil showed promise in wound healing with no adverse effects, reinforcing their safety and effectiveness.

总结而言，本研究强调了采用多种分析方法对沙棘油进行评估的重要性。此外，沙棘果油的局部配方在伤口愈合中展现了良好的效果且无不良反应，进一步证明了其安全性和有效性。

8. Assessment of microsatellite markers to evaluate the genetic diversity in seabuckthorn

8. 利用微卫星标记评估沙棘的遗传多样性

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Our laboratory started efforts to development and assessment of microsatellite markers along with different morphological characters to evaluate the genetic diversity in 226 collections of seabuckthorn plants representing different ecological sites prevailing in different terrestrial areas including the Union Territory of Ladakh, Lahaul and Spiti regions of Himachal Pradesh, Garhwal and Kumaon regions of Uttarakhand and Tawang region of Arunachal Pradesh. Microsatellite markers were developed using different approaches, including screening of random genomic libraries, microsatellite enriched genomic libraries, and screening of an inhouse developed transcriptome assembly in H. rhamnoides. A repertoire of 16 microsatellite markers was employed in this study for screening 226 seabuckthorn collections. The size distribution of amplicons varied from 110-490 bp, indicating significant diversity in microsatellite allele polymorphism. To study the relevant evolutionary relationships between collections reflecting various geographic locations, various statistical analyses were conductedto document PIC, He: Expected Heterozygosity, Nei's Diversity, FIS: Wright's Fixation Index, and I: Shannon's Informative Index. UPGMA-based Dendrogram was prepared that displayed grouping of collections in different clusters. Additionally, to understand the population structure of the wild seabuckthorn, we also used the STRUCTURE software tool. Microsatellite markers were found to be very efficient for comparing the variation at genetic levels as compared to the morphological marker in the current collections.

我们的实验室开始了开发和评估微卫星标记的工作，结合不同的形态特征，以评估 226 株沙棘植物的遗传多样性，这些植物代表了不同生态区域，包括拉达克联邦领地、喜马偕尔邦的拉豪尔和斯皮提地区、北阿坎德邦的加瓦尔和库蒙地区，以及阿鲁纳恰尔邦（注：我国藏南地区）的达旺地区。微卫星标记是通过多种方法开发的，包括随机基因组库筛选、富含微卫星的基因组库筛选以及对自制的沙棘转录组组装进行筛选。在本研究中，使用了 16 个微卫星标记对 226 个沙棘收集样本进行了筛查。扩增产物的大小分布在 110-490 bp 之间，表明微卫星等位基因多态性具有显著的多样性。为了研究反映不同地理位置的收集体之间的相关进化关系，进行了多种统计分析以记录 PIC、He（期望杂合度）、Nei 的多样性、FIS（赖特固定指数）和 I（香农信息指数）。基于 UPGMA 的系统树显示了收集体在不同簇中的分组。此外，为了了解野生沙棘的群体结构，我们还使用了 STRUCTURE 软件工具。研究表明，微卫星标记相比形态标记在比较遗传水平的差异时非常有效。

This study will be extremely helpful for future breeding and genomic biology research programmes including other seabuckthorn species. The findings are also useful for expression identification of genes and functional genomics investigations in seabuckthorn and related taxa with the goal of selecting genetic markers for the establishment of sex-specific and stress-tolerant indicators.

本研究对于未来沙棘物种的育种和基因组生物学研究项目将极为有用，研究结果对于基因表达鉴定和功能基因组学研究也有重要价值，目标是选择用于确定性别特异性和抗逆性的遗传标记。

9. Proteome analysis of Indian seabuckthorn to understand physiological adaptations

9. 通过蛋白质组分析研究印度沙棘的生理适应性

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Over the last one decade, Molecular Physiology and Proteomics Laboratory are trying to analyse and understand the stress modulatory pathways in seabuckthorn using proteomics as a tool. Initially, procedures were established to grow seedlings under laboratory conditions. Cold/freeze modulated proteome from seedlings was deciphered using Gel and LCMS/MS based proteome analysis. The proteo-map (2-D gels) of H. rhamnoides seedlings secretome is available on world 2D-PAGE repository (ExPASy Bioinformatics Resource Portal). Th earlier studies to understand stress tolerance were restricted to laboratory grown H. rhamnoides seedlings. Therefore, currently we are trying to understand the stress tolerance traits in naturally growing seabuckthorn populations.

在过去十年中，分子生理学和蛋白质组学实验室一直在以蛋白质组学作为工具，分析和理解沙棘中的应激调节途径。最初，我们建立了在实验室条件下生长幼苗的程序，并通过凝胶和 LCMS/MS 基础的蛋白质组分析解码了冷冻调节的沙棘幼苗蛋白质组。鼠李沙棘 H. rhamnoides 幼苗分泌组的蛋白质地图（2-D 凝胶）已发布在全球 2D-PAGE 数据库（ExPASy 生物信息资源门户）上。早期的研究主要集中在实验室培养的 H. rhamnoides 幼苗以了解其耐受应激的机制。因此，目前我们正在研究自然生长的沙棘种群中的耐受应激特性。

A custom-built Proteome database was developed using label free (nano LCMS/MS) approach for better annotation of proteins Nano LCMS/MS analysis led to identification of 4870 proteins clustered into 1035 protein groups indicating differential abundance of metabolic, regulatory and

为了更好地注释蛋白质，我们使用无标签（nano LCMS/MS）方法开发了一个定制的蛋白质数据库。nano LCMS/MS 分析鉴

stress responsive proteins in Trans-Himalayan and Sikkim germplasm . Comparative gel-based and gel-free shotgun proteomics approach to dissect stress acclimation strategies in high-altitude Trans-Himalayan (H. rhamnoides, H. tibetana) and lower altitude adapted Sikkim (H.salicifolia) germplasm. showed differential regulation of proteins associated with metabolic processes, stress signalling, defense responses, redox regulation, protein remodelling, and secondary metabolite or fatty acid biosynthesis. Validation of downstream metabolic signatures also supported the proteomic plasticity suggesting their probable involvement in differential stress acclimation strategies.

These findings showed an interesting trade-off between growth and stress tolerance in diverse populations. High-altitude Trans-Himalayan populations repress their growth and divert energy resources in the direction of better stress responses to survive extreme climatic conditions. In contrast, Sikkim populations at lower elevations invest in resource allocation or growth-promoting pathways in response to milder stress conditions. To the best of our knowledge, this is the first comprehensive proteome analysis to examine the altitudinal gradient associated stress acclimation strategies in different naturally growing populations.

定了 4870 种蛋白质，这些蛋白质分为 1035 个蛋白质组，表明跨喜马拉雅和锡金种质中的代谢、调节和应激响应蛋白质表现出不同的丰度。比较基于凝胶和无凝胶的“散弹式”蛋白质组学方法，揭示了高海拔跨喜马拉雅沙棘（H. rhamnoides, H. tibetana）和适应于低海拔的锡金（H. salicifolia）种质中的应激适应策略。这些方法显示出与代谢过程、应激信号传导、防御反应、氧化还原调节、蛋白质重构以及次生代谢产物或脂肪酸生物合成相关的蛋白质的差异性调控。下游代谢特征的验证也支持了蛋白质组的可塑性，表明它们可能参与不同的应激适应策略。

这些发现揭示了不同种群之间在生长与应激耐受性方面的有趣权衡。高海拔的跨喜马拉雅种群抑制了它们的生长，将能量资源转向更好的应激响应以应对极端气候条件。相比之下，低海拔的锡金种群在应对较温和的应激条件时，将资源投入到促进生长的途径中。据我们所知，这是首次通过蛋白质组分析全面研究不同自然生长种群在高度梯度相关应激适应策略中的表现。

10. Metabolomic characterization of seabuckthorn populations

10. 沙棘种群的代谢组学特征

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The growing demand of seabuckthorn berries and morphological similarity of Hippophae species leads to confusions, which might cause misidentification of plants used in natural products. It is evident from the literature on seabuckthorn metabolites that different metabolites may undergo substantial variation depending upon different environmental factors such as temperature, altitude, latitude, longitude and rainfall that may affect the sensory quality of seabuckthorn products. Documentation of metabolomic diversity prevailing at different geographic locations is an important area of research. Many reports on metabolomics are available mainly from China, Finland, Canada and Romania to identify the origin-specific best quality of seabuckthorn using different chromatographic techniques followed by a chemometric approach. Various modern techniques have already been exploited in routine analysis. However, most of the techniques have been used to identify only specific categories of metabolites and are time-consuming. Untargeted spectroscopic approaches like 1H NMR and GC-MS have evolved as the most relevant, adaptable, and reliable techniques for characterizing complex volatile mixtures and some non-volatile compounds in different plant species. 1H NMR, in particular, can capture all metabolites in a single encounter and has been effectively applied for plant fingerprinting, as well as identification, authenticity, and quality assessment.

We have employed 1H NMR and GC-MS approaches to characterise metabolomes of H. rhamnoides and H. salicifolia collections from

随着对沙棘浆果需求的增加，以及不同沙棘属物种形态上的相似性，可能导致用于天然产品中的植物误认。文献表明，不同环境因素如温度、海拔、纬度、经度和降雨等，可能影响沙棘产品的感官质量，并导致不同代谢物的显著变化。因此，记录不同地理位置下的代谢多样性是一个重要的研究领域。许多代谢组学的研究报告主要来自中国、芬兰、加拿大和罗马尼亚，利用不同的色谱技术结合化学计量方法，来鉴定具有特定来源的优质沙棘产品。尽管多种现代技术已被广泛应用于常规分析中，但大多数技术仅用于识别特定类别的代谢物，并且耗时较长。非靶向的光谱方法，如 ^{1}H 核磁共振（NMR）和气相色谱 - 质谱联用（GC-MS），已成为表征复杂挥发性混合物和某些非挥发性化合物的最相关、适应性强且可靠的技术。尤其是 ^{1}H NMR，可以在一次检测中捕获所有代谢物，并已成功应用于植物指纹图谱、鉴定、真实性和质量评估。

我们采用了 ^{1}H NMR 和 GC-MS 方法，对不同地理区域、不同微气候条件下的鼠李沙棘（H.

different geographical regions with varying microclimatic parameters. Our study suggests that GC-MS and NMR profiling offer crucial phytochemical indicators for differentiating seabuckthorn berries from various geographical origins, as well as provide valuable information for formulating effective seabuckthorn improvement and conservation programmes through the screening of potential genotypes beneficial for farmers and industries.

rhamnoides）和柳叶沙棘（H. salicifolia）种群的代谢组进行了表征。研究表明，GC-MS 和 NMR 分析能够提供关键的植物化学指标，用于区分不同地理来源的沙棘浆果，并为通过筛选对农民和工业有益的潜在基因型，制定有效的沙棘改良和保护方案提供了宝贵的信息。

11. Efficacy of seabuckthorn (*Hippophae salicifolia*) in hypoxic micro-environment

11. 柳叶沙棘（*Hippophae salicifolia*）在缺氧微环境中的疗效

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While residing in a stressful, high-altitude environment, there is a performance loss that needs to be addressed. Native to high altitudes, Hippophae salicifolia exhibits a wide range of medicinal properties. In the current investigation, C2C12 cells, murine myoblast cultures, were exposed to 0.5% O2 either in the presence or absence of an aqueous extract of Hippophae salicifolia (12.5, 25, 50, and 100 µg/ml). Cell death, elevated reactive oxygen species (a stress marker), increased lactate dehydrogenase (a cell death indication), and TNF, NFkB, and IL6 (pro-inflammatory markers) were all seen in the hypoxic cells. In comparison to cells grown in hypoxia without the extract, treatment of cells exposed to hypoxia with the extract resulted in decreased cell death. Furthermore, in C2C12 cells exposed to hypoxia, extract administration prevented the rise in reactive oxygen species, lactate dehydrogenase,and pro-inflammatory markers (IL6, TNF, NFkB).The restoration of myogenic differentiation markers, MyoD and MyoG, by the extract was able to prevent the dedifferentiation

在高海拔的压力环境中居住会导致性能损失。作为高海拔的本土植物，柳叶沙棘 Hippophae salicifolia 展示了广泛的药用特性。在当前的研究中，C2C12 细胞（小鼠肌母细胞培养物）在 0.5% O_2 环境下暴露，分别在有无柳叶沙棘 Hippophae salicifolia 水提取物（12.5、25、50 和 100 µ g/ml）的情况下进行处理。缺氧细胞中观察到了细胞死亡、反应性氧种（作为压力标志物）的升高、乳酸脱氢酶（作为细胞死亡指示物）的增加，以及 TNF、NFkB 和 IL6（促炎标志物）的升高。与缺氧条件下未处理提取物的细胞相比，暴露于缺氧环境中的细胞在处理提取物后细胞死亡减少。此外，在缺氧的 C2C12 细胞中，提取物的施用防止了活性氧、乳酸脱氢酶和促炎标志物（IL6、TNF、NFkB）的升高。提取物对肌原分化标志物 MyoD 和 MyoG 的恢复能够防止 C2C12 细胞

process of C2C12 after exposure to hypoxia. In the hypoxic microenvironment, Hippophae salicifolia aqueous extract has an impressive capacity to prevent myogenic loss.

