The Annual Report of International Seabuckthorn Development for the Year of 2020
国际沙棘发展报告（2020 年度）

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

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国际沙棘协会
水利部沙棘开发管理中心

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Preface

For the purpose of information exchange, data sharing among member countries and to improve attraction globally from all members, 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 2020 is the important basic materials. The members of Board/Scientific Committee of ISA are requested to provide with the following 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 isazhangbin@qq.com.

By the October of 2021, we have received the Country Report of China, Finland, France, India, Kyrgyzstan, Latvia, Pakistan, Romania and Russia respectively. All these reports have been translated into Chinese or English for further bilingual printing with assistances from the Board and Scientific Committee of ISA.

According to the uncompleted statistics, by the end of 2020, seabuckthorn was found in 52 countries. The global resource was around 2,330,000 ha, including 2,071,000 ha in China.

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

The Editing Committee

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序 言

为加强国际沙棘协会各成员之间的信息交流，分享世界各国沙棘种植、加工、销售和科学研究等方面的基础数据和成功经验，国际沙棘协会秘书处根据 2021 年度工作计划安排，成立了《国际沙棘发展报告》编印专门工作组，起草了报告编写框架（见附录），于 2021 年 5 月组织邀请了国际知名沙棘专家撰写其所在国家的 2020 年度沙棘发展报告。截止 2021 年 10 月，我们已经收到来自中国、芬兰、法国、印度、吉尔吉斯斯坦、拉脱维亚、巴基斯坦、罗马尼亚和俄罗斯 9 个国家的报告（比上一年新增加了法国、吉尔吉斯斯坦和罗马尼亚），并组织翻译成中文（或英文）。现将 9 个国家的报告汇编《国际沙棘发展报告》，用中英文双语印制成册。

据统计，截止 2020 年 12 月，沙棘植物分布在全球 52 个国家，总面积约 2,330,000 公顷（3500 万亩）。其中，中国约有 2,071,000 公顷（3110 万亩），其他国家有约 259,000 公顷（390 万亩）。

今后，国际沙棘协会秘书处将在协会技术委员会的指导下，继续组织更多国家的沙棘最新进展，于每年 10 月前编辑上一年度的《国际沙棘发展报告》，与中外广大沙棘工作者分享。

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

2021 年 12 月

附 录

2020 年度国家沙棘发展报告编写框架

1. 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。

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6. 当年本国有关沙棘的主要政策文件、发表的研究论文等。

1. Country Report of China

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Seabuckthorn Development in China in the Year of 2020

2020 年中国的沙棘发展报告

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 berry yield, e.g. the total area of seabuckthorn resources up to the year of 2020 including the natural stands and the artificial plantations, and the increased areas in the year of 2020 and the harvested and the estimated qualities of total production of seabuckthorn berries in the country in the year of 2020.

China has the richest and largest area of seabuckthorn natural stands and artificial plantation. By the year of 2020, there were nationally in total 2,071,000 ha of seabutkthorn resources, accounting around 90% of the global resources, including 722,000 ha of natural ones, 1,287,000 ha of articicial ones for ecological pruposes and 62,000 ha of articicial ones for economic purposes. In China, seabutkthorn distributes naturally in 12 provinces (or autonomous regions, or municipality) e.g. Beijing, Hebei, Shanxi, Inner Mongolia, Sichuan, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang. And it has been artificially planted in 5 provinces e.g. Liaoning, Jilin, Heilongjiang, Henan and Shandong. In 2020, around 64,000 ha of seabuckthorn was planted for ecological and economic purposes.

The northeasttern, northwestern and northern China and the Loess Plateau are the concentrated regions of seabuckthorn resources. In estimation for the year of 2020, there were around 500,000 to 600,000 tonnes of yielding seabuckthorn berries, 200,000 to 300,000 tonnes of harvesting availnable

1. 全国沙棘资源总面积及当年新增面积（含天然林和人工种植生态林、经济林）、当年（估算）鲜果实总产量及采收量。主要种植区（种植园）简要介绍。

中国是天然沙棘林和人工种植沙棘面积最大的国家。截止 2020 年 12 月，全国沙棘资源总面积约 3107 万亩（约合 207.1 万公顷），约占世界沙棘资源总面积 3500 万亩（约合 233 万公顷）的 90%。其中人工沙棘林 2024 万亩，约合 134.9 万公顷（含人工生态林 1931 万亩、经济林约 93 万亩），天然沙棘林 1083 万亩（约合 72.2 万公顷）。全国 12 个省、自治区、直辖市（北京、河北、山西、内蒙古、四川、云南、西藏、陕西、甘肃、青海、宁夏、新疆）有沙棘天然分布，还有 5 个省（辽宁、吉林、黑龙江、山东、河南）人工种植沙棘。其中在 2020 年，全国新增 96 万亩人工沙棘林（约 6.4 万公顷），受新冠疫情影响，2020 年沙棘林新增面积比 2019 年新增面积 150 万亩（10 万公顷）略有下降。

我国“三北”地区和黄土高原是全国沙棘之乡。2020 年全国沙棘结果情况正常，果实产量与上一年基本持平。估算年产中国沙棘果实 50

and 80,000 to 100,000 tonnes of harvested. Because of the unconvinience caused by thorny and remote mountainous location, the practical harvesting rate was about 15% of the total yields. During the harvesting season, seabuckthorn companies rushed for berry purchase. Some of them had to reduce production due to short of rough materials. In the following Table 1, showed the resources of seabuckthorn provincially in China.

万 –60 万吨，可采收约 20 万 –30 万吨，实际采收加工利用约 8 万 –10 万吨，主要原因是我国沙棘多分布在大山沟深地区，并且沙棘有刺，不便采收，造成沙棘资源浪费。虽然每年收获季节，国内客商云集到此竞相收购，但多年供不应求，致使国内部分企业因原料不足半年生产、半年停产。

From the year of 2021 on, around 60,000 ha of articicial seabuckthorn plantation for economic purposes in Xinjiang, Heilonhjiang, Jilin and Inner Mongolia will be in high yield ages and is expected to supply with 100,000-200,000 tonnes of fresh berries per year and with the growth of 10-15% annually. Main resources and distribution locations are listed as in Table 1.

预计从 2021 年开始，位于新疆、黑龙江、吉林、以及内蒙古北部人工种植的约 90 万亩大果沙棘原料林逐渐进入结果果期，每年将新增大果沙棘果实可采收的产量 10 万 –20 万吨，并且其产量将以每年 10–15% 速度增长。国内沙棘企业的原料开始得到充足供应，半年停产的现象逐渐消失。表 1 为我国主要沙棘产区沙棘资源与分布情况。

Table 1. Total area up to 2020 and the newly increased area of seabuckthorn in 2020 in China (unit: 10,000 mu, 1 ha is equal to 15 mu)

表 1. 2020 年中国主要省现存及新增沙棘资源面积 (万亩，1 公顷 =15 亩)

产区 Province	截至 2020 年底 Up to 2020	2020 年新增沙棘生态林 New SBT for ecological purpose	2020 年新增沙棘经济林 New SBT for economic purpose
河北 Hebei	121	2	1
山西 Shanxi	582	16	1
内蒙古 Inner Mongolia	585	21	5
辽宁 Liaoning	91	2	1
吉林 Jilin	18	1	3
黑龙江 Heilongjiang	54	2	4
四川 Sichuan	60	2	
云南 Yunnan	10		
西藏 Tibet	130	5	
陕西 Shaanxi	360	5	
甘肃 Gansu	480	5	
青海 Qinghai	450	5	
宁夏 Ningxia	90	2	

产区 Province	截至 2020 年底 Up to 2020	2020 年新增沙棘生态林 New SBT for ecological purpose	2020 年新增沙棘经济林 New SBT for economic purpose
新疆 Xinjiang	70	5	10
其他地区 Other provinces	6		
合计 in total	3107	71	25

2. Introduction of genetic resources including natural seabuckthorn species and subspecies of Hippophae and names of newly bred seabuckthorn varieties and introduced cultivars from other countries and their performance including morphological/biochemical features.

2. 沙棘种质资源情况，天然分布的种类（种、亚种），培育的新品种名称、从国外引种的沙棘品种名称及其形态学、生物化学性状。

Seabuckthorn is found in 52 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, located in China 6 species and 8 subspecies e.g. Hippophae rhamnoides ssp. sinensis, Hippophae rhamnoides ssp. Yunnanensis, Hippophae rhamnoides ssp. Turkestanica, Hippophae rhamnoides ssp. Mongonica, Hippophae salicifolia, Hippophae tibetana, Hippophae gyantsensis, Hippophae neurocarpa ssp. Stellatopilosa, Hippophae neurocarpa ssp. neurocarpa, Hippophae goniocarpa, Hippophae goniocarpa ssp. Litangensis, Hippophae goniocarpa ssp. Goniocarpa.

全球约 52 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。按照我国沙棘植物学家廉永善的分类法，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）、中亚沙棘（亚种）、蒙古沙棘（亚种）、密毛肋果沙棘（亚种）、肋果沙棘（亚种）、理塘沙棘（亚种），棱果沙棘（亚种）。

China has introduced from Russia, Mongolia, Germany, Finland dozen of improved seabuckthorn varieties with good economic properties of large berry, reliable yield, high content of seed oil, less thorn or thornless, convenience for harvesting and processing.

目前我国先后从蒙古、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、易采摘和加工。

3. In the year of 2019, the number of seabuckthorn enterprises, the gross output and the total value of seabuckthorn products in the country and a brief introduction of main enterprises and their main products of seabuckthorn.

3. 目前全国沙棘企业总数、总产量、总产值。主要生产企业及产品简要介绍。

Chinese seabuckthorn industry started in 1980's and in rapid development in early 21st century. Following the national R&D, China is leading in the ultilization and production of seabuckthorn juice, leaf, lipid, pharmaceutical application of flavonoids etc. At the presence, around 80,000 to 100,000 tonnes of fresh seabuckthorn berries be harvested and consumed annually.

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。近年来沙棘高科技产品不断出现，在沙棘果汁、叶、油脂、黄酮药用等研究开发利用领域已处于国际先进水平。中国目前每年生产加工利用约8万-10万吨沙棘果实。

China is currently the country with the most sea-buckthorn products developed and applied, covering more than 200 varieties in 8 categories such as food, medicine, health care products and cosmetics.After more than 30 years of development, there are more than 3,200 sea-buckthorn enterprises in China, among which more than 200 are processing enterprises with sea-buckthorn as the main product, with an annual production value of about 26 billion yuan. Gaoyuan Shengguo Sea-buckthorn products Co., LTD., Beijing Powder Health Industry Co., LTD., Shaanxi Haitian Pharmaceutical Co., LTD., Shanxi Luliang Yeshanpo Food Co., LTD., Hebei Shenxing Sea-buckthorn Research Institute are among the outstanding ones, and have achieved good economic and social benefits.

中国是目前开发应用沙棘产品最多的国家，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30多年的发展，全国现有各类沙棘企业3200余家，年加工各类沙棘制品10万多吨。其中，以沙棘为主要产品的加工企业200多家，年产值约70亿元，加上其他沙棘企业的销售收入，全沙棘行业产值达240亿-260亿元。其中高原圣果沙棘制品有限公司、北京宝得瑞健康产业有限公司、陕西海天制药有限公司、山西吕梁野山坡食品有限公司、河北神兴沙棘研究院等都是其中的佼佼者，取得了较好的经济社会效益。

In terms of food processing, sea-buckthorn can be used as raw material 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, eliminating phlegm, benefiting lung, nourishing stomach, strengthening spleen, promoting blood circulation and removing blood stasis, burning and scalding, knife injury and frostbite, etc. Sea-buckthorn also shows its unique value in light industry and other aspects. Developed skin care products and cleanses that nourish skin, promote cell metabolism, promote epithelial tissue regeneration, have anti-allergy, antibacterial, strong penetrability and protect skin's natural color. Seabuckthorn stems have hard wood and can be used as raw materials for building materials such as plywood.

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。

In recent years, sea-buckthorn seed oil, fruit oil, fruit powder, procyanidin, flavone, dietary fiber and so on are the main extracts of sea-buckthorn in the domestic and foreign markets. Seabuckthorn seed oil and fruit oil, as intermediates and raw materials of drugs, cosmetics and functional foods, have broad application fields and huge market potential. The demand for various natural sea-buckthorn extracts and fruit juices, such as seabuckthorn concentrate juiec, fruit powder, oil, flavonoids, etc., has doubled. Some well-known enterprises at home and abroad, such as Nestle, Procter & Gamble, have launched or developed a number of sea-buckthorn related products.According to statistics, there are more than 200 kinds of sea-buckthorn 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)

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美国雀巢公司、美国宝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 applicaton of seabuckthorn in China
表 2. 沙棘应用情况

应用领域 Application sections	应用范围 Function subjects	相关产品 Products
食品加工 Food production	饮料、果酒、果醋、果酱、糕点、奶制品 drink,wine, vinegar, jam, pastry, dairy products, etc.	沙棘醋、沙棘酒、沙棘茶 seabuckthorn vine-gar, wine, tea
医药保健 Medicine & healthcare product processing	心脑血管、祛斑、润肺、健脾养胃、宫颈糜烂、外伤 treatment for cardiovasvular, gastric ulcer, lung improvement,cervical erosion, scald, burn,etc.	五味沙棘散、参芪沙棘合剂 Wuwei seabuck-thorn power, seabuckthorn compounds with gingseg and jaundicen
轻工业及其他方面 Daily stuffs processing	化妆品、洗涤用品 cosmetic, detergent etc,	沙棘护肤产品 seabuckthorn products for skin protection

According to incomplete statistics, from 2016 to 2019, the sales revenue of sea-buckthorn extract products alone in China was 560 million yuan, 940 million yuan, 1.56 billion yuan and 2.1 billion yuan, respectively. It is estimated that the output value of downstream industries such as drugs, cosmetics and health products corresponding to sea-buckthorn plant extract products is about 1:22.

据不完全统计，2016 年至 2020 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，数据显示，沙棘产业每年都有明显的增长，预计到 2021 年销售收入达到 30 亿元左右。据测算，沙棘植物提取物产品对应的药品、化妆品、保健品等下游产业的产值为 1：22 左右。

Sea-buckthorn enterprises in China have developed more than 200 products in eight categories, including food, beverage, medicine and health care, daily chemicals, feed and bait, with an annual output value of more than 26 billion yuan. Sea-buckthorn products not only promote the rational use of resources, mobilize the enthusiasm of the masses to plant sea-buckthorn, but also create a new way for people in poor mountainous areas to get rid of poverty and get rich. In China's sea-buckthorn planting areas, farmers rely on fruit and leaves harvest and development to raise sheep and cattle, with an average income of 200 yuan.

全国沙棘企业已经开发出了食品、饮料、医药保健、日化、饲料、饵料等八大类约 200 多种产品，年产值 260 亿元以上。沙棘产品不仅促进了资源的合理利用，调动了群众种植沙棘的积极性，而且为贫困山区人民脱贫致富创出了一条新路，在中国沙棘种植区农民靠采果和叶及发展养羊、养牛，人均增收达 200 元。

Seabuckthorn extract products, seabuckthorn seed oil and seabuckthorn fruit oil are currently the most exuberant products in the market, the market is in short supply. Seabuckthorn fruit powder, as a new functional product additive or raw material, is now being recognized and accepted by relevant industries and markets in China. In recent years, the market demand has grown particularly rapidly.

沙棘提取物产品中，沙棘籽油和沙棘果油是目前市场需求最为旺盛的产品，市场处于供不应求的状态；沙棘果粉作为新兴功能产品添加剂或原辅料，目前正在被中国相关行业和市场所认识并接受，近年来，市场需求增长尤为迅速。

4. The status of seabuckthorn scientific institution in the country in terms of the number of institutes and their scientists and their research field, and a brief introduction of main research institutes/universities and enterprisers, the main research programs and updated achievements on seabuckthorn.

4. 全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。

4.1. Research progress and achievements of Seabuckthorn in Desert Forestry Experimental Center, Chinese Academy of Forestry in 2020

4.1. 中国林业科学研究院沙漠林业实验中心

In 2020, based on the existing genetic resources, it was achieved by Desert Forestry Center of Chinese Academy of Forestry that the preservation of seabuckthorn varieties and the collection of new varieties' basic data by strengthening the forest care management of seabuckthorn and the basic data investigation of excellent varieties, so as to provide high-quality materials and theoretical basis for the next research.

2020 年沙漠林业实验中心（简称“沙林中心”）以现有资源为基础，通过加强沙棘林地抚育管理和优良品种的基础数据调查等方面，达到沙棘良种保存和新品种基础数据收集的目的，进而为下一步研究提供优质材料和理论基础。

4.1.1. Seabuckthorn cross breeding

4.1.1 沙棘杂交繁育工作

From April to July 2020, in the seabuckthorn germplasm bank of the Center, cross-breeding of seabuckthorn was carried out. In the cross pollination, Russian variety Aley and Chinese variety Jianxiong No. 1 were used as the pollinators, and Chinese variety Fengning, and foreign varieties Xiangyang and Shenqiuhong were used as the female parents. The annual activities mainly include propagation by hard cutting, soft cutting and seedling of seabuckthorn. Among the soft cutting propagation, there were 15 varieties, 45 superior clones, about 70,000 plants. And the survival rate was 90%. A total of 2 ha of reforming plantation was carried out.

2020 年 4 月至 7 月，中心沙棘种质资源库进行了沙棘杂交繁育工作。杂交工作主要为以“阿列伊”和“健雄一号”作为父本，“丰宁”、“向阳”、“深秋红”作为母本分别进行杂交授粉。繁育工作主要包括沙棘硬枝扦插育苗、种子育苗和嫩枝扦插育苗。其中嫩枝扦插育苗共15个品种，45个优良单株无性系，约7万株，成活率 90%。且进行更新造林共 30 亩。

4.1.2. Experimental progress of sea buckthorn

4.1.2 沙棘实验进展

4.1.2.1. Field basic data survey

In September of 2020, the growth and fruit characteristics of 25 new varieties of SBT in the field were investigated to improve the basic data of new varieties and provide theoretical basis for the selection of better varieties of new varieties and the construction of germplasm bank.

（1）野外基础数据调查

2020 年 9 月通过对野外 25 个沙棘新品种生长情况和果实特性进行基础调查，完善新品种基础资料，为新品种良种筛选和种质资源库的建设提供理论依据。

4.1.2.2. Experiment of inoculation of seabuckthorn insect Glabropenes

This experiment was initially conducted in June 2019, and mature seabuckthorn stands of shenqiuhong were selected in research. The inoculation experiment was carried out on 10 trees. Through the continuous observation of the excretion, emergence and adult growth of longhorn in experimental trees for more than one year, seabuckthorn has been basically determined as the host of Glabropenes.

（2）沙棘接种光肩星天牛观测

本实验于 2019 年 6 月进行，选择成熟“深秋红”沙棘林作为研究对象。分别在 10 棵树上进行天牛接种试验。通过近 1 年多的持续观察实验树上天牛排泄、羽化和成虫生长等情况，已基本确定沙棘是光肩星天牛的宿主。

4.1.2.3. Experiments on the biological functions and regulatory mechanisms of lncRNA and circRNA technologies in the drought resistance of seabuckthorn

（3）lncRNA 和 circRNA 在沙棘抗旱过程中的生物学功能和调控机制实验

In this study, the seabuckthorn cutting seedlings of Hippophae rhamnoides L. ssp sinensis were taken as the research object, and drought treatment was carried out on them. Through the whole transcriptome sequencing, translation group sequencing and m6A sequencing methods, the non-coding RNA data within the whole genome range of seabuckthorn were firstly obtained. Secondly, the lncRNA and circRNA related to drought resistance were screened, especially the lncRNA and circRNA related to the synthesis and metabolism of active substances under drought stress. Finally, VIGS and transgenic technology were used to verify the biological functions and regulatory mechanisms of key lncRNA and circRNA in the drought resistance of seabuckthorn.

本研究以中国沙棘扦插苗为研究对象，对其进行干旱处理，通过全转录组测序、翻译组测序和 m6A 测序方法，首先得到沙棘全基因组范围内的非编码 RNA 数据；其次筛选得到与沙棘抗旱相关的 lncRNA 和 circRNA，尤其是与沙棘干旱胁迫中活性物质合成代谢相关的 lncRNA 和 circRNA；最后使用 VIGS 和转基因技术验证关键 lncRNA 和 circRNA 在沙棘抗旱过程中的生物学功能和调控机制。

4.1.3. Main achievements

4.1.3 主要成果

4.1.3.1. Genetic bank construction

In April of 2020, The National Forestry and Grassland Administration officially approved the project of the National Tree Germplasm Bank Construction in Desert Forestry Experimental Center, Chinese Academy of Forestry, with a total investment of 25.1 million yuan.

（1）资源库建设

2020 年 4 月，国家林草局正式批复同意实施中国林科院沙漠林业实验中心沙棘国家林木种质资源库建设项目，总投资 2510 万元。

4.1.3.2. Research projects

A. Forestry intellectual property transformation and application project Demonstration and Promotion of Eco-Economic Seabuckthorn Variety Hongji No. 1(under research)

B. Ministry of Water Resources funded project: The Natural Form Domestication and Cross Breeding of Sea Buckthorn (under research)

（2）项目 / 课题研究

A. 林业知识产权转化运用项目《生态经济型“红棘 1 号”示范与推广》（在研）

B. 水利部重点项目《沙棘野生驯化与杂交育种》（在研）

4.1.3.3. Research paper

DNA demethylation and non-canonical RdDM synergistically regulate sea buckthorn fruit ripening. (to be published)

（3）论文发表

DNA demethylation and non-canonical RdDM synergistically regulate sea buckthorn fruit ripening（在投）

4.1.3.4. Graduate students training

Based on sea buckthorn experiment platform of the

Center and the research project of seabuckthorn, two postgraduate students and one doctoral student received training in 2020.

4.2. Research progress of sea buckthorn by National Forestry and Grassland Sea Buckthorn Engineering Technology Research Center; Shanxi Academy of Forestry and Grassland Sciences in 2020

In 2020, sea buckthorn engineering center has undertaken a total of 7 national and provincial scientific research projects. Around the projects and topics, we carried out scientific research, technical services, academic exchanges and achievements transformation and promotion of sea buckthorn.

In the aspect of sea buckthorn scientific research, we carried out the research on the breeding of improved varieties of Hippophae rhamnoides subsp. sinensis Rousi, the construction of artificial sea buckthorn demonstration garden, high-yield cultivation techniques, the extraction methods of sea buckthorn active substances and the pretreatment equipment of sea buckthorn fruit residue. In the study of improved variety selection, the technical standard of superior individual selection of sea buckthorn in China has been formulated. In the natural distribution areas of sea buckthorn in Shanxi and Inner Mongolia Province, the plus tree selection of sea buckthorn has been carried out with high yield, big fruit and few thorns as indexes. So far, 290 excellent individuals of different types have been selected, and propagation materials have been collected for propagation. In the natural distribution areas of Hippophae rhamnoides subsp. sinensis Rousi in Shanxi and Inner Mongolia, taking high yield, big fruit, few thorns and other traits as indexes, we have carried out the selection of superior individual of sea buckthorn. In the experimental base of Shanxi Academy of Forestry, 139 superior individual of sea buckthorn and 19 introduced varieties were used to build 150 mu experimental forest, and the tree shape structure cultivation experiment of the demonstration garden was

（4）研究生培养

基于沙林中心实验平台和沙棘研究项目，2020 年共培养硕士研究生 2 名、博士研究生 1 名。

4.2. 国家林业和草原局沙棘工程技术研究中心（山西省林业科学研究院）

2020 年，沙棘工程中心共承担了国家和省级科研项目 7 项，围绕项目和课题，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，分别开展了中国沙棘良种选育、人工沙棘示范园营建、丰产栽培技术和沙棘活性物提取方法及沙棘果渣预处理设备研究。在良种选育研究中制订了中国沙棘优良单株选择技术标准，在山西省、内蒙古自治区中国沙棘天然分布区，以丰产、大果、少刺等性状为指标，开展了沙棘优良单株选择，到目前为止，共选择不同类型优良单株 290 株，并采集了繁殖材料进行扩繁。在山西省林科院景尚林场基地利用选择的 139 个中国沙棘优树无性系和引进的 19 个沙棘品种和无性系营建试验林 150 亩，并对示范园进行了树形结构培养试验，同时，开展了不同施肥量对树体生长、产量的对比试验。在沙棘活性物质高效提取技术研究方面，开展了沙棘叶黄酮含量分析、沙棘果渣中黄酮提取技术、超临界 CO_2 流体技术精提沙棘油和沙棘果渣活性物高效利用预处理设备研究。

carried out. At the same time, the effects of different fertilizer rates on tree growth and yield were tested. In the aspect of high-efficiency extraction technology of sea buckthorn active substances, we carried out the analysis of flavonoids content in sea buckthorn leaves, extraction technology of flavonoids from sea buckthorn fruit residue, supercritical CO2 fluid technology to extract sea buckthorn oil and pretreatment equipment for high-efficiency utilization of sea buckthorn fruit residue active substances.

In terms of innovation achievements, two improved varieties were approved, namely, Jinji 1 (Jin S-SC-HR-030-2020) and Yanji 1 (Jin S-SC-HR-031-2020). Eight papers were published.

In terms of technical services, combined with the project of improving the quality and efficiency of economic forest, technical training on sea buckthorn seedling, natural sea buckthorn forest transformation and pest control was carried out three times for members of afforestation professional cooperatives in Guangling and Hunyuan counties of Shanxi Province. The total number of trainees is 300.

In terms of academic exchanges, in July 2020, the center held a seminar on Industry University Research Cooperation Association with North University of China, Shanxi Hengyi Biotechnology Co., Ltd. and Xinjiang Xuebairen Food Co., Ltd. In September 2020, the center invited two professors from Shanxi Agricultural University to give a lecture entitled “scientific and technological innovation promotes the development and utilization of sea buckthorn resources in Shanxi”. In October 2020, we participated in the sea buckthorn academic exchange held by the enterprise Committee of international Seabuckthorn Association (China).

In the aspect of achievement transformation, the center actively carried out the transformation and promotion of scientific and technological

在创新成果方面，审定地方良种 2 项，分别为：晋棘 1 号（晋 S-SC-HR-030-2020）和雁棘 1 号（晋 S-SC-HR-031-2020）。发表论文 8 篇。

在技术服务方面，结合我省实施的经济林提质增效工程，分别在山西广灵和浑源等县，对造林专业合作社社员开展了沙棘育苗、天然沙棘林改造、病虫害防治等技术培训 3 次，累计培训人数 300 人次。

在学术交流方面， 2020 年 7 月，中心与中北大学、山西恒义生物科技有限公司和新疆雪白仁食品有限公司开展产学研合作交流研讨会。2020 年 9 月，中心邀请山西农业大学两位教授，做了题为“科技创新推动山西沙棘资源的开发和利用”讲座。2020 年 10 月，参加了国际沙棘协会（中国）企业委员会 2020 年年会暨沙棘学术交流会。

在成果转化方面，沙棘工程中心在加强沙棘科技创新的同时，积极开展科技成果转化和技术推广，加大了对沙棘产业发展的科技支撑。对大同市桦林背林场利用我院制订的《沙棘播种育苗技术规程》和《沙棘扦插育苗技术规程》地方标准，申报成功的 2020 年中央财政林业科技推广示范项目给予技术上的支撑。

发表的论文 8 篇：

（1）山西省沙棘产业发展对策研究 . 山西林业 ,2020,(02)；

（2）沙棘酵素果冻制备工艺的研究 . 食品工程 ,2020,(02)；

（3）微生物发酵制备沙棘果浆酵素的研究 . 山

achievements while strengthening the scientific and technological innovation of sea buckthorn, and increased the scientific and technological support for the development of sea buckthorn industry. Based on the local standards of “technical regulations of sea buckthorn seeding and seedling raising” and “technical regulations of sea buckthorn cutting and seedling raising” formulated by our institute, Hualinbei forest farm of Datong City successfully applied for the demonstration project of forestry science and technology promotion of central finance in 2020, and the center provided technical support.

4.3. Report of Sea Buckthorn Team of Dalian Minzu University in 2020

4.3.1. Approved projects

4.3.1.1. National Natural Science Foundation of China, 32071799, New mechanism of miR319e mediated transcription factor AP4m in seed development of Hippophae rhamnoides, 2021/1-2024/12, under study.

4.3.1.2. Natural Science Foundation of Liaoning, Research and demonstration on molecular breeding and seedling breeding technology of sea buckthorn with high ratio of sugar and acid, 2020/3-2022/3, under study.