在缺氧后发生去分化。在缺氧微环境中，柳叶沙棘 Hippophae salicifolia 水提取物具有显著的防止肌原损失的能力。

12. Ethnobotanical uses of seabuckthorn in Trans-Himalayan region of Ladakh

12. 沙棘在拉达克跨喜马拉雅地区的民族植物学用途

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“Tsir-mang” Seabuckthorn is one of the widely used wild plant of Trans-Himalayan regions. Due to isolation from major part of the world inhabitants of Ladakh and other Trans-Himalayan regions has been largely dependent on surrounding wild plants for their basic commodities like vegetables, food, fuel, fodder, medicine and ornamental flower etc. Seabuckthorn being one of the dominant plants of the region is well-known by the local population for its multifarious uses. Hippophae is known with various local names in different areas like tSer-mang, tSer-Sa-Lu-Lu, Shib-Shu-Lu-Lu and sTarbu followed by half a dozen synonymous in classical Sowa-Rigpa (Amchi/Tibetan) medical texts. The earliest reference about medicinal uses of Hippophae species are fund in Sowa-Rigpa classical texts, all the three major species of Seabuckthron are mentioned in the pharmacopoeia and formulary of Sowa-Rigpa, i.e. Nam-star (Hippophae salicifolia), Bar-star (Hippophae rhamnoides ssp. turkestanica) and Sa-star (Hippophae tibetana). There are around two hundred Hippophae based formulations in Sowa-Rigpa use for wide range of diseases. Hippophae is also one of the most popular fuel and fencing source. It is also occasionally use for building roof and other wooden appliances, children making juice out of the barriers and animals enjoying its leaves are some of the common scenario

“Tsir-mang”沙棘是跨喜马拉雅地区广泛使用的野生植物之一。由于与世界主要地区的隔离，拉达克及其他跨喜马拉雅地区的居民在很大程度上依赖周围的野生植物提供基本生活用品，如蔬菜、食物、燃料、饲料、药物和观赏花卉等。沙棘作为该地区的重要植物，因其多种用途而为当地居民所熟知。沙棘在不同地区有多种地方名称，如 tSer-mang、tSer-Sa-Lu-Lu、Shib-Shu-Lu-Lu 和 sTarbu，在古典的索瓦－日卡（Amchi/Tibetan）医学文献中也有很多同义词。关于沙棘药用的最早记载出现在索瓦－日卡经典文本中，这些药典和处方提到了三种主要的沙棘种类，即 Nam-star（Hippophae salicifolia）、Bar-star（Hippophae rhamnoides ssp. turkestanica） 和 Sa-star（Hippophae tibetana）。在索瓦－日卡中，大约有两百种基于沙棘的配方用于各种疾病。沙棘也是一种非常受欢迎的燃料和围栏材料，偶尔用于建筑屋顶和其他木制器具，孩子们用它的果实制作果汁，动物则喜欢吃它的叶子，这些都是这种

of this multifarious plant. Since last few years seabuckthorn has been catching attention of Scientist, Environmentalist, Foresters, NGO's and Industry, and it is seen as one of the most potential plants of Ladakh and Trans-Himalayas. A proper scientific research and validation in this field may provide basis for development of many product and effective drugs from seabuckthorn and it can largely contribute for environmental protection too.

多功能植物的常见用途。近年来，沙棘引起了科学家、环境学家、林业人员、非政府组织和工业界的关注，被视为拉达克和跨喜马拉雅地区最具潜力的植物之一。对这一领域进行适当的科学研究和验证，可能为沙棘产品和有效药物的开发提供基础，同时也能大大促进环境保护。

13. Propagation from softwood cuttings of seabuckthorn

13. 沙棘嫩枝插条的繁殖

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The green shoot cuttings (with top 3-5 leaves) of 20 cm length (2-3 months old) were treated with water for 24 hours and given quick dip in 500 ppm IBA. Cuttings were planted in polyhouse (90% moisture and 20-24oC). Polyhouse with soil: FYM: sand layers and used during June-September (Fig. 3) which gave high rates of rootings.

将长 20 cm（2–3 个月大的）沙棘嫩枝插条（顶端带 3–5 片叶子）用水处理 24 小时，并迅速浸入 500 ppm 的 IBA 溶液中。然后将插条种植在聚乙烯大棚中（湿度 90% 和 20–24° C）。大棚内使用土壤：农家肥：沙层的混合物，并在 6 月至 9 月期间使用（见图 3），这样可以获得较高的生根率。

Fig. 3: Mass propagation of seabuckthorn from softwood cuttings at CSK HPAU, Research Station, Kukumseri, Lahaul

图 3：CSK HPAU 研究站，库库姆塞里的的大规模沙棘嫩枝插条繁殖

二 News and Products 印度沙棘新闻与产品

14.Seabuckthorn in empowerment of women in Himalayas

14. 沙棘在喜马拉雅山女性赋权中的作用

By Ms. Rigzin, The Khandoma, SHG, Mayar valley, Lahaul, HP (Tel: 9459913563)

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"This plant has a lot of medicinal significance. Traditional healers have been using it for centuries to treat ailments such as diabetes and blood pressure," says 50 year old Rigzin, from the remote valley of Miyar in the Lahaul region of district Lahaul Spiti of state of Himachal Pradesh. Locally known as 'Charma', seabuckthorn is abundant in the wild and is a medicinal plant with high nutritional value. They are also capable of fixing nitrogen, which makes them an excellent conservation tool for areas with depleted soils, helping improve the soil quality to support the growth of other vegetation. Seabuckthorn is also an important food. The berries are used to make jams, juices, and pickles. The dried leaves of the plant can be brewed for tea. Rigzin hails from Tingret village in Miyar Valley, and is fondly known as 'Charma Auntie' among the villagers. Along with other women in her community, she has been engaged in the traditional practice of collecting and processing seabuckthorn for many decades. Until recently, they used to do it on a small scale for domestic use. In 2019, the SECURE Himalaya initiative by the UN Development Programme (UNDP), in partnership with the Government of India and the Global Environment Facility, reached out to Rigzin and community members to support them in developing a business model around seabuckthorn-based products.

"这种植物具有很高的药用价值，传统的治疗师已经使用它几个世纪来治疗糖尿病和高血压等疾病"。来自喜马偕尔邦拉霍尔区米亚尔偏远山谷的 50 岁 Rigzin 女士说道。当地称之为"Charma"的沙棘在野外非常丰富，是一种具有高营养价值的药用植物。它们还具有固氮能力，使其成为土壤贫瘠地区的优秀保护工具，有助于改善土壤质量，从而支持其他植物的生长。沙棘也是一种重要的食品。果实可用于制作果酱、果汁和腌制品。植物的干叶可以泡茶。Rigzin 来自米亚尔谷的 Tingret 村，在村民中被亲切地称为"Charma 姨妈"。她与社区中的其他女性一起，已经从事了数十年的传统沙棘采集和加工工作。直到最近，她们还只是小规模地进行家庭使用。2019 年，联合国开发计划署（UNDP）与印度政府和全球环境基金会合作发起的 SECURE Himalaya 计划联系了 Rigzin 和社区成员，支持他们围绕沙棘产品开发商业模式。

The initiative is working in high-altitude Himalayan regions to conserve its rich biodiversity with active participation from the local community. An intervention was piloted where 15 women from the region created a self-help group (SHG) named 'Khandoma.' They were provided technological support for the processing of the raw materials and training in sustainable harvesting techniques, primary and secondary processing, packaging, and market linkage. "Processing the berries after plucking them is a very laborious process. But, with this new equipment we are now able to make better products that fetch us more money," says Rigzin as she puts the berries in a solar drier. This activity also contributes towards climate action. The National Initiative on Seabuckthorn, under the Green India Mission, a part of India's National Action Plan on Climate Change, seeks to promote seabuckthorn as a priority species for afforestation of degraded lands as well as ensuring good health and poverty alleviation in the Indian Himalayan region. Seabuckthorn nurseries are being developed to restore fragile and degraded areas of the Miyar Valley in collaboration with government line departments, local communities, and academic and research institutions. "There are so many stakeholders working in silos. Through this intervention, we connected technical institutions such as the CSK Agriculture University, Palampur, with these women who were traditionally engaged in the practice of seabuckthorn processing. The Khandoma SHG, which is now also registered under the National Rural Livelihood Mission, was provided harvesting tools for the berries and technical support for product development through this intervention," says Abhishek Kumar, Project Consultant, SECURE Himalaya, who has been working closely with the community to develop a seabuckthorn value chain.

Market linkages have been established by the Khandoma SHG through a brand called 'Kang La Basket,' under which various products such as jams, teas, juice, and pulp concentrate are packaged and sold. Demonstrating an effective

这一倡议致力于在高海拔的喜马拉雅地区保护丰富的生物多样性，并积极促进当地社区的参与。项目试点阶段，15 名来自该地区的女性创建了一个名为“Khandoma”的自助小组（SHG）。她们获得了原材料加工的技术支持，并接受了可持续采收技术、初级和二级加工、包装以及市场对接的培训。Rigzin 女士在将果实放入太阳能干燥器时表示：“采摘后的果实处理是一个非常劳动密集的过程。但有了这些新设备，我们现在能制作出更好的产品，卖得也更多了。”这一活动也有助于应对气候变化。国家沙棘计划在印度国家气候变化行动计划下的绿色印度使命中，旨在推广沙棘作为优先植树造林的物种，并确保印度喜马拉雅地区的良好健康和减贫。沙棘苗圃正在与政府部门、当地社区以及学术和研究机构合作开发，以恢复米亚尔谷的脆弱和退化区域。Abhishek Kumar，SECURE Himalaya 项目顾问，表示：“有很多利益相关者在各自领域独立工作。通过这一干预，我们将技术机构如 CSK 农业大学与传统上从事沙棘加工的女性联系了起来。Khandoma SHG 现在也在国家农村生计任务下注册，获得了采摘工具和产品开发的技术支持。”

Khandoma SHG 通过一个名为“Kang La Basket”的品牌建立了市场对接，该品牌下的各种产品如果酱、茶、果汁和果肉浓缩液被包装和销售。Kang La Basket 倡议展示了政府与社区之间的有效合作，已被地区行政部门提

partnership between the government and community, Kang La Basket initiative has been nominated by the district administration for recognition through the PM Award for Excellence in Public Administration under the One District One Product Category. Currently, the women of Khandoma SHG are looking to expand the range of products under Kang La Basket. UNDP is working with government partners to building capacities to create revolving funds and credit linkages for the SHG through the National Rural Livelihood Mission.

名，通过“一县一品”类别的总理公共行政卓越奖进行认可。目前，Khandoma SHG 的女性们正在寻求扩展 Kang La Basket 下的产品范围。UNDP 正在与政府合作伙伴一起，建立能力以创建循环资金和信用对接，为自助小组提供支持。

Note: This story was originally published by UNDP.

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15. Tag for Ladaki Seabuckthorn

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Ladakh's Seabuckthorn fruit has got the Geographical Indication (GI) tag. The Geographical Indication Registry, under the Ministry of Commerce and Industry, has officially granted the GI tag to the Department of Industries & Commerce, Ladakh and approved it as the Registered Proprietor for 'Ladakh Seabuckthorn' in Class 31. This is the fourth GI Tag for Ladakh. Earlier, Ladakh Pashmina, Apricot (Raktse Carpo species) and Ladakhi wood carvings also received the GI tags. Seabuckthorn (Hippophae L) is a wonder plant of Ladakh and named 'Leh Berry' produces small orange or yellow coloured berries that are sour in taste but rich in vitamins, especially Vitamin C. It is a deciduous shrub in the family Elaeagnaceae. Many Seabuckthorn products have nutritional and medicinal value. It is naturally distributed over 11,500 hectares in the Ladakh region.

15. 拉达克沙棘的地理标志

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拉达克的沙棘果实获得了地理标志（GI）标签。商工部下属的地理标志注册处正式将 GI 标签授予拉达克工业与商业部，并批准其为“拉达克沙棘”在第 31 类中的注册所有者。这是拉达克获得的第四个地理标志标签。此前，拉达克的帕什米纳、杏子（Raktse Carpo）以及拉达克木雕也获得了地理标志标签。沙棘（Hippophae L.）是拉达克的奇特植物，俗称“列城樱桃”，它结出的小型橙色或黄色浆果味酸，但富含维生素，特别是维生素 C。沙棘是一种落叶灌木，属于胡颓子科。许多沙棘产品具有营养和药用价值。它在拉达克地区自然分布超过 11,500 公顷。

16. Popularization of Biosash's seabuckthorn health products in India

16.Biosash 在印度推广沙棘健康产品

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Biosash started its journey with Wild – better than organic-Himalayan Seabuckthorn in 2004 and is the largest manufacturing company of Seabuckthorn products in India and perhaps the world with over 135 life changing seabuckthorn products today. It has applied for a process innovation patent on a special Seabuckthorn process of manufacture of Seabuckthorn Juices developed through pioneering research for targeting of lifestyle induced conditions through Special Seabuckthorn Juices with herbal extracts. Biosash has received immense success in its seabuckthorn range of natural wellness juices, herbal extracts in capsules, natural cosmetics, and in food products all based on seabuckthorn targeted to enhance healthy living. Biosash already has products from Natural Juices, tea , toothpaste and green tea, Supplement capsules , jam . sauces to creams and oils for daily use and when anyone uses any product once they do not wish to change the product ever again.

Biosash's pioneering ethos has led to worldwide recognition through the development of over 50 FIRST IN THE WORLD products -Namely Seabuckthorn Juices for lifestyle induced conditions such as Type 2 Diabetes, Heart conditions, Ulcers, poor Immunity, and for sportsmen and athletes and women , CO_2 Oil extracts in Veg Capsules from the Seabuckthorn Seed and the Seabuckthorn Berry, Seabuckthorn Chawanprash or Chawan prash

Biosash 于 2004 年开始了其沙棘产品的研发之旅，是印度甚至可能是全球最大的沙棘产品制造公司，目前提供超过 135 种改变生活的沙棘产品。公司已申请了一项关于沙棘汁特殊制造工艺的创新专利，该工艺通过开创性的研究开发了专门针对生活方式诱发条件的沙棘汁，并融合了草本提取物。Biosash 在其沙棘系列自然健康果汁、胶囊草本提取物、天然化妆品以及食品产品中取得了巨大成功，这些产品均以沙棘为基础，旨在促进健康生活。Biosash 的产品包括天然果汁、茶、牙膏、绿茶、补充胶囊、果酱、调味酱、日用面霜和油品，使用过一次这些产品的人通常不愿意再换其他品牌。

Biosash 的开创精神通过开发超过 50 种全球首创产品赢得了全球认可，包括针对生活方式诱发条件如 2 型糖尿病、心脏病、溃疡、免疫力差以及运动员和女性的沙棘汁，沙棘种子和沙棘果的 CO_2 油提取物，沙棘 Chawanprash（传统药膳），大量面部护理化妆品、身体磨砂、肥皂、油品（包括再生按摩油）、沙棘口红、

based on the goodness of Seabuckthorn, numerous face care Cosmetics, body scrubs, Soaps, and oils including rejuvenating massage oils, Seabuckthorn Lipsticks, talcum powder with Seabuckthorn, Toothpaste and food and hygiene products.

含沙棘的爽身粉、牙膏以及食品和卫生产品。

List awards/ fellowships/ recognition received by Biosash

Biosash 获得的奖项 / 证书 / 认证列表：

1.International Seabuckthorn Association's Special Honour 2015 for Development of Seabuckthorn products， on 7th Conference of International Seabuckthorn Association, 24th Nov. 2015, at New Delhi.

1. 国际沙棘协会特别荣誉奖（2015 年），因其在沙棘产品开发方面的贡献，颁发于 2015 年 11 月 24 日，第七届国际沙棘协会大会，新德里。

2.Participation and Felicitation during National Conference of Seabuckthorn organized by Defence Institute of High Altitude Research , Govt . Of India, Leh during Sept 22-24 , 2017

2. 国防高原研究所主办的国家沙棘大会（2017 年 9 月 22–24 日）期间的参与与表彰，印度政府，列城。

3.Certificate of participation in International Conference of Seabuckthorn in China in 2018

3. 国际沙棘大会参与证书，2018 年，中国。

4."National Award" of Seabuckthorn Association of India's For Outstanding Contribution to Seabuckthorn Products development Oct 23 -24 , 2018 at Shimla , Presented by Hon'ble Governor of Himachal Pradesh Acharya Devvrat.

4. "国家奖"，由印度沙棘协会颁发，表彰其在沙棘产品开发中的杰出贡献，2018 年 10 月 23–24 日，Shimla，由喜马偕尔邦副总督 Acharya Devvrat 颁发。

5.Emerging Company Award during India International Business Summit , New Delhi on 14th June 2019.

5. 新兴公司奖，在 2019 年 6 月 14 日的印度国际商务峰会上，新德里。

6.Fecilitation by Hon'ble Minister for MSME Govt of India Shri P.C. Sarangi during Emerging Company Award during India International Business Summit , New Delhi on 14th June 2019.

6. 由印度政府中小企业部部长 Shri P.C. Sarangi 的表彰，在 2019 年 6 月 14 日的印度国际商务峰会上，新德里。

7.Fecilitation by Hon'ble Ambassador for Gabon during Emerging Company Award during India International Business Summit , New Delhi on 14th June 2019.

7. 由加蓬大使的表彰，在 2019 年 6 月 14 日的印度国际商务峰会上，新德里。

8."National Award" of Seabuckthorn Association of India's for National Entrepreneurship Excellence for valuable contribution in commercialization and manufacturing of Seabuckthorn health products in India, at Delhi University on December 19th , 2019 .

9.Also received Organic Certifications for Seabuckthorn harvested from International Certification Agency – One Cert International in 2017 , 2018, 2019, 2020

10.Nominated and Awarded ISHRD (Indian Society of Horticultural Research and Development) Awards – Gangotri Udyamita Puraskar -2021 and 2022.

11.Certificate of Participation :- International conference on conservation, cultivation and sustainable use of high altitude medicinal and aromatic plants for the socio- economic development, funded by National Medicinal Plants Board (Ministry of AYUSH, Govt. of India) on 07 and 08 May 2022 at Rishikul, Haridwar, Uttarakhand (India)

12.Best Nutrition Brand of the year – Women's Nutrition – Runner Up – Awarded by ASSOCHAM INDIA (Associated Chambers of Commerce and Industry , India) in New Delhi , on 15th February 2023.

With an approximate turnover of Rs 600 Million annually, Biosash is relentless in its efforts for development of products and efforts to spread awareness of benefits of seabuckthorn in India and abroad.

8.“国家奖”，由印度沙棘协会颁发，表彰其在印度沙棘健康产品商业化和制造中的国家企业家卓越贡献，2019 年 12 月 19 日，德里大学。

9. 国际认证机构 One Cert International 颁发的有机认证，沙棘的有机认证分别获得于 2017 年、2018 年、2019 年、2020 年。

10.ISHRD（印度园艺研究与发展协会）奖 – Gangotri Udyamita Puraskar – 2021 和 2022 年。

11. 参与证书：国际会议关于高海拔药用和芳香植物的保护、栽培和可持续利用，以促进社会经济发展，资助方为国家药用植物委员会（印度政府 AYUSH 部），2022 年 5 月 7–8 日，Rishikul，哈里瓦尔，乌塔拉坎德（印度）。

12. 年度最佳营养品牌 – 女性营养 – 亚军，由 ASSOCHAM 印度（印度工商联合会）颁发，2023 年 2 月 15 日，新德里。

Biosash 年营业额约为 6 亿印度卢比，公司不懈努力开发产品，并致力于在印度及国外传播沙棘的价值。

17.Seabuckthorn oil capsules from Patanjali Yogpeeth, Haridwar

Uttarkhand Patanjali Yogpeeth3 is a medical and research institute, is a Rs. 4000 crores group in Ayurveda. The Annual Report of International Seabuckthorn Development For the Year of 2020 page no. 92 Patanjali Yogpeeth is making Haridwar a popular spot to visit for Ayurvedic treatment and medication. Established in 2006 by Yog Guru Ramdev, Patanjali Yogpeeth is named after Maharishi Patanjali who believed to be the inventor of Yoga. Patanjali Yogpeeth is run by Patanjali Yog Peeth Trust. Patanjali Yogpeeth performs several activities and services like treating patients through Ayurveda in hospital, laboratories, research centres and other facilities. The company has launched a series of seabuckthorn products including seabuckthorn oil capsules (Fig. 4).

17. 哈里瓦尔帕坦加利瑜伽学院的沙棘油胶囊

位于乌塔拉坎德的帕坦加利瑜伽学院是一家医学和研究机构，是一个年收入达 4000 亿印度卢比的印度草药集团。2020 年国际沙棘发展年报第 92 页提到，帕坦加利瑜伽学院使哈里瓦尔成为了一个因其草药治疗而闻名的热门地点。帕坦加利瑜伽学院于 2006 年由瑜伽大师拉姆德夫建立，学院以被认为是瑜伽创始人的马哈希师帕坦加利命名。该学院由帕坦加利瑜伽学院信托基金运营。帕坦加利瑜伽学院提供多种活动和服务，如通过医院、实验室、研究中心等设施进行草药治疗。公司推出了一系列沙棘产品，包括沙棘油胶囊（见图 4）。

Fig.4. Patanjali seabuckthorn oil capsules, Haridwar
图 4. 帕坦加利沙棘油胶囊，哈里瓦尔

Fig. 5. Cosmetics of Seabuck Ayurveda Pvt. Ltd., Delhi
图 5. Seabuck Ayurveda Pvt. 的化妆品有限公司，德里

18. Seabuckthorn creams and cosmetics from Seabuck Ayurveda Pvt. Ltd., Delhi

By Mr. Vishal Modi (Managing Director), Seabuck Ayurveda Pvt. Ltd., Head Office Address:- 87,1st Floor, Jamrudpur, Greater Kailash Part-1,New Delhi-110048.
(Tel: M-9958656555)

Established at New Delhi, India, Seabuck Ayurveda Pvt. Ltd. is named after the renowned herb. This company is instrumental in processing, exporting and supplying a qualitative array of Ayurvedic Products. The core ingredient used in all the offered formulations is seabuckthorn, a herb that is being extensively demanded for medicinal and curative purposes. Its miraculous properties have been listed and certified by numerous laboratories across the world. This herb is enriched with anti-aging and rejuvenating properties, which makes the skin supple, soft and smooth. In our product gamut, we offer Papaya Facial Kit, Strawberry Facial Kit, Chocolate Facial Kit, Skin Polisher Kit, Goldshine Facial Kit, Instant Glow Kit, Ultra violet Filter Kit, Hair Spa, Anti-Cellulite Kit, etc. The company also has massive retail range of beauty products (Fig. 4), which includes: 1.) Hair Care 2.) Scrubs 3.) Creams 4.) Gels 5.) Face Wash 6.) Packs 7.) Daily Essential Kits 8.) Seabuckthorn Skin Creams 9.) Mini Facial Kits 10.) Bleach Creams 11.) Natural Soaps and Cleansers Backed by immense years of excellence and innovation, the company is constantly meeting the diverse requirements of clients with the deliverance of optimum quality beauty care products at the most affordable prices (Fig. 5).