4.3.1.3. Fundamental Research Funds for the Central Universities, Whole genome map construction and excellent gene resource mining of Hippophae rhamnoides, 2021/4-2021/12, under study.

4.3.1.4. Fundamental Research Funds for the Central Universities, The mechanism of DNA methylation in differential expression of oil synthesis genes in different organs of Sea buckthorn fruit, 2020/3-2021/2, under study.

西林业科技 ,2020,49(02);
（4）大果沙棘品种引种栽培试验初报 . 山西林业科技 . 2020,49(03);
（5）干燥温度对沙棘果渣中 Vc、Ve 和总黄酮含量的影响 . 食品工程 ,2020,(04);
（6）超声波提取沙棘叶总黄酮的工艺优化试验研究 . 山西林业科技 ,2020,49(04);
（7）右玉沙棘资源异地保存评价 . 防护林科技 ,2020,(08);
（8）右玉沙棘嫩枝扦插试验 . 防护林科技 ,2020,(12)。

4.3. 大连民族大学植物资源研究所

4.3.1 研究项目

(1) 国家自然科学基金面上项目，32071799，沙棘 miR319e 介导转录因子 AP4m 调控种子发育的新机制，2021/1−2024/12，58 万元，在研，主持。

(2) 辽宁省自然科学基金 − 联合基金，高糖酸比沙棘分子育种和工厂化育苗技术研究及示范，2020/3−2022/3，10 万元，在研，主持。

(3) 中央高校基本科研业务费学科团队项目，沙棘全基因组图谱构建及优异基因资源挖掘，2021/4−2021/12，3.45 万元，在研，主持。

(4) 中央高校基本科研业务费学科团队项目，0919−110125，DNA 甲基化在沙棘果不同器官油脂合成基因差异表达中的作用机制，2020/3−2021/2，24 万元，已结题，主持。

4.3.2.Project in progress

4.3.2.1. National Natural Science Foundation of China, 31800574, Study on the mechanism of miR168b targeting Δ9D gene regulates high accumulation of palmitoleic acid in sea buckthorn pulp, 2019/1-2021/12, under study.

4.3.3. Published paper

4.3.3.1 Li He, Ruan Chengjiang*, Ding Jian, Li Jingbin, Wang Li, Tian Xingjun*. Diversity in sea buckthorn (Hippophae rhamnoides L.) accessions with different origins based on morphological characteristics, oil traits, and microsatellite markers. PLoS ONE, 2020, 15(3): e0230356. IF=3.240, SCI-3

4.3.4. Research progress

4.3.4.1 Diversity in sea buckthorn accessions with different origins based on morphological characteristics, oil traits, and microsatellite markers

We assessed the diversity of 78 accessions cultivated in northern China using 8 agronomic characteristics, oil traits in seeds and fruit pulp, and SSR markers at 23 loci. The 78 accessions included 52 from ssp. mongolica, 6 from ssp. sinensis, and 20 hybrids. To assess the phenotypic diversity of these accessions, 8 agronomic fruit traits were recorded and analyzed using principal component analysis (PCA). The first two PCs accounted for approximately 78% of the variation among accessions. The oil contents were higher in pulp (3.46–38.56%) than in seeds (3.88–8.82%), especially in ssp. mongolica accessions. The polyunsaturated fatty acid ratio was slightly lower in the seed oil of hybrids (76.06%) than that of in ssp. mongolica (77.66%) and higher than that of in ssp. sinensis (72.22%). The monounsaturated fatty acid ratio in the pulp oil of ssp. sinensis (57.00%) was highest, and that in ssp. mongolica (51.00%) was equal to the ratio in the hybrids (51.20%). Using canonical correspondence analysis, we examined the correlation between agronomic

4.3.2 正在进行的项目

4.3.2.1 国家自然科学基金青年科学基金，31800574，miR168b 介导 Δ9D 基因调控沙棘果肉高积累棕榈油酸的机理研究，2019/1–2021/12，25 万元，在研，主持。

4.3.3 发表论文

(1)Li He, Ruan Chengjiang*, Ding Jian, Li Jingbin, Wang Li, Tian Xingjun*. Diversity in sea buckthorn (Hippophae rhamnoides L.) accessions with different origins based on morphological characteristics, oil traits, and microsatellite markers. PLoS ONE, 2020, 15(3): e0230356. IF=3.240, SCI-3

4.3.4 研究进展

(1) 基于形态特征、油脂特性和微卫星标记的沙棘遗传多样性分析

以蒙古沙棘亚种、中国沙棘亚种和蒙中沙棘杂交种为试验材料，利用沙棘种子和果肉的不同农艺性状、油脂特性和 SSR 标记对 78 份沙棘种质进行了多样性评价。研究表明：(1) 通过 8 个农艺性状的主成分分析发现，前两个主成分贡献率达到了 78%；(2) 果肉含油率 (3.46 ~ 38.56%) 高于种子含油率 (3.88 ~ 8.82%)，杂交种的种子油多不饱和脂肪酸含量 (76.06%) 略低于蒙古沙棘亚种 (77.66%)，但高于中国沙棘亚种 (72.22%)。中国沙棘亚种的果肉油单不饱和脂肪酸含量最高 (57.00%)，在蒙古沙棘亚种 (51.00%) 与杂交种 (51.20%) 中相近；(3) 利用典型相关性分析发现，沙棘种子和果肉的

traits and oil characteristics in pulp and seeds. Oil traits in pulp from different origins were correlated with morphological groupings ($r = 0.8725$, $p = 0.0000$). To assess the genotypic diversity, 23 SSR markers were used among the 78 accessions with 59 polymorphic amplified fragments obtained and an average PIC value of 0.2845. All accessions were classified into two groups based on the UPGMA method. The accessions of ssp. sinensis and ssp. mongolica were genetically distant. The hybrid accessions were close to ssp. mongolica accessions. These results will be valuable for cultivar identification and genetic diversity analysis in cultivated sea buckthorn.

油脂特性与农艺性状的相关性较好。不同产地的果肉油脂特性与形态特征相关 ($r = 0.8725$, $p = 0.0000$)；(4) 利用 23 个 SSR 标记对 78 个沙棘种质进行基因型进行多样性分析，获得 59 个多态性扩增片段，PIC 值为 0.2845。利用 UPGMA 方法将所有样品分为两大类。中国沙棘亚种和蒙古沙棘亚种获得明显的区分，杂交种与蒙古沙棘亚种亲缘较近。这为沙棘品种选育、鉴定和遗传多样性分析提供科学依据。

4.3.4.2 Functional identification of sea buckthorn Δ9D gene related to palmitoleic acid synthesis

(2) 沙棘棕榈油酸合成相关基因 Δ9D 的功能鉴定

The 1152bp HrΔ9D gene with complete coding region was isolated from the berry pulp of sea buckthorn, which encoded 383 amino acids. Sequence analysis showed that this protein had a delta-7 desaturase motif which regulates the synthesis of palmitoleic acid. The results of multiple sequence alignment and evolutionary analysis showed that HrΔ9D had high homology with other Δ9D proteins related to palmitoleic acid synthesis, and the consistency values of HrΔ9D with Jujube and pear Δ9D were 83% and 81%, respectively. Using the previously constructed HrΔ9D gene vector, the leaf disk method was used to transform into tobacco leaf (NC89), and a number of HrΔ9D gene positive clones were obtained. GC-MS analysis showed that the overexpression of HrΔ9D gene significantly increased the content of palmitoleic acid in the transformed tobacco leaves. qRT-PCR analysis showed that HrΔ9D gene was highly expressed in transgenic tobacco leaves. In conclusion, overexpression of HrΔ9D in tobacco can significantly promote the accumulation of palmitoleic acid in leaves, and it plays an important role in the synthesis of palmitoleic acid.

从沙棘果肉中分离得到全长为 1152bp 具有完整编码区的 HrΔ9D 基因序列，该序列编码 383 个氨基酸。序列分析表明该蛋白具有调控棕榈油酸合成的 delta-7 desaturase 特征基序。多序列比对和进化分析结果显示 HrΔ9D 与其他已鉴定功能的棕榈油酸调控 Δ9D 蛋白有很高的同源性，其中与枣和白梨的 Δ9D 一致性分别为 83% 和 81%。利用前期构建的 HrΔ9D 基因载体，采用叶盘法转化至烟草 NC89，获得一批 HrΔ9D 基因阳性克隆植株，利用 GC-MS 分析发现过表达 HrΔ9D 基因显著提高了转化烟草叶片棕榈油酸含量，qRT-PCR 分析发现 HrΔ9D 基因在转基因烟草叶中显著高表达。可见，在烟草中过表达 HrΔ9D 基因能显著促进叶片中棕榈油酸的积累，其在棕榈油酸合成过程中具有重要作用。

4.4. Sea-buckthorn has been successfully popularized and applied in soil erosion control

4.4. 沙棘在黄土高原砒沙岩区水土流失治理中成功推广应用。

1998 年以来，水利部沙棘开发管理中心在地处

in the soft rock area of the Loess Plateau. Since 1998, Management Center for Seabuckthorn Development, Ministry of Water Resources has planted sea-buckthorn ecological forests on a large scale in Inner Mongolia, Shanxi and Shaanxi provinces, which are located on the Loess Plateau, with a total planting area of more than 7.6 million mu, of which more than 100,000 mu was newly planted in 2020.

黄土高原的内蒙古、山西、陕西省大规模人工种植沙棘生态林，累计种植面积 760 多万亩。其中，2020 年新种了植面积 10 万余亩。

4.5. New varieties

4.5. 沙棘新培育

By the year of 2020, more than 30 new varieties or cultivars of seabuckthorn have achived by cross breeding or selection in China.

目前，我国沙棘育种专家已培育了 30 多个沙棘新品种。

(1) Up to 2020, 28 new varieties have been assessed and named by Management Center for Seabuckthorn Development, Ministry of Water Resource, China.

(1) 由水利部沙棘开发管理中心通过杂交育种和引种选育，培育的 28 个沙棘优良新品种：蒙中黄、蒙中红、达拉特、蒙中雄、俄中金、俄中鲜、金黄后、朱丹红、小香蕉、黄冠、黄妃 1 号、黄妃 2 号、黄妃 3 号、夕照、赛枸杞、丹棒、橙棒、红苞米。

(2) In 2019, National Forestry and Grassland Administration authorized four new seabuckthorn cultivars, Chaoyang (20190346), Wanxia (20190341), Wanhuang (20190342) and Gaoyou No.1 (20190345) owned by Dalian Minzu University.

(2) 由大连民族大学培育的 4 个沙棘新品种: “朝阳”沙棘 (20190346) 、“晚霞”沙棘 (20190341)、“晚黄”沙棘 (20190342) 、“高油 1 号”沙棘 (20190345)。

(3) Two improved varieties were approved, namely Jinji 1 (Jin S-SC-HR-030-2020) and Yanji 1 (Jin S-SC-HR-031-2020) owned by Shanxi Academy of Forestry and Grassland Sciences in 2020.

(3) 由山西省林科院新培育的 2 个沙棘新品种：晋棘 1 号（晋 S-SC-HR-030-2020）和雁棘 1 号（晋 S-SC-HR-031-2020）。

5. The total personnel involved in seabuckthorn research, manufacturing, marketing planting, public management, etc. in the country, and the members of National Seabuckthorn Association.

5. 全国沙棘从业人员情况，全国性协会会员总数（团体会员）。主要沙棘会员单位简要介绍。

In the past 30 years, China has established a powerful seabuckthorn expert team, with around 15,000 professionals, covering forestry, agriculture, water and soil conservation, gardening, medicine, food indstry, etc. In recent years, we have included many qualified experts who are both professional and proficient in English communication, and served as chairman or the co-chairman in the

30 多年来，中国建立了强大的沙棘专家团队，专家团队技术专业领域广泛，全国沙棘从业人员约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。近年来，培养了一些既懂专业又熟练掌握英语交流能力的知名专家，

academic exchange session at the International Seabuckthorn Association Conference, showing the active role of global seabuckthorn acivities.

担任国际大会学术交流环节的联合主席，展示出我国的沙棘大国风范。

The Enterprise Committee (China) as a sub-organization of International Seabuckthorn Association, was established in May 2017, with 82 group members by the end of 2020. (See the tedail in Table 6)

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，截止 2020 年底有团体会员 82 个。（详见附表 6）

Namelist of Enterprise Committee (China)/ISA Members
表 6. 国际沙棘协会（中国）企业委员会团体会员名单

序号	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	卢健 LU Jian	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	王辉斌 WANG Huibin	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	张泽凯 ZHANG Zekai	营销总监 Marketing Manager
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	内蒙古吉隆生态科技有限责任公司 Inner Mongolia Jilong Eco-tech Co. Ltd	副会长单位 Vice Chairman	刘三利 LIU Sanli	董事长 Chairman
7	山西五台山沙棘制品有限公司 Shanxi Wutaishan Seabuckthorn Co. Ltd	理事单位 Board member	赵志侃 ZHAO Zhikan	董事长 Chairman
8	鸿泰农林科技开发有限公司 Hongtai Agri-Forestry Technical Development Co. Ltd	理事单位 Board member	张艳锋 ZHANG Yanfeng	董事长 Chairman
	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
9	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
10	内蒙古森工集团有限公司 Inner Mongolia Wood Industry Co. Ltd	理事单位 Board member	许玉成 XU Yucheng	处长 Division Chief
11	内蒙古大兴安岭重点国有林管理局 Inner Mongolia Daxinganling State-owned Forestry Bereau	理事单位 Board member	周艳昌 ZHOU Yanchang	总会计师 Chief Accountant
12	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	胥肾 XU Shen	董事长 Chairman
13	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	理事单位 Board member	姚玉军 YAO Yujun	业务经理 Manager

14	内蒙古鄂尔多斯乌兰集团公司 Inner Mongolia Erdos Wulan Group Co.	理事单位 Board member	康占义 KANG Zhanyi	副总经理 Deputy General Manager
15	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
16	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
17	黑龙江圣宝泰农业有限公司Helongjiang Shengbaotai Agricuture Co. Ltd	理事单位 Board member	赵胜臣 ZHAO Shengchen	董事长 Chairman
18	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
19	黑龙江延寿县鼎鑫生物工程有限公司 Helongjiang Yanshou County Dingxin Bioengineering Co.Ltd	理事单位 Board member	张建东 ZHANG Jiandong	总经理 General Manager
20	黑龙江众源冬果沙棘开发有限责任公司 Helongjiang Zhongyuan Dongguo Seabuckthorn Development Co.Ltd	理事单位 Board member	杜中元 DU Zhongyuan	董事长 Chairman
21	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 Researcher
22	上海容邦投资管理有限公司 Shanhai Rongbang Investment Management Co. Ltd	理事单位 Board Member	李相军 LI Xiangjun	董事长 Chairman
23	上海沃迪智能装备股份有限公司 Shanghai Wodizineng Equipment Corporation	理事单位 Board member	王冲 WANG Chong	业务经理 Manager
24	陕西黄龙国寿堂生物工程有限公司 Shaanxi Huan-glong Guoshoutang Bioengineering Co. Ltd	理事单位 Board member	陈家顺 CHEN Jiashun	董事长 Chairman
25	清华德人西安幸福制药有限公司 Qinghua Deren Xi’an Happiness Pharmaceutical Co. Ltd	理事单位 Board member	刘红娜 Liu Hongna	研究员 Researcher
26	甘肃艾康沙棘制品有限公司 Gansu Aikang Seabuck-thron Co. Ltd	理事单位 Board member	马静 MA Jing	总经理 General Manager
27	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
28	青海康普生物科技股份有限公司 Qinghai Kangpu Bio-tech Co. Ltd	理事单位 Board member	孙允武 SUN Yunwu	总经理 General Manager
29	新疆康元生物科技股份有限公司 Xinjiang Kangyuan Bio-tech Co. Ltd	理事单位 Board member	刘宗浩 LIU Zonghao	董事长 Chairman
30	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
31	新疆中科沙棘科技有限公司 Xinjiang Zhongke Sea-buckthorn Tech Co. Ltd	理事单位 Member	徐均 XU Jun	总经理 General Manager
32	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
33	山西山阳生物药业有限公司 Shanxi Shanyang Bio-Medicine Co. Ltd	会员单位 Member	姜瑞林 JIANG Ruilin	总经理 General Manager
34	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

35	山西省山地阳光食品有限公司 Shanxi Shandi Sunshine Food Co. Ltd	会员单位 Member	姜瑞林 JIANG Ruilin	董事长 Chairman
36	山西科林生物技术开发有限公司企业 Shanxi Kelin Bio-tech Development Co. Ltd	会员单位 Member	宁聚保 NING Jubao	总经理 General Manager
37	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
38	山西献果园生物科技有限公司 Shanxi Xianguoyuan Bio-tech Co. Ltd	会员单位 Member	曹满 CAO Man	董事长 Chairman
39	山西葆源生物科技有限公司 Shanxi Baoyuan Bio-tech Co. Ltd	会员单位 Member	郭林宝 GUO Linbao	经理 Manager
40	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
41	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
42	山西助农药茶资源开发有限公司 Shanxi Zhunong Hherbal Tea Resources Devel-opment Co. Ltd	会员单位 Member	宫铁军 GONG Tiejun	董事长 Chairman
43	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
44	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
45	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
46	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
47	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
48	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
49	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
50	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
51	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
52	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	董事长 Chairman
53	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
54	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

55	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
56	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
57	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
58	上海高原圣果实业有限公司 Shanhai Gaoyuanshengguo Industry Co. Ltd	会员单位 Member	汤顺新 TANG Shunxin	董事长 Chairman
59	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
60	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
61	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
62	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
63	山东清香茗泽农业科技有限公司 Shandong Qingxiangmingze Agri-tech Co. Ltd	会员单位 Member	于海洋 YU Haiyang	总经理 General Manager
64	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
65	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
66	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
67	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
68	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
69	青海久实虫草生物科技有限公司 Qinghai JIushichongcao Bio-tech Co. Ltd	会员单位 Member	曾静 ZENG Jing	经理 Manager
70	青海清华博众生物技术有限公司 Qinghai Qinghua Bozhong Bio-tech Co. Ltd	会员单位 Member	费楠 FEI Nan	总经理 General Manager
71	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
72	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
73	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
74	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
75	新疆乌苏市佳禾畜牧科技有限公司 Xinjiang Wusu Jiaohe Livestock-tech Co. Ltd	会员单位 Member	宋悦恒 SONG Yueheng	经理 Manager

76	新疆吉盛元沙棘生物科技有限公司 Xinjiang Jishengyuan Bio-tech Co. Ltd	会员单位 Member	陶桐生 TAO Tongsheng	经理 Manager
77	新疆景华天宝科技发展有限公司 Xinjiang Jinghua-tianbao Tech-development Co. Ltd	会员单位 Member	刘佳羽 LIU Jiayu	董事长 Chairman
78	新疆先农伯益生物科技有限公司 Xinjiang Xiannong Boyi Biotechnology Co., Ltd	会员单位 Member	赵军丰 ZHAO Junfeng	总经理 General Manager
79	新疆清雅丰健康科技有限公司 Xinjiang Qingyafeng Health Tech Co. Ltd	会员单位 Member	田丰 TIAN Feng	董事长 Chairman
80	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
81	新疆红蚁农业科技有限公司 Xinjiang Hongyi Agricutural Tech Co.Ltd	会员单位 Member	王军扬 WANG Junyang	总经理 General Manager
82	阿勒泰太阳石健康产业发展有限公司 Altay Sunstone Health Industry Development Co., LTD	会员单位 Member	邓惠中 DENG Huizhong	总经理 General Manager

6. Introduction of important activities, major events, successful stories and advanced persons in the country in the year of 2020.

At present, China has initially established collabaration with Russia, Germany, France, Greece, UK, Latvia, Romania, Finland, Sweden, Mongolia, Japan, Korea, India, Nepal, Pakistan, Kyrgyzstan, Iran, Canada, the United States, Chile, Peru, Bolivia, and other countries. And once won the World Bank, the United Nations Development Programme, the European Union, Pero Fund of the Group 77, and International Centre for Integrated Mountain Development of technical and financial supports, technology cooperation and economic 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" development strategy. Sea-buckthorn is a kind of efficient soil and water conservation plant, which can improve ecological environment construction and promote economic development. Sea-buckthorn has great ecological value and economic value. It is the good opportunity for seabuckthorn development in conjunction with the "Belt and Road" strategy, to promote bilateral and multilateral sea-buckthorn exchanges and cooperation. Along the Belt and Road related to 65

6. 当年全国有关沙棘的重要活动、重大事项介绍。

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”发展战略。沙棘是一种高效的水土保持植物，可以改善生态环境建设，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”战略相结合，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、

countries and regions globally, more than a dozen countries, including Russia, Mongolia, Kazakhstan, Tajikistan, Uzbekistan, Iran, India, Nepal, Pakistan, Germany, Finland, Latvia, etc. have a solid base for seabuckthorn cultivation and industrial development.

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。

International Seabuckthorn Association as an international non-governmental, non-profit organization, and with members from seabuckthorn enterprises, research institutes and individuals was proposed by international seabuckthorn experts from China, Germany, Russia, Finland, India, etc. and launched in 2001. 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.

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。

On October 15, 2019, at the General Assembly of International Sea-buckthorn Association held in Berlin, Germany, 13 members from 7 countries, including China, Germany, Russia, Finland, Latvia, India and Canada, were elected as the second board of directors. Mr. ZHAO Dongxiao, Director General of Management Center for Sea-buckthorn Development, Ministry of Water Resources, and Mr LU Shunguang, Deputy Director General were elected as Chairman and Secretary General of International Sea-buckthorn Association respectively. Mr. Veli-markku Korteniemi from Finland, Jorg-Thomas Morsel from Germany and 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 Sea-buckthorn Association. (See in detailed in Table 7)

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 13 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如 Baoru YANG 教授当选为新一届国际沙棘协会科技委员会主席。（详见附表 7）

In March of 2020, the sceond meeting of the Second Board of International Seabuckthorn Association was chaired over email by Mr. ZHAO Dongxiao, Chairman of ISA. It is agreed by all ISA Board members to postpone the 9th International Seabuckthorn Association Conference (ISA-2020) planed be held in Greece in May of 2020, to May of 2022

2020 年 3 月，国际沙棘协会理事会通过电子邮件方式举行了二届二次会议，讨论同意原定于 2020 年 5 月在希腊举办的第九届国际沙棘大会推迟到 2022 年 5 月。

Facing to the global epidemic of COVID-19, on April 21 of 2020, Mr. ZHAO Dongxiao, President of International Seabuckthorn Association sent global seabuckthorn colleagues his proposal of Supporting the Global Fight Against the Covid-19 Pandemic as the following.

Dear Board Directors and Members of ISA,

First of all, on behalf of the ISA Board, I extend our well wishes to those involved in the fight against humanity's common enemy, the Covid-19 virus, and pay the highest tribute to the efforts made by all directors and members to fight the Covid-19 outbreaks in their various countries. The ISA shall continue, as always, to support the work of its board directors and members.

As we all know, since the latter half of this January, there have been outbreaks of the Covid-19 virus in more than 180 countries and regions around the world. The World Health Organization believes that the current pandemic is the gravest challenge and threat that humanity has ever faced. Hence, the ISA has decided to postpone the ninth ISA Conference (originally due to be held in Greece this May) to 2021.

This is both in response to the WHO's call to reduce mass gatherings and international traffic, as well as to safeguard the health of all ISA scientists.
I wish to take this opportunity to urge that all ISA board directors and members lend their support to the various measures and recommendations by the WHO in relation to the fight against the Covid-19 virus. Together, we can jointly safeguard human health and save lives.

Stay safe.

In April, Consultancy Experts Team for Seabuckthorn Enterprise Committee (China) of ISA, as a professional technical supporter, was established with more than 300 scientists or researchers from national departments of

2020 年 4 月，国际沙棘协会主席、中国水利部沙棘开发管理中心主任赵东晓向全球沙棘同行发出“关于支持全球共同抗击新冠疫情的倡议”。倡议书全文如下：

各位会员、各位理事：

首先我代表国际沙棘协会理事会向大家在与新冠病毒这一全人类共同敌人的战斗表示亲切慰问，对各位会员、各位理事为各自国家抗击疫情所作出的努力表示崇高敬意。国际沙棘协会将一如既往支持各会员、各理事的工作。

众所周知，自今年一月下旬以来，新冠病毒已相继在全球 180 多个国家和地区爆发。世界卫生组织认为，这可能是人类历史上最严峻的挑战和威胁。国际沙棘协会为此决定，原定于今年 5 月在希腊召开的第九届国际沙棘大会延期至 2021 年举办，这既是为全球沙棘科学家的安全考虑，也是为响应世界卫生组织关于减少人员跨境流动和聚集的建议。

在此，我倡议，国际沙棘协会全体会员和理事，应团结一心，支持世界卫生组织关于抗击新冠病毒的各项建议和举措，共同维护人类健康和生命安全。

祝愿大家平安！

2020 年 4 月，国际沙棘协会咨询专家库正式建立，收录国内大专院校、科研机构、企业实验室等 300 余名知名专家学者。涵盖医药、保健食品、食品、化妆品、原材料、种植等各个

agriculture, forestry, soil conservation, medicine, cosmetis, food and benerage etc.

On May8 of 2020, the Tthird meeting of the Second Board of International Seabuckthorn Association was converned over email. After full discussion and review, all ISA Board members agreed with the recommendation from Mr. ZHAO, Dongxiao, Chairman of ISA to accept Mr. MO Mo, Deputy Director General, Department of Soil and Water Conservation, Ministry of Water Resources of China, as a new member of ISA Board. At the same time, at the recommendation of Professor YANG Baoru, Chairwoman of Scientific Committee of ISA (SCISA), Dr. Asad Hussain Shah, Chairman Department of Biotechnology, University of Azad Jammu and Kashmir, Pakistan, and Dr. RUAN Chengjiang, professor of Plant Biotechnology, Dalian Nationalities University, China, were welcome to join SCISA.

On September 15, 2020, entrusted by Mr ZHAO Dongxiao, Chairman of ISA, the Fourth Meeting of the Second Board of International Seabuckthorn Association was chaired by Prof. LU Shunguang, Secretary General of ISA over email communication. After full discussion, all ISA members agreed to the two documents proposed and revised by ISA Secretariat as: Guideline for Nomination of Lifetime Achievement Award, Outstanding Contribution Award and Special Contribution Award of International Seabuckthorn Association (ISA) and Guideline for International Seabuckthorn Association Conference. These two documents have taken effect since September 16, 2020.

方面，加强了国际沙棘协会的科技影响力，进一步提升了服务全体会员的能力。

2020 年 5 月 8 日，国际沙棘协会理事会通过电子邮件方式举行了二届三次会议，增补中国水利部水土保持司副司长莫沫为新一届理事会成员。同时，根据国际沙棘协会技术委员会主席、芬兰图尔库大学教授杨宝茹的推荐，同意增补巴基斯 Azad Jammu and Kashmir 大学的 Asad Hussain Shah 教授和中国大连民族大学阮成江教授为新一届技术委员会委员。

2020 年 8 月 15 日，国际沙棘协会理事会通过电子邮件方式举行了二届四次会议，分别审议通过了《 国际沙棘协会奖励评选工作指南 》和《 国际沙棘协会大会工作指南 》。

Table.7. Namelist for Board members of International Seabuckthorn Association
表 7. 国际沙棘协会理事会成员名单

序号	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	赵东晓 Zhao Dongxiao	男 M	中 国 China	水利部沙棘开发管理中心 Management Center for Sea-buckthorn Development, Ministry of Water Resource	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 Insititute,Chinese Academy of Science	教授 Professor	理 事 Board menber
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 menber
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 menber
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 menber
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 menber
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 menber
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 menber
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 Reseacher	理 事 Board menber
13	卢顺光 Lu Shunguang	男 M	中 国 China	水利部沙棘开发管理中心 Management Center for Sea-buckthorn Development, Ministry of Water Resource	副主任 Deputy Director General	秘书长、理事 Secretary General
14	夏静芳 Xia Jingfang	女 F	中 国 China	水利部沙棘开发管理中心 Management Center for Sea-buckthorn Development, Ministry of Water Resource	处 长 Division Chief	副秘书长、理事 Deputy Secretary General

7. Policies and documents related with seabuckthorn, and research papers in the year of 2020 in the country.

7.1. The development of the sea-buckthorn industry has received strong support from the Central government of China.It was included by National Development and Reform Commission in the guiding catalogue of industrial restructuring to encourage projects and enjoy relevant preferential tax policies. In 1999, the State Forestry Administration formulated The Development Plan of Sea-buckthorn for 1999-2000, which implemented the task of afforestation of sea-buckthorn into six key forestry construction projects. In 2002, Ministry of Public Health issued a regulation as The Notice on Further Management of Healthcare Food Raw Materials. Seabuckthorn was included in the name lists of plant resources as both food and medicine, for the legal development and utilization of seabuckthorn resources.