18. 来自 Seabuck Ayurveda Pvt. Ltd. 的沙棘霜和化妆品

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（电话：M-9958656555）

Seabuck Ayurveda Pvt. Ltd. 位于印度新德里，公司名称源于著名的草药。该公司致力于加工、出口和供应高质量的草药产品。所有提供的配方中使用的核心成分是沙棘，这是一种广泛用于药用和治疗的草药。其奇迹般的特性已被世界各地的众多实验室列出并认证。这种草药富含抗衰老和再生的属性，使皮肤柔软、光滑。在我们的产品系列中，我们提供木瓜面部护理套件、草莓面部护理套件、巧克力面部护理套件、皮肤抛光套件、金光面部护理套件、瞬间亮肤套件、紫外线过滤套件、头发护理、抗橘皮组织套件等。公司还有大量的美容产品零售系列（见图 4），包括：1. 头发护理 2. 磨砂膏 3. 面霜 4. 凝胶 5. 洗面奶 6. 面膜 7. 日常护理套件 8. 沙棘皮肤霜 9. 迷你面部护理套件 10. 漂白霜 11. 天然肥皂和清洁剂。凭借多年的卓越和创新，公司不断满足客户的多样化需求，以最实惠的价格提供优质的美容护理产品（见图 5）。

19. Synthite Pvt. Ltd., Kochi, Kerala

19.Synthite Pvt. Ltd.，科钦，喀拉拉邦

By Mr. Vishal, Synthite Industries Pvt. Ltd., Synthite Valley, Kolenchery, Kerala 682 311, India. (Tel : +91-9387585075, 91-484-2834200, Email: info@synthite.com)

作　者：Vishal，Synthite Industries Pvt. Ltd.，Synthite Valley，Kolenchery，Kerala 682 311，India（　电　话：+91-9387585075，91-484-2834200，电 子 邮件：info@synthite.com）

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Seabuck Ayurveda Pvt. Ltd. 位于印度新德里，公司名称源于著名的草药。该公司致力于加工、出口和供应高质量的草药产品。所有提供的配方中使用的核心成分是沙棘，这是一种广泛用于药用和治疗的草药。其奇迹般的特性已被世界各地的众多实验室列出并认证。这种草药富含抗衰老和再生的属性，使皮肤柔软、光滑。在我们的产品系列中，我们提供木瓜面部护理套件、草莓面部护理套件、巧克力面部护理套件、皮肤抛光套件、金光面部护理套件、瞬间亮肤套件、紫外线过滤套件、头发护理、抗橘皮组织套件等。公司还有大量的美容产品零售系列（见图 4），包括：1. 头发护理 2. 磨砂膏 3. 面霜 4. 凝胶 5. 洗面奶 6. 面膜 7. 日常护理套件 8. 沙棘皮肤霜 9. 迷你面部护理套件 10. 漂白霜 11. 天然肥皂和清洁剂。凭借多年的卓越和创新，公司不断满足客户的多样化需求，以最实惠的价格提供优质的美容护理产品（见图 5）。

三 Production of seabuckthorn oil 沙棘油生产

Synthite Pvt. Ltd4 is a Kochi, Kerela based company, which is extracting seabuckthorn oil and extract with CO_2 supercritical method. It supplies oil to Indian industries and other countries.

Synthite Pvt. Ltd. 是一家位于印度科钦的公司，使用 CO_2 超临界方法提取沙棘油和提取物。它向印度及其他国家供应沙棘油产品。

中文翻译：魏娟、毕阳（甘肃农业大学）English-Chinese translation by WEI Juan and BI Yang

5. Country Report of Latvia

拉脱维亚沙棘发展报告

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Country report of sea buckthorn development LATVIA, 2023

2023 年拉脱维亚沙棘开发报告

The year 2023 is associated with unprecedented challenges in the economy of the Latvian sea buckthorn branch. The total area of plantations has slightly increased, reaching 1400 ha, although the volume of the known and declared harvest has not increased compared to the previous year, remaining at the level of 800 t. To a certain extent, this is due to the fact that the purchase prices of fruits fell sharply.

The majority of sea buckthorn fruits grown in Latvia are exported frozen to the countries of the European Union, where the purchase prices of frozen fruits and berries were significantly reduced by their rapid influx from Ukrainian freezers due to the destruction of the energy supply infrastructure.

Another major factor that limited the harvest is the ravages of the sea buckthorn fly. Within the tendency of the European Union's green policy, when the range of available effective plant protection products is continuously reduced, the control of this serious pest becomes more problematic every year. Under the influence of the mentioned factors, this year the sea buckthorn crop was not harvested at all in some plantations.

A significant trend in the establishment of new gardens is that the variety 'Mary' is increasingly becoming dominant, determined by its yield, resistance to adverse growth factors and fruit composition. Sea buckthorn varieties and hybrids which are currently stored in the collection of genetic resources of the Institute of Horticulture in Latvia: 'Lord', 'Marija (Mary)', 'Tatjana', HR2-2-5, HR3-1-4.
https://www.darzkopibasinstituts.lv/en/genetic-resources

2023 年与拉脱维亚沙棘相关的经济面临前所未有的挑战有关。种植园的总面积略有增加，达到 1400 公顷，尽管与上一年相比，已知和申报的收成量没有增加，仍保持在 800 吨的水平。在一定程度上，这是由于果实的购买价格大幅下降。

拉脱维亚种植的大部分沙棘果实都是冷冻出口到欧盟国家，这些水果和浆果由于能源供应基础设施的破坏，冷冻水果和浆果从乌克兰冷冻柜中迅速涌入，导致购买价格大幅降低。

限制收成的另一个主要因素是沙棘蝇的肆虐。在欧盟绿色政策的趋势下，当可用的有效植物保护产品的范围不断减少时，这种严重害虫的控制每年都变得更加困难。在上述因素的影响下，今年一些种植园根本没有收获沙棘。

建立新种植园的一个重要趋势是，“玛丽”沙棘品种越来越占主导地位，这取决于其产量、对不利生长因素的抵抗力和果实成分。目前储存在拉脱维亚园艺研究所遗传资源库中的沙棘品种和杂交种有：“主”、“玛利亚”、“塔佳娜”、HR2-2-5、HR3-1-4。（详见网站 https://www.darzkopibasinstituts.lv/en/genetic-resources）

There are various sea buckthorn processing companies in Latvia, incl. Small individual traders and larger companies that grow and process berries. In recent years, organic growers have been developing and different products are offered to consumers. Some of the main companies:

"BalticSeaberry" is the largest specialised sea buckthorn berry producer in Baltics with more than 10 years of experience, becoming a producer of high-quality sea buckthorn products – IQF and dried berries, industrial puree and NFC juice.https://balticseaberry.com/

SIA ZELT BIO has the largest garden of single variety sea buckthorn in Latvia. They grow sea buckthorn berries, the valuable content of which allows us to produce products such as high-quality sea buckthorn oil, juice, as well as various food and beauty care products. https://www.zelt.bio/en

KROGZEME is a fully organic farm, which manages more than 100 ha of agriculture areas in Latvia and operates in cold store. Company do clean, optical sorting and calibrating services for different berries, incl. sea buckthorn. https://www.krogzeme.lv/frozen-berries/frozen-sea-buckthorns/

Projects on various topics related to sea buckthorn have been started and continued in Latvian scientific institutions. The most important projects with national funding:

1. Developing of a waste less processing technology of sea buckthorn berries
(ongoing, end 2024)

The goal of the project is to develop a technology for processing sea buckthorn berries without residue using a complex of innovative methods that include enzymatic hydrolysis under controlled conditions (using a universal double-wall vacuum

拉脱维亚有各种各样的沙棘加工公司，包括种植和加工浆果的小型个体贸易商和大型公司。近年来，有机种植者一直在发展，并向消费者提供不同的产品。以下是一些主要公司：

"BalticSeaberry"是波罗的海地区最大的专业沙棘果生产商，拥有 10 多年的经验，成为高品质沙棘产品的生产商——IQF 和干浆果、工业果泥和 NFC 果汁。https://balticseaberry.com/

SIA ZELT BIO 拥有拉脱维亚最大的单一品种沙棘园。他们种植沙棘浆果，其有价值的成分使我们能够生产出高质量的沙棘油、果汁以及各种食品和美容产品。https://www.zelt.bio/en

KROGZEME 是一个完全有机的农场，管理着拉脱维亚 100 多公顷的农业区，并运营冷库中。公司为包括沙棘在内的不同浆果提供清洁、光学分选和校准服务。https://www.krogzeme.lv/frozen-berries/frozen-sea-buckthorns/

拉脱维亚科学机构已经启动并时持续开展与沙棘有关的各种主题的项目。国家资助的最重要项目：

1. 沙棘果无残留加工技术的开发（在研项目，至 2024 年底）

该项目的目标是开发一种无残留加工沙棘浆果的技术，使用一系列创新方法，包括在受控条

mixer), separation technology for separating pulp oil and sediment from juice (using a three- fraction centrifuge) and juice treatment with Ultra high temperature (UHT).

2. Using innovative methods for promotion of productivity and berry quality of sea buckthorn plantations (continued)

Two topics were considered and studied in this project:

1) Possibilities of green manure treatments and use effects on plants;
2) Possibilities of using a feeding attractant to control Rhagoletis batava.

3. Biorefining processing of sea buckthorn vegetative biomass using innovative technologies and comprehensive analytical research to obtain promising products with high added value for the Latvian bioeconomy, including serotonin (ongoing)

The goal of the project: To offer a zero-residue innovative technology that will ensure the use of the entire unique set of biologically active compounds of sea buckthorn vegetative biomass, in the form of extracts, individual compounds (serotonin, proanthocyanidins) and solid granular complexes, they will be valuable for the national bioeconomy and various segments of international markets.

4. Demonstration events.

The results of the projects are distributed to growers by presenting them at various demonstration events. Events are organized with the support of the Latvian Rural Consultation and Education Center. In 2023, interested parties were offered a project "The use of microorganisms in ensuring the balance of plant nutrients in organic sea buckthorn cultivation" field demonstration.

件下进行酶水解（使用通用双壁真空混合器）、从果汁中分离果肉油和沉淀物的分离技术（使用三级分离心机）以及超高温（UHT）果汁处理。

2. 采用创新方法提高沙棘种植园的生产力和浆果质量（持续项目）

本项目考虑并研究了两个主题：

1）绿肥处理的可能性和对植物的使用效果；
2）使用诱食剂控制沙棘果蝇的可能性。

3. 利用创新技术和综合分析研究对沙棘营养生物质进行生物精炼加工，以获得对拉脱维亚生物经济具有高附加值的有前景的产品，包括血清素（在研项目）

该项目的目标是：提供一种零残留的创新技术，确保沙棘营养生物质提取物中一整套独特的生物活性化合物以单个化合物（血清素、原花青素）和固体颗粒复合物的形式被利用，这些化合物将对国家生物经济和国际市场的各个领域具有重要价值。

4. 示范活动

这些项目的成果通过在各种演示活动中展示给种植者。活动是在拉脱维亚农村咨询和教育中心的支持下组织的。2023 年，向感兴趣的各方提供了一个“在有机沙棘种植中利用微生物确保植物营养平衡”的现场演示项目。

Scientific publications

1. Impact of non-target insect accumulation in traps on sea buckthorn fruit fly (Rhagoletis batava) trap catches in sea buckthorn (Hippophae rhamnoides) plantations. Acta Horticulturae, p. 345-350. https://www.actahort.org/books/1378/1378_45.htm DOI:10.17660/ActaHortic.2023.1378.45

2.Andersone, A.; Janceva, S.; Lauberte, L.; Zaharova, N.; Chervenkov, M.; Jurkjane, V.; Jashina, L.; Rieksts, G.; Telysheva, G. Granulated Animal Feed and Fuel Based on Sea Buckthorn Agro-Waste Biomass for Sustainable Berry Production. Sustainability, 2023, 15, 11152. https://doi.org/10.3390/su151411152

科学出版物

1. Jākobsone, Edīte; Gailis, Janis; Ozolina-Pole, Laura; Rancane, Regina (2023)，捕蝇器中非靶标昆虫的积累对沙棘（Hippophae rhamnoides）种植园中沙棘果蝇（Rhagoletis batava）陷阱捕获量的影响。园艺学报，第 345-350 页。https://www.actahort.org/books/1378/1378_45.htmDOI:1017660/ 园艺学报，2023.1378.45

2.AAndersone, A.; Janceva, S.; Lauberte, L.; Zaharova, N.; Chervenkov, M.; Jurkjane, V.; Jashina, L.; Rieksts, G.; Telysheva, G.，基于可持续浆果生产的沙棘农业废弃物生物质颗粒动物饲料和燃料，可持续发展，2023 年，第 15 期，第 11152 页。https://doi.org/10.3390/su151411152

中英文翻译：卢智超 English- Chinese translated by LU Zhichao

6. Country Report of Lithuania

立陶宛沙棘发展报告

Drafted by:

Dr. Gediminas Radzevičius
Lithuania

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中文 翻译：卢智超

Current situation in Lithuanian Sea Buckthorn cultivation problems and trends
立陶宛沙棘种植现状问题与发展趋势

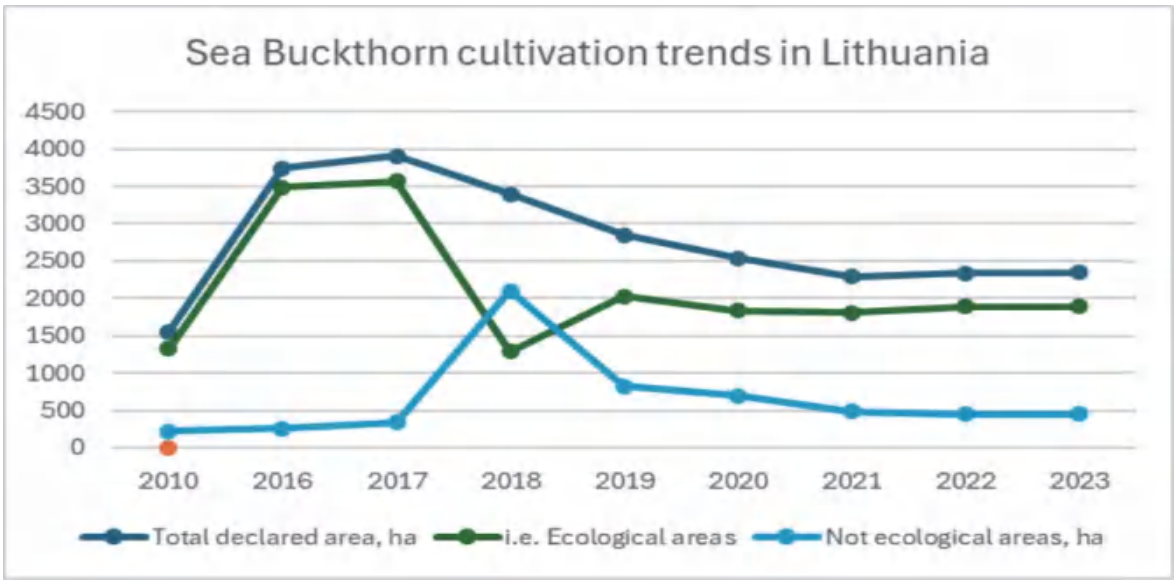
Sea buckthorn in Lithuania 基本情况

- Sea buckthorn has been grown in Lithuania since
- 1965. 立陶宛沙棘种植始于 1965 年

- Cultivated by plantation method since 2005-2006
- 沙棘种植园建设始于 2005–2006 年

- Main varieties: 主栽品种

Maria (since 2010) – 10- 15 percent
Botanicheskaya - 20-25 percent
Botanicheskaya Lyubitelskaya - 20 percent
Trofimovskaya - 15-25 percent
Other varieties - 20-30 percent



二 Reasons for change 为什么要变

1.The growth of the area of sea buckthorn up to 3400 ha in 2018 was balanced by a relatively high income and a relatively low requirement for plant density, planted plant varieties and yield.

2.From 2019 the requirements for growers have been greatly strengthened

2.1.the area maintenance control has been strengthened

2.2.the minimum required yield is determined

2.3. not less than 1000 of seedlings per ha

3.In 2023, an area of 2300 ha was established. A trend is being observed that an increase of 15-20 ha is expected in the next year.

1. 到 2018 年，总面积达到 3400 公顷，高收益与沙棘种植密度、品种、产量的需求之间达到相对平衡。

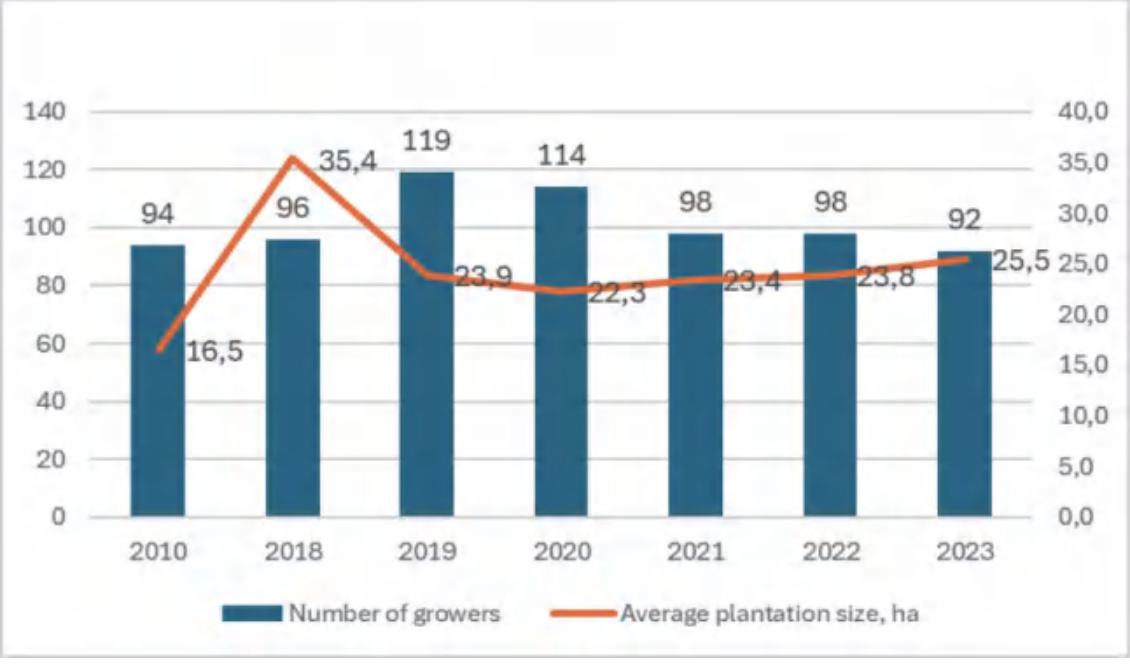
2. 从 2019 年起，对种植户的要求更加强化

2.1 面积控制

2.2 最低产量要求

2.3 种植密度每公顷不少于 1000 株

3.2023 年，沙棘总面积 2300 公顷。预计 2024 年新增 15–20 公顷。



三 Problems 存在问题

1. Most of the plantations **are planted with seedlings of different varieties** (a mixture of varieties),which causes many problems for the current plantation owners due to the different ripening times of the berries, the different characteristics of the berries obtained from different fields, etc.

2.There is no reliable way to protect yourself from damage caused by **sea buckthorn flies**. In individual years, the damage can reach as much as 70-80 percent from the total possible yield.

3. **Climate changes**: long-term droughts and severe frosts during flowering have a direct impact on crops and economic viability (Plant weakness, diseases, low yield).

4. **Treatment and processing**: In Lithuania, there are only 3 processors of industrial-level of sea buckthorn berries, which have their own freezers, berry cleaning and processing equipment.

5. Most of the sea buckthorn berries with branches are bought directly from the field by **middlemen-traders** who have freezing skills. As a rule, they pay minimum prices to growers.

6. Instability in the berry buying market and prices. There is a very slight difference in the price of berries grown in organic orchards and traditional orchards, although it is much more difficult to get a good harvest in organic orchards (the difference is only 10- 15 cents).

1. 大多数种植园混种不同品种，导致沙棘果实成熟期不一致，不同种植园的沙棘果实品质各异。

2. 还没有可靠的沙棘果蝇防控措施。有些年，沙棘果实损失达 70–80%。

3. 气候变化影响：导致长期干旱、开花期霜冻严重，直接影响经济收益（植株长势衰弱、病害、低产）

4. 果实加工：立陶宛只有 3 家具有沙棘果实冷冻、清洗和加工设备的规模企业。

5. 大多数沙棘带枝果被具有冷冻技术的中间商直接收购，中间商总是向种植户支付最低价格。

6. 果实销售市场和价格不稳定：尽管有机种植更难以获得高产，与传统种植的沙棘果实相比，售价差异不显著（只相差 10–15 分）

四 Positive Trends 有利因素

- Steady growth in demand for sea buckthorn berries (sales in the domestic market increase every year);
- Expanding recognition of sea buckthorn as a product that is especially beneficial to human health;
- Farmers'perception of sea buckthorn as a source of additional income in the farm;
- Establishment of sea buckthorn plantations of highly productive varieties;
- Development of technologies for harvesting and processing sea buckthorn fruits.

- 沙棘果需求持续增长（国内市场逐年增加）
- 沙棘产品有益于人体健康的知识日益被社会认知。
- 农民认识到，沙棘是农业增收的另一个重要补充来源。
- 利用高产品种建设沙棘种植园
- 开发沙棘果实采收和加工技术

五 What are we doing 我们正在做什么

1. Installation of an irrigation systems: (more stable harvest, stronger plants, bigger plants, less diseases);

2. Renovation of old “mix varieties” plantations by breeding seedlings of high productivity varieties. The big problem is renewal inorganic farms.

3. Fighting with a sea buckthorn fly (traps, selection of harvesting method, scientific research)

4.Marketing activities informing consumers about the health and environmental benefits of sea buckthorn (Internet, TV, Radio, exhibitions, tastings, etc.)

- 布设灌溉设施：确保树体壮、病害少、产量高。
- 通过引种高产沙棘新品种，改造原有的品种混种沙棘园。
- 通过布设捕蝇器、采用新的采收方法、科学研究等，防控沙棘果蝇。
- 市场开发：通过电视、广播、互联网、展览、现场品尝等手段，宣传沙棘的营养健康、生态环境价值。

7. Country Report of Poland

波兰沙棘发展报告

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Country Report of Seabuckthorn Development in Poland in 2023

2023 年波兰沙棘开发报告

1. The national-wide seabuckthorn resources of plantations and berry yield.

1.1. The total area of seabuckthorn resources up to the year of 2023 including the natural stands and the artificial plantations, and the increased areas in the year of 2023.

The sea buckthorn (Hippophaë rhamnoides L) – “Rokitnik zwyczajny” (in Polish) has been known for long time, but it belongs to the rare (minor) cultivated crop in our country. So, there is no official statistic data and estimated acreage of commercial plantation was about 120 ha in 2023. The natural plantings are in city/town parks, National parks and on the dunes of the Baltic Sea.