7.2.Two standards International Seabuckthorn Association namely Seabuckthorn Juice （T-ISAS002-2020） and Seabuckthorn Seed Oil （T-ISAS001-2020）were issued and implemented by ISA in the year of 2020.

7.3. Two annual publications namely China Seabuckthorn Development in 2019 (In Chinese) and International Seabuckthorn Development in 2019 (Both in English and Chinese) were published in December of 2020 by International Seabuckthorn Association jointly with Management Center for Seabuckthorn Development, Ministry of Water Resource, People’s Republic of China.

7.4. According to data of Baidu Search, in total 323 scientific artices on seabuckthorn were published by Chinese scientists/researchers at Chinese profersional jounnals in 2020. See the detail as in Appendix 1: Articles/papers/thesis on seabuchthorn published in the year of 2020 in China.

7. 当年全国颁布有关沙棘的主要政策文件、技术标准，发表的研究论文等。

（1）沙棘行业的发展得到了中国中央政府的大力支持。国家发展和改革委员会产业结构调整指导目录中将其列入鼓励项目并享受相关的税收优惠政策；1999 年国家林业局制定了《1999-2000 年沙棘发展规划》，把沙棘造林任务落实到六大林业重点建设工程中；卫生部 2002 年公布《关于进一步规范保健食品原料管理的通知》中，对药食同源物品、可用于保健食品的物品和保健食品禁用物品做出具体规定，将沙棘列入既是食品又是药品的植物资源名单，为沙棘资源的开发利用确立了法定地位。

（2）国际沙棘协会新制定和实施了《沙棘原汁》团体标准（T-ISAS002-2020）和《沙棘籽油》团体标准（T-ISAS001-2020）。

（3）水利部沙棘开发管理中心联合国际沙棘协会编辑出版了《2019 年度中国国沙棘开发报告》和《2019 年度国际沙棘开发年度报告》（中英文）。

（4）全国沙棘专家共发表沙棘论文或相关文章 323 篇（数据来源于百度学术、知网），详见附件 1。

Appendix 1: Scientific articles/papers/thesis on seabuchthorn published in the year of 2020 in China

附件 1：2020 年度中国学者发表的沙棘科技论文

1. ZHOU Z.S., LING J.C., Research on selection of grasses, trees and the inter-planting technology for soil conservation in coal mining districts, Soil and Water Conservation in China, 2020(1)

1. 周忠三，陵军成；煤矿水土流失区固土草种、树种筛选及间作技术研究，中国水土保持，2020（1）

2. WEI C.Y., BAO X.W., WANG J., et al, Isolation and purification of seabuckthorn polysaccharide and its anti- oxidation, Food Science, 2020(1)

2. 魏晨业，包晓玮，王娟，何梦梦，曾兰君，沙棘多糖分离纯化及抗氧化活性，食品科学，2020（1）

3. YAN X.L., XU X.M., DUAN J.F., et al, Seabuckthorn introduction and control measures to pests, insects and birds in gully district of the Loess Plateau, Modern Agricultural Science and Technology, 2020(1)

3. 闫晓玲；许小梅；段景峰；王健；马小瑞，黄土高原沟壑区沙棘引种概况及病虫鸟兽害防治措施，现代农业科技，2020（1）

4. AI N., QIANG D.H., LIU G.Q., et al, Impact of age and leaf position in post coal mine reclamation land to the water content of seabuckthorn leaf and berry, Journal of Northwest Forestry College. 2020(1)

4. 艾宁；强大宏；刘广全；土小宁；刘长海，煤矿复垦区林龄与叶位对沙棘果叶含水量的影响，西北林学院学报，2020（1）

5. ZHANG Q., ZHANG M.M., FAN M.Y., et al, The microscope observation of seabuckthorn nodule and its Frankia, Journal of Northwest Forestry College, 2020(1)

5. 张情；张明明；樊梦颖；张春丽；刘西平，沙棘根瘤及根瘤内弗兰克氏菌形态的显微观察，西北林学院学报，2020（1）

6. TAO C., WANG J., YAO Y.J., et al, Expressing method and distribution of seabuckthorn L-quebrachitol, Journal of Beijing Forestry University, 2020(1)

6. 陶翠；王捷；姚玉军；韩雪；吕兆林，沙棘中白雀木醇表征方法及其分布规律，北京林业大学学报，2020（1）

7. WANG G.H., XUE L. Z., Seabucckthorn cultivation and management technology in Inner Mongolia, Agricultural Engineering Technology, 2020(1)

7. 王国辉；薛灵芝，内蒙古地区沙棘栽培管理技术，农业工程技术，2020（1）

8. YAO N.N., CHE F. B., LI Y.H., et al, Overview of seabuckthorn nutritional value and its comprehensive utilization, Fresh Keeping and

8. 姚娜娜；车凤斌；李永海；张婷；张辉，沙棘的营养价值及综合开发利用概述，保鲜与加

Processing, 2020(1).

9.XIANG Y.F., LIU R.J., CHANG M., et al, Research of micro-capsule production and its property of seabuckthorn seed oil, Chinese Oil, 2020(1)

10. CAI Y.G., YUAN J.L., ZHU G.Q., et al, The experiment research of seabuckthorn pulp oil on mice immunity function improvement, Notification of Disease Prevention and Control, 2020(1)

11. ZHOU J. L., YAN Y.F., WU Y.W., et al, Research on preparation technology of seabuckthorn vinegar drink, Food Science and Technology, 2020(1).

12. ZHANG X.F., XUE Y.T., ZHANG Y.H., et al, The protective effect of seabuckthorn phyto-sterols to gastric mucous membranes injury induced by alcohol, Magazine of Huaxi Pharmacy, 2020(1)

13. ZHENG J., YAN Y.B., Application of seabuckthorn and its by-products in animal husbandry, Feed Overview, 2020(1)

14. MA J.Y., Key technical points of seabuckthorn propagation and plantation, Seed Science and Technology, 2020(1)

15. HE J.J., Extraction technique of seabuckthorn flavonoid and its application in animal husbandry, Hunan Feed, 2020(1)

16. LIU J., DING J., RUAN C.J., et al, Bioinformatics and expression analysis of glycerol 3-phosphate dehydrogenase gene in sea buckthorn, Molecular Plant Breeding, 2020(1)

17. MIU C.Q., WANG J., ZHENG R., et al, Nutritional compounds analysis of different crops in rich selenium regions of Zhangye city, Molecular Plant Breeding, 2020(1)

工，2020（1）

9. 向殷丰；刘睿杰；常明；金青哲；王兴国，沙棘籽油微胶囊制备及其特性研究，中国油脂，2020（1）

10. 蔡永国；袁江玲；朱国强；刘俭，沙棘果油提高小鼠免疫功能的实验研究，疾病预防控制通报，2020（1）

11. 周景丽；闫裕峰；武耀文；梁楷；郎繁繁，沙棘果醋饮料调配工艺的研究，食品科技，2020（1）

12. 张晓凤；薛延团；张育浩；张本印；张得钧，沙棘甾醇对酒精性胃黏膜损伤的保护作用，华西药学杂志，2020（1）

13. 郑娟；闫益波，沙棘及其副产物在畜牧业中的应用，饲料博览，2020（1）

14. 马剑媛，沙棘育苗与造林技术要点，种子科技，2020（1）

15. 何锦晶，沙棘黄酮的提取工艺及其在畜牧业中的应用，湖南饲料，2020（1）

16. 刘景；丁健；阮成江；杜维；张莞晨，沙棘3-磷酸甘油脱氢酶基因生物信息学及表达分析，分子植物育种，2020（1）

17. 缪纯庆；王娟；郑荣；刘秦；陈益，张掖市富硒带不同农作物营养成分分析，分子植物育种，2020（1）

18. HU C.X., The clinical study on seabuckthorn seed oil compound suppository combined with metronidazole vagina bubble tablet in treatment of vasculitis patients, New Chinese Medicine, 20120(1)

18. 胡春秀，复方沙棘籽油栓联合甲硝唑阴道泡腾片治疗阴道炎临床研究，新中医，2020（1）

19. ZHAO D.X., The second term of phase II (2021-2030) work plan of seabuckthorn breeding in China, Soil and Water Conservation in China, 2020(1)

19. 赵东晓，我国第二阶段第二期（2021—2030 年）沙棘育种工作草案，中国水土保持，2020（1）

20. ZHAO M.X., YU G.M., BAI E.L., et al, Research on soil enzyme activity in vegetation regions in Loess Plateau of Northern Shaaxi province, Notification of Soil, 2020(2)

20. 赵满兴；余光美；白二磊；刘慧；曹阳阳，陕北黄土高原植被恢复区土壤酶活性研究，土壤通报，2020（2）

21. SU Y.S., Optimization of seabuckthorn wine fermentation processing, Heilongjiang Agricultural Sciences, 2020(2)

21. 苏云珊，沙棘果酒发酵工艺优化，黑龙江农业科学，2020（2）

22. FAN F., QIN F.C., LI L., et al, Research on soil water holding capacity of different seabuckthorn stand types in north Yinshan, Guide of Chinese Agricultural Science and Technology, 2020(2)

22. 芳菲；秦富仓；李龙；杨振奇，阴山北麓不同林分类型土壤持水性能研究，中国农业科技导报，2020（2）

23. YANG Y., WU C.W., WU Z.Y., et al, Comparison of wind erosion prevention effect among three seabuckthorn bushes in north Hebei province, Journal of Soil and Water Conservation, 2020(2)

23. 杨越；吴才武；武智勇；杨依天；韩永娇，冀北坝上地区 3 种人工灌木林地防风蚀效果的比较，水土保持学报，2020（2）

24. HAO Z., CHEN N. ZHANG Y., et al, The relationship analysis of seabuckthorn growth and soil property of post mining residue, Journal of Liaoning University, 2020(2)

24. 郝喆；陈娜；张颖；张亮；肖圣博，尾矿库土壤综合性质与沙棘生长状况相关性分析，辽宁大学学报（自然科学版），2020（2）

25. LI Y.M., Investigation of seabuckthorn (Hippophae Tibetana) resources in Huzhu county, Qinghai province, Agricultural Engineering Technology, 2020(2)

25. 李永梅，青海省互助县西藏沙棘资源现状调查，农业工程技术，2020（2）

26. XU S.N., LIU H,B., TANG Z.S., et al, Research on micro capsule spray dry processing of seabuckthorn pulp and its physical and chemical properties, Food and Fermentation Industry, 2020(2)

26. 徐思宁；刘红波；唐志书；宋忠兴；孙静，沙棘果浆微囊喷雾干燥制备工艺及其理化性质研究，食品与发酵工业，2020（2）

27. LI Z.F., WEN K.S., ZHAO J.J., et al, Impact on bio-active substances content of seabuckthorn extractive by different dry methods, Anhui Agricultural Science, 2020(2)

27. 李治芳；温奎申；赵建军；雍婧姣；高晓娟，不同干燥方法对沙棘提取物中活性成分含量的影响，安徽农业科学，2020（2）

28. LIU X., ZHU D., NIU G.C., et al, Emulsification processing of micro capsule for seabuckthorn seed oil, Food Industry, 2020(2)

28. 刘鑫；朱丹；牛广财；魏文毅；杨楠，沙棘籽油微胶囊化的乳化工艺，食品工业，2020（2）

29. ZHANG M.M., ZHANG D.G., CHEN W., Impact on soil physical and chemical properties of different land uses in alpine meadows, Grassland and Lawn, 2020(2)

29. 张苗苗；张德罡；陈伟，高寒草甸不同利用方式对土壤理化性质的影响，草原与草坪，2020（2）

30. DU X.L., CHEN Y.P., CHEN X.G., et al, Research of seabuckthorn fermented residues applied as a feed resource, Feed Overview, 2020(2)

30. 杜雪林；陈亚平；陈旭刚；舒洪前；张鹏，发酵果渣作为饲料资源的应用研究，饲料博览，2020（2）

31. ZHANG J.H., Technology for the establishment of seabuckthorn cuttings pool, Shanxi Forestry, 2020(2)

31. 张晋华，沙棘采穗圃营建技术，山西林业，2020（2）

32. ALEHES, ZHENG X.G., WANG C., et al, Technology for trans-planting, transportation and planting of clean seabuckthorn seedlings, Modern Horticulture, 2020(2)

32. 阿勒合斯·加尔得木拉提；郑兴国；王程；楚光明，沙棘裸根苗夏季起苗运输栽植技术方法，现代园艺，2020（2）

33. YAN H., LIU X.M., ZUO Z.Y., et al, Analysis on anti-diabetes effect mechanism of seabuckthorn based on molecular connection and systematic pharmacology, Modern Chinese Medicine Research and Application, 2020(2)

33. 闫浩；刘小毛；左振宇；刘靖丽；宋逍，基于分子对接和系统药理学探讨沙棘抗糖尿病的作用机制，现代中药研究与实践，2020（2）

34. MA Y,T., Seabuckthorn planting technology and its resource utilization, Agriculture Development and Facility, 2020(2)

34. 马玉婷，沙棘种植技术及其资源开发与利用，农业开发与装备，2020（2）

35. LIU J.B., R&D of seabuckthorn seedlings propagation and afforestation technology, Agriculture Development and Facility, 2020(2)

35. 刘靖帮，沙棘育苗及造林技术开发研究，农业开发与装备，2020（2）

36. XIE W.Y., Chemical components analysis and anti-oxidant bioactive substances selection of

36. 谢文玉，沙棘油化学成分分析与抗氧化活

seabuckthorn, Journal of Hebei Medical University, 2020(3)

37. LIU P., Research progress on palmitoleic acid function of seabuckthorn, Grain and Oil, 2020(3)

38. ZENG X.J., Clinical research of seabuckthorn seed oil compound suppository in the treatment of high risk HPV infected patients, Medical Guideline in China, 2020(3)

39. LUO L.R., CAI Y.G., SUN J.Y., et al, Analysis on powder anti-agglomeration property caused by seabuckthorn residue, Modern Food Science and Technology, 2020(3)

40. ZHAO J.J., LI M., Seabuckthorn has created a new way of green development for Aershan County, Inner Mongolia Forestry, 2020(3)

41. LI X.J., WU B., Effect on seabuckthorn (Hippophae rhamnoides, ssp. sinensis) seed germination by different treatments, Communication of Forestry Science and Technology, 2020(3)

42. ZHAO D.W., Key technical points of seabuckthorn cultivation and management in Huzhu County, Qinghai province, Agricultural Engineering Technology, 2020(3)

43. CUI Y.Q., FAN S.J., HAO Z.P., et al, Application of seabuckthorn moth hormone in forest monitoring, Shanxi Forestry Science and Technology, 2020(3)

44. LU Z.M., Pest and insect control technology for Russian seabuckthorn varieties, Agricultural Engineering Technology, 2020(3)

45. WANG Q.R., ZHOU Y.Q., WANG F., et al, Technology of reforming and resuscitation for natural seabuckthorn stands, Shanxi Forestry Science and Technology, 2020(3)

性成分筛选，河北医科大学学报，2020（3）

37. 刘平，棕榈油酸功能的研究进展，粮食与油脂，2020（3）

38. 曾宪静，复方沙棘籽油栓治疗高危型HPV感染的临床研究，中国医药指南，2020（3）

39. 罗丽蓉；蔡永国；孙静瑶；胡旭东；伊力夏提·艾热提，沙棘果渣对沙棘果粉的抗结块性能分析，现代食品科技，2020（3）

40. 赵佳佳；李猛，阿尔山走出一条生态优先的绿色发展新路——内蒙古大兴安岭阿尔山林业局高质量创新发展纪实，内蒙古林业，2020（3）

41. 李小娟；武斌，不同处理对中国沙棘种子萌发的影响，林业科技通讯，2020（3）

42. 赵得文，青海互助县沙棘栽培与管理技术要点，农业工程技术，2020（3）

43. 崔亚琴；范世锦；郝志鹏；刘随存；顾春雷，沙棘木蠹蛾性诱剂在林间监测中的应用，山西林业科技，2020（3）

44. 鲁忠梅，大果沙棘病虫害防治技术，农业工程技术，2020（3）

45. 汪清锐；周玉泉；王富；崔智敏；郝文贵，天然沙棘林复壮改造技术，山西林业科技，2020（3）

46. DONG S.T., CHEN Y., GAO Q.Y., Research progress of seabuckthorn bioactive substance and its function, Chinese Brewery, 2020(3)

46. 董诗婷；陈云；高群玉，沙棘果生物活性成分及其功能的研究进展，中国酿造，2020（3）

47. WANG R., LI S.N., CHEN C., et al, Research on macrophages and immunity regulation effect of mice by seabuckthorn polysaccharide, Zhongnan Pharmacy, 2020(3)

47. 王蓉；李胜男；陈春；刘振康；原永芳，沙棘多糖对巨噬细胞和免疫抑制小鼠的免疫调节作用研究，中南药学，2020（3）

48. ZHANG L., The prospect of Russian seabuckthorn variety introduction in Maowusu sandy lands of Yulin city. Seed Science and Technology,2020(3)

48. 张雷，榆林毛乌素沙地大果沙棘的发展前景探析，种子科技，2020（3）

49. PAN Y., YU C., XIA H.H., et al, Effect of gergenso, curcumin and seabuckthorn flavonoids compounds on mice protection of live injury induced by alcohol, Heilongjiang Science, 2020(3)

49. 潘钰；于冲；夏海华；叶阳，葛根素、姜黄素、沙棘黄酮复合物对乙醇致小鼠肝损伤的保护作用，黑龙江科学，2020（3）

50. HAN X.L., HUANG C.G., ZHANG Y.X., et al, Structure and function of nirS denitrification flora in different vegetation soil on upper reach Wenyuhe riverbank, Journal of Ecology, 2020(3)

50. 韩晓丽；黄春国；张芸香；郭晋平，文峪河上游河岸带不同植被类型土壤 nirS 反硝化菌群结构及功能，生态学报，2020（3）

51.YU J.Q., XU X.X., GUO Z.N., et al, Impact on seabuckthorn wine aged effect by ultra-high pressure, Chinese Brewery, 2020(3)

51 于佳琦；许晓旭；郭子楠；滕飞；双全，超高压处理对沙棘酒催陈效果的影响，中国酿造，2020（3）

52. ZHANG M.M., ZHANG Q., FAN M.Y., et al, Comparison of bacteria diversity in seabuckthorn stand soil of two kinds of eco-condition, Journal of Northwest Forestry College, 2020(3)

52. 张明明；张倩；樊梦颖；刘西平，2 种立地条件下沙棘林地土壤中细菌多样性比较，西北林学院学报，2020（3）

53. LIU C., SU J.S., LI X.H., et al, Selection of Five Herds Seabuckthorn Powders, a Tibetan medicine based on web-pharmacology and molecular connection in the treatment of COVID-19, Modernization of Chinese Medicine, 2020(3)

53. 刘川；苏锦松；李轩豪；唐策；刘悦，基于网络药理学和分子对接法筛选藏药五味沙棘散治疗新型冠状病毒肺炎（COVID-19）活性，世界科学技术－中医药现代化，2020（3）

54. WEN K.S., R&D of seabuckthorn extractive and its quality evaluation, Journal of Ningxia Medical University, 2020(3)

54. 温奎申，沙棘提取物的产品研究与开发及质量评价，宁夏医科大学学报 2020（3）

55. WANG M.M., LIU Z.H., ZHANG Y., Analysis on flavonoids, polyphenols and its anti-oxidized activity of two kinds of seabuckthorn in Xinjiang, Food Industry Science and Technology, 2020(4)

56. SUI M., LIU G.D., Research progress of seabuckthorn integrated values, Shihezi Science and Technology, 2020(4)

57. LI X.L., Technology of seabuckthorn stands reforming and resuscitation by root cutting in Maowusu sandy land, Rural Practical Technology, 2020(4)

58. ZHOU H.N., HU N., DONG Q., et al, Research progress of seabuckthorn chemical components and its pharmacological effect, Magazine of Huaxi Pharmacy, 2020(4)

59. HUANG H.H., HU H., GONG H.M., et al, Chromatography identification and content measurement of seabuckthorn formula particles, Magazine of Huaxi Pharmacy, 2020(4)

60. ZHOU W.J., WEI T.X., LIU G.Q., et al, The coupling relationship of seabuckthorn community with soil factors of typical slope farmlands in north Shaanxi province, Grass Science, 2020(4)

61. HAN S.J., Propagation technology of seabuckthorn, Chinese Forestry Products, 2020(4)

62. WANG Z.X., Impact on seabuckthorn hard cutting rooting by mother tree age and cultivating matrix, Shelterbelt Science and Technology, 2020(4)

63. ZHU D.R., QIAN J., DONG N., et al, Clinical research on child capillary bronchitis treatment by seabuckthorn syrup joined with Budinader inhalation, Journal of Inner Mongolia Medical University, 2020(4)

64. CAO R., HU Z.M., DENG Y.Y., et al, Formula

55. 王苗苗；刘宗浩；张永；严欢；田合，2 种新疆沙棘中黄酮、多酚及其抗氧化活性分析，食品工业科技，2020（4）

56. 隋明；刘根娣，沙棘的综合价值研究进展，石河子科技，2020（4）

57. 李夏隆，毛乌素沙地沙棘平茬复壮更新技术，农村实用技术，2020（4）

58. 周浩楠；胡娜；董琦；王洪伦，沙棘化学成分及药理作用的研究进展，华西药学杂志 2020（4）

59. 黄海华；胡辉；龚华梦；刘源才，沙棘配方颗粒的色谱鉴定及含量测定，华西药学杂志，2020（4）

60. 周文洁；魏天兴；刘广全；朱清科，陕北典型退耕地沙棘群落与土壤因子的耦合关系，中国水土保持科学，2020（4）

61. 韩淑静，沙棘繁育技术，中国林副特产，2020（4）

62. 王忠贵，栽培基质和母树年龄对沙棘硬枝扦插生根的影响，防护林科技，2020（4）

63. 朱丹荣；钱娟；董娜；徐伟；梁国栋，沙棘糖浆联合布地奈德雾化吸入治疗小儿毛细支气管炎的临床研究，内蒙古医科大学学报，2020（4）

64. 曹瑞；胡宗苗；邓颖颖；姚东风；马丽，沙

optimization of seabuckthorn Gongyu Gel, Western Chinese Medicines, 2020(4)

65. LI Q.H., Key technical points of seabuckthorn cutting propagation, Agricultural Engineering Technology, 2020(1)

66. KONG Y., ZHANG Y.F., HAN P.Y., et al, Processing optimization and component analysis of polyphenols and research of its anti-oxidized property, Chinese Oil, 2020(4)

67. DONG J.W., LI Q.F., WANG R., et al, Space-time expressing mode of seabuckthorn (Hippophae rhamnoides ssp sinensis) HB15 gene with drought stress, Journal of Qinghai University, 2020(4)

68. WANG C.H., Seabuckthorn seedlings propagation technology for Russian variety in Daxinganling region, Modern Agricultural Science and Technology, 2020(4).

69. GAO Y.X., HOU Z.Q., REN D.F., et al, Processing of seabuckthorn seed oil micro capsule and its oxidation stability evaluation, Food Industry Science and Technology, 2020(4)

70. SU D.Y., XIONG J., LIU P.Z., et al, Blood sugar lowering activity of seabuckthorn seed protein peptides on db/db mice and its protective effect on kidney, Food Industry Science and Technology, 2020(4)

Shanxi Forestry, 2020(4)
71. GUO X.B., Research of countermeasure for seabuckthorn industry development in Shanxi province, Shanxi Forestry, 2020(4)

72. CAO Z.L., WANG X.L., LI G.Q., Impact on seabuckthorn (Hippophae rhamnoidest ssp sinensis) young seedlings unearthed and growth by three kinds of soil in central Yunnan province, Seed, 2020(4)

73. YANG C.H., Role and significance of

棘宫愈凝胶辅料配比优化方法，西部中医药，2020（4）

65. 李庆华，沙棘扦插育苗技术要点，农业工程技术，2020（4）

66. 孔宇；张倚菲；韩鹏云；韦柳伊；李文华，沙棘籽粕多酚提取工艺优化、组分分析及抗氧化性能研究，中国油脂，2020（4）

67. 董佳伟；李强峰；汪荣；马吉良；张忠存，干旱胁迫下中国沙棘 HB15 基因的时空表达模式，青海大学学报，2020（4）

68. 王纯华，大兴安岭林区俄罗斯大果沙棘苗木培育技术，现代农业科技，2020（4）

69. 高雅馨；侯占群；任迪峰；林静；柳嘉，沙棘籽油微胶囊的制备及氧化稳定性评价，食品工业科技，2020（4）

70. 舒丹阳；熊犍；刘鹏展；崔春，沙棘籽蛋白肽对 db/db 小鼠降血糖活性及肾脏保护作用，食品工业科技，2020（4）

71. 郭学斌，山西省沙棘产业发展对策研究，山西林业，2020（4）

72. 曹子林；王晓丽；李根前，滇中高原 3 种土壤对中国沙棘幼苗出土及生长的影响，种子，2020（4）

73. 杨辰虎，沙棘在退耕还林中的作用与地位，

seabuckthorn in retreating slop eland to forest land. Modern Horticulture, 2020(4)

现代园艺，2020（4）

74. ZHANG X.L., LI Z.H., Planting 400,000 mu of seabuckthorn for poverty alleviation in southern Xinjiang, Central Asia Information, 2020(4)

74. 张晓龙；李志浩，40 万亩沙棘 3 年内“进驻”南疆助脱贫，中亚信息，2020（4）

75. ZHU L.B., ZHU D., NIU G.C., et al, R&D of seabuckthorn juice beverage and its anti-oxidized property research, Beverage Industry, 2020(4)

75. 朱立斌；朱丹；牛广财；魏文毅；苗欣月，沙棘果汁饮料的研制及其抗氧化活性研究，饮料工业，2020（4）

76. DONG L.G., Research on soil salt content change of seabuckthorn bush land by different irrigation treatment, Hubei Forestry Science and Technology, 2020(3)

76. 董立国，不同滴灌处理下沙棘林内土壤盐分变化研究，湖北林业科技，2020（4）

77. GAO Y.X., LI X.Q, YU Y.Q., et al, Processing of seabuckthorn seed oil gel and its rheological property research, Food and Fermentation Industry, 2020(4)

77. 高雅馨；李晓倩；于有强；侯占群；牟德华，沙棘籽油凝胶的制备及流变特性研究，食品与发酵工业，2020（4）

78. LI Y.M., Strength-weakness and suggestion of seabuckthorn industry development in Lanxian county, Rural Science and Technology, 2020(4)

78. 李艳梅，岚县沙棘产业发展优劣势及建议，乡村科技，2020（4）

79. GAO Y.X., Processing of lactoferrin-cinnamic acid-seabuckthorn seed oil compound gel and its digestion property research, Journal of Hebei Technical University, 2020(4)

79. 高雅馨，乳铁蛋白－肉桂酸复合沙棘籽油凝胶的制备及其消化特性的研究，河北科技大学学报，2020（4）

80. HAN.D., Hyperspectral based research on seabuckthorn vegetation succession and geomorphological features in glacier retreating regions, Journal of Southwest Technical University, 2020(3)

80. 韩丹，基于高光谱的冰川退缩区地貌特征与植被演替系列研究，西南科技大学学报，2020（4）

81. LIU Y.L., Impact on soil organic C by fallen leaves decomposition during seabuckthorn vegetation recovery in Zhiwuling mountain, Journal of Northwest Agro Forestry Technical University, 2020(4)

81. 刘玉林，子午岭植被恢复中凋落物分解对土壤有机碳的影响，西北农林科技大学学报，2020（4）

82. XU F.Y., Effect and mechanism research on DDS induced mice ulcerative colitis by seabuckthorn leave total flavonoids, Journal of Inner Mongolia

82. 徐凤英，沙棘叶总黄酮对 DSS 诱导的小鼠溃疡性结肠炎的缓减作用及机制研究，内蒙古

Medical University, 2020(4)

医科大学学报，2020（4）

83. BAO W.B., Research on the relationship between seabuckthorn vegetation and typical slope soil moisture features in southern Ningxia mountainous regions, Journal of Ningxia University, 2020(4)

83. 包维斌，宁南山区典型坡面土壤干层特征与植被关系研究，宁夏大学学报，2020（4）

84. FAN M.Y., Survey on root nodule bacteria diversity of three kinds of nodule added wood plants, Journal of Northwest Agro Forestry Technical University, 2020(5)