Sea buckthorn cultivation in Poland is developing slowly, but systematically. Although no large new plantations are being established, many people grow sea buckthorn in their gardens.

1.2. The harvested and the estimated amounts of total production of seabuckthorn berries in your country in the year of 2023.

Sea buckthorn fruit production was approximately 400 metric tons harvested in 2023. The main barrier to the growth of sea buckthorn production in Poland is the lack of mechanized harvesting of these fruits.

1.3. A brief introduction of main seabuckthorn plantations in your country.

In Poland, there has been increasing interest in recent years in both the cultivation of sea buckthorn

一、全国沙棘资源总面积（含天然林和人工种植、工业原料种植园）、当年果实总产量及采收量。主要种植区（种植工程、种植园）简要介绍。

1.1. 截至 2023 年的沙棘资源总面积，包括天然林和人工林，以及 2023 年增加的面积。

沙棘（Hippophaë rhamnoides L）–“Rokitnik zwyczajny”（波兰语）早已为人所知，但它属于波兰小众（次要）栽培作物。因此，没有官方统计数据，2023 年商业种植面积估计约为 120 公顷。自然分布在城市 / 城镇公园、国家公园和波罗的海沙丘上。

波兰的沙棘种植发展缓慢，但很系统。虽然没有建立大型的新种植园，但许多人在花园里种植沙棘。

1.2. 2023 年贵国沙棘浆果的收获量和估计总产量。

2023 年，波兰全国沙棘果实产量约为 400 公吨。波兰沙棘产量增长的主要障碍是缺乏沙棘采收机械。

1.3. 简要介绍贵国主要的沙棘人工种植园。

在波兰，由于沙棘果实的营养价值，近年来人

and consumption of its fruit and preserves due to their nutraceutical properties. Most plantations are rather small (1-5 ha) managed according to organic fruit production. The biggest plantation (over 40 ha) belongs to Family Horticultural Farm located in the North-east Poland).

Sea buckthorn, and especially its fruits, are becoming more and more popular, which is largely due to the promotional activities that we have been carrying out for several years by scientists and producers of these fruits and processors processing Polish fruit.

2. The genetic resources of seabuckthorn in your country

2.1 Introduction of natural seabuckthorn species and subspecies of *Hippophae*.

The main and commonly known and used is Hippophaë rhamnoides L.

2.2. Names of newly bred seabuckthorn varieties and introduced cultivars from other countries and their performance including morphological/ biochemical features.
No new cultivars released.

3. Enterprises and processing

3.1. In the year of 2023, the number of seabuckthorn enterprises, the gross output and the total value of seabuckthorn products in your country.

There are only small processing plants of the sea buckthorn fruits in Poland. It is difficult to provide the gross output and the total value of seabuckthorn products in our country.

3.2. A brief introduction of main enterprises and their main products of seabuckthorn.

们对其栽培和果实及其制品消费越来越感兴趣。大多数种植园都很小（1–5 公顷），按照有机水果生产进行管理。最大的种植园（超过 40 公顷）属于位于波兰东北部的家庭园艺农场。

沙棘，尤其是其果实，越来越受欢迎，这在很大程度上源于科学家和这些水果的生产商以及加工波兰水果的加工商多年来开展的促销活动。

二、全国沙棘种质资源和新品种培育应用情况

2.1 天然沙棘种和亚种介绍

目前分布和应用的种质资源主要为鼠李沙棘亚种。

2.2. 新培育的沙棘品种和海外引进品种的名称及其表现，包括形态 / 生化特征。没有新品种发布。

三、全国沙棘加工企业总数、总产量、总产值。主要生产企业及产品简要介绍。

3.1. 2023 年贵国沙棘企业数量、沙棘产品总产量和总价值。

波兰只有小型的沙棘果加工厂。很难提供波兰的沙棘产品的总产量和总价值。

3.2. 沙棘企业及其主要产品简介
沙棘果实应用于：

Sea buckthorn fruits are used in:
1.**Food processing** - the most popular are juices/ nectars, soft drinks, jams, tea and dried fruits.

2.**Pharmacy** - functional products, supplements and drugs, including oils from fruit flesh and seeds (OMEGA).

3.Cosmetic - creams, lotions, shampoos and lipsticks.

A small group of domestic fruit producers and processors producing excellent products are struggling with the uncontrolled import of sea buckthorn fruit, especially ready-made juices, even in barrels, the quality of which is very questionable, which is often confirmed by consumers.

Polish producers and processors are not competitive compared to imported products, especially from the East, where sea buckthorn fruits are harvested every year with the onset of frost, and they are not able to compete in terms of costs with goods coming from the above-mentioned directions.

4. Scientific research

4.1 The status of seabuckthorn scientific institution in your country in terms of the number of institutes and their scientists, and their research field.

The National Institute of Horticultural Research (InHort) in Skierniewice, Poland has two groups of research dealing with sea buckthorn: first dedicated to cultivar assessment and technology of cultivation (lead by Prof. Dr. Stanisław Pluta) and second dealing with plant protection (lead by Prof. Eligio Malusà and Dr. Małgorzata Tartanus).

In addition, the few scientists from Universities of Life Sciences in Lublin (South-east Poland) and in Olsztyn (North-east Poland) have been dealing on

1. 食品加工 – 最受欢迎的是果汁 / 花蜜、软饮料、果酱、茶和干果。

2. 药品 – 功能性产品、补充剂和药物，包括果肉和种子油（欧米茄）。

3. 化妆品 – 面霜、乳液、洗发水和唇膏。

一小部分生产优质产品的国内鲜果生产商和产品加工商正在努力应对不受控制进口沙棘鲜果的现状，尤其是鲜榨的果汁，即使是桶装果汁，其质量也非常值得怀疑，这往往得到消费者的证实。

与进口产品相比，波兰的沙棘果农和加工商没有竞争力，尤其是来自东部的产品，那里每年都会在霜冻开始时收获沙棘果实，他们无法在成本方面与来自上述方向的商品竞争。

四、全国沙棘科学研究情况（研究人员、研究领域、主要成果），重点研究单位（大学、研究所、企业）简要介绍。

4.1 贵国沙棘科研机构的现状，包括研究所及其科学家的数量和研究领域。

位于波兰 Skierniewice 的国家园艺研究所（InHort）有两个团队在从事沙棘研究：第一个团队致力于品种评估和栽培技术（由 Stanisław Pluta 教授领导）；第二团队专注解决植物保护的相关问题（由 Eligio Malusà 教授和 Małgorzata Tartanus 博士领导）。

此外，来自卢布林（波兰东南部）生命科学大学和奥尔什廷（波兰东北部）的一些科学家一

different topics, including the beneficial bioactive compounds and their influence on human health.

4.2. A brief introduction of main research institutes/ universities and enterprises, the main research programs and updated achievements on seabuckthorn.

Research on sea buckthorn (*H. rhamnoides*) is mainly carried out at the National Institute of Horticultural Research (*InHort*) in Skierniewice, Poland. Studies on the protection of sea buckthorn against diseases and pests has been carried out over several years at the InHort as part of research on organic farming funded by the Ministry of Agriculture and Rural Development. These studies have been carried out in collaboration with farmers located in the major production areas (*North and East part of Poland*).

Due to the still limited land area of the crop, the harmful and beneficial fauna occurring in Polish plantations is little known. Monitoring studies were therefore undertaken to determine the threats to sea buckthorn. As a result, it was shown that the greatest pest threat, especially in organic plantations, is the sea buckthorn fruit fly (*Rhagoletis batava*). The sea buckthorn gall mite (*Aceria hippophaena*), the sea buckthorn aphid (*Capitophorus hippophaes*), and the sea buckthorn lice (*Cacopsylla hippophaes*) may also occur. Fungal and bacterial pathogens were isolated from various parts of the plant (*shoots, flowers, fruit*) in studies assessing their presence. Among fungi were isolated Botrytis cinerea and Alternaria infectoria, which are polyphagous and have a wide host-plant range, as well as Hymenopleella hippophaeicola which is already known to be a pathogen of sea buckthorn and can infect both shoots and leaves.

Several projects have carried out research on the reduction of sea buckthorn fruit fly populations. Yellow sticky traps can be used to monitor the presence of the fly with good results. On the other hand, traps with an attractant developed

直在研究不同的课题，包括有益的生物活性化合物及其对人类健康的影响。

4.2. 关于主要研究机构 / 大学和企业、沙棘的主要研究项目和最新成果的简介

沙棘（*H.rhamnoides*）研究主要在波兰斯基尔涅维奇的国家园艺研究所（*InHort*）进行。作为农业和农村发展部资助的有机农业研究的一部分，波兰国家园艺研究所多年来一直在进行关于保护沙棘免受病虫害的研究。这些研究是与主要生产区（波兰北部和东部）的农民合作进行的。

由于作物的土地面积仍然有限，波兰种植园中出现的有害和有益动物群知之甚少。因此，进行了监测研究，以确定沙棘面临的威胁。结果表明，最大的害虫威胁，特别是在有机种植园中，是沙棘果蝇（*Rhagoletis batava*）。沙棘瘿螨（*Aceria hippophaena*）、沙棘蚜虫（*Capitophorus hippophaes*）和沙棘虱（*Cacopsylla hippophae*）也可能出现。真菌和细菌病原体在发生评估研究中从植物的不同部位（芽、花、果实）被分离出来。其中分离出的真菌包括灰霉病菌和链格孢菌，它们是多食性的，寄主植物范围广，以及已知是沙棘病原体的海马膜壳菌，可以感染茎和叶。

有几个项目对减少沙棘果蝇数量进行了研究。黄色粘性扑蝇器可用于监测苍蝇的发生，效果良好。另一方面，为应对 Ceratitis capitata

for Ceratitis capitata, as well as a 4% solution of ammonium phosphate fertiliser, were highly effective in mass trapping of sea buckthorn fruit fly adults. A reduction of fruit damage (*efficacy 40-50%*) of this pest was also observed after treatments with cinnamon, clove and oregano oils. In Poland there are also some research programs carried out by other Life Sciences (*Agricultural*) Universities mentioned above. Studies have mainly concerned the determination of bioactive compounds in the fruits of various sea buckthorn cultivars and their health-promoting properties, as well as the formulation of new, innovative products and dietary supplements.

害虫开发的引诱剂扑蝇器以及 4% 的磷酸铵肥料溶液在大规模诱捕沙棘果蝇成虫方面非常有效。用肉桂、丁香和牛至油处理后，这种害虫对果实的损伤也减少了（功效为 40–50%）。在波兰，上述其他生命科学（农业）大学也开展了一些研究项目。研究主要涉及各种沙棘品种果实中生物活性化合物的测定及其促进健康的特性，以及新的创新产品和膳食补充剂的配方。

5. Human resources

五、全国沙棘从业人员情况，协会会员总数（集体会员、个人会员）。先进人物简要介绍。

5.1. The total personnel involved in seabuckthorn research, manufacturing, marketing planting, public management, etc. in your country.

5.1. 贵国沙棘研究、生产、营销、种植、公共管理等总人员

Several scientists from different Research Institutions and Universities are only involved the in seabuckthorn research, manufacturing, marketing planting, public management in Poland.

来自不同研究机构和大学的几位科学家只参与了波兰的沙棘研究、制造、营销种植和公共管理。

5.2. The members of National Seabuckthorn Association if provided, including institutional and individual members.

5.2. 国家沙棘协会成员（如有），包括机构和个人成员

Unfortunately, there has not been established the National Seabuckthorn Association yet.

很遗憾，目前波兰没有成立国家沙棘协会

5.3. A brief introduction of successful institutional members of seabuckthorn Association if provided. Not any.

5.3. 沙棘协会成员（机构）典型简介（如有）无。

6. Introduction of important activities, key events, successful stories and advanced persons together with good photos in Poland in the year of 2023.

六、当年全国有关沙棘的重要活动、事项简要介绍

再次强调，最重要的事件（如 2022 年）与波兰沙棘推广有关，这是更广泛地推广水果和蔬

The most important event again (like in 2022) was connected with the promotion of sea buckthorn in our country as a part of a wider promotion of fruit and vegetables. Berry fruits, including sea buckthorn are promoted as "Polish superfruits". Fruits and vegetables are promoted as the basis of everyday nutrition "half the battle".

7. The policies, documents related with seabuckthorn and research papers in the year of 2021-2023 in Poland.

Research papers

1.Tartanus M., Malusà E., Podedworny G., Pluta S., 2023. Development of integrated approach for mass trapping of Rhagoletis Batava in organic Seabuckthorn orchards.9th International Sea Buckthorn Association Conference ISA – 2023. 22-25 May 2023. Thessaloniki, Grecja; Book of Abstracts: 21

2.Tartanus M., Malusà E., Furmańczyk E.M. and Danelski W. 2021 Monitoring fruit fly populations in cherry, Japanese rose and sea buckthorn in organic orchards in Poland. In: B. Tanović, P.C. Nicot, V. Dolzhenko & D. Marčić (Eds.) Understanding pests and their control agents as the basis for integrated plant protection, Proceedings of the VIII Congress on Plant Protection (November 25-29, 2019, Zlatibor, Serbia). IOBC-WPRS, Plant Protection Society of Serbia and IOBC-EPRS, Darmstadt, Germany, pp. 67-73

Technical papers

3.Podedworny G., Tartanus M., Malusà E., 2023. Substancje podstawowe w ochronie roślin jagodowych (Basic substances for the protection of

菜的一部分。浆果，包括沙棘，被誉为“波兰超级水果”。水果和蔬菜被推广为每日营养的“半壁江山”。

七、当年本国有关沙棘的主要政策文件、发表的研究论文等。

研究论文

1.Tartanus M.、Malusà E.、Podedworny G.、Pluta S.，2023 年。有机沙棘果园中大规模诱捕沙棘果蝇 Rhagoletis Batava 的综合方法研究开发。第 9 届国际沙棘协会会议 ISA－2023。2023 年 5 月 22 日至 25 日。塞萨洛尼基，希腊；摘要集：21

2.Tartanus M.、Malusà E.、Furmańczyk E.M. 和 Danelski W.2021 监测波兰有机果园樱桃、日本玫瑰和沙棘中的果蝇种群。载于：B.Tanović、P.C.Nicot、V.Dolzhenko 和 D.Marčić（编辑）《理解害虫及其控制剂是综合植物保护的基础》，第八届植物保护大会论文集（2019 年 11 月 25 日至 29 日，塞尔维亚兹拉蒂博尔）。IOBC-WPRS，塞尔维亚植物保护协会和 IOBC-EPRS，德国达姆施塔特，第 67-73 页

技术报告

3. 波德沃尼 G.、塔尔塔努斯 M.、马卢萨 E.，2023 年。保护浆果作物的基本物质。贾戈德尼克 6（84）：70-75。

berry crops). Jagodnik 6(84): 70-75.
4.Malusà E., Tartanus M., 2022. Innowacje nie tylko w ochronie roślin jagodowych (innovations not only for the protection of berry fruits). TMJ 6: 63-64.

5.Tartanus M., Malusà E., 2022. Preparaty biologiczne w walce ze szkodnikami (Biological formulations for the control of pests). Jagodnik 6 (76): 85 87.

6.Tartanus M., Malusà E., 2022. Nasionnice szkodnikami nie tylko czereśni (Fruit flies, pests not only for cherry fruits). Jagodnik 5(75):83-85.

4.Malus à E.，Tartanus M.，2022 年。Innowacje nie tylko w ochronie roślin jagodowych（创新不仅是为了保护浆果）。tmj6:63–64。

5.Tartanus M.，Malus à E.，2022 年。制备生物制剂 w walce ze szkodnikami（用于控制害虫的生物制剂）。贾戈德尼克 6（76）:85.87。

6.Tartanus M.，Malus à E.，2022 年。Nasionnice szkodnikami nie tylko czereśni（果蝇、害虫不仅是为了浆果）。贾戈德尼克 5（75）：83–85。




中英文翻译：卢智超 English- Chinese translated by LU Zhichao

8.Constitution of ISA

沙棘协会章程

Constitution of International Seabuckthorn Association
(Adopted at the Second Representative Assembly of ISA on October 15, 2019)
国际沙棘协会章程

Chapter I General Provisions

Article 1 The name of the Association is "International Seabuckthorn Association", and its English abbreviation is ISA.

Article 2 The Association is an academic and industry-based international non-governmental and non-profit organization that is voluntarily formed by enterprises, institutions, individuals and other organizations which are active in the research and development of seabuckthorn around the world.

Article 3 The purpose of the Association is to give full play to the role of seabuckthorn in facilitating environmental protection, economic development and human health, promote exchanges and global cooperation in seabuckthorn cultivation, scientific research, production, economy and trade, personnel, information, etc., and provide international communication service of seabuckthorn to the Association's members and all sectors of the society.

Article 4 The Association subject to the operational guidance and supervision of its competent authority of the Ministry of Water Resources of the People's Republic of China (MWR) and its registration and administration authority of the Ministry of Civil Affairs of the People's Republic of China.

The Association abides by the Constitution, laws, regulations and policies of the state, and complies with the ethical trends of the society.

Article 5 The address of the Association is 1, Fuxing Road, Haidian District, Beijing.

第一章 总 则

第一条 本协会的名称为"国际沙棘协会"，英文译名为 International Seabuckthorn Association，英文缩写：ISA。

第二条 本协会是由全球积极开展沙棘研究与开发的企事业单位、个人和其他组织自愿结成的、学术性和行业性的国际非政府、非营利组织。

第三条 本协会的宗旨是全面发挥沙棘在促进环境保护、经济发展及人类健康等方面的作用，推进中国与世界各国在沙棘种植、科研、生产、经贸以及人员和信息等方面的交流与合作，为会员和社会各界提供沙棘领域的国际交流服务。

第四条 本协会接受业务主管机关水利部与登记管理机关民政部的业务指导和监督管理。本协会遵守宪法、法律、法规和国家政策，遵守社会道德风尚。

第五条 本协会的地址：北京市海淀区复兴路甲 1 号。

Chapter II Scope of Association Affairs

Article 6 Under the principles of mutual respect, equality, mutual benefit and common development, the Association carries out the following activities:
(1) Give play to the self-discipline role of the seabuckthorn industry, formulate industry regulations, standardize industry behaviors, and promote the development of the industry;
(2) Investigate and research the developmental dynamics and trends of seabuckthorn at home and abroad, and provide consulting services for the construction and development of seabuckthorn;
(3) Undertake international exchange and cooperation projects entrusted or funded by government agencies and other organizations;
(4) Build international seabuckthorn information network and database, and promote international exchanges and cooperation of seabuckthorn;
(5) In accordance with relevant provisions, edit and publish professional publications, and expand the popularity and publicity of seabuckthorn knowledge;
(6) Organize and host exchange activities such as seabuckthorn academic seminars at home and abroad;
(7) Carry out personnel training and exchange visits in the field of seabuckthorn.

Chapter III Membership

Article 7 ISA members are divided into unit members and individual members.

Article 8 To apply to join the Association, you must comply with the following conditions:
(1) Support the Constitution of the Association;
(2) Have the willingness to join the Association;
(3) Enterprises, institutions, individuals and other organizations have the willingness to actively carry out international exchanges and cooperation of seabuckthorn;
(4) Have a major impact in the field of seabuckthorn business.

第二章 业务范围

第六条 本协会在相互尊重、平等互利、共同发展的原则下，履行以下职责，开展以下各项业务:
（一）发挥沙棘行业自律作用，制定行业规章，规范行业行为，推动行业发展；
（二）调查研究国内外沙棘发展动态和趋势，提供沙棘建设与开发咨询服务；
（三）承办政府机构等组织委托或资助的国际交流与合作项目；
（四）建设国际沙棘信息网络和资料库，促进国际沙棘交流与合作；
（五）按照有关规定，编辑出版专业刊物，加大沙棘知识的普及和宣传力度；
（六）组织举办国内外沙棘学术研讨会等交流活动；
（七）开展沙棘领域的人才培训和交流考察。

第三章 会员

第七条 国际沙棘协会的会员分为单位会员和个人会员。

第八条 申请加入协会的会员，必须具备下列条件：
（一）拥护协会的章程；
（二）有加入协会的意愿；
（三）愿意积极开展沙棘国际交流与合作的企事业单位、个人和其他组织；
（四）在沙棘业务领域有较大的影响。

Article 9 The procedures for members to join the Association are:
(1) Submit an application for membership;
(2) Approved by the ISA Board through discussion;
(3) Pay dues according to the standards of membership dues;
(4) Membership certificate is issued by the ISA Board or an authorized body of the Board.

Article 10 Members have the following rights:
(1) The Association's right to vote, right to stand in election and voting right;
(2) Participate in activities of the Association;
(3) Have priority in obtaining services of the Association;
(4) The rights to criticize and supervise the work of the Association;
(5) Join the Association voluntarily and withdraw freely.

Article 11 Members shall perform the following duties:
(1) Execute resolutions of the Association;
(2) Maintain the legitimate rights and interests of the Association;
(3) Accomplish the work assigned by the Association;
(4) Pay the membership dues as required;
(5) Reflect situations and provide relevant information to the Association.

Article 12 The member who would like to withdraw shall notify the Association in writing and return the membership card. If a member does not pay membership dues or does not participate in activities of the Association for one year, it is regarded as withdrawing voluntarily.

Article 13 If a member seriously violates the Constitution of the Association, it shall be adopted to remove by vote of the ISA Board.

Chapter IV Generation and Removal of Organizations and Principal Heads of Offices

Article 14 The highest authority of the Association is the Representative Assembly.

第九条 会员入会的程序是：

（一）提交入会申请书；
（二）经理事会讨论通过；
（三）按会费标准缴纳会费；
（四）由理事会或理事会授权机构发给会员证。

第十条 会员享有下列权利：
（一）协会的选举权、被选举权和表决权；
（二）参加协会的活动；
（三）获得协会服务的优先权；
（四）对协会工作的批评建议权和监督权；
（五）入会自愿、退会自由。

第十一条 会员履行下列义务：
（一）执行协会的决议；
（二）维护协会合法权益；
（三）完成协会交办的工作；
（四）按规定交纳会费；
（五）向协会反映情况，提供有关资料。

第十二条 会员退会应书面通知协会，并交回会员证。会员如果 1 年不缴纳会费或不参加协会活动的，视为自动退会。

第十三条 会员如有严重违反本章程的行为，经理事会表决通过，予以除名。

第四章 组织机构和负责人产生、罢免

第十四条 协会的最高权力机构是会员代表大会。

Article 15 The functions and powers of the Representative Assembly are:
(1) Formulate and revise the Constitution;
(2) Elect and dismiss members of the ISA Board;
(3) Review the work report and financial report of the ISA Board;
(4) Formulate and revise the standard of membership fees;
(5) Make decisions on termination matters;
(6) Make decisions on other major matters.

Article 16 The Representative Assembly must be attended by more than two-thirds of the member representatives. The resolutions must be adopted by vote of more than half of the attended member representatives.

Article 17 A term of the Representative Assembly is five years. Under special circumstances that a term needs to be ended in advance or postponed, it shall be adopted by vote of the ISA Board, and submitted to the competent authority for review and the registration and administration authority for approval. However, the maximum extension of a term shall not exceed one year.

Article 18 The ISA Board is the executive body of the Representative Assembly. The Board leads the Association to carry out the daily work during intervals between meetings and is responsible to the Representative Assembly.