84. 樊梦颖，三种木本结瘤植物根瘤细菌多样性调查，西北农林科技大学学报，2020（5）

85. WANG Q.Q., SUN B., Measurement on 7 substance contents of Wuwei seabuckthorn powder by UPLC, Chinese Pharmacists, 2020(5)

85. 王全巧；孙宝，UPLC 法同时测定五味沙棘散中 7 个成分的含量，中国药师，2020（5）

86.XIE J.T., DU B., Impact of seabuckthorn leaves on mice diarrhoea and intestinal peristalsis, Chinese and Oversea Entrepreneurs, 2020(5)

86. 解静恬；杜蓓，沙棘叶对小鼠腹泻及肠蠕动的影响，中外企业家，2020（5）

87. YAN X.L., HU J.Z., TUO Z.P., et al, Comparison of branch property of different seabuckthorn varieties in gully regions of Loess Plateau, Modern Agricultural Science and Technology, 2020(3)

87. 闫晓玲；胡建忠；脱忠平；荆亚翡；罗莉芳，黄土高塬沟壑区不同沙棘品种分枝性状对比，现代农业科技，2020（5）

88. ZHOU Y., LI W., PENG S.F., et al, Impact of seabuckthorn polysaccharide to fermented latex gel property and processing optimization of seabuckthorn polysaccharide yoghurt, Chinese Dairy Industry, 2020(5)

88. 周勇；李伟；彭禛菲；胡旭东；周先林，沙棘多糖对发酵乳凝胶特性的影响及沙棘多糖酸奶工艺优化，中国乳品工业，2020（5）

89. DU X.L., WANG X.X., TIAN X.Y., et al, Research progress of seabuckthorn comprehensive values, Grain and Oil, 2020(5)

89. 杜晓兰；王旭旭；田旭阳；苑宁，沙棘综合价值的研究进展，粮食与油脂 2020（5）

90. ZHOU P.C., Seabuckthorn growth features and high yield cultivation technology, Special Economic Animals and Plants, 2020(5)

90. 周鹏程，沙棘的生长习性及丰产栽培技术，特种经济动植物，2020（5）90

91. CHEN Y.H., LI J.X., FENG L.D., et al, R&D of seabuckthorn blend juice and stabilizer formula optimization, Food and Fermentation Industry, 2020(5)

91. 陈永浩；李霁昕；冯丽丹；张祯；把灵珍，沙棘、梨混合果汁配方研发及稳定剂配比优化，食品与发酵工业，2020（5）

92. LI N., WANG J.L., LIU J.G., et al, Statue of research on seabuckthorn nutritional substances and its pharmacological activity, Chinese Fruit and Vegetable, 2020(5)

92. 李娜；王佳乐；刘建国；束弛；田金龙，沙棘营养成分及药理活性研究现状，中国果菜，2020（5）

93. ZENG F.Z., DENG Q.C., YU X., Impact on seabuckthorn oil quality and main lipid companion oil migration by processing part and extraction technique, Chinese Oil, 2020(5)

93. 曾凡正；邓乾春；禹晓，加工部位及提取工艺对沙棘油品质特性及主要脂质伴随物油相迁移的影响，中国油脂 2020（5）

94. BAI X.C., JIANG Z., ZHANG Z.Y., et al, Impact on seabuckthorn (Hippophae rhamnoides ssp sinensis) endogenous hormones by root cutting germination ability, Journal of Southwest Forestry University, 2020(5)

94. 白双成；姜准；张增悦；曹子林；陈文红，中国沙棘平茬萌蘖能力对内源激素的响应，西南林业大学学报（自然科学），2020（5）

95. YUAN J.L., XU X.H., DU Y., et al, Animal experimental research on geno-toxicity and teratogenic effect of seabuckthorn pulp oil, Magazine of Chinese Preventive Medicine, 2020(5)

95. 袁江玲；徐晓辉；杜勇；陈欣如；艾尔肯·塔西铁木尔，沙棘果油的遗传毒性及致畸作用动物实验研究，中国预防医学杂志 2020（5）

96. FENG D.D., XUE Q.Q., QI J.Y., et al, Structure and occurrence law of fly community in artificial seabuckthorn stands, Shanxi Agricultural Science, 2020(5)

96. 冯丹丹；薛琪琪；祁靖宇；王利军；李浩，人工沙棘林螟蛾科群落结构及发生规律，山西农业科学，2020（5）

97. YE S.Y., Seabuckthorn cutting propagation and planting technology arid region, Inner Mongolia Forestry Survey and Design, 2020(5)

97. 叶尚宇，沙棘扦插育苗及干旱区造林技术，内蒙古林业调查设计，2020（5）

98. WANG S.T., Comparison research on photosynthesis property of different seabuckthorn varieties, Shelterbelt Science and Technology, 2020(5)

98. 王斯彤，不同沙棘品种光合特性的比较研究，防护林科技，2020（5）

99. LIN T., FENG X.B., YAO Z.M., et al, Detection technology research on pesticide residues determination of seabuckthorn product by GC-MS/MS, Chinese Port Science and Technology, 2020(5)

99. 林童；凤晓博；姚志敏；苏姗姗；王瑞，GC−MS/MS 法测定沙棘制品中农药残留检测技术研究，中国口岸科学技术，2020（5）

100. LU Z.M., Main technology of seabuckthorn seedlings propagation and planting, Agricultural Engineering Technology, 2020(1)

100. 鲁忠梅，青海地区沙棘育苗与造林关键技术，农业工程技术，2020（5）

101. HAN Y.L., Research on seedlings propagation and planting of seabuckthorn, Rural Consultants, 2020(5)

101. 韩玉兰，沙棘育苗及造林技术研究，农家参谋，2020（5）

102. GAO F. GUO Y.L., LIU Q., et al, Overview of seabuckthorn leave research and utilization, Anhui Agricultural Science, 2020(5)

102. 高峰；郭延丽；刘巧；李敏；欧莉，沙棘叶子研究利用综述，安徽农业科学，2020（5）

103.QI X. N., ZHANG Y.X., LI Z.L., et al, Processing of natural seabuckthorn polysaccharide emulsion with anti-bacteria and moisture keeping, Chemical World, 2020(5)

103. 祁小妮；张元霞；李振亮；董艳娇，天然沙棘果多糖抑菌保湿型乳剂的制备，化学世界，2020（5）

104. ZHU H.J., ZHAO X.J., Research on industry development of economic purpose seabuckthorn plantation in Weichang county, Anhui Agricultural Science, 2020(5)

104. 朱华娟；赵宪军，围场县经济林产业发展问题研究，安徽农业科学 2020（5）

105. MA J.X., Research on seabuckthorn lactic acid bacteria drink, Countryside Agriculture and Farmers, 2020(5)

105. 马婧萱，一种含沙棘爆珠的乳酸菌饮料分析研究，农村 . 农业 . 农民 (B 版)，2020（5）

106. REN L.H., LIU L., WANG H., et al, Research on processing of seabuckthorn tablets with reishi and saussurea, Food Science and Technology, 2020(5)

106. 任立焕；刘磊；王鹤；侯金才，灵芝沙棘雪莲片制备工艺研究，食品科技，2020（5）

107. ZHOU S.J., REN J., Seabuckthorn industry serves for ecological benefit and poverty alleviation in Zuoyun county, Observation of Reporters, 2020(5)

107. 周世俊；任键，左云沙棘产业生态脱贫保双赢，记者观察，2020（5）

108. JIA C., DU Y.R., SUN K., Effect and mechanism of total seabuckthorn flavonoids in inhabitation of lung cancer A549 proliferation and migration, Natural Products Research and Development, 2020(5)

108. 贾丛；杜亚蓉；孙坤，沙棘总黄酮抑制肺癌 A549 增殖和迁移作用及机理，天然产物研究与开发，2020（5）

109. ZHANG A.M., GUO B.M., HAN X.Y., et al., Diversity of endogenous bacteria of seabuckthorn (Hippophae rhamnoides ssp. sinensis) seed in two kinds of eco-site, Journal of Ecology, 2020(5)

109. 张爱梅；郭保民；韩雪英；李曦冉，两种不同生境中国沙棘种子内生细菌的多样性，生态学报，2020（5）

110. QI Y.H., LIU R.Y., Statue and suggestion for seabuckthorn medicinal tea industry development

110. 齐永红；刘瑞宇，山西药茶产业现状及发

in Shanxi province, Chinese Agricultural Technology Extension, 2020(5)

展思考，中国农技推广，2020（5）

111. HUANG Y.Y., ZHAN Z.B., High efficient and comprehensive utilization of seabuckthorn, Introduction of Food Safety, 2020(5)

111. 黄媛媛；张志斌，沙棘的高效综合利用，食品安全导刊，2020（5）

112. WANG F., Effect analysis of seabuckthorn seed oil compound suppository joining recombinant human interferon in the treatment of high risk HPV infected chronic cervicitis patients, Doctor, 2020(5)

112. 王芳，复方沙棘籽油栓联合重组人干扰素治疗高危型 HPV 感染合并慢性宫颈炎疗效分析，名医，2020（5）

113. DING J., Separation processing of seabuckthorn active substances and research on its inhabitation of Dorothy Star induced myocardial cell damage, Journal of Yantai University, 2020(5)

113. 丁金，沙棘活性成分分离制备及抗多柔比星致心肌细胞损伤的研究，烟台大学学报，2020（5）

114. ZHANG X.X., JIA H.Z., YU C.Q., et al, Processing optimization on soluble dietary fiber extraction from seabuckthorn berry residues by ultrasonic and microwave synergy, Food Industry Science and Technology, 2020(5)

114. 张晓雪；贾鸿震；于长青；魏文慧；李冰，超声波－微波协同提取沙棘果皮渣中可溶性膳食纤维工艺优化，食品工业科技，2020（6）

115. WANG X.X., Research of intervention effect of seabuckthorn pulp oil and its effective substances on atopic dermatitis mice based on Th1/Th2 balance, Journal of Liaoning Chinese Medicinal University, 2020(6)

115. 王欣欣，基于 Th1/Th2 平衡研究沙棘果油及其有效成分对特应性皮炎小鼠的干预作用，辽宁中医药大学学报，2020（6）

116. ZHENG J., Research on fermentation processing of seabuckthorn with vegetable compound juice and its gastrointestinal digestion property, Journal of Shanxi University, 2020(6)

116. 郑婕，复合果蔬汁发酵工艺及胃肠消化特性研究，山西大学学报，2020（6）

117. HAN L., Effect of seabuckthorn frozen powder on fat reduction and intestinal flora regulation of high fat diet feed mice, Journal of Shanxi University, 2020(6)

117. 韩丽，沙棘冻干粉对高脂饮食小鼠的降脂减肥与肠道菌群的调节作用，山西大学学报，2020（6）

118. SUN Z., Effect of thermal treatment on components of seabuckthorn tea beverage and drinking quality, Journal of Shenyang Agriculture University, 2020(6)

118. 孙卓，热处理对沙棘叶茶饮料组分及饮用品质影响研究，沈阳农业大学学报，2020（6）

119. XU R., Research on stands community feature of seabuckthorn and its mechanism of dynamic succession in Maowusu sandy regions, Journal of Inner Mongolia University, 2020(6)

119. 旭日，毛乌素沙地柳湾林群落特征及其动态演替机制研究，内蒙古大学学报，2020（6）

120. CUI M.M., Active substances of seabuckthorn berry binding polyphenols for colon cancer inhibition effect and molecular mechanism, Journal of Shanxi University, 2020(6)

120. 崔米米，沙棘果结合态多酚抗结肠癌效应的活性成分及分子机制，山西大学学报，2020（6）

121. YANG Z.Q., Research on water induced soil erosion control mechanism of artificial seabuckthorn vegetation in bare Pishayan regions, Journal of Inner Mogolia Agriculture University, 2020(6)

121. 杨振奇，裸露砒砂岩区人工植被对水力侵蚀的调控机制研究，内蒙古农业大学学报，2020（6）

122. LU Y.Y., Separation and purification of anti-tumor active substances of seabuckthorn leave binding polyphenols and its ingredients analysis, Journal of Shanxi University, 2020(6)

122. 路洋洋，沙棘叶结合态多酚中抗肿瘤活性成分的分离纯化及成分分析，山西大学学报，2020（6）

123. ZHANG Y., Research on toxicology safety of seabuckthorn berry binding polyphenols, Journal of Shanxi University, 2020(6)

123. 张颖，沙棘果结合态多酚的毒理学安全性研究，山西大学学报，2020（6）

124. WANG X.F., Impact of seabuckthorn biological nitrogen fixation on soil environment and vegetation development in bare lands of glacier recession zones, Journal of Chinese Academy of Science University, 2020(6)

124. 王小芳，生物固氮对冰川退缩区裸地土壤环境及植被发育的影响，中国科学院大学（中国科学院水利部成都山地灾害与环境研究所）学报，2020（6）

125. XIAO B., Seabuckthorn and peanut intercropping allocation and soil nutrient mechanism features in sandy regions of western Liaoning province, Journal of Shenyang Agriculture University, 2020(6)

125. 肖斌，辽西北沙区花生与林木复合系统配置及土壤养分动态特征，沈阳农业大学学报，2020（6）

126. ZHAN X., Inhibition effect of seabuckthorn extractives on colon-rectal tumor HCT116, Journal of Shanxi University, 2020(6)

126. 张欣，沙棘叶提取物对结直肠癌细胞HCT116的抑制作用，山西大学学报，2020（6）

127. LI Y., Research on soil microbe community structure and its diversity of artificial seabuckthorn stands in post coal mine reclamation regions, Journal of Yanan University, 2020(6)

127. 李阳，煤矿复垦区沙棘人工林土壤微生物群落结构及其多样性研究，延安大学学报，2020（6）

128. WANG W.N., Analysis on flavonoids substances of seabuckthorn berry, Journal of Northeast Agriculture University, 2020(6)

128. 王琬宁，沙棘果实中黄酮类物质的分析，东北农业大学学报，2020（6）

129. BAI E. L., Research on soluble organic C content change of soil and its absorption property during seabuckthorn planting rehabilitation in hilly regions of Loess Plateau, Journal of Yanan University, 2020(6)

129. 白二磊，黄土丘陵区沙棘林恢复过程土壤可溶性有机氮含量变化及其吸附特性研究，延安大学学报，2020（6）

130. WANG Z., Seabuckthorn trunk liquid flow and its impact factors in Pishayan regions, Journal of Inner Mongolia Agriculture University, 2020(6)

130. 王卓，砒砂岩区沙棘树干液流及其影响因素，内蒙古农业大学学报，2020（6）

131. SU R.N., Comparison on root mechanics property of seabuckthorn and another soil conservation plant in arid regions, Journal of Inner Mongolia Agriculture University, 2020(6)

131. 苏日娜，干旱区两种水土保持植物根系力学特性的比较，内蒙古农业大学学报，2020（6）

132. WANG M., Signal transition mechanism of seabuckthorn quercetin in regulation of chicken lipid metabolism, Journal of Northeast Agriculture University, 2020(6)

132. 王密，槲皮素调节肉鸡脂质代谢的信号转导机制，东北农业大学学报，2020（6）

133. ZHONG C., Research of root cutting effect on seabuckthorn fine roots growth features and soil moisture, Journal of Inner Mongolia Agriculture University, 2020(6)

133. 仲宸，平茬措施对沙棘细根生长特性及土壤水分的影响研究，内蒙古农业大学学报，2020（6）

134. YANG X.S., Extraction of lipid soluble substances and its composition analysis of seabuckthorn berries, Journal of Northeast Agriculture University, 2020(6)

134. 杨旭升，沙棘果中脂溶性组分的提取及其组成分析，东北农业大学学报，2020（6）

135. LIU X.J., High yield cultivation technology of Russian variety seabuckthorn plantation in western Liaoning province, Modern Agriculture, 2020(6)

135. 刘晓静，辽西地区大果沙棘建园丰产栽培技术，现代农业，2020（6）

136. LI X., Research of seabucktorn extractives on cataract development inhibition of diabetic rat, Journal of North China Technical University, 2020(6)

136. 李晓，沙棘提取物延缓糖尿病大鼠白内障进展的研究，华北理工大学学报，2020（6）

137 LI R.Y., Anti pull and shear mechanics property research on roots of seabuckthorn and other three

137. 李瑞燊，反复加－卸载对 4 种植物根系抗拉剪组合力学特性影响的研究，内蒙古农业大

plants by repeated on and off stress, Journal of Inner Mongolia Agriculture University, 2020(6)

138. ASIBYER, Research on protective benefits of seabuckthorn shelterbelts of retreated from farm lands in Wuchuan county, Journal of Inner Mongolia Agriculture University, 2020(6)

139. WANG Y., LIU Q., GENG J., Isolation and purification of seabuckthorn flavonoids and its effect of anti-sports fatigue, Food Industry Science and Technology, 2020(6)

140. GUO Y.N., Bio-diversity and its features of soil microbe in rehabilitated vegetation of cold mine sinking region in semi-arid grass zones, Journal of Inner Mongolia University, 2020(6)

141. MIAO H.L. ZHANG R.Q., WANG J., et al, Function mechanism and benefits of seabuckthorn for soil and water conservation, Soil and Water Conservation in China, 2020(6)

142. ZHANG L., Technology of seabuckthorn seedlings propagation, Modern Agriculture Science and Technology, 2020(6)

143. SHU D.Y., Anti-oxidized activity of seabuckthorn seed protease peptides and its effects on mice blood sugar lowering and kidney protection, Journal of Southern China Technical University, 2020(6)

144. XING D.Q., Nutrition and application of seabuckthorn and other plants as feeds, New Countryside, 2020(6)

145. SHAO Z. W., LIU H.Y., ZHANG Y.G., Natural shrub species for signseeing in autumn and winter seasons and its utilization, Special Economic Animals and Plants, 2020(6)

146. LI W., LI B.G., ZHOU S.M., et al, Processing research on palmitoleic acid of seabuckthorn pulp oil by low temperature liquid extraction and

学学报，2020（6）

138. 阿斯布尔，武川县退耕还林区林带防护效益研究，内蒙古农业大学，2020（6）

139. 王玉；刘琦；耿杰，沙棘黄酮的分离纯化及其抗运动性疲劳作用，食品工业科技，2020（6）

140. 郭洋楠，半干旱草原煤矿沉陷区复垦植被土壤微生物多样性及特征，内蒙古大学学报，2020（6）

141. 苗恒录；张瑞强；王健；刘虎；尉迟文思，沙棘的水土保持作用机制与效益，中国水土保持 2020（6）

142. 张玲，沙棘播种育苗技术，现代农业科技，2020（6）

143. 舒丹阳，沙棘籽蛋白酶解肽的抗氧化活性、对小鼠的降血糖效果及肾脏保护作用，华南理工大学学报，2020（6）

144. 幸奠权，几种植物性饲料的营养及用法，新农村，2020（6）

145. 邵占武；刘宏宇；张玉国，长白山区秋、冬季节野生观果灌木种类及开发利用，特种经济动植物，2020（6）

146. 李伟；李保国；周盛敏；姜元荣，低温溶剂分提与分子蒸馏复合法富集沙棘果油棕榈油

molecular distillation concentration, Chinese Oil, 2020(6)

酸的工艺研究，中国油脂，2020（6）

147. WANG J.C., Research on processing of seabuckthorn pulp enzymes by microbial fermentation, Shanxi Forestry Science and Technology, 2020(3)

147. 王巨成，微生物发酵制备沙棘果浆酵素的研究，山西林业科技，2020（6）

148. LIU Y.T., GAO J.L., HUANG Y.R., et al, Impact on rooting of seabuckthorn green cutting by use of different root stimulating powders, Temperate Forestry Research, 2020(6)

148. 刘禹廷；高君亮；黄雅茹；罗红梅；马迎宾，不同生根粉对沙棘嫩枝扦插生根的影响，温带林业研究，2020（6）

149. LIU R., ZHAI G.X., JIA Y.H., Monthly comparison analysis on seabuckthorn leave flavonoids contents in northern Shanxi province, Shanxi Forestry Science and Technology, 2020(6)

149. 刘荣；翟贵喜；贾艳红，不同月份晋北地区沙棘叶总黄酮含量比较分析，山西林业科技，2020（6）

150. ZHONG C., GUO Y.F., QI W., et al, Seabuckthorn fine roots and collapse resistance features of soil in Pishayan regions, Inner Mongolia Forestry Science and Technology, 2020(6)

150. 仲宸；郭月峰；祁伟；姚云峰；王贺，砒砂岩区沙棘林缓冲带细根及土体抗崩解特征，内蒙古林业科技，2020（6）

151. YANG Z.G., Preliminary study on technology of seabuckthorn afforestation and management in arid regions of northern Shanxi province, Green Science and Technology, 2020(6)

151. 杨智广，晋北干旱地区沙棘造林抚育管理技术探讨，绿色科技，2020（6）

152. ZHAO Y.M., ZHANG X.J., LIU H.S., et al, Propagation technology of seabuckthorn green cuttings in Keerqing sandy lands, Inner Mongolia Forestry Science and Technology, 2020(6)

152. 赵玉海；张秀君；刘哈申；张军红，科尔沁沙地沙棘嫩枝扦插繁育技术，内蒙古林业科技，2020（6）

153. CHEN A.H., Propagation technology of seabuckthorn seedlings in Chaoyang city, Liaoning province, Chinese Special Forestry Products, 2020(6)

153. 陈爱华，朝阳地区沙棘播种育苗技术，中国林副特产，2020（6）

154. SONG X.M., Control technology for main seabuckthorn pests and insects in Qinghai province, Agricultural Engineering Technology, 2020(6)

154. 宋晓梅，青海沙棘主要病虫害防治技术，农业工程技术，2020（6）

155. SHAN J.J., Keys of propagation technology for seabuckthorn variety, Agricultural Engineering Technology, 2020(1)

155. 山建军，沙棘良种育苗技术要点，农业工程技术，2020（6）

156. GUO Y.F., QI W., YAO Y.F., et al, Impact of seabuckthorn root cutting height on its physiological characteristics in Pishayan regions, Journal of Ecological Environment, 2020(6)

157.WANG Z.Z., SHA R.Y., WANG G.J., et al, Detection on twelve organic acids of seabuckthorn enzymes by HPLC, Food Industry Science and Technology, 2020(3)

158. ZHENG W.H., BAI H.Y., WANG L.Y., et al. Analysis on ingredients of seabuckthorn berries, leave and twigs by UPLC-QTOF-MS, Proprietary Chinese Medicines, 2020(6)

159. QIN H.F., Technology for seabuckthorn seedlings lignification improvement, Modern Rural Science and Technology, 2020(6)

160. SU Y.N., Protective measures of bare root seabuckthorn seedlings in winter, Modern Rural Science and Technology, 2020(6)

161. WANG Y.H., CHI J.L., ZHONG L.J., Research on processing of new green bio-feeds by solid fermentation of seabuckthorn pulp residues, Feed Industry, 2020(6)

162. ZHU Y.J, DANG H.Z., DU J., et al, Water consumption and its impact factors of seabuckrhorn in earth-covered Pishayan regions, Soil and Water Conservation Research, 2020(6)

163. HAN L.Z., DUAN X., SUN C.Y., et al, R&D on functional compound beverage of seabuckthorn with Chinese date and hawthorn, Chinese Food and Nutrition, 2020(6)

164. LIYAZ W., LIU X.Y., ABULAIHAITI A., et al, Research overview on chemical compounds of different seabuckthorn parts and its pharmacological effects, Chinese Minzu Fork Medicines, 2020(6)

156. 156 郭月峰；祁伟；姚云峰；王鑫，留茬高度对砒砂岩区沙棘生理特征的影响，生态环境学报，2020（6）

157. 王珍珍；沙如意；王高坚；徐成龙；戴静，HPLC 法同时测定食用植物酵素中 12 种有机酸，食品工业科技，2020（6）

158. 郑文惠；白海英；王丽瑶；包芳；杨志刚，UPLC−QTOF−MS 法分析沙棘果实、叶和枝的成分，中成药，2020（6）

159. 秦海峰，促进沙棘苗木木质化技术，现代农村科技，2020（6）

160. 苏雅男，裸根沙棘苗木冬季保护措施，现代农村科技 2020（6）

161. 王艳华；池景良；钟丽娟，利用沙棘果渣固态发酵生产新型绿色生物饲料的研究，饲料工业，2020（6）

162. 朱雅娟；党宏忠；杜娟；李永华，覆土砒砂岩区沙棘耗水量及其影响因子，水土保持研究，2020（6）

163. 韩立柱；段玺；孙春燕；胡坤霞；汪芸兰，沙棘、红枣、山楂复合功能饮料的研制，中国食物与营养，2020（6）

164. 尼亚孜 · 乌吉艾合买提；刘续元；阿卜来海提 · 阿卜杜瓦伊提；帕尔哈提 · 柔孜，沙棘不同部位化学成分和药理作用研究概况，中国民族民间医药，2020（6）

165. WANG J,C., Research on processing of seabuckthorn enzyme jelly, Food Engineering, 2020(6)

165. 王巨成，沙棘酵素果冻制备工艺的研究，食品工程，2020（6）

166. HUANG Y, Research progress on seabuckthorn cold and drought resistances in Tibet Plateau, Green Science and Technology, 2020(3)

166. 黄勇，西藏地区高原林木抗寒抗旱性研究进展，绿色科技，2020（6）

167. WANG Z., GUO Y.G., QI W., et al, Relationship of seabuckthorn liquid flow feature by different irrigation gradients with environmental factors, Arid Zones Research, 2020(6)

167. 王卓；郭月峰；祁伟；姚云峰；仲宸，不同灌水梯度下沙棘液流特征与环境因子的关系，干旱区研究，2020（6）

168. ALEHESI, J., Research on introduction adaptability of seabuckthorn variety and its green cutting propagation technology, Journal of Shihezi University, 2020(7)

168. 阿勒合斯・加尔得木拉提，新疆吉木萨尔县沙棘品种引种适应性及嫩枝扦插技术研究，石河子大学学报，2020（7）

169. XU Z.W., JIA S.N., ZHAO G.F., et al, Investigation of seabuckthorn resources and suggestions of industry development in Qinghai province, Modern Chinese Medicines in China, 2020(7)

169. 徐智玮；贾守宁；赵国福；马春花；王双玺，青海沙棘资源调查与产业发展建议，中国现代中药，2020（7）

170. PENG M., Optimization on extraction processing of total seabuckthorn flavonoids by Star Design - Response Face, Chinese Pharmacists, 2020(7)

170. 彭明，星点设计－响应面法优化沙棘总黄酮提取工艺，中国药师，2020（7）

171.SU X.T., Impact on sport capacity of Mongolia horse and its sugar metabolism by feeding different contents of seabuckthorn polysaccharide additives, Chinese Feeds, 2020(7)

171. 苏兴田，饲料中添加不同水平的沙棘多糖对蒙古马运动性能及糖代谢的影响，中国饲料，2020（7）

172. WANG Q.Q., Clone expressing on genes of seabuckthorn moth EhHsp90-1 and EhHsp90-2 and construction of its EhHsp90-1 gene RNA interference system, Journal of Beijing Forestry University, 2020(7)

172. 王倩倩，沙棘木蠹蛾幼虫 EhHsp90−1 和 EhHsp90−2 基因的克隆表达及 EhHsp90−1 基因 RNA 干扰体系的构建，北京林业大学学报，2020（7）

173. XU S.H., ZHU Y.J., WU C.X., et al, Analysis on water use efficiency of seabuckthorn and other two soil conservative plants in Erdos Plateau, Journal of Applied Ecology, 2020(7)

173. 许素寒；朱雅娟；吴彩霞；李蕴，鄂尔多斯高原 3 个水土保持树种的水分利用策略，应用生态学报，2020（7）

174, HAN L.Z., GAO H., HU K,X., et al, Research on formula screening and its processing of seabuckthorn seed oil micro-milk, Modern Chinese Medicines in China, 2020(7)

174. 韩立柱；高欢；胡坤霞；汪芸兰；唐志书，沙棘籽油微乳的处方筛选及制备工艺研究，中国现代中药，2020（7）

175. NAN J.B., YANG G H., WU T M., et al. Comparison research on drought resistance of three seabuckthorn species or sub-species in Tibet, Journal of Northwest Agro Forestry Technical University, 2020(7)

175. 南吉斌；杨广环；吴天彧；林玲，西藏3种沙棘属植物抗旱性比较研究，西北农林科技大学学报（自然科学版），2020（7）

176. LV J.W., WANG Z., LIU Y.Q., et al, Processing research on extraction and purification of seabuckthorn polyphenols, Food Industry Science and Technology, 2020(7)

176. 吕佳玮；王颉；刘亚琼；孙剑锋；王文秀，沙棘多酚提取纯化工艺研究，食品工业科技，2020（7）

177. LUO S.J., JIN X., GUO Y.X., et al, Clinical research on treatment of child food-eating functional constipation by seabuckthorn dry emulsion, Modern Chinese Medicines, 2020(7)

177. 罗世杰；金瑄；郭亚雄；宋晓波；马艳芳，沙棘干乳剂治疗儿童食积型功能性便秘临床研究，现代中医药，2020（7）

178. YAO N.N., CHE F.B., ZHANG T., et al, Comparison analysis on hot wind dry effect of Russian variety seabuckthorn berries by different pre-treatment, Modern Food Science and Technology, 2020(7)

178. 姚娜娜；车凤斌；张婷；李永海；张谦，不同预处理对提高大果沙棘热风干燥效果的对比分析，现代食品科技，2020（7）

179. WANG G.J., SHI L., LI Z.Y., Seabuckthorn development for green poverty alleviation action in Aohan county, Inner Mongolia Forestry, 2020(7)

179. 王国疆；时柳；刘忠友，敖汉旗开展绿色扶贫行动，内蒙古林业，2020（7）

180. SUN K., DING X.Y., ZHANG H., et al, Research of NBA1/MERIT40 on adaptability differentiation of three seabuckthorn species or sub-species, with study of second-generation sequencing technology in application of hybrid assessment, Botanical Research, 2020(7)

180. 孙坤；丁雪洋；张辉；李雪丽；汪颖，NBA1/MERIT40在3种沙棘中的适应性分化研究——兼论二代测序技术在杂种鉴定中的应用，植物研究，2020（7）

181. HAO J., FANG L., Research progress of determination methods for seabuckthorn nutritional components, Modern Foods, 2020(7)

181. 郝娟；方亮，沙棘各营养成分测定方法研究进展，现代食品，2020（7）

182. LIU X.M., Anti-tumor effect of seabuckthorn pulp oil on H22 hepatocarcinoma mice, Journal of Inner Mongolia Nationality University, 2020(7)

182. 刘雪梅，沙棘果油对H22肝癌小鼠的抑瘤作用，内蒙古民族大学学报（自然科学版），2020（7）

183. QUAN S.T., Seabuckthorn cultivation technology, Modernized Agriculture, 2020(7)

184. ZHAO Y.J., HU T.L., HU J.M., et al, Facility design for seabuckthorn berry pre-breaking and finite analysis, Journal of China Agriculture Mechanization, 2020(7)

185. TAN J.X., Appraisal on health of artificial ecological seabuckthorn forest of a typical small watershed in high cold Loess Plateau of Qinghai province, Journal of Beijing Forestry University, 2020(7)

186. JIA J.B., LI G., ZHANG Y.H., et al, Research on seabuckthorn nodules property of different eco-conditions in Yulin city, Journal of Yunlin College, 2020(7)

187. MA Y.L., Technology for main pests and insects control of seabuckthorn and other two berry plants, Horticulture and Seedlings, 2020(7)

188. LI J.D., Cash fruits yielded from seabuckthorn stands in inner Tianshan mountain, Chinese Forestry Industry, 2020(7)

189. JIAO Y.H., YAN A., ZHAO Y., et al, Comparison on methods of seabuckthorn leave area index inversion and drone based seabuckthorn height image extraction, Journal of Xinjiang Agriculture University, 2020(7)

190. ZHOU W.J., Research on vegetation features of seabuckthorn and its community stability in northern Shanxi Loess Plateau, Journal of Beijing Forestry University, 2020(7)

191. DENG C.C., XU M.J., XIANG J.F., et al, Thin layer chromatography identification on seabuckthorn components of Qingzhining capsules, Food Industry, 2020(7)

192. CHEN J.M., LI C., WANG Z., Preparation and application effects of seabuckthorn compound feed

183. 圈寿庭，沙棘栽培技术，现代化农业，2020（7）

184. 赵艳杰；胡天亮；胡靖明；毕阳，沙棘预破碎装置设计与有限元分析，中国农机化学报，2020（7）

185. 谭继旭，青海省高寒黄土区典型小流域人工生态公益林健康评价，北京林业大学学报，2020（7）

186. 加建斌；李刚；张永恒；艾银婷；陈花，榆林地区不同生境下沙棘根瘤特性研究，榆林学院学报，2020（7）

187. 马艳丽，3 种小浆果树种主要病虫害防治技术，园艺与种苗，2020（7）

188. 李金铎，天山深处沙棘林结出“致富果”，中国林业产业，2020（7）

189. 焦亚辉；颜安；赵英；聂松伟；杨利，基于无人机影像的沙棘树高提取及叶面积指数反演方法比较，新疆农业大学学报，2020（7）

190. 周文洁，陕北黄土区沙棘林下植被特征及群落稳定性研究，北京林业大学学报，2020（7）

191. 邓辰辰；许明君；相继芬；王婧；丁艳，清旨宁胶囊中沙棘成分薄层色谱鉴别方法，食品工业，2020（7）

192. 陈家明；李超；王洲，赛马沙棘复合饲料

for racehorses, Chinese Feed, 2020(7)

的制备和应用效果，中国饲料，2020（7）

193. WANG B.F., Over winter management of seabuckthorn young seedlings in northern China, Modern Rural Science and Technology, 2020(7)

193. 王保富，北方沙棘小苗越冬管理，现代农村科技，2020（7）

194. FAN J.Y., QIN X.L., YU Z.J., Research on processing of seabuckthorn jam-residue compounds, Guide of Food Safety, 2020(7)

194. 范军营；秦新磊；余祖捷，复合果渣果酱加工工艺研究，食品安全导刊，2020（7）

195. LI X.G., WANG L., DING C.F. et al, Application analysis on big data management platform for Xinjiang forestry fruit, taking seabuckthorn for an example, Forestry Science and Technology, 2020(7)

195. 李曦光；王蕾；丁程峰；罗磊；高健，新疆林果大数据管理平台的应用实例分析——以沙棘为例，林业科技，2020（7）

196. WANG H. JING W., MA W.L., et al, Intensive cultivation technology of seabuckthorn in Ningxia Hui Nationality Autonomous Regions, Chinese Agricultural Technology Extension, 2020(8)

196. 王昊；靳韦；马文礼；陈永伟；卜建华，宁夏回族自治区沙棘集约化栽培技术，中国农技推广，2020（8）

197. YAN S., NAN X.D., MA S.J., et al, Research progress of isorhamnetin on effect of anti-atherosclerosis, Chinese Modern Applicated Pharmacy, 2020(8)

197. 闫姗；南晓东；马世杰；汪晨净，异鼠李素抗动脉粥样硬化作用的研究进展，中国现代应用药学，2020（8）

198. ZHAO X.Q., MA Y.J., XU Q.M., Clinical research on Mongolian medicine seabuckthorn joined with western medicines in treatment of senior cerebral infarction joining respiratory infections, Magazine of Chinese Minzu Medicines, 2020(8)

198. 赵孝强；马永菊；许庆梅，蒙药联合常规西药治疗老年脑梗死合并呼吸道感染临床研究，中国民族医药杂志，2020（8）

199. LIU Y.Y., WANG Q.Y., CAO Z.W., Processing optimization on biscuit formula of seabuckthorn whole berry power, Grain Processing, 2020(8)

199. 刘莹莹；王秋玉；曹仲文，优化沙棘全果粉饼干配方工艺，粮食加工，2020（8）

200. WU X.G., LIU L., ZHANG H.F., et al, Water holding performance of seabuckthorn fallen leave and its soil physical property in Pshayan regions, Journal of Soil and Water Conservation, 2020(8)

200. 吴晓光；刘龙；张宏飞；孙林；闫旭东，砒砂岩区主要造林树种枯落物持水性能及土壤物理性质，水土保持学报，2020（8）

201. WANG L.Z., Pre-treatment technology of bare root seabuckthorn seedlings planting, Modern Rural Science and Technology, 2020(8)

201. 王雷灼，沙棘裸根苗栽植之前处理技术，现代农村科技 2020（8）

202. JIA Y., Irrigation technology after seabuckthorn seed sowing, Modern Rural Science and Technology, 2020(8)

202. 贾宇，沙棘播种后的浇水技术，现代农村科技，2020（8）

203. YU L.J., Seabuckthorn planting technology in Bashang regions, Modern Rural Science and Technology, 2020(8)

203. 于立军，坝上地区造林技术，现代农村科技，2020（8）

204. TANG K., SHAN J.Y., WU Y.X., et al., Research on conductivity identification for seabuckthorn branch half-lethal temperature, Heilongjiang Agriculture Science, 2020(8)

204. 唐克；单金友；吴雨蹊；周双；房磊，电导法测定沙棘枝条半致死温度的研究，黑龙江农业科学，2020（8）

205. YING H.Y., ZHANG Z.W., HOU L., et al, Distribution features of scatter aged seabuckthorn and analysis of its protection strategy in Changdu city of Tibet, Journal of Zhongnan Forestry Technical University, 2020(7)

205. 尹惠妍；张志伟；侯磊；潘刚，西藏昌都市居民点散生古树分布特征及主要保护策略分析，中南林业科技大学学报，2020（8）

206. CHEN H,Y., LI Z.L., Two three cases of child massage therapy joined with seabuckthorn dry emulsion in treatment of child acute intestinal membrane lymphnodes, Chinese Medicines in Henan, 2020(8)

206. 陈虹余；李正琳，小儿推拿疗法联合沙棘干乳剂治疗儿童急性肠系膜淋巴结炎 23 例，河南中医，2020（8）

207. MIAI L.L., LIU H.L., HUI R.J., Identification on eleven kinds of ester aroma components of seabuckthorn wine by HS-SPME-GC-MS, Analytical Lab, 2020(8)

207. 苗莉莉；刘海丽；惠人杰，HS−SPME−GC−MS 法同时测定沙棘酒中 11 种酯类香气成分，分析试验室，2020（8）

208. WANG J., HOU Z., SUN Y., et al, Research and optimization on processing of blend juice of seabuckthorn and blueberry, Chinese Medicines in Heilongjiang, 2020(8)

208. 王静；侯喆；孙妍；李静，蓝莓沙棘复合果汁饮料工艺优化及研制，黑龙江中医药，2020（8）

209. JING Q.J., DONG S.S., WANG Z.W., et al, Research on processing of F&V blend juice of seabuckthorn and pumpkin, Chinese Fruits and Vegetables, 2020(8)

209. 景秋菊；东莎莎；王志伟；苏云珊，沙棘南瓜复合果蔬汁工艺研究，中国果菜，2020（8）

210. LIU J.F., YAO Y., ZHAO J., et al, Mechanism on seabuckthorn insect resistance and its research progress of molecular breeding, Guide of Chinese Agriculture Science and Technology, 2020(8)

210. 刘建凤；姚莹；赵婕；苏智；魏建荣，沙棘抗虫性机制及其分子育种研究进展，中国农业科技导报，2020（8）

211. LAI S.L., Some points on high yield cultivation of seabuckthorn in western Liaoning province, Chinese Special Forestry Products, 2020(8)

211. 赖淑丽，辽西北地区沙棘高产栽培的几个问题，中国林副特产，2020（8）

212. CHEN T.M., LI Y.Y., WEI J.R., et al, Development on micro-pills of poly-bactericide compounds with ammonium carbonate and its control effects on seabuckthorn fly larva, Forestry Science, 2020(8)

212. 程态明；李彦艳；魏建荣；苏智，多杀菌素与碳酸铵复合微球的制备及其对沙棘绕实蝇成虫的防治效果，林业科学，2020（8）

213. NIU L.S., Impacts of environment, media and hormone on effect of seabuckthorn hard cutting propagation, Agricultural Engineering Technology, 2020(8)

213. 牛梁山，不同环境、基质与激素对沙棘硬枝扦插效果的影响，农业工程技术，2020（8）

214. LI J., CHEN D.M., Impact of seabuckthorn blueberry blend liquids on recovery after gynecological surgery based on rapid recovery surgery methodology, Chinese Medicines in Heilongjiang, 2020(8)

214. 李静；陈冬梅，基于快速康复外科理念的术前口服沙棘蓝莓合剂对妇科良性手术术后恢复的影响，黑龙江中医药，2020（8）

215. HE Y.C., MA J.L., LI Y.C., et al, Evaluation on ex-situ protection of seabuckthorn resources in Youyu county, Shelterbelt Science and Technology, 2020(8)

215. 贺义才；马佳琳；李永琛；王建义；姚建忠，右玉沙棘资源异地保存评价，防护林科技，2020（8）

216. ZHOU Y.C., Hazard features of main seabuckthorn pests and insects and its control measures in Qinghai provinces, Agricultural Engineering Technology, 2020(8)

216. 周有成，青海地区沙棘常见病虫害的危害特点与防治措施，农业工程技术 2020（8）

217. LI D.M., Key points of seabuckthorn planting and cultivation technology in Huzhu county of Qinghai province, Agricultural Engineering Technology, 2020(1)

217. 李得明，青海省互助县沙棘种植培育技术要点，农业工程技术，2020（8）

218.JIN Z.X., Impact of seabuckthorn vegetation structure on soil erosion and runoff in Diediegou small watershed of Liupanshan mountain, Ningxia Autonomous Regions, Journal of Beijing Forestry University, 2020(8)

218. 靳仔鑫，宁夏六盘山叠叠沟小流域植被结构对产流产沙的影响，北京林业大学学报，2020（8）

219. ZHANG Y.S., WAN S.S., WANG J., et al, Analysis on soil moisture deficit in seabuckthorn vegetation succession in Loess Plateau, Soil and Water Conservation, 2020(8)

219. 张永旺；万珊珊；王俊；魏瑶瑶；屈亚潭，黄土高原植被演替过程中土壤水分亏缺，水土保持，2020（8）

220. ZHANG T., LV Z.R., WEI J.H., et al, Analysis on difference of α-linolenic acids content and related genes of different seabuckthorn variety seeds, Forestry Science Research, 2020(8)

220. 张彤；吕中睿；魏继华；张国昀；罗红梅，不同沙棘品种种子中 α－亚麻酸含量差异及相关基因分析，林业科学研究，2020（8）

221. CHEN S.H., Research of seabuckthorn plant for wind erosion prevention and sand stabilization in desertification regions, Seed Science and Technology, 2020(8)

221. 陈思航，沙漠地区防风固沙植物的研究，种子科技，2020（8）

222. SHENG G.X., JIA G.J., CHANG X., Discussion on bread processing of seabuckthorn grape red wine residues, Foods, 2020(8)

222. 申国霞；贾国军；常鑫，浅谈沙棘红葡萄酒酒渣面包的制作工艺，食品界，2020（8）

223. WANG X., Impact of eco-condition on degradation and renewal of man-made seabuckthorn plantation in Wuqi county, Journal of Beijing Forestry University, 2020(8)

223. 汪晓，立地条件对吴起沙棘人工林衰退及更新的影响，北京林业大学学报，2020（8）

224. JIA X.L., LIU G.M., ZHAO S.H., Research on total seabuckthorn leave flavonoids extraction by mimi-ion liquids, Food Additives, 2020(8)

224. 贾晓丽；刘改梅；赵三虎，咪唑类离子液体提取沙棘叶总黄酮的研究，中国食品添加剂，2020（8）

225. SHENG G.X., CHANG X., JIA G.J., Brewing processing of seabuckthorn ice wine compounded with grape, Guide of Food Safety, 2020(7)

225. 申国霞；常鑫；贾国军，沙棘冰白葡萄复合果酒的酿造工艺，食品安全导刊，2020（8）

226. REN W.M., AN B., Discussion and suggestion on promotion of all course machinery manufacturing for medicine tea in Shanxi province, Modern Agricultural Machinery, 2020(8)

226. 任维民；安邦，关于推进山西药茶生产全程机械化的思考和建议，当代农机，2020（8）

227. BAI X.X., AI H.J., ZHANG J., et al, Impact of different parts of seabuckthorn green branch on cutting propagation, Shaanxi Agriculture Science, 2020(8)

227. 白晓霞；艾海舰；张静；乔楠，沙棘嫩枝不同部位对扦插育苗的响应，陕西农业科学，2020（8）

228. WANG H.C., Technology of seabuckthorn seedlings propagation and cultivation, Shanxi Forestry, 2020(8)

228. 王红超，山西省沙棘繁育与栽植技术，山西林业，2020（8）

229. ZHU G.X., WU L.P., YIN S.M., Study on modernized propagation technology of seabuckthorn seedlings in Ningxia, Southern China Agriculture, 2020(8)

229. 朱新国；吴临平；殷韶梅，宁夏地区现代化沙棘育苗技术探索，南方农业，2020（8）

230. LI F.P., Research on afforestation mode of different eco-conditions in Daning county, Shanxi Forestry, 2020(8)

230. 李芳平，大宁县不同立地条件造林模式研究，山西林业，2020（8）

231. WEI J.M., LIU C.Y., FANG Y., et al, Testing on fatty acids and micro-elements of seabuckthorn pulp oil Food and Fermentation Industry, 2020(10)

231. 魏晋梅；刘彩云；方彦；坚乃丹，沙棘果油脂肪酸与微量元素测定，食品与发酵工业，2020（8）

232. ZHAN A.M., YIN Y,R., SUN K., Research progress on Frankia bacteria of Hippophae Genus, Journal of Microbiology, 2020(8)

232. 张爱梅；殷一然；孙坤，沙棘属植物弗兰克氏菌研究进展，微生物学通报，2020（8）

233. JIN Z.N., FANG S., SHA R.Y., et al, Research on functional ingredients of seabuckthorn enzyme and its in vitro anti-oxidant properties, Food Research and Development, 2020(8)

233. 金哲宁；方晟；沙如意；毛建卫，沙棘酵素功能成分及其体外抗氧化性能研究，食品研究与开发，2020（8）

234. REN L.H., LIU L., WANG H., et al, Research of tablets of reishi, seabuckthorn and saussurea on mice immunity function strengthening, Modern Chinese Medicine Research and Practice, 2020(8)

234. 任立焕；刘磊；王鹤；侯金才，灵芝沙棘雪莲片增强小鼠免疫力功能研究，现代中药研究与实践，2020（8）

235.WANG Z., GUO Y.F., YAO Y.F., et al, Research on ecological regulation effect of different width of seabuckthorn vegetative buffer belts in Pishayan regions, Jiangsu Agricultural Science, 2020(9)

235. 王卓；郭月峰；姚云峰；李旻宇；祁伟，砒砂岩区不同宽度沙棘缓冲带生态调控效应研究，江苏农业科学，2020（9）

236. MA H.M., Technology of seabuckthorn cutting propagation and impact factors, Rural Science and Technology, 2020(9)

236. 马红梅，沙棘扦插育苗技术及影响因素，乡村科技，2020（9）

237. ZHENG P., WANG B., WANG Q., Protective effects of seabuckthorn pulp oil on oxidant hurts induced by hydrogen peroxide, Guangxi Botany, 2020(9)

237. 郑鹏；王波；王前，沙棘果油对过氧化氢诱导氧化损伤的保护作用，广西植物，2020（9）

238. LIU W.H., ZHAO M.Q., HUANG C.M., Impact research on slope protection ecological benefits of seabuckthorn in western Sichuan province, Environmental Ecology, 2020(9)

238. 刘文虎；赵茂强；黄成敏，川西高原不同植物类型对边坡防护生态效益影响研究，环境生态学，2020（9）

239. LIANG G.D., WU Q.J., NA H.Y., Effect of

239. 梁国栋；吴启进；娜黑芽，沙棘糖浆对

seabuckthorn syrup on digestion promotion of food-eating model mice, Pharmacy Research, 2020(9)

食积症模型小鼠的消食化滞作用，药学研究，2020（9）

240. XU H.J., WEI P.F., GAO F., et al, Clinical effects of seabucktorn-chaishu capsules on treatment of simple obesity and impact on sex hormone TLH/FSH, Western Chinese Medicines, 2020(9)

240. 徐虎军；卫培峰；高峰；欧莉；李敏，沙棘柴术胶囊治疗单纯性肥胖的临床疗效及其对性激素 TLH/FSH 的影响，西部中医药，2020（9）

241. KONG F.W., Preliminary report on cultivation experiment of Russian variety introduction, Shanxi Forestry Science and Technology, 2020(9)

241. 孔凡武，大果沙棘品种引种栽培试验初报，山西林业科技，2020（9）

242. LI M., Seabuckthorn afforestation technology in semi-arid hilly-gully regions of Loess Plateau of Shanxi province, Shanxi Forestry Science and Technology, 2020(9)

242. 李梅，山西省半干旱黄土丘陵沟壑区造林技术，山西林业科技，2020（9）

243. CHEN Y.Q., LI J.J., Technology of seabuckthorn seedling propagation and planting in Huzhu county, Qinghai province, Agricultural Engineering Technology, 2020(1)

243. 陈永强；李积军，青海互助县沙棘苗木繁育与种植技术，农业工程技术，2020（9）

244. HAN Y.L., REN Y.Y., HE J.J., et al, Impact of root cutting height and implementing method on renewal and strengthening of seabuckthorn, Shelterbelt Science and Technology, 2020(9)

244. 韩易良；任余艳；何金军；卢立娜；韩梅，不同留茬高度及作业方式对沙棘更新复壮的影响，防护林科技，2020（9）

245. LI Q.R., XIA S., HUANG T., et al, Test on hydroxyl free radical elimination activity of seabuckthorn by establishment of enzyme labeling method, Food Science and Technology, 2020(9)

245. 李倩茹；夏珊；黄婷；吴婷；石桂莲，建立酶标仪法检测沙棘的羟自由基清除活性，食品科技，2020（9）

246. ZHANG S., Trial practice on promotion of seabuckthorn plantation for poverty alleviation with inputs of forestry asset earnings in Lanxian county, Shanxi Forestry, 2020(9)

246. 张嵩，岚县林业资产收益扶贫试点助推沙棘基地建设实践探索，山西林业，2020（9）

247. LI Q., Current statue and development suggestion of seabuckthorn wine processing, Food Engineering, 2020(9)

247. 李琼，沙棘果酒加工现状与发展对策，食品工程，2020（9）

248. LI T.T., LIU F., WANG S.Q., et al, Research of Tibetan medicine seabuckthorn on network pharmacology in prevention and treatment effect mechanism of plateau erythrocyte hypertrophy,

248. 李田田；刘芳；王淑琼；付成冰，藏药沙棘防治高原红细胞增多症作用机制的网络药理

Magazine of Chinese Plateau Medicines and Biology, 2020(9)

学研究，中国高原医学与生物学杂志，2020（9）

249. GUO C.X., Measures of seabuckthorn pests and insects control, Rural Science and Technology, 2020(9)

249. 郭晨霞，沙棘病虫害防治措施，乡村科技，2020（9）

250. LI Y., WU J., ZHANG T., Suggestion on standardization for promotion of seabuckthorn industry development of Russian variety, Xijiang Standardization, 2020(10)

250. 李瑜；吴江；张婷，标准化助推新疆大果沙棘产业发展与对策建议，新疆标准化，2020（10）

251. HU X.M., Research and practice on standardized agriculture demonstration park building for high quality local industry development with seabuckthorn varieties, Xijiang Standardization, 2020(10)

251. 胡小明，农业标准化示范区建设引领产业高质量发展的实践研究——以大果沙棘国家级农业标准化示范区为例，新疆标准化，2020（10）

252. YANG F., Analysis on negative impact and countermeasures for seabuckthorn ecological plantation development in semi-arid regions, Modern Agriculture, 2020(10)

252. 杨帆，半干旱地区生态林建设与发展的不利因子分析及克服对策，现代农业，2020（10）

253. MA Y., YAN S., NAN X.D., et al, Research progress on cardiovascular pharmacological effects of isorhamnetin , Gansu Science and Technology, 2020(10)

253. 马悦；闫姗；南晓东；马世杰；汪晨净，异鼠李素的心血管药理作用研究进展，甘肃科技，2020（10）

254. ZHANG L., WANG S.C., Research on seabuckthorn ecological protection application of Pohaizi dedicated railway, Coal Engineering, 2020(10)

254. 张龙；王守春，沙棘在泊江海子专用线生态防护中的应用研究，煤炭工程，2020（10）

255. MI Z., LIU L.Z., WU X.H., Research on processing optimization of seabuckthorn fruit powder and flavonoids extraction by Response Face method, Chinese Condiments, 2020(10)

255. 米智；刘荔贞；武晓红，响应面法优化沙棘果粉黄酮提取工艺的研究，中国调味品，2020（10）

256. YANG H.M, To develop seabuckthorn forestry and fruit industry for precise poverty alleviation, Inner Mongolia Forestry, 2020(10)

256. 杨海明，发展林果产业 实现精准扶贫，内蒙古林业，2020（10）

257. TANG W.W., ZHAO H., KONG L.Z., et al, Research on effect mechanism of network pharmacology and molecular connection

257. 汤威威；赵宏；孔令洲；高琪；焦莹莹，基于网络药理学及分子对接技术探讨沙棘治疗阿

technology in treatment of Alzheimer patients, Chinese Pharmacy, 2020(10)

尔茨海默病的作用机制，中国药房，2020（10）

258. WANG C., WANG H.Y., WANG M.Q., et al. Research on chemical components content of different origin seabuckthorn berries and its anti-oxidant activity, Magazine of Huaxi Pharmacy, 2020(10)

258. 汪成；王怀友；汪蔓青；段然；李智浩，不同产地沙棘果化学成分含量及抗氧化活性的研究，华西药学杂志，2020（10）

259. LIU X.S., LI S., XUE H.M., et al, Analysis on vegetable oil resources utilization and development of seabuckthorn and some other plants, Food and Grain Industry, 2020(10)

259. 刘晓松；李森；薛红梅；刘玉美；班金，浅析几种特种植物油料资源的开发与利用，粮食与食品工业，2020（10）

260. MA Z.C., CUI M., MA Z.F., Comparison of two methods for polyphenols extraction of seabuckthorn leave from southern Gansu province, Journal of Gansu Gaoshi, 2020(10)

260. 马正才；崔淼；马中福，甘南沙棘叶中茶多酚两种提取方法的对比，甘肃高师学报，2020（10）

261. ZHANG S., LI R.P, CHEN F., et al, Research progress on application of seabuckthorn flavones in chicken keeping, Journal of Livestock Ecology, 2020(10)

261. 张硕；李瑞萍；陈菲；刘雅丽；刘长国，植物黄酮在养鸡生产中的应用研究进展，家畜生态学报，2020（10）

262. LIANG G.D., WU Q.J., NA H.Y., Experimental research of seabuckthorn syrup on effect of cough and sputum treatment, Pharmacy Research, 2020(10)

262. 梁国栋；吴启进；娜黑芽，沙棘糖浆止咳祛痰作用的实验研究，药学研究，2020（10）

262. JIA J., Research on seabuckthorn afforestation design in Jinzhong city, Modern Rural Science and Technology, 2020(9)

263. 贾俊，，晋中市荒山造林配置模式研究，现代农村科技，2020（10）

264. LIU Y.D., Testing and appraisal on uncertainty of sodium cyclamate of seabuckthorn beverages by GC, Foods, 2020(10)

264. 刘阳东，气相色谱法测定沙棘汁饮料中甜蜜素的不确定度评定，食品界，2020（10）

265. ZHANG Z.N., LI F., GUO C.Y., et al, Response of seabuckthorn (Hippophae rhamnoides, ssp. sinensis) root cutting height on root branch germination ability, Journal of Southwest Forestry University, 2020(10)

265. 张泽宁；李芳；郭彩云；陈文红；刘春红，中国沙棘伐桩萌枝能力对平茬高度的响应，西南林业大学学报（自然科学），2020（10）

266. CHEN J.M., YU S.M., MA J., et al, Impact on seabuckthorn seed germination by temperature and

266. 程继铭；于思敏；马佳；朱雅婷；闫兴富，温度与 PEG-6000 模拟干旱对沙棘种子萌发

PEG-6000 drought simulation, Seeds, 2020(10)

267. SONG F.H., JIANG Y.M., SHENG W.J., et al, Optimization on formula of apple-seabuckthorn blend fruit puree and its quality analysis, Food and Fermentation Industry, 2020(10)

268. DENG B.H., QIN X.Z., ZHANG T., et al, Impact of daily feeds with seabuckthorn residue additives on intramuscular lipid precipitation of meat sheep and its enzyme activity, Journal of Laser Biology, 2020(10)

269. YANG J.Y., PAN M.F., YIN Z.J., et al, Production and identification of standard substances of seabuckthorn flavonoids isorhamnetin and ludin, Abstracts of 17th Annual Conference of Chinese Society for Food Science and Technology, 2020(10)

270. SUN J.Y., YANG H.Y., Enrichment of seabuckthorn pulp oil palmitoleic acid and its interference on non-alcoholic fatty liver disease, Abstracts of 17th Annual Conference of Chinese Society for Food Science and Technology, 2020(10)

271. AERZIGULI A., LIU J.F., MAO L.K, et al, Impact of dynamic high voltage micro-jet treatment on stability, micro-structure and carotenoids release rate of seabuckthorn juice, Abstracts of 17th Annual Conference of Chinese Society for Food Science and Technology, 2020(10)

272. DU Y.L., TU W.G., V. Dmitrie, Impact of Russian seabuckthorn variety introduction on vegetative community, soil and micro-eco-environment of western Sichuan province, Notification of Chinese Agronomy, 2020(11)

273. WANG M.G., Discussion on cultivation technology of Russian seabuckthorn varieties in Qinghai province, Modern Horticulture, 2020(11)

274. CHANG M., GUO Y,M., XIANG Y.F., et al, Evaluation on quality of seabuckthorn seed oil

的影响，种子，2020（10）

267. 宋菲红 ; 蒋玉梅 ; 盛文军 ; 李霁昕 ; 姚静，苹果沙棘复合果泥配方优化及品质分析，食品与发酵工业，2020（10）

268. 邓步皓 ; 秦旭泽 ; 张婷 ; 张建新 ; 赵俊星，日粮中添加沙棘果渣对肉羊肌内脂肪沉积及其关键基因和酶活力的影响，激光生物学报，2020（10）

269. 杨晶莹 ; 潘明飞 ; 尹宗佳 ; 刘凯欣 ; 王硕，沙棘中黄酮类化合物异鼠李素和芦丁标准物质的制备及鉴定，中国食品科学技术学会第十七届年会摘要集，2020（10）

270. 孙静瑶 ; 杨海燕，沙棘果油棕榈油酸的富集及其对非酒精性脂肪肝病的干预，中国食品科学技术学会第十七届年会摘要集，2020（10）

271. 阿尔孜古丽 · 阿不力孜 ; 刘锦芳 ; 毛立科 ; 袁芳 ; 高彦祥，动态高压微射流处理对沙棘汁的物稳定性、微观结构和类胡萝卜素释放率的影响，中国食品科学技术学会第十七届年会摘要集，2020（10）

272. 杜玉龙 ; 涂卫国 ; Vladimirov Dmitrii，引种俄罗斯大果沙棘构建微生境对川西北沙地植物群落与土壤的影响，中国农学通报，2020（11）
v273. 王梅贵，青海地区大果沙棘栽培技术的探讨，现代园艺，2020（11）

274. 常明 ; 郭怡雯 ; 向殷丰 ; 刘睿杰 ; 金青哲，沙棘籽油微胶囊品质评价及应用研究，中国

micro-capsule and its application research, Chinese Oils, 2020(11)

油脂，2020（11）

275. LI T.H., Pest and insect development features and its control measures for Russian seabuckthorn varieties, Modern Agricultural Science and Technology, 2020(9)

275. 李天洪，大果沙棘病虫害发生特点及防治措施，现代农业科技，2020（11）

276. SONG D., SCP analysis on seabuckthorn manufacture industry of Lvliang city, Shanxi Agricultural Economy, 2020(11)

276. 宋岱，吕梁市沙棘加工产业的 SCP 分析，山西农经，2020（11）

277. YU Z.L., ZHANG D.W., QIAN L., et al, Technology of seabuckthorn green cutting propagation and afforestation in semi-arid regions, Jiling Forestry Science and Technology, 2020(11)

277. 于忠亮；张大伟；钱利；闫亚东；罗也，沙棘嫩枝扦插育苗及半干旱地区造林技术，吉林林业科技，2020（11）

278. ZHANG Q.W., Technology of propagation and high yield cultivation for Russian seabuckthorn varieties, Liaoning Forestry Science and Technology, 2020(11)

278. 张庆武，大果沙棘繁殖及丰产栽培技术，辽宁林业科技，2020（11）

279. WEI J., Comparison of cold resistance for different seabuckthorn varieties in Qinghai province, Agricultural Engineering Technology, 2020(1)

279. 魏军，青海省不同沙棘品种抗寒性比较，农业工程技术，2020（11）

280. AN X.T., Experiment on introduction of Russian seabuckthorn varieties, Shelterbelt Science and Technology, 2020(11)

280. 安雄韬，不同品种大果沙棘引种试验，防护林科技，2020（11）

281. ZHU Z.M., TAO Y.P., Analysis on reformation and renewal technology of seabuckthorn stands, Southern China Agriculture, 2020(11)

281. 朱志民；陶艳萍，沙棘林更新改造技术分析，南方农业，2020（11）

282. TIAN J.H., ZHANG C.Y., WEI L., Optimization on extraction processing of seabuckthorn berry residue total flavonoids and its anti-oxidant activity, R&D of Natural Products, 2020(11)

282. 田建华；张春媛；魏璐，沙棘果渣总黄酮提取工艺优化及抗氧化活性研究，天然产物研究与开发，2020（11）

283. DUAN A.G., ZHANG J.G., LUO H.M., et al, Introduction of new seabuckthorn variety Zhongji No. 25, Journal of Horticulture, 2020(11)

283. 段爱国；张建国；罗红梅；何彩云，沙棘新品种‘中棘 25 号’，园艺学报，2020（11）

284. DUAN A.G., ZHANG J.G., LUO H.M., et al, Introduction of new seabuckthorn variety Zhongji No. 1, Journal of Horticulture, 2020(11)

284. 段爱国；张建国；罗红梅；何彩云，沙棘新品种‘中棘 1 号’，园艺学报，2020（11）

285. DUAN H.W., LI H., YANG Y., Extraction of seabuckthorn leave polysaccharide and its yoghurt preparation, Foods, 2020(11)

285. 段皓文；李慧；杨阳，沙棘叶中多糖的提取及沙棘叶多糖酸奶的制作，食品界，2020（11）

286. GENG R.M., HAN Y.Z., LIU Z.H., et al, Optimization on seabuckthorn SCoT-PCR reaction system and primer screening, Molecular Plant Breeding, 2020(11)

286. 耿睿曼；韩有志；刘志红；王林；解庆，沙棘 SCoT-PCR 反应体系的优化及引物筛选，分子植物育种，2020（11）

287. GUO Y.F., QI W., YAO Y.F., et al, Response of root cutting to growing features of seabuckthorn fine roots in Pishayan regions of Inner Mongolia, Guide of Chinese Agriculture Science and Technology, 2020(11)

287. 郭月峰；祁伟；姚云峰；徐雅洁；王鑫，内蒙古砒砂岩区沙棘细根生长特征对平茬的响应，中国农业科技导报，2020（11）

288. REN Y.Y., HAO Y.L., LIU Z.X., et al, Eco-site classification and plant species selection for hash condition resistance in Maowusu sandy regions, Resources and Environment in Arid Regions, 2020(11)

288. 任余艳；韩易良；刘朝霞；何金军；郑玉峰，毛乌素沙地立地类型划分与抗逆树种筛选，干旱区资源与环境，2020（11）

289. FAN M.Y., ZHANG M.M., ZHANG Q., et al, Monthly comparison analysis on features of seabuckthorn nodule bacteria community structure, Journal of Northwest Forestry College, 2020(11)

289. 樊梦颖；张明明；张情；张春丽；刘西平，不同月份沙棘根瘤细菌群落结构特征的分析对比，西北林学院学报，2020（11）

290. SONG W., CHEN P., Research on sustainable development of seabuckthorn engineer plantation of Qinghe county based on resources stress, Hubei Agricultural Science, 2020(11)

290. 宋薇；程平，资源约束条件下青河县沙棘工程林可持续发展路径研究，湖北农业科学，2020（11）

291. WEI Z.C., HUANG J., LI Y.Z., et al, Data based analysis on seabuckthorn application rule of Tibetan medicines formula, Chinese Medicines and Clinics, 2020(12)

291. 魏志成；黄静；李玉竹；杨强；李文，基于数据挖掘的含沙棘藏药组方用药规律分析，中药与临床，2020（11）

292. LIN H., LIANG G.D., Clinical research on seabuckthorn syrup joining moshabili tablets of sorghum in treatment of child functional indidestion, Journal of Inner Mongolia Medical University, 2020(11)

292. 林海；梁国栋，，沙棘糖浆联合枸橼酸莫沙必利片治疗儿童功能性消化不良的临床研究，内蒙古医科大学学报，2020（11）

293. WANG Y.N., KONG D.J., Test on licorice acid content of Mongolia medicine seabuckthorn powdesr by HPLC, Magazine of Chinese Minzu Medicines, 2020(11)

293. 王艳楠；孔德娟，高效液相色谱法测定蒙药沙棘散中甘草酸的含量，中国民族医药杂志，2020（11）

294. ZHAO N., Effects of seabuckthorn seed oil compound suppository assisted reformed human interferon α2b gel and microwave on chronic cervicitis joining HR-HPV infected patients, Henan Medical Research, 2020(11)

294. 赵娜，复方沙棘籽油栓辅助重组人干扰素 α−2b 凝胶及微波治疗慢性宫颈炎伴 HR−HPV 感染患者的效果，河南医学研究，2020（11）

295. ZHANG X.M., Resrarch on salt resistance of seabucktorn and selection of plant species for landscape greening, Journal of Shenyang Agriculture University, 2020(11)

295. 张晓敏，园林绿化植物沙棘的耐盐性研究及耐盐品种筛选，沈阳农业大学学报，2020（11）

296. XU J.G., Research of different treatments on rooting impact of seabuckthorn green cutting propagation, Modern Agriculture, 2020(12)

296. 许建国，不同处理对沙棘嫩枝扦插生根的影响研究，现代农业，2020（12）

297. WANG J.L., Impact of pretreatment methods on quality and functionality of seabuckthorn frozen whole berry podwer, Journal of Shenyang

297. 王佳乐，预处理方式对沙棘全果冻干粉的品质及功能性影响，沈阳农业大学学报，2020（12）

298. LIU Y.N., BAO X.W., WANG J., et al, Reseach on effects of seabuckthorn anti-oxidant and resistantance to sports fatigue, Food Industry Science and Technology, 2020(12)

298. 刘雅娜；包晓玮；王娟；魏晨业；白羽嘉，沙棘多糖抗运动性疲劳及抗氧化作用的研究，食品工业科技，2020（12）

299. TANG K., SHAN J.Y., WU Y.X., et al, Coparison research on berry properties of the three generation Russian seabuckthorn varieties in black soil region of northeast China, Soil and Water Conservation in China, 2020(12)

299. 唐克；单金友；吴雨蹊；王蕊；王肖洋，东北黑土区俄罗斯第三代沙棘果实性状比较研究，中国水土保持，2020（12）

300. HU J.Z., Technology innovation on introduction experiment of the three generation Russian seabuckthorn varieties and its application, Soil and Water Conservation in China, 2020(12)

300. 胡建忠，“俄罗斯第三代沙棘良种引进试验技术创新与应用”课题通过科技成果评价，中国水土保持，2020（12）

301. HAN F.Q., Chinese Minzu Medicines, 2020(12)

301. 韩风强，重组人干扰素 α−2b 凝胶联合复方沙棘籽油栓治疗慢性宫颈炎合并高危型 HPV 感染的效果，中国民康医学，2020（12）

302. LIN Z.G., Hard cutting propagation technology of seabuckthorn variety Shenqiuhong in southeast Heilongjiang province, Forestry Survey and Design, 2020(12)

302. 林治国，黑龙江省东南部沙棘深秋红的硬枝扦插育苗技术，林业勘查设计，2020（12）

303. TANG K., SHAN J.Y., WU Y.X., Selection proceedure and cultivation keypoints for new

303. 唐克；单金友；吴雨蹊；王蕊；房磊，晚

seabuckthorn variety Wanhuang with features of late ripe, high yield and good quality, Heilongjiang Agricultural Science, 2020(12)

304. ZHANG H.S., ZHA T.G., LI X., et al, Photosynthesis and philological response on drought stress of seabuckthorn and other five shrubs in northern Hebei province, Magazine of Ecology, 2020(12)

305. LI Y., LIU H.N., YIN Y.L., et al, Quercetin of seabuckthorn, Science Overlook, 2020(12)

306. LIU Y.C., ZHANG C.Y., LIU A.J., et al, Experimental research on processing optimization of seabuckthorn leave total flavonoids extracted by ultrasonic, Shanxi Forestry Science and Technology, 2020(12)

307. GE C., MAO Y., Research of different treatments on effect of seabuckthorn cutting propagation rooting, Green Science and Technology, 2020(12)

308. ABULIEZI R., Four values of seabuckthorn ecological development in cold arid regions of Xinjiang, Fruit Tree Practical Technology and Information, 2020(12)

309. TIAN T., WANG B., WANG Y,P., et al, Research on time simulation experiment of seabuckthorn berry vacuum freeze dry, Refrigeration Technology, 2020(12)

310. LUO J.J., WANG F.C., WANG K., et al, Seabuckthorn moth development features and its comprehensive control, Fruit Tree Practical Technology and Information, 2020(12)

311. HE J.Z., ZHU X.G., Key technology for seabuckthorn seedling propagation in green house, Modern Agriculture Research, 2020(12)

312. LIU J.L., SHI Z.W., LUOSANSUOLANG, et al, Seabuckthorn seedling propagation technology in

熟优质高产沙棘新品种晚黄的选育经过及栽培要点，黑龙江农业科学，2020（12）

304. 张恒硕；查同刚；李肖；彭栋，冀晓东；冀北地区 6 种灌木对干旱胁迫的光合及生理响应，生态学杂志，2020（12）

305. 李垚；刘红南；印遇龙，槲皮素，科学观察，2020（12）

306. 刘英翠；张春媛；梁爱军；史鹏；马倩，超声波提取沙棘叶总黄酮的工艺优化试验研究，山西林业科技，2020（12）

307. 葛成；毛瑛，不同方法对沙棘扦插生根影响研究，绿色科技，2020（12）

308. 阿不列孜・热合曼，新疆干旱寒冷地区生态建设中发展沙棘的四大价值，果树实用技术与信息，2020（12）

309. 田甜；王波；王云鹏；李浩；刘双双，真空冷冻干燥沙棘果冻干时间模拟与实验研究，冷藏技术，2020（12）

310. 罗静静；王付成；王康；宋乐；秦文胜，新疆塔额垦区沙棘木蠹蛾的发生特点与综合防治，果树实用技术与信息，2020（12）

311. 何金柱；朱新国，沙棘设施大棚育苗关键技术，现代农业研究，2020（12）

312. 刘俊龙；石振威；洛桑索朗；顿珠，高海

high altitude regions, Anhui Forestry Science and Technology, 2020(12)

313. HU H.D., Experiment of seabuckthorn green cutting propagation in Youyu county, Shelterbelt Science and Technology, 2020(12)

314. YANG X.D., ZHANG Y., ZHANG Z., et al, Physical-chemical properties and active substances analysis of pulp oils of Hippophae rhamnoides, ssp. sinensis and Hippophae rhamnoides, ssp. turkestanica, Chinese Oils, 2020(12)

315. LI Y., LIU Q., WANG Y., et al, Utilization of seabuckthorn leave and modern research progress, Magazine of Chinese Medicines in China, 2020(12)

316. YANG L.C., WANG Y., ZHU H.Y., et al, Identification on 26 inorganic elements of seabuckthorn berries by inductively coupled plasma MS, Food Industry, 2020(12)

317. ZHENG M.L., MAO P.C., ZHANG C.P., et al, Analysis on growth property, meat feature and quality comparison of chickeny raised freel in seabuckthorn and grass intercropping lands of Qinghai-Tibet Plateau, Grass Science, 2020(12)

318. HUANG J., DENG K., LUO D., et al, Optimization on processing index of yak yoghur with seabuckthorn and snow pear, Food and Fermentation Science and Technology, 2020(12)

319. HAN Y.F., Discussion on seabuckthorn and arborvitae (Platycladus orientalis) mixed afforestation mode in Wutaishan regions, Shanxi Forestry, 2020(12)

320. WEN Y.J., Technology of seabuckthorn stands reformation and pests and insects control in northern Shanxi province, Shanxi Forestry, 2020(12)

321. SU N., HU R.B., SU L.K., et al, Research

拔地区沙棘播种育苗技术，安徽林业科技，2020（12）

313. 胡海东，右玉沙棘嫩枝扦插试验，防护林科技 2020（12）

314. 杨旭升；张宇；张昭；袁月；代志国，中国沙棘果油和中亚沙棘果油的理化特性及活性成分分析，中国油脂，2020（12）

315. 李月；刘青；王悦；俎元虎；王志宏，沙棘叶的应用及现代研究进展，中国中药杂志，2020（12）

316. 杨玲春；王英；朱红玉；张薇；高山，电感耦合等离子体质谱法测定沙棘果中 26 种无机元素，食品工业，2020（12）

317. 郑明利；毛培春；张春平；田小霞；俞旸，青藏高原沙棘林间补播草地放养鸡的生长性能、屠体性能及肉品质比较分析，草学，2020（12）

318. 黄静；邓楷；罗丹；游敬刚；刘林林，沙棘雪梨牦牛酸奶加工工艺参数优化，食品与发酵科技，2020（12）

319. 韩跃峰，五台山林区侧柏混交造林模式探讨，山西林业，2020（12）

320. 温雅静，同朔地区沙棘林改造与病虫害防治技术，山西林业，2020（12）

321. 苏宁；胡日巴；苏龙嘎；通拉嘎；锡林其其

progress of seabuckthornas a Mongolia medicine, Magazine of Chinese Minzu Medicines, 2020(11)

322. AI G., NIE W.Y., Research on changes of seabuckthorn oil fatty acids before and after micro-capsuleization, Modern Foods, 2020(12)

323. TIAN J.H., Impact of dry temperature on contents of VC, VE and total flavonoids of seabuckthorn residues, Foods Engineering, 2020(12)

格，蒙药沙棘的研究进展，中国民族医药杂志，2020（12）

322. 爱国；聂斌英，沙棘油微胶囊化前后脂肪酸组成的变化研究，现代食品，2020（12）

323. 田建华，干燥温度对沙棘果渣中 VC、VE 和总黄酮含量的影响，食品工程，2020(12）

2. Country Report of Finland

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Seabuckthorn Research and Development in Finland in 2020

2020 年芬兰沙棘研究与发展报告

In Finland, there were active developments in research, cultivation, industrial processing and utilization of seabuckthorn. In addition, pilot effort initiated by the University of Turku has been on-going to use sea buckthorn in protection of the Baltic sea ecosystem.

在芬兰，沙棘的研究、栽培、工业加工和利用均取得了积极进展。此外，由图尔库大学发起的试点工作正在使用沙棘保护波罗的海生态系统。

一 Research 研究工作

University of Turku (UTU) has been a leading institute in the research on sea buckthorn in Finland. Four peer-reviewed papers were published in 2020 based the long-term continuous sea buckthorn research.

图尔库大学 (UTU) 一直是芬兰沙棘研究的领先机构。基于长期持续的沙棘研究，于 2020 年发表了 4 篇同行评议论文。

1. Pariyani R, Kortesniemi M, Liimatainen J, Sinkkonen J, Yang B. (2020) Untargeted metabolic fingerprinting reveals impact of growth stage and location on composition of sea buckthorn (Hippophaë rhamnoides) leaves. J. Food Sci. DOI: 10.1111/1750-3841.15025.

1. Pariyani R, Kortesniemi M, Liimatainen J, Sinkkonen J, Yang B.(2020)，非目标代谢指纹图谱揭示了生长阶段和位置对沙棘 (Hippophaë rhamnoides) 叶片组成的影响。J. 食品科学，DOI: 10.1111 / 1750 - 3841.15025。

In this paper, modern Metabolomics method is used to study the composition of leaves of sea buckthorn and the influence of developmental stage, and growth location and growth year.

本文采用现代代谢组学方法，研究了沙棘叶片的组成，以及发育阶段、生长部位和生长年份对沙棘叶片的影响。

2. Damerau A, Kakko T, Tian Y, Tuomasjukka S, Sandell M, Hopia A, Yang B (2020). Effect of plant extracts on storage stability and consumer acceptance of frozen Baltic herring (Clupea harengus membras) fish mass. Food

2. Damerau A, Kakko T, Tian Y, Tuomasjukka S, Sandell M, Hopia A, Yang B，植物提取物对冷冻波罗的海鲱鱼 (Clupea harengus membras) 鱼块贮存稳定性和消费者接受度的影响，食品化学，332,127385，https://doi.org/10.1016/

Chem. 332, 127385. https://doi.org/10.1016/j.foodchem.2020.127385

j.foodchem.2020.127385

In this paper sea buckthorn press cake from juice pressing was used a natural antioxidant to reduce the oxidation of fish mass during frozen storage. Also impact of use of the sea buckthorn presscake on sensory qualities of fish mass was also studied.

本文采用天然抗氧化剂沙棘果渣饼来降低鱼类在冷藏过程中的氧化作用。同时研究了沙棘压滤饼的使用对鱼体感官品质的影响。

3. Markkinen N, Laaksonen O, Yang B (2020) Impact of fermentation with Lactobacillus plantarum on volatile compounds of sea buckthorn (Hippophaë rhamnoides) juice. Eur. Food Res. Technol. DOI: 10.1007/s00217-020-03660-3

3. Markkinen N, Laaksonen O, Yang B(2020)，植物乳杆菌发酵对沙棘果汁挥发性物质的影响，。欧洲食品研究工艺，DOI: 10.1007 / s00217 − 020 − 03660 − 3

Malolactic fermentation was studied as a technology for modifying the composition and sensory properties of sea buckthorn juice. In this paper, the impact of Malolactic fermentation on volatile aroma compounds of sea buckthorn juice was studied.

本文研究了苹果乳酸发酵技术对沙棘汁成分和感官特性的影响，研究了苹果酸乳酸发酵对沙棘汁挥发性香气成分的影响。

4. Ma X, Yang W, Kallio H, Yang B. (2020) Health promoting properties and sensory characteristics of bioactive compounds in berries and leaves of sea buckthorn (Hippophaë rhamnoides). Critic. Rev. Food Nutri. DOI: 10.1080/10408398.2020.1869921.

4. Ma X, Yang W, Kallio H, Yang B (2020)，沙棘果实和叶片中活性物质的健康促进作用及其感官特性，食品营养评论综述，DOI: 10.1080 / 10408398.2020.1869921。

This review paper provides a critical examination of the compounds that are both active components and sensory compounds in sea buckthorn berries.

本文对沙棘果实中的活性成分和感官成分进行了详细的分析。

二 Seabuckthorn plantation in Utsjoki 乌茨约基的沙棘种植园

A plantation is being established by University of Turku in Utsjoki, Finland, which will be the most northern sea buckthorn plantation in the world. The plantation will be used for studying the impact of subartic latitude on the composition and physiology of sea buckthorn. The establishment of the plantation is supported by the Turku University Foundation.

图尔库大学正在芬兰乌茨约基建立一个沙棘种植园，这将是世界上最北部的沙棘种植园。该种植园将用于研究亚北极纬度对沙棘组成和生理的影响。该种植园的建立由图尔库大学基金会支持。

三 Sea buckthorn plantations to reduce phosphorus leakage into the Finnish Archipelago Sea via the outlet–rivers (TYRNIRAKI project) 种植沙棘以减少磷通过出口河流流入芬兰群岛海 (TYRNIRAKI 项目)

A ten-year sea buckthorn project, "TYRNIRAKI", organized by the University of Turku has started in South-West Finland to reduce leakage of phosphorus, nitrogen and other nutrients from the farmed fields into the local rivers. The Archipelago Sea suffers from severe eutrophication, and annual "cyanobacterial blooming" is not anymore only a visual problem. The increased rainfalls and shorter snow-covered winters, evidently due to the climate change, worsens the situation. The TYRNIRAKI project lead by the Food Chemistry and Food Development unit of the University of Turku aims to utilize sea buckthorn stands in nutrient sequestration in the Finnish Archipelago Sea drainage basins. The effects of the sea buckthorn stands to the nutrient cycles are monitored by studying the composition and the quality of the soil and the biomass produced, as well as the soil microbiome. In 2020, over 3,000 sea buckthorn saplings were planted in five different river bank areas in the southwestern Finland.

由图尔库大学组织的一个为期十年的沙棘项目"TYRNIRAKI"已经在芬兰西南部启动，以减少磷、氮和其他营养物质从农田流入当地河流的情况。群岛海遭受着严重的富营养化，每年"蓝藻繁盛"不再仅仅是一个视觉问题。明显由气候变化引起的降雨增加和冬季降雪缩短使情况更加恶化。由图尔库大学食品化学和食品发展单位领导的 TYRNIRAKI 项目的目的是利用沙棘在芬兰群岛海流域的营养位置。通过对沙棘林分组成、质量、生物量和微生物群的研究，监测沙棘林分对土壤养分循环的影响。2020 年，在芬兰西南部的 5 个不同河岸地区种植了 3000 多棵沙棘树苗。

四 The Finnish Archipelago Sea 芬兰群岛海

The Finnish Archipelago Sea is one of the most valuable natural resources in the Nordic countries. The sea with its 40 000 islands and islets started to be formed only 10 000 years ago after the local icecap melted towards the end of the ice age. This inland sea is shallow, the salt content is low and the connection to the Atlantic Ocean is very narrow. This is why the nutrient leakages cause an immediate problem and we have to reduce the local runoffs from our farmed fields in the rivers and

芬兰群岛海是北欧国家最宝贵的自然资源之一。这个拥有 4 万个岛屿和小岛的海洋是在 1 万年前冰河时代末期当地冰盖融化后才开始形成的。这个内海很浅，含盐量低，与大西洋的连接很狭窄。这就是为什么营养物质的排污会造成一个紧迫的问题，我们必须减少从我们的农田流入河流和海洋的径流。整个生态系统受

further into the sea. The whole ecosystem suffers and our living conditions are getting worse. We need several options to resolve the problem and the “TYRNIRAKI” project is one of them. (TYRNIRAKI; tyrniä ravinteiden kierrätykseen, sea buckthorn to harvest nutrients)

损，我们的生活条件越来越糟。我们需要几个选项来解决这个问题，“TYRNIRAKI”项目就是其中之一。(TYRNIRAKI; tyrniä ravinteiden kierrätykseen，沙棘拦截营养物质）

五 The action plan 行动计划

The first sea buckthorn (SB) seedlings were planted in May 2020 in five riverbed and seashore fields in SW-Finland. The four SB varieties were all of Finnish origin. Ten-year agreements with the farmers guarantee the proper management of the bushes that are at disposal of the University of Turku for research and follow-up. The sea buckthorn fields bind nutrients and carbon, and the soil quality is improved and the biodiversity increases. Neither fertilizers nor herbisides/pesticides are used on the test fields. The leakages in the local rivers and into the sea decrease, and P and N are removed by harvesting and by the field treatments. (Figure 1.)

This brings along additional business opportunities for the farmers and the goal is to multiply the SB plantations according to the upcoming results. (Figures 2 and 3.)

第一批沙棘 (SB) 幼苗于 2020 年 5 月在芬兰西南部的 5 个河床和海滨地区种植。四种沙棘品种都来自芬兰。与农民签订的 10 年协议保证对图尔库大学用于研究和后续工作的沙棘林进行适当管理。沙棘林地固定了养分和碳，改善了土壤质量，增加了生物多样性。试验林地既不使用化肥，也不使用除草剂 / 杀虫剂。当地河流和海洋的排污量减少，磷和氮通过收集和田间处理被清除。(见图 1)。

这为农民带来了额外的商业机会，目标是根据即将到来的研究结果扩大沙棘种植园。(见图 2 和 3。)

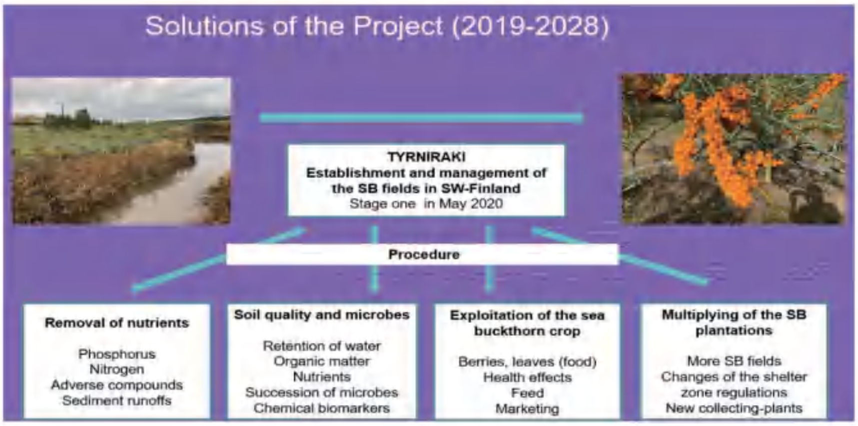

图 1

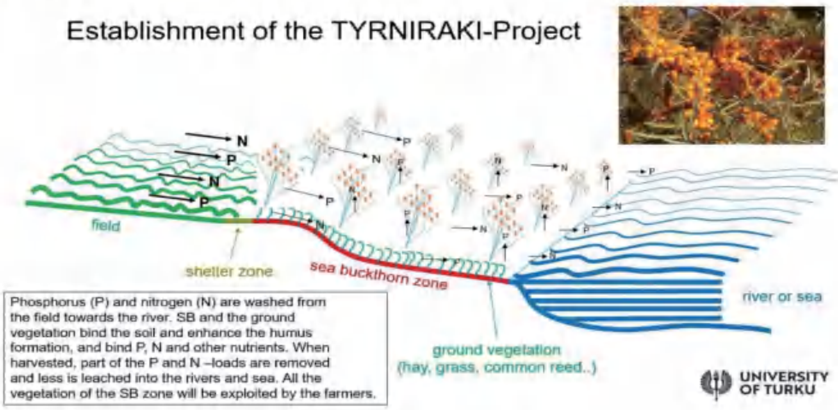

图 2

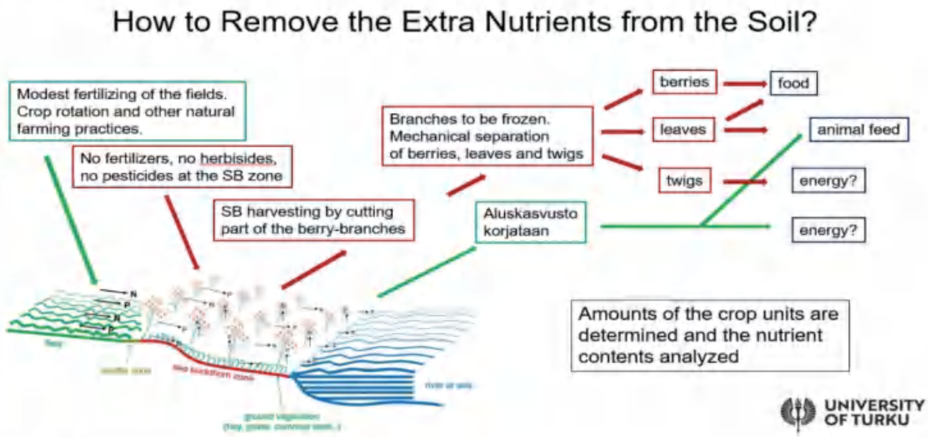

图 3

Cultivation and processing

六 The functional model from China 来自中国的有效模式

The Ministry of Water Resources (China) has over 30 years of experience on the topic. The International Seabuckthorn Association (ISA, SCISA), run by the Ministry, is an international organization, and the University of Turku has joined the activities since 1989.

中国水利部在这方面有 30 多年的经验。由水利部管理的国际沙棘协会 (理事会 ISA/ 技术委员会 SCISA) 是一个国际组织，图尔库大学自 1989 年以来加入了该活动。

Sea buckthorn seedlings have been planted in wide areas, e.g. at the Huang He River Plateau to bind soil, to produce berries and to make the reforestation possible. SB is a significant and increasing line of business, as well in China as in Finland. Among the plants tested, SB is the best one to bind soil and to reduce erosion caused by water, wind and frost. As a heritage from this long-term co-operation, the University of Turku has a wide knowledge of SB as well, with more than 100 scientific international publications.

沙棘已广泛种植在中国黄河流域的黄土高原地区，用于固土、生产果实和绿化造林。不管在中国还是在芬兰，沙棘均是一个重要的和不断增长的产业。在已经试验的植物中，沙棘是保持水土，减少因水蚀、风蚀和冻融造成水土流失的最好植物。作为这一长期合作的遗产，图尔库大学也拥有广泛的合成生物学知识，拥有 100 多份国际科学出版物。

七 A plan for the entire country 整个国家的计划

The aim is to multiply the concept but it requires changes in the domestic farming regulations, especially related to the shelter zones. Further, significant financial and political support from the government is necessary. It is a long-term project and results faster than in 10 years should not be expected. The farmers have taken a positive attitude. Multidisciplinary co-operation in natural sciences, technology, nutrition, agricultural sciences, also with entrepreneurs and industry is a must. Removal of phosphorus from the fields is more effective than from the sea.

其目的是扩大推广这一理念，但它需要改变国内的农业法规，特别是与保护区有关的法规。此外，来自政府的重大财政和政治支持是必要的。这是一个长期项目，不应指望 10 年内就能取得成果。农民们采取了积极的态度。在自然科学、技术、营养、农业科学以及企业家和工业领域的多学科合作是必须的。从林地里去除磷比从海里除磷更有效。

八 Cultivation and processing 种植和加工

In 2020 in Finland there were 172 growers and they had total area 95 ha in such stage that it was possible to get crop. The total crop was 30 tons. The hectares in cultivation were nearly the same as in 2019 but crop was very much lower (119 tons in 2019). There are no analysis which caused the drop.

2020 年，芬兰有 172 名沙棘种植者，在这个阶段有可能产果的种植园总面积为 95 公顷，总产量为 30 吨。沙棘资源总面积与 2019 年几乎相同，但果实产量要低得多 (2019 年为 119 吨)。没有分析是什么导致了下降。

In addition to growers there are many small home growers with some bushes and these are not included in statistics. In the coastal area of Finland there are wild sea buckthorn bushes and people have right to pick berries. Also this crop is not included in statistics.

除了沙棘种植园主，还有许多小型家庭种植者同时种植其他灌木没有统计在内。在芬兰的沿海地区有野生沙棘灌丛，人们有权采摘浆果。此外，这种果实也没有被统计在内。

In Finland the biggest volumes in sea buckthorn products are juices and beverages. Because cultivation is so small, berries and juice are mainly imported. About 500 tons of frozen berries were imported.

在芬兰，最大量的沙棘产品是果汁和饮料。由于种植面积很小，沙棘浆果和果汁主要靠进口，2020 年进口了大约 500 吨沙棘冻果。

Also in Finland there is special production of products based on sea buckthorn. These are sea buckthorn oils produced by supercritical fluid extraction process by Aromtech Ltd. Use of sea buckthorn material is thousands of tons calculated as weight of fresh berries. Products are food supplements and products for different symptoms.

芬兰也有以沙棘为基础的特色产品，包括 Aromtech 有限公司采用超临界流体萃取工艺生产的沙棘油。每年加工利用数千吨的沙棘鲜果原料，加工的产品是针对不同症状的食品补充剂和产品。

Aromtech Ltd has continued co-operation with vocational college on Lapland to boost sea buckthorn cultivation in Northern part of Finland . The way is to combine education and pilot cultivation. Aromtech has invested on sea buckthorn bushes. Students of the college can get experience of cultivation, crops, handle and sales of crops before starting their own cultivation on their home fields. This experimental phase will take several years and results will be informed.

Aromtech 公司继续与拉普兰的职业学院合作，促进芬兰北部沙棘的种植。途径是教育与试点种植栽培相结合。由 Aromtech 投资沙棘种植，该学院的学生在自己开始果园种植种之前，可以先学到沙棘种植、采收、处理和销售果实的经验。这个实验阶段将持续数年时间，有关结果以后将会公布。

3. Country Report of France

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Seabuckthorn Development in France

法国的沙棘研究开发利用情况

The genetic resources, in France, of spontaneous wild seabuckthorn are both: Hippophae rhamnoides subsp rhamnoides, and Hippophae rhamnoides sub fluviatilis. The areas of cultivation of seabuckthorn (SBT) in France in 2020 is shared in quite small parcels, in the region of South Alpes. There is 4 known seabuckthorn companies according to our research, offering various transformed products of SBT. All located precisely in the National parc des Ecrins, South Alpes.

In this region, there is presence of wild Hippophae rhamnoides sub fluviatilis, growing spontaneously. For these reasons, the local population has traditionally known and harvested the seabuckthorn fruit from wild. The largest parcel there is around 9 hectares, and there is manual picking, of wild fruits, by at least two of the four companies,

Spontaneous Hippophae rhamnoides grows from littoral of Belgium, from Hauts de France, to south of Region Bretagne, where the climate resembles somehow to Mediterranean climate. In these regions, only a small part of the population has acquaintance with SBT, mostly because of the resemblance with cotoneaster, which seeds are toxic.

For our part, we have selected wild sources of

首先，我希望通过这封邮件分享沙棘在法国的早期状况，那里的果实还没有被大家知晓。

法国自然生长的野生沙棘遗传资源有：海滨沙棘 Hippophae rhamnoides subsp rhamnoides 和溪生沙棘 Hippophae rhamnoides sub fluviatilis。2020 年，法国的沙棘种植分布在南阿尔卑斯地区的一小块土地上。根据我们的研究，已知有 4 家沙棘公司提供各种沙棘加工产品，都位于南阿尔卑斯国家公园。在该地区存在野生的溪生沙棘 Hippophae rhamnoides sub fluviatilis，处于自然生长。由于这些原因，当地居民传统上就知道如何收获野生沙棘果实。该地最大的一块沙棘林约 9 公顷，由至少两家公司人工采摘野果。

沙棘自然生长于比利时沿海地区，从法国的 Hauts 到我们所在的布列塔尼地区南部，那里的气候与地中海气候有某种相似之处。在这些地区，只有一小部分人认识沙棘，主要是因为与种子有毒的车轮棠 cotoneaster 相似。

Hippohae rhamnoides on the coats of France, where it grows, from Hauts de France to south of region Bretagne, in sand dunes, sea sides and some undisturbed coast. My main and actual focus is searching and selecting these oceanic climate sources, and have found quite a few populations of seabuckthorn, with very variable characteristics. The selected wild sources, that showed interesting features, of disease resistance, strong growth and facility of multiplication, are as of now breeding from natural pollination, of various male cultivars, such as the male Pollimix No 2 from Germany.

Some wild sources show to have a much more upright shape, and some grow quasi-rampant on the sea side (joining photos). The main characteristics that can be observed, is that these local wild sources show differences in dormancy with all of the collected cultivars, from Latvian, German and Russian sources. In fact, the loss of leaves occurs very late in season, almost as the bud break, the plant loses the few remaining leaves of the passing year.

All the spontaneous local populations of SBT we have found was on coasts of our region, South Bretagne. Here on the coast, the climate is oceanic, and the SBT populations are confronted more to salt, hard winds, and acidic soils, then to frost that is almost never occurs. Amplitude in temperature is very low, with an average temperature of 12°c. The somehow abundant precipitations, principally in winter and spring, oscillate between 600/900 mm/year. Here it is often a septentrional limit to Mediterranean climate type of plants.

The Baie de Somme Sand dunes have also some spontaneous populations. It is where I am planning a trip this year, to collect more of wild Hippophae rhamnoides sources. Also the botanical conservatory in Brest, located in our region is organizing searches for wild local plants, with their help we may find some more SBT sources there.

就我们而言，我们选择了生长在法国海岸上的沙棘野生资源，主要分布在法国的 Hauts 到布列塔尼地区南部，在沙丘、海边和一些未被破坏的海岸。我们的主要和实际的重点是寻找和选择这些海洋气候种源，并已经发现了一些具有非常不同特征的沙棘种群。所选择的野生种源表现出了有趣的特征，如抗病、生长健壮和繁殖能力强，这些是目前通过自然授粉培育的各种雄性品种的优良性状，如德国的雄株授粉品种 Pollimix No 2。

一些野生资源显示出一个更直立的形状，一些在海边疯狂生长（参见照片）。可以观察到，这些地方野生源表现出与来源于拉脱维亚、德国和俄罗斯沙棘品种不同的休眠特征。事实上，叶子的脱落发生在这个季节很晚的时候，几乎就在花芽开裂的同时，植株上过去一年里仅有的几片叶子才掉落。

我们发现的所有自然生长的本地沙棘种群都在我们的地区南布列塔尼海岸。这里的海岸属海洋性气候，沙棘种群面临更多的盐、强风和酸性土壤，和很少发生的霜冻。温度的变幅很低，平均温度为 12° c，相对丰富的降水，主要在冬季和春季，在 600 / 900 毫米 / 年之间变化。这里通常是地中海气候类型植物的北部界限。

索姆湾沙丘也有一些自然分布的沙棘种群，这是我今年计划去的地方，去收集更多的野生沙棘资源。位于我们地区布雷斯特的植物保护组织正在组织寻找当地野生植物，有了他们的帮

Here is all the information of the four companies what we have found:

1.Altiflore, created 1989, based in Chabottes, South Alpes. specialized in Fruit transformation and ice creams. In 2017, the total income of the company was of 2,180,100 €. The company has a total human resources of 10 to 19 employees. President of the company is Mr Jean Francois Gonfard.

2. Gayral Reynier, created in November 2002, based in Saint-Jean Saint-Nicolas, South Alpes. specialized in preparation of fruit juices and vegetables juices, Human resources includes 6 to 9 employees. In 2018, it realizes a total income of 745 000 €, an increase of 6,00 % between 2017 and 2018. President of the company is Mr. Bernard Reynier. Harvest of the SBT said to be manual, and using wild Hippophae rhamnoides ssp. Fluviatilis.

3.L'argousier Sauvage (Franck Amar), based in Neffes, South Alpes. was created in 07/04 2006, specialized in food retail on local markets, specialized in wild picking of seabuckthorn. self-employed/ individual entrepreneur. President of the company is Mr. Franck Amar.

4.Natvit, created in 2007, Based in Claret, South Alpes, specialized in preparation of juices. In 2012, the total income was of 121,400 €. President is Mr. Cabanes.

Exact production and berry crop was not given to us, production of SBT there is quite confidential. The use of the seabuckthorn product is mainly focused on health benefits, and it is sold for such purpose.

There has not institutes in France, working

助，我们可能会在那里找到更多的沙棘源。

以下是 4 个沙棘企业的相关信息：

1. Altiflore 公司创立于 1989 年，总部设在南阿尔卑斯夏博特 Chabottes，专门从事水果加工和冰淇淋生产。2017 年公司总收入为 2,180,100 欧元，公司现有人力资源 10 – 19 名员工。该公司的总裁是让 · 弗朗索瓦 · 冈法尔 Jean Francois Gonfard 先生。

2. Gayral Reynier 公司创建于 2002 年 11 月，总部位于南阿尔卑斯的 Saint-Jean – Saint-Nicolas，专门制作果汁和蔬菜汁，人力资源包括 6 到 9 名员工，2018 年实现总收入 740,5000 欧元，2017 年至 2018 年增长了 600%。该公司的总裁是 Bernard Reynier 先生。据介绍是手工采收沙棘，原料是野生的溪生沙棘 Hippophae rhamnoides ssp. Fluviatilis。

3. L 'argousier Sauvage) 公司位于南阿尔卑斯 Neffes，公司成立于 2006 年 7 月 4 日，专门从事当地市场的食品零售，从事野生沙棘采摘是个体经营者和个体企业家企业。公司的总裁是弗兰克 · 阿马尔 Franck Amar 先生。

4. Natvit 公司创建于 2007 年，总部位于南阿尔卑斯波尔多 Claret。专门制作果汁，2012 年的总收入为 121,400 欧元。总裁是卡班斯 Cabanes 先生。

这是我们在研究中发现的所有公司。公司并没有给我们确切的沙棘产品产量和沙棘浆果的产量，这些数据对企业是高度机密。沙棘产品的应

specifically on the subject of seabuckthorn. For SBT is, at the moment, not yet a popular fruit here, and the promoting of seabuckthorn is still to do. I truly believe that in the coming years, the interest for the SBT fruit will rise significantly.

My wish and ambition is to enlarge the interest for the fruit in France. And to work specifically on the subject of seabuckthorn, we are currently gathering with passions, who are willing to share and work together, in running tests and experiments with seabuckthorn, from very various backgrounds such as farmers, veterinarians, horticulturist, physicians, agronomic engineers.

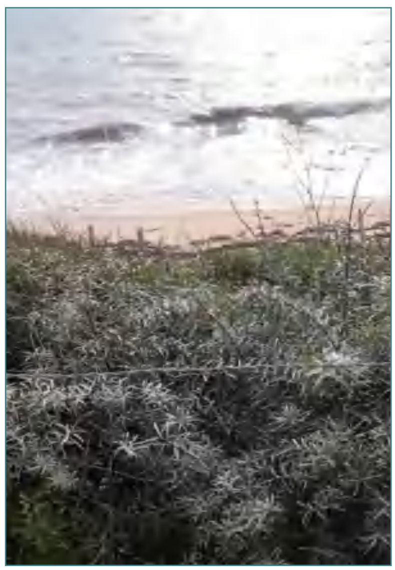
And I will remain very dedicated in the promoting of seabuckthorn in France.

用主要是为了健康效益，并以此为目进行销售。

在法国，还没有专门研究沙棘的机构。因为沙棘目前在这里还不是一种知名度很高水果，推广沙棘的工作还在继续。我真的相信，在未来的几年里，对沙棘果实的兴趣将显著上升。

我的愿望和抱负是扩大法国人对沙棘的兴趣。为了专门研究沙棘，我们现在正以热情聚集一群愿意分享和一起工作的人，开展沙棘测试和实验。他们有着各种各样的背景，比如农民、兽医、园艺师、内科医生、农艺工程师。

我将带着我所有的敬意继续致力于在法国推广沙棘。



4. Country Report of India

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India Report on Seabuckthorn for the Year of 2020

2020 年印度沙棘发展报告

一 The national–wide seabuckthorn resources of plantations and berry yield. 全国沙棘资源种植园和果实产量

1.1. The total area of seabuckthorn resources up to the year of 2020 including the natural stands and the artificial plantations, and the increased areas in the year of 2020.

Total seabuckthorn natural resources in Indian Himalayas is about 16,300 ha, most of which is lying in Ladakh Himalayas (11,000 ha), Uttarakhand (3000 ha), Himachal Pradesh (1500 ha), Sikkim (500 ha) and Arunachal Pradesh (300 ha). It also comprises a total plantation of seabuckthorn of about 1200 ha, mostly carried out on river side for the environmental conservation in Himachal Pradesh and Uttarakhand.

全国沙棘资源种植园和果实产量

印度喜马拉雅地区的沙棘自然资源总量约为 16300 公顷，其中大部分位于喜马拉雅山拉达克 11000 公顷、北阿坎德邦 3000 公顷、喜马偕尔邦 1500 公顷、锡金 500 公顷和“阿鲁纳恰尔邦”(中国藏南地区)300 公顷。它还包括一个约 1200 公顷的沙棘人工种植林，主要在喜马偕尔邦和北阿坎德邦的河边进行环境保护。

1.2. The harvested and the estimated amounts of total production of seabuckthorn berries in your country in the year of 2020.

While natural seabuckthorn fruit yield is about 20,000 tons, however, collection of fruit during 2020 has been mere 600 tons only in Ladakh due to Corona outbreak.

2020 年全国沙棘果实的收获情况和估计总产量

天然沙棘产量约为 2 万吨。但由于新冠肺炎疫情的影响，拉达克地区 2020 年的沙棘采收量仅为 600 吨。

1.3. A brief introduction of main seabuckthorn plantations in your country.

Plantation of Hippopahe rhamnoides spp. turkestanica has been carried out by Department of Forest in district of Lahaul-Spiti in 800 ha marginal lands in Himachal Pradesh and of H. salicifolia by farmers in 120 ha (Fig. 1). About 300 ha marginal

全国主要的沙棘种植园

在过去，在喜马偕尔邦的 Lahal－Spiti 地区，林业部门在 800 公顷的荒地上种植了中亚沙棘，农民在 120 公顷的荒地上种植了柳叶沙棘 (图 1)。在北阿坎德邦，大约 300 公顷的边际

land has been brought under seabuckthorn in Uttarakhand. However, no additional plantation has been carried out during 2020 due outbreak of Corona.

土地上种植了沙棘。但是，由于新型冠状病毒感染症 (Covid－19 病毒) 的扩散，在 2020 年没有新的沙棘种植。

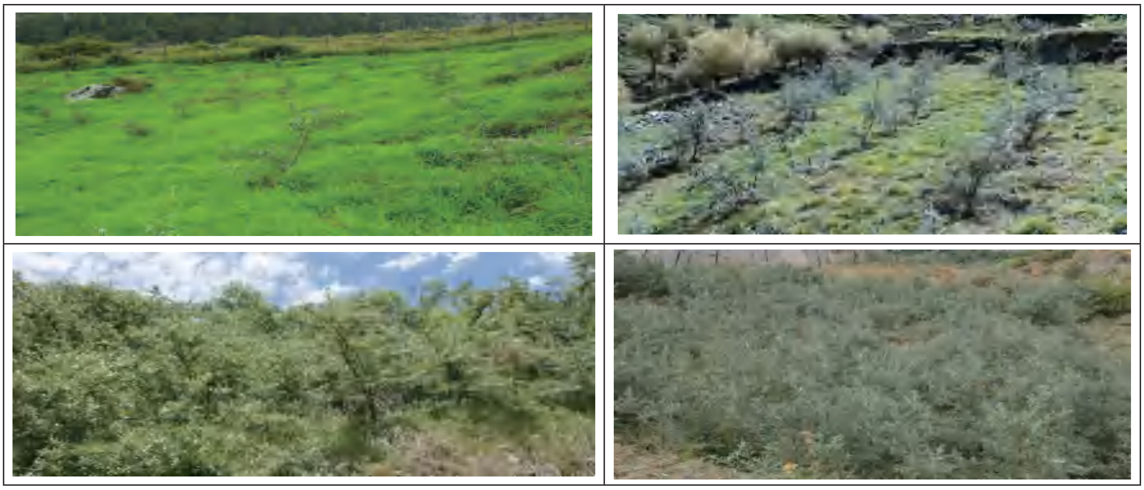


Fig. 1. Plantation of seabuckthorn on marginal lands, Lahaul, HP
图 1 在 HP 的 Lahaul 地区边远荒地上种植沙棘

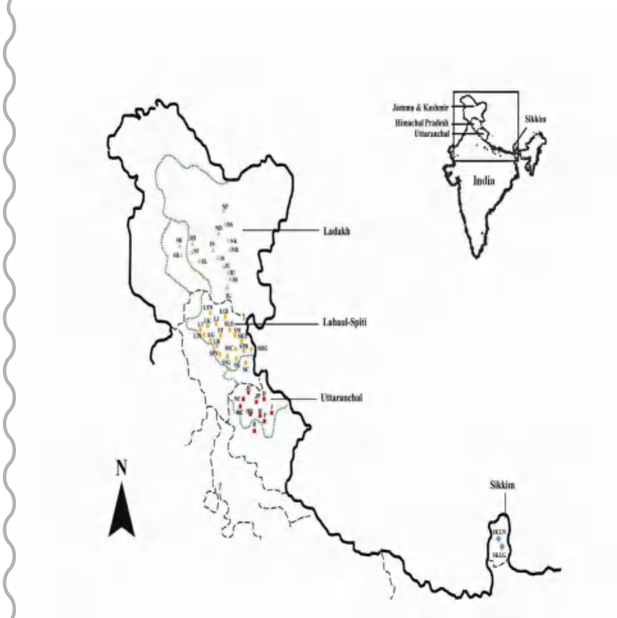
二 The national–wide seabuckthorn resources of plantations and berry yield. 全国的沙棘遗传资源

2.1 Introduction of natural seabuckthorn species and subspecies of Hippophae.

沙棘天然种及沙棘亚种情况介绍。

Indian Himalayas is believed to possess about 16,000 ha seabuckthorn resources (Fig 2). Three species namely H.rhamnoides ssp. turkestanica, H.salicifolia and H.tibetana have been found in Indian Himalayas. Seabuckthorn has been found in cold desert and other regions of Himalayas, comprising the states of Himachal Pradesh, Ladakh (H.rhamnoides ssp. turkestanica and H.tibetana), Uttranchal (H.salicifolia and H.tibetana), Sikkim (H.salicifolia) and Arunachal Pradesh (H.salicifolia) (Fig. 2).

印度的喜马拉雅山脉拥有大约 16000 公顷的沙棘资源 (图 2)。中亚沙棘亚种 turkestanica，和柳叶沙棘 H.salicifolia、西藏沙棘 H.tibetana 已经在印度的喜马拉雅山脉被发现。沙棘分布在寒冷的沙漠和喜马拉雅山的其他地区，包括喜马偕尔邦、拉达克 (有中亚沙棘和西藏沙棘)、Uttranchal (有柳叶沙棘和西藏沙棘)、锡金 Arunachal Pradesh (均有柳叶沙棘)(图 2)。



Seabuckthorn distribution in Himalayas
(Source: Raina et al., 2011)
喜马拉雅地区的沙棘分布

H. rhamnoides ssp. turkestanica shrub 中亚沙棘灌丛

H. salicifolia tree 柳叶沙棘树

H. tibetana undershrub 西藏沙棘灌丛

Fig. 2. Distribution of different species of seabuckthorn in Indian Himalayas.
图 2 印度喜马拉雅山脉不同种沙棘的分布。

2.2. Names of newly bred seabuckthorn varieties and introduced cultivars from other countries and their performance including morphological/biochemical features.

CSK Himachal Pradesh Agricultural University, Palampur has introduced 14 exotic seabuckthorn varieties including 10 varieties in 2014 (Table 1) and 4 varieties in 2010 at the University Seabuckthorn Research Farm (HAREC) at Kukumseri (2750 m asl) in district Lahaul-Spiti under the scheme of DST, Ministry of Science & Technology, Government of India, as given below (2014-18).

沙棘新品种和国外引种品种的名称及其性状

位于帕兰普尔的 CSK 喜马偕尔农业大学 (CSK Himachal Pradesh Agricultural University, Palampur) 在印度政府科技部 DST 的项目计划下，引进了 14 个国外沙棘品种，包括 2014 年的 10 个品种（表 1）和 2010 年的 4 个品种，引种在 Lahal – Spiti 的 Kukumserin（海拔 2750 米）设立的大学沙棘研究农场 (HAREC)。如下所示 (2014–18)。

Table 1. Characteristics of Russian and Latvian seabuckthorn varieties in the country of origin
表 1 引自俄罗斯和拉脱维亚沙棘品种在原产国的性状

№ 序号	Code No. 品种代码	Fruit yield, kg/plant 单株果实产量，千克	Mass of 100 fruits, g 百果重，克	Oil content, % 油含量 ,%	Vitamin "C", mg/100g 含维生素 C, 毫克 / 100 克	Carotenoids, mg/% 含类胡萝卜素，毫克 / %	Plant height, (m) 株高（米）	Time of repining 成熟时间	Productivity, t/ha 总产量，吨 / 公顷
1	NX-1	10-11	64	5.0	110	9.9	2.5	25-30.08	11.4
2	NX-2	10-11	65	4.1	86	27.0	2.5-2.7	10-15.08	11.0
3	NX-3	7-8	75	4.5	95	28.8	2.5-2.8	01-05.09	9.0
4	NX-4	10-12	80	2.5	97	9.8	2.5	25-30.08	12.0
5	NX-5	10-12	70	5.7	162	24.0	2.5	10-15.09	12.0
6	NX-6	-	60-110	4,7	81	10,7	3-4	15.08.-15.09	-
7	NX-7	-	60	4,9	74,5	8,7	3	-	-
8	NX-8	10	55-60	-	-	-		-	-
9	NX-10	5.3	-	1,5-3,0	37,5-103,		3.1	-	-
10	NX-11	6.3	-	-	-	-	3.2	-	-
11	Dribu	5.0	32	2.5	930	-	5	15.09-15.10	10

The two varieties HI-2 and NX-12 have completed field trial at Kukumseri farm and now will be tested in farmer fields in Lahaul valley. HI-2 and NX-12 exotics along with "Drilbu" cultivar have also been introduced by Palampur university in Uttarakhand.

HI-2 和 NX-12 两个品种已经在 Kukumseri 农场完成了田间试验，现在将在 Lahaul 山谷的农民田间进行试验。HI-2 和 NX-12 以及"Drilbu"品种也被引种到位于北阿坎德邦的帕拉普尔大学。

三 Enterprises and processing 企业和加工

3.1. In the year of 2020, the number of seabuckthorn enterprises, the gross output and the total value of seabuckthorn products in your country.

2020 年，全国沙棘企业数量、沙棘产品总产值、沙棘产品总产值

In seabuckthorn growing areas of Himalayas, about 12-15 semi-processing units are working, processing about 800-1000 tons of seabuckthorn fruits, producing seabuckthorn fruit pulp, seeds and fruit waste. However, it has gone down to 600 tons in 2020 due to corona outbreak. There are at present 5-6 private sector companies, which have established seabuckthorn processing industries producing a range of 120 seabuckthorn health products.

在喜马拉雅地区的沙棘种植区，大约有 12−15 个半加工单位正在生产，加工沙棘果实约 800−1000 吨，产生沙棘果肉、种子和果渣。但由于新冠肺炎疫情，到 2020 年已降至 600 吨。目前有 5−6 家私营企业建立了沙棘加工业，生产 120 种沙棘保健品。

3.2. A brief introduction of main enterprises and their main products of seabuckthorn.

沙棘主要生产企业及其主要产品简介

3.2.1. BIOSASH Business Pvt. Ltd., Faridabad

With a turnover of more than INR Rs 600 Million, Biosash is a Leading manufacturer of a wide variety of Seabuckthorn products across different verticals such as Health care and supplements, Food, Tea, Personal care and Cosmetics, Soaps, natural Seabuckthorn Soaps, Seabuckthorn CO2 extracted Oils , Hygiene and sanitisers, Beauty Care, Men's grooming products and Home care products and Detergents (Fig. 3).

We also manufacture vegetarian Seabuckthorn Seed oil capsules and Seabuckthorn Berry fruit oil capsules both for national and international markets

3.2.1 位于法里达巴德的 BIOSASH 商业有限公司

营业额超过 6 亿印度卢比的 Biosash 公司是一家主要生产沙棘系列产品龙头的企业，产品包括：医疗保健和补充剂、食品、茶叶、个人护理、化妆品、肥皂、天然沙棘肥皂、二氧化碳提取沙棘油、卫生洗液、美容护理、男士美容产品和家庭护理产品和洗涤剂 (图 3)。

该公司有以 CO2 萃取沙棘有机油为原料，生

which are made out of CO2 extracted organic oil of seabuckthorn.

Our Health care Products such as Organic Juices based on Seabuckthorn targeting various lifestyle conditions of diabetes, heart, digestion, ulcers, liver and immunity.

Our innovative food products include first in the world Seabuckthorn Tomato Chilli Sauce and Seabuckthorn Corn Flakes as well. The total an amount of Rs.60 crores of annual business is done by the company.

产国内外市场的素食沙棘籽油胶囊和沙棘浆果油胶囊。

公司生产针对糖尿病，以及心脏、消化、溃疡、肝脏和免疫等多种生活问题的健康保健产品，如沙棘有机果汁。

公司的创新食品产品包括世界上第一款沙棘番茄辣椒酱和沙棘玉米片。公司每年的总营业额为 6 亿卢比。

Fig. 3. Biosash seabuckthorn food, skin care and health products
图 3 Biosash 公司的沙棘食品、护肤保健品

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公司联系人：Arjun, Khnna 先生、总经理
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3.2.2. Chandigarh Agritech Pvt. Lt.

Nutraceutex is USDA Organics & USFDA registered Dietary Supplement, Nutritional Lipids & essential oils extraction by C02 super critical extraction method-state of the art, true nature greener tech Industry located at Himalayan foothills of India (Fig. 3).

- Nutraceutex is R & D Company carrying 4 IPR patents, registered TM and range of 12 New & Novel Seabuckthorn products of international standards. Mr. Pawan Kamra (MD) is Indian National Award Winner of Seabuckthorn Processing; 2019.
- In the year 2020-2021 Nutraceutex exported 2000 Kg Seabuckthorn Fruit & Seed oil abroad.
- Seabuckthorn oil export is continued along with Bulk domestic sale to Patanjali (India).

3.2.2. 昌迪加尔 · 农业科技有限公司

Nutraceutex 是美国农业部有机食品和美国食品和药物管理局注册的膳食补充剂，营养脂类和 C02 超临界提取的精油，是位于印度喜马拉雅山麓的最先进的、真正的自然绿色技术产业(图3)。

- Nutraceutex 是一家拥有 4 项知识产权专利、注册商标和 12 种符合国际标准的沙棘新产品的研发型公司。Pawan Kamra 帕万 · 卡姆拉先生（医学博士）是 2019 年印度沙棘加工国家奖得主。
- 2020−2021 年，Nutraceutex 向国外出口了 2000 公斤沙棘籽油。
- 沙棘油持续出口，并向帕坦贾利（印度）批量销售。

Seabuckthorn Co2 Supercritical extraction Unit, Baddi, HP 沙棘二氧化碳超临界萃取装置

Seabuckthorn oil and neutraceuticals
沙棘油和营养剂

Fig. 3. Seabuckthorn Oil processing units and its products at Baddi, HP.
图 3 所示。沙棘油加工车间及其产品在 Baddi, HP.

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3.2.3. Zeon Life Sciences Ltd., Paonta Sahib, Himachal Pradesh

3.2.3. 位于喜马偕尔邦 Paonta Sahib 的 Zeon 生命科学有限公司

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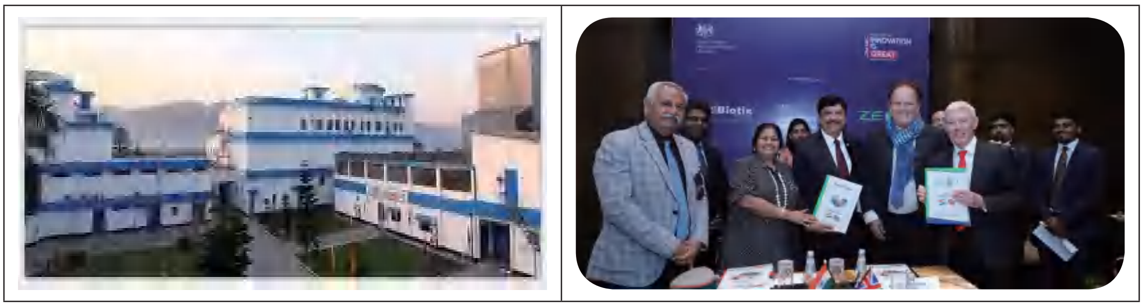


Fig. 4. The Complex of Zeon industries, at Paonta Sahib, HP
图 4 位于喜马偕尔邦 Paonta Sahib 的 Zeon 工业综合体

Zeon Life Sciences Limited, a Presidential Award winning company of India for quality products, incorporated in 1987, having registered Office and manufacturing plant at Paonta Sahib, Himachal Pradesh (Fig. 4). The product portfolio includes Dietary Supplements, Functional Foods, Medical Nutrition, Herbal Products, Ayurvedic Proprietary

Zeon 生命科学有限公司是一家获得印度优质产品总统奖的公司，成立于 1987 年，在喜马偕尔邦 (Himachal Pradesh) 的 Paonta Sahib 注册了办公室和生产工厂 (图 4)。产品组合包括膳食补充剂、功能食品、医疗营养、草药产品、阿育吠陀专用药物等等。Zeon 的

Medicines and many more. Zeon's facility is spread over an area of 300000 SqFt for manufacturing of Dry Blend Powder, Wet Blend Powder, Liquids, Tablets, Two Piece Capsules, Diskettes and Granulated Powders for a variety of more than 200 products with annual capacity of 820 Lacs tins, 1250 Lacs bottles and 3600 Lacs tablets/capsules. The facility is USFDA, NSF-GMP and FSSC 22000 certified and WHO-GMP compliant. Zeon is having licenses under FSSAI, AYUSH and Pharma. Zeon's Research & Development facility is approved by Dept. of Scientific and Industrial Research (DSIR), Ministry of Science and Technology, Govt. of India, whereas quality lab is NABL accredited.

Products Developed by Zeon Life Sciences Ltd.:

1. Seabuckthorn Capsules 500 mg (Enriched with Omega 3, 6 and 9).
2. Seabuckthorn Capsules 500 mg (Enriched with Omega 7).
3. Seabuckthorn Sachet (Enriched with Omega 3, 6, 7, 9 and Vitamin D2).
4. Veg Capsules of Oil Blend (Enriched with Omega 3, 5, 6, 7 and 9).
5. Combination of Herbal Ingredients along with Seabuckthorn Ext (Recommended for Neuro-degenerative Disorder).
6. SCP as adjuvant therapy for prophylaxis of COVID-19.

Key Findings on Innovative Research:

1. Combination of Herbal Ingredients along with Seabuckthorn Ext: The product is a poly herbal formulation of Seabuckthorn Fruit Extract along with other potential herbs. There are several bio molecules present in the formulation which have therapeutic potential in the prevention and management of neurodegenerative disorders.

生产车间总面积 300000 平方英尺，生产干混粉、湿混合粉、液体、片剂、两片装胶囊和粒状粉末等种类超过 200 种产品，年产量 820 Lacs 罐、1250 Lacs 瓶 和 3600 Lacs 片 / 胶囊。工厂通过了 USFDA、NSF-GMP 和 FSSC 22000 认证，并符合 WHO-GMP 要求。Zeon 拥有 FSSAI、AYUSH 和 Pharma 的许可证。Zeon 的研发设施是由印度科技部科学和工业研究部 (DSIR) 批准的，而质量实验室是 NABL 认可的。

Zeon 生命科学有限公司开发的产品有：

1. 500 毫克装沙棘胶囊（富含欧米茄 3,6 和 9）。
2. 500 毫克装沙棘胶囊（富含欧米茄 7）。
3. 沙棘包（富含欧米茄 3、6、7、9 和维生素 D2）。
4. 植物油混合胶囊（富含欧米茄 3，5，6，7 和 9）。
5. 草药成分与沙棘提取物的组合（推荐用于神经退化性疾病）。
6. SCP 作为预防 COVID-19 的辅助治疗。

创新研究的主要成果：

1. 沙棘提取物与草药成分复合制剂

该产品是由沙棘果提取物和其他潜在草药组成的聚草药配方，其中有几种生物分子，在预防和管理神经退化性疾病方面具有治疗潜力。该配方已经在美国和欧盟专利注册，并临床验证

Our formulation has already been patented in US and EU and proven clinically (Preclinical, Phase1, Phase 2 and Phase 3 clinical studies) for its benefits (Fig. 5). The dossier of same has also been submitted in DCGI and under discussion with authority for approval to launch in India Market and subsequently for global market.

2. SCP Blend as adjuvant therapy for prophylaxis of COVID-19: Patent pending.

The World Health Organization declared COVID-19 a pandemic on March 2020. This led to an unprecedented closure of public life in the UK, United States, Europe, India and many other countries all over the world to prevent widespread infection. And subsequent 2 and 3 wave of Covid is also a concern for medical fraternity and all Govt. authorities. There is no specific treatment recommended for COVID-19, and lack of vaccine availability.

We proposed to develop a synergistic combination of Natural Ingredients (SCP Formulation: Extract 1 + Seabuckthorn + Extract 2) using novel delivery technologies to increase its efficacy in synergy, until more is known about the COVID-19.

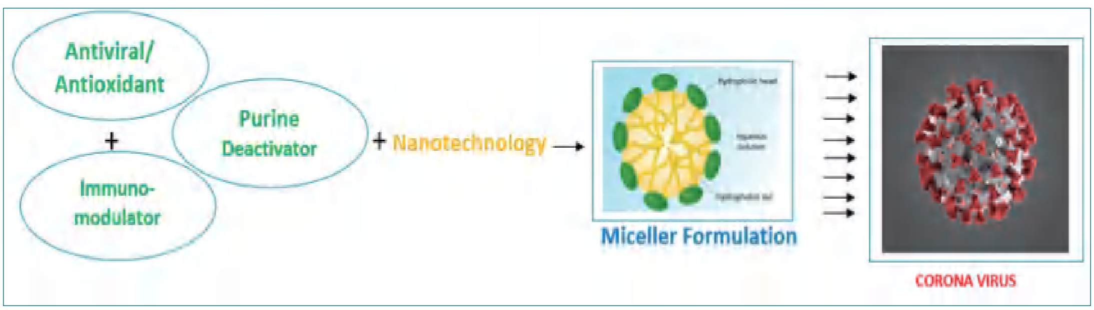
其疗效(预临床及1、2、3期临床研究)(图5)。同时有关材料也提交印度DCGI权威部门审议批准后在印度推向市场,随后推向全球市场。

2. SCP复合剂作为预防COVID-19的辅助治疗:专利申请中

2020年3月，世界卫生组织宣布2019冠状病毒病为大流行。这导致英国、美国、欧洲、印度和世界各地许多其他国家史无前例地关闭公共生活，以防止广泛感染。随后的第二波和第三波新冠疫情也让医学界和所有政府当局感到担忧。针对COVID-19没有推荐的特定治疗方法，而且缺乏疫苗。

我们提出开发一种天然成分的协同组合(SCP配方:提取物1+沙棘提取物2)，在人类更多地了解COVID-19之前，使用创新性的技术，以增加其协同效力。

Mechanism of Action: Three ways approach



Preclinical Studies: 临床前期研究

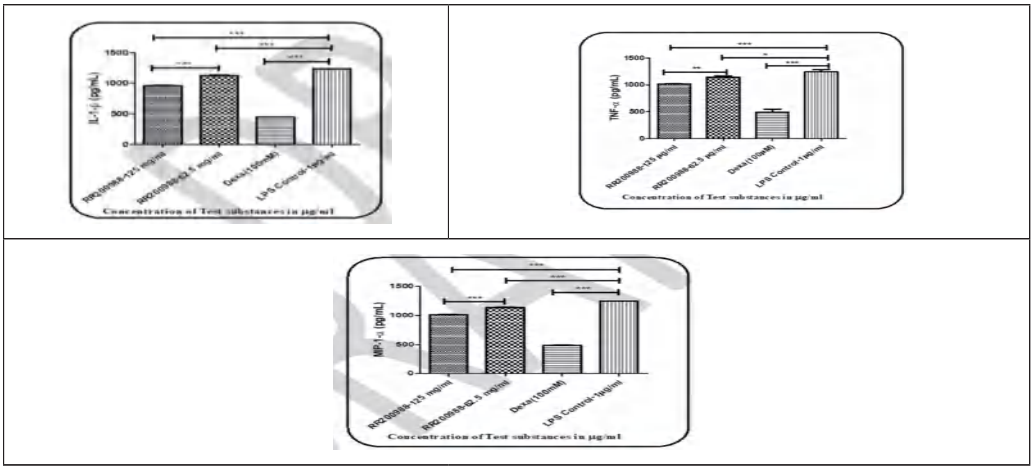


Fig. 5. Preclinical studies on seabuckthorn. 图 5 沙棘的临床前期研究

Figure: Modulatory effect of the SCP-Blend on LPS induced Pro-inflammatory cytokines, IL-1-β, TNF-α and MIP-1-α generation in Dendritic cells. Levels of TNF-α, IL-1-β and MIP-1-α were measured by ELISA. Values were expressed in mean±S.D. of the mean. Statistical analysis was performed using one way ANOVA followed by Newman-Keuls post hoc test, * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Conclusive Remarks: Preliminary observation are very promising and we are planning for determination of antiviral activity in BSL-4 Laboratory and subsequently for Phase 1, 2 and 3 clinical trial in Covid patient as adjuvant therapy for prophylaxis.

Future Plans: Zeon Lifesciences is rigorously working to develop many formulations using seabuckthorn as individual ingredient as well as synergistic combination. And exploring the opportunity in the area of Nutri-cosmetics and various therapeutic segment (Viz: Diabetes, Eye Health, Gastric Ulcer, Women Hygiene etc.) with clinical measure.

3.2.4. Patanjali Yogpeeth, Haridwar, Uttarkhand

Patanjali Yogpeeth is a medical and research institute, is a Rs. 4000 crores group in Ayurveda.

结论：初步观察非常有前景，我们计划在 BSL-4 实验室进行抗病毒活性测定，随后在 Covid 患者进行 1、2、3 期临床试验作为预防辅助治疗。

未来计划：Zeon 生命科学公司将沙棘作为单独成分以及协同组合，正积极研发多种沙棘配方。并在营养化妆品和各种治疗领域（糖尿病、眼科保健、胃溃疡、妇女卫生等）的临床测定领域探索商机。

3.2.4. 位于北坎德邦 Haridwar 的 Patanjali Yogpeeth 公司

Patanjali Yogpeeth是一家医学和研究机构，是阿育吠陀一个总资产 400 亿卢比的集团公

Patanjali Yogpeeth is making Haridwar a popular spot to visit for Ayurvedic treatment and medication (Fig. 6). 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.

司。Patanjali Yogpeeth 公司正在使北坎德邦 Haridwa 成为接受阿育吠陀治疗和药物治疗的热门景点 (图 6)。Patanjali Yogpeeth 公司于 2006 年由瑜伽大师拉姆德夫创立，并以瑜伽发明者摩哈里希 · 帕坦伽利命名。Patanjali Yogpeeth 公司由 Patanjali Yog Peeth 信托集团运营。Patanjali Yogpeeth 开展多项活动和服务，比如在医院、实验室、研究中心和其他设施中通过阿育吠陀治疗病人。公司推出了一系列沙棘产品。

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电子邮件 : info@prft.co.in

Patanjali Haridwar, Uttarkhand
Patanjali Yogpeeth 公司

Patanjali Seabuckthorn capsules are made with seabuckthorn fruit oil, having a high content of omega 3, 6 & 9 fatty acids, hence supports a healthy cardiovascular system.
帕坦加利沙棘胶囊由沙棘果油制成，含有高含量的欧米茄 3、6 和 9 脂肪酸，因此支持健康的心血管系统。

Fig. 6. Patanjali Yogpeeth, Haridwar, Uttarkhand.
图 6. 位于北坎德邦 Haridwar 的 Patanjali Yogpeeth 公司

3.2.5. Synthite Pvt. Ltd., Kochi, Kerala

Synthite Pvt. Ltd is a Kochi based company (Fig. 7), which is extracting seabuckthorn oil and extract with CO2 supercritical method. It exports oil to Indian and other countries. It has also launched seabuckthorn skin care products and soap.

3.2.5. 位于 Kerala Kochi 的 Synthite 有限公司

Synthite 有限公司是位于 Kochi 的一家公司（图 7)，该公司采用 CO2 超临界法提取沙棘油，向印度和其他国家。该公司还推出了沙棘护肤产品和肥皂。

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Fig. 7. Synthite Pvt. Ltd., Kochi, Kerala and Co2 extracted seabuckthorn oil.
图 7：Synthite 公司及用二氧化碳提取的沙棘油。

3.2.6. Himalaya Naturals

3.2.6. 喜马拉雅天然产品公司

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At Himalaya Naturals, we promote herbal & natural remedies, wild or organic or otherwise having potential health benefits chiefly seabuckthorn, rhododendron arboreum, perilla frutescens, prickly pear, roselle etc (Fig. 8).

All products are handcrafted and are uniquely designed by the promoter himself whether these are herbal beverages, herbal teas, premixes or jams, sauces and spreads. the main focus remains on the products having useful antioxidants, anti-inflammatory, anti-diabetic and anti-cancer properties.
Though the Products are useful and helpful in supporting a healthful lifestyle, yet these are not medicines, drugs or remedies in medical terms.

喜马拉雅天然产品公司致力于推广草药和天然药物、野生或有机或其他有潜在健康价值的药物，主要是沙棘、杜鹃花、紫苏、仙人球、玫瑰等（图 8）。

无论是草本饮料、草本茶、预混料还是果酱、酱料和酱料，所有产品都是由推广方自己手工制作和独特设计的。主要关注的是具有有用的抗氧化剂、抗炎、抗糖尿病和抗癌特性的产品。虽然这些产品在支持健康的生活方式方面是有用的和有帮助的，但不是在医学意义上药物、药物或补救措施。

Fig. 8. Seabuckthorn food juice products. 图 8：沙棘食品果汁产品

四 Scientific research 科学研究

4.1 The status of seabuckthorn scientific institutions in your country in terms of the number of institutes and their scientists, and their research field.

沙棘科研机构的数量、科研人员、研究领域等情况

N/A

无资料

4.2. A brief introduction of main research institutes/universities and enterprisers, the main research programs and updated achievements on seabuckthorn.

国内主要研究机构 / 院校和企业概况，主要研究项目和最新成果。

4.2.1. CSK Himachal Pradesh Agricultural University, Palampur

Dr. Virendra Singh and Dr. Ramesh Rana*
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4.2.1. CSK 喜马偕尔邦农业大学，帕拉姆普尔

联系人：Virendra Singh 博士和 Ramesh Rana 博士 *
CSK 喜马偕尔邦农业大学，生物与环境科学系
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Studies on evaluation of performance of Russian seabuckthorn in Indian Himalayas

a.Studies on young plants (Fig. 8.)

1.11 Russian seabuckthorn varieties (NX 1-14) showed no occurrence of thorns during 4 years of growth. No attack of fruit fly was found.

印度喜马拉雅地区引种俄罗斯沙棘的性状评价研究

a. 沙棘幼苗研究 (图 8)

1. 引进的 11 个俄罗斯沙棘品种 (NX 1–14) 在 4 年的生长过程中无刺发生。未发现果蝇侵害。

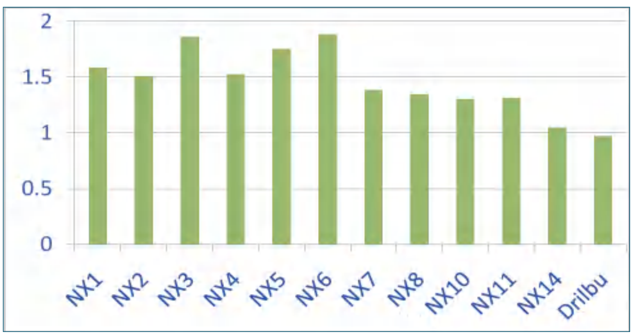

Fig. 8. Variation in plant height of seabuckthorn exotics (NX 1–14) and local selection (Drilbu) at HAREC, Kukumseri, Lahaul, HP.
图 8: 在 HAREC 外来沙棘品种 (NX 1–14) 与当地选育品种的株高差异 (Drilbu)

2.There is significant (P<0.05) variations in the morphological features of Russian seabuckthorn varieties during early stage of growth. We will reach to any conclusion only after studies on fruiting is complete.

2. 俄罗斯沙棘品种生长前期形态特征存在显著差异 (P<0.05)。我们只有等待沙棘结实时才能得出其他进一步的结论。

b. Study on old plants

The 2 Russian seabuckthorn varieties (NX-12 and HI-2) along with 4 local seabuckthorn selections were characterized under germplasm bank conditions at Kukumseri, Lahaul (Fig. 9). The morphological characterization of 6 seabuckthorn genotypes were characterized for diameter at base, plant height, canopy spread and fruit yield.

b. 对老沙棘的研究

研究 2 个俄罗斯沙棘品种 (NX−12 和 HI−2) 和在 Lahaul 沙棘基因库条件下选出的 4 个当地沙棘选种的表型特征 (图 9)，包括地径、株高、冠幅和果实产量等形态表征。

Fig. 9. Germplasm Bank at CSK HPKV’s Seabuckthorn Research Farm, Kukumseri, Lahaul, HP
图 9：位于 CSK HPKV 沙棘研究农场的种质资源库

Fig. 10. Exotic seabuckthorn HI–2 and NX–12
图 10：外来沙棘品种 HI–2 和 NX–12

The Fruit yield varied in the range of 3.2-5.5 kgs per plant. The maximum value of fruit yield of 5.5 kgs was estimated in exotics HI-2, followed by NX-12 (5.4 kgs), Drilbu (5.1 kg), which were significantly higher ($P<0.05$) than Darcha (3.8 kgs), Gemur (3.6 kgs) and a minimum of 3.2 kgs in Jispa (Fig. 5). It is clear that exotic HI-2 and NX-12 and local selection Drilbu have shown better fruit yield than the local selections of seabuckthorn (Fig. 10, 11).

果实产量在每株 3.2–5.5 公斤之间。最高的是 HI–2 品种 5.5kg, 其次是 NX–12 (5.4 kgs)、Drilbu (5.1 kg)，显著高于 Darcha (3.8 kgs)。Gemur(3.6 公斤)，Jispa 最低 3.2 公斤 (图 5)。很明显，外来的 HI–2 和 NX–12 和当地选择的 Drilbu 显示出比当地选择的沙棘更高的果实产量 (图 10,11)。

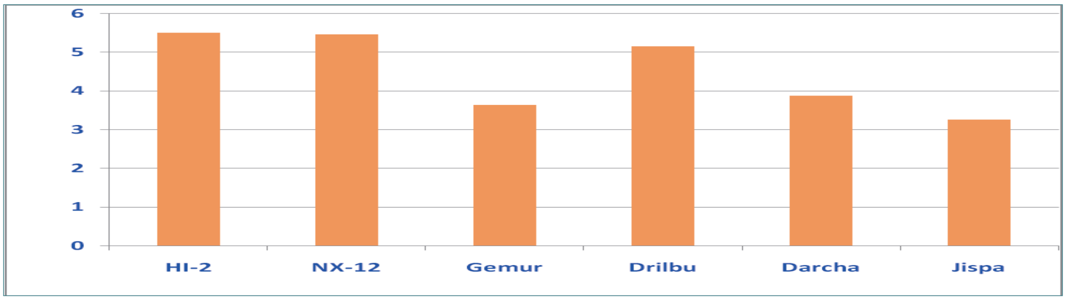

Fig. 11. Variation in fruit yield (kg/plant) in various seabuckthorn genotypes.
图 11：不同沙棘基因型果实产量 (公斤 / 株) 变化

3.The “Drilbu” a local selection of H. salicifolia, having vigorous growth, mild thorny and high fruit yields is suitable for cultivation on the community land.

3. “Drilbu”是从当地柳叶沙棘种选育的品种，生长旺盛、多刺温和、果实产量高，适宜在社区土地上种植。

4.The local selections of H. rhamnoides spp. turkestanica, low yielding, are suitable only for afforestation on marginal lands for the environmental conservation.

4. 从当地中亚沙棘中选种的品种产量较低，仅适合于环境保护的荒地造林。

5.The results of the study were affected by untimely heavy snowfall during September 2018 (effect of climate change).

5. 研究结果受到 2018 年 9 月过早强降雪 (气候变化影响) 的影响。

c. Mass propagation of Russian seabuckthorn

About 41,000 saplings of 2 Russian (HI-2 and NX-12) and 2 local selections (Drilbu and Shiva) have been propagated during July-September 2020

c. 大批量繁殖俄罗斯沙棘苗木

2020 年 7 月至 9 月期间，在温室大棚控制条件下，共繁殖了 2 个俄罗斯品种 (HI–2 和 NX–12) 和 2 个当地选育品种 (Drilbu 和

under polyhouse controlled conditions (Fig. 12). In case they achive growth of 40-50 cm height, the saplings will be trasplanted in open nursery for better growth and provided to farmers in September 2021 for integration in alley cropping systems.

Shiva) 的约 4.1 万株苗木 (图 12)。当苗高达到 40−50 厘米时，这些树苗将被转移到露天苗圃，以更好地生长，并将于 2021 年 9 月提供给农民，以整合到集中种植体系中。

Fig. 12. Mass propgation of Russian and local selections of seabuckthorn under polyhouse controlled conditions.
图 12：在温室控制条件下大量繁殖俄罗斯和地方选育的沙棘品种苗。

4.2.2. Deference Research Laboratory (DRDO), Tejpur, Assam Dr. S.K. Dwivedi, Director

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In the current study, a survey was done during the year 2018-19 in various regions of Arunachal Pradesh, H. salicifolia have been found growing naturally in Tawang district of the state. It is reported along the basins of river Naymjang Chu in Zemithang valley (270 43’ 36’’ and 910 43’ 25’’) having an altitude of 8000 ft above msl which is located approximately 100 Km away from Tawang city. It is spread in an area of about 5 km along the river banks. The natural plantation is in the plains, sandy soils of river basins only and absent

4.2.2. 位于阿萨姆邦印度国防研究组织 (DRDO)

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在目前的研究中，2018−19 年在“阿鲁纳恰尔邦”(中国藏南地区)不同地区进行了一项调查，发现柳叶沙棘在该邦的达旺区自然生长。据报道，它沿着 Zemithang 山谷 (270 43 ' 36 " 和 910 43 ' 25 ") 的 Naymjang Chu 河的盆地分布，海拔 8000 英尺，离达旺市大约 100 公里。它沿河岸分布在约 5 公里的区域内。天然沙棘

on the hills & rocky soils. A preliminary study has been carried out for its distribution, botany and ethnobotanical uses.

The detailed study is divided into following objectives:

1. Botany and diversity studies of the species.

- The natural growing population of H. salicifolia in Zemithang is dioecious