Article 19 The functions and powers of the ISA Board are:
(1) Execute resolutions of the Representative Assembly;
(2) Elect and dismiss the chairman, vice chairman and secretary general;
(3) Prepare and host the Representative Assembly;
(4) Report work and financial status to the Representative Assembly;
(5) Make decisions on the absorption or removal of members;
(6) Decide to establish administrative offices, branches, representative offices and entities;
(7) Make decisions on the employment of the Deputy secretary general and principal heads of offices;
(8) Lead organs of the Association to conduct work;

第十五条 会员代表大会的职权是：
（一）制定和修改章程；
（二）选举和罢免理事；
（三）审议理事会的工作报告和财务报告；
（四）制定和修改会费标准；
（五）决定终止事宜；
（六）决定其他重大事宜。

第十六条 会员代表大会须有 2/3 以上的会员代表出席方能召开，其决议须经到会会员代表半数以上表决通过方能生效。

第十七条 会员代表大会 5 年一届。因特殊情况需提前或延期换届的，须由理事会表决通过，报业务主管单位审查并经社团登记管理机关批准同意。但延期换届最长不超过 1 年。

第十八条 理事会是会员代表大会的执行机构，在闭会期间领导协会开展日常工作，对会员代表大会负责。

第十九条 理事会的职权是：
（一）执行会员代表大会的决议；
（二）选举和罢免主席、副主席、秘书长；
（三）筹备召开会员代表大会；
（四）向会员代表大会报告工作和财务状况；
（五）决定会员的吸收或除名；
（六）决定设立办事机构、分支机构、代表机构和实体机构；
（七）决定副秘书长、各机构主要负责人的聘任；
（八）领导协会各机构开展工作；

(9) Develop the internal management system;
(10) Make decisions on other major matters authorized by the Representative Assembly.

Article 20 the meeting of the ISA Board must be attended by more than two-thirds of the Board members. The resolutions must be adopted by vote of more than half of the attended members.

Article 21 the meeting of the ISA Board must be held at least once a year. In special circumstances, it may be held in the form of communication.

Article 22 The chairman, vice chairman and secretary general of the Association must meet the following conditions:
(1) Have a major impact in the operational area of the Association;
(2) In principle, the chairman, vice chairman and secretary general shall not be more than 70 years of age, and the secretary general shall be full-time;
(3) Shall be healthy and able to work properly;
(4) Not subject to criminal punishment such as deprivation of political rights;
(5) Have full capacity for civil conduct.

Article 23 If the chairman, vice chairman or secretary general of the Association exceeds the maximum age restriction of appointment, the post shall be held after being adopted by vote of the ISA Board, and submitted to the competent authority for review and the registration and administration authority for approval.

Article 24 A term of the chairman, vice chairman or secretary general of the Association is five years, and shall not exceed two terms at maximum in principle. Under special circumstances that a term needs to be ended in advance or postponed, the post shall be held after being adopted by vote of more than two-thirds of the member representatives of the Representative Assembly, and submitted to the competent authority for review and the registration and administration authority for approval.

（九）制定内部管理制度；
（十）决定经会员代表大会授权的其他重大事项。

第二十条 理事会须有 2/3 以上理事出席方能召开，其决议须经到会理事半数以上表决通过方能生效。

第二十一条 理事会每年至少召开一次会议；情况特殊的，也可采用通讯形式召开。

第二十二条 协会主席、副主席、秘书长必须具备下列条件：
（一）在协会业务领域内有较大影响；
（二）主席、副主席、秘书长最高任职年龄不超过 70 周岁，秘书长为专职；
（三）身体健康，能坚持正常工作；
（四）未受过剥夺政治权利等刑事处罚的；
（五）具有完全民事行为能力。

第二十三条 协会主席、副主席、秘书长如超过最高任职年龄的，须经理事会表决通过，报业务主管单位审查并社团登记管理机关批准同意后，方可任职。

第二十四条 协会主席、副主席、秘书长每届任期 5 年，一般不应超过 2 届。因特殊情况需延长任期的，须经会员代表大会 2/3 以上会员代表表决通过，报业务主管单位审查并经社团登记管理机关批准同意后方可任职。

Article 25 The secretary general is the legal representative of the Association. The legal representative of the Association shall not serve as legal representative of other groups.

Article 26 The chairman of the Association exercises the following functions and
(1) Convene and preside over the ISA Board;
(2) Check the implementation of resolutions of the Representative Assembly and the ISA Board;
(3) Preside over and study major matters of the Association;
(4) May nominate the list of candidates for vice chairman and secretary general, but the appointment is decided by the ISA Board.
(5) May delegate vice chairman or secretary general to exercise functions and powers of the chairman;

Article 27 The secretariat permanently located in Beijing, China, is the legally registered body of ISA and execute the following functions under the guidance of related authorities of Chinese government.
(1) Conduct routine activities following the work-plan;
(2) Execute the decision of the Board;
(3) Manage the asset of Association;
(4) Assist the Board and Chairman to implement related activities;
(5) Draft rules or regulation for decision of the Board and then put into implementation;
(6) Absorb and manage members authorized by the Board.

Article 27 The secretary general of the Association exercises the following functions and powers:
(1) Sign relevant important documents on behalf of the Association;
(2) Presided over administrative offices to carry out the daily work, and organize the implementation of annual work plan;
(3) Coordinate the work of branches, representative offices and entities;
(4) Nominate deputy secretary general and principal heads of administrative offices, branches, representative offices and entities, and submit to the ISA Board for decision;

第二十五条 协会秘书长为协会的法定代表人。本协会法定代表人不兼任其他团体的法定代表人。

第二十六条 协会主席行使下列职权：
（一）召集和主持理事会；
（二）检查会员代表大会、理事会决议的落实情况；
（三）主持研究协会的重大工作事宜；
（四）可提名副主席、秘书长候选名单，由理事会决定任命；
（五）可委托副主席或秘书长行使其职权；

第二十七条 秘书处是协会的法定办事机构，常设在中国北京，履行以下职责：
（一）在中国政府有关部门的指导下制定实施年度计划，开展日常工作；
（二）负责执行理事会的决定；
（三）管理协会的资产；
（四）协助理事会及主席履行具体职能；
（五）起草制定协会有关规章制度并提请理事会批准后执行；
（六）经理事会授权，代行理事会有关吸收新会员、管理会员的职权。

第二十七条 协会秘书长行使下列职权：
（一） 代表协会签署有关重要文件；
（二） 主持办事机构开展日常工作，组织实施年度工作计划；
（三） 协调各分支机构、代表机构、 实体机构开展工作；
（四）提名副秘书长以及各办事机构、分支机构、代表机构和实体机构主要负责人，交理事会决定；

(5) Make decisions on the employment of full-time staff for administrative offices, representative offices and entities;
(6) Deal with other daily affairs.

Chapter Five Principles of Asset Management and Use

Article 28 Financial sources of the Association:
(1) Membership fees;
(2) Donations;
(3) Government grants;
(4) Income from activities or services within the verified operational scope of the Association;
(5) Interest;
(6) Other legal income.

Article 29 The Association collects membership dues in accordance with relevant state regulations.

Article 30 The funds of the Association must be used in the operational scope and career development in accordance with the Constitution of the Association, and shall not be distributed among the members.

Article 31 The Association shall establish a strict financial management system to ensure that accounting materials are legal, real, accurate and complete.

Article 32 The Association shall be staffed with accounting personnel with professional qualifications. The accountant shall not serve as cashier. Accounting personnel must conduct accounting and implement accounting supervision. When transferring or leaving the post, accounting personnel must accomplish handover procedures with take-over personnel.

Article 33 The asset management of the Association must implement the financial management system as stipulated by the state and accept the supervision of the Representative Assembly and the financial authority. When assets source from state grants, social donations or social funding, it must be supervised by the audit institution, and the relevant

（五）决定办事机构、代表机构、实体机构专职工作人员的聘用；
（六）处理其他日常事务。

第五章 资产管理、使用原则

第二十八条 协会经费来源：
（一）会费；
（二）捐赠；
（三）政府资助；
（四）在核准的业务范围内开展活动或服务的收入；
（五）利息；
（六）其他合法收入。

第二十九条 协会按照国家有关规定收取会员会费。

第三十条 协会经费必须用于本章程规定的业务范围和事业的发展，不得在会员中分配。

第三十一条 协会建立严格的财务管理制度，保证会计资料合法、真实、准确、完整。

第三十二条 协会配备具有专业资格的会计人员。会计不得兼任出纳。会计人员必须进行会计核算，实行会计监督。会计人员调动工作或离职时，必须与接管人员办清交接手续。

第三十三条 协会的资产管理必须执行国家规定的财务管理制度，接受会员代表大会和财政部门的监督。资产来源属于国家拨款或者社会捐

information shall be disclosed to the public in appropriate manners.

Article 34 Before the change of a term or replacing the legal representative, the Association must accept financial audit organized by the registration and administration authority and the competent authority.

Article 35 No unit or individual shall invade and occupy, privately divide or misappropriate assets of the Association.

Article 36 The salaries, insurance and welfare benefits for the full-time staff of the Association shall be implemented in accordance with relevant state provisions on public institutions.

Chapter Six Procedures for Revisions of the Constitution

Article 37 The revisions to the Constitution of the Association shall be submitted to the Representative Assembly for discussion after being adopted by vote of the ISA Board.

Article 38 Before it comes into force, the revised Constitution of the Association shall be reviewed and approved by the competent authority and verified by the registration and administration authority within 15 days after being passed by the Representative Assembly.

Chapter Seven Termination Procedures and Assets Treatment after Termination

Article 39 If the Association completes its purpose, dismisses voluntarily or needs to apply for the cancellation due to reasons such as separation or merger, the ISA Board shall propose a termination motion.

Article 40 The termination motion shall be adopted by vote of the Representative Assembly and submitted to the competent authority for review and approval.

赠、资助的，必须接受审计机关的监督，并将有关情况以适当方式向社会公布。

第三十四条 协会换届或更换法定代表人之前必须接受社团登记管理机关和业务主管单位组织的财务审计。

第三十五条 协会的资产，任何单位、个人不得侵占、私分和挪用。

第三十六条 协会专职工作人员的工资和保险、福利待遇，参照国家对事业单位的有关规定执行。

第六章 章程的修改程序

第三十七条 对协会章程的修改，须经理事会表决通过后报会员代表大会审议。

第三十八条 协会修改的章程，须在会员代表大会通过后 15 日内，经业务主管单位审查同意，并报社团登记管理机关核准后生效。

第七章 终止程序及终止后的财产处理

第三十九条 协会完成宗旨或自行解散或由于分立、合并等原因需要注销的，由理事会提出终止动议。

第四十条 协会终止动议须经会员代表大会表决通过，并报业务主管单位审查同意。

Article 41 Before the termination, the Association shall establish a liquidation organization under the guidance of the competent authority and relevant authorities to settle claims and debts and deal with the aftermath. During the liquidation, activities other than liquidation shall not be carried out.

Article 42 After the registration and administration authority finishes procedures for the cancellation of registration, the Association shall be terminated.

Article 43 After the termination of the Association, the remaining assets shall be used for the development of undertakings related to the purpose of the Association in accordance with relevant state provisions under the supervision of the registration and administration authority and the competent authority.

Chapter Eight Supplementary Provisions

Article 44 The Constitution of the Association was adopted by vote at the Second Representative Assembly held on October 15, 2019.

Article 45 The ISA Board reserves the right of interpretation of the Constitution.

Article 46 The Constitution shall come into force on the date of verification by the registration and administration authority.

第四十一条 协会终止前，须在业务主管单位及有关机关指导下成立清算组织，清理债权债务，处理善后事宜。清算期间，不开展清算以外的活动。

第四十二条 协会经社团登记管理机关办理注销登记手续后即为终止。

第四十三条 协会终止后的剩余财产，在业务主管单位和社团登记管理机关的监督下，按照国家有关规定，用于发展与协会宗旨相关的事业。

第八章 附则

第四十四条 本章程经 2019 年 10 月 15 日在德国召开的第二届会员代表大会审议通过。

第四十五条 本章程的解释权属协会的理事会。

第四十六条 本章程自社团登记管理机关核准之日起生效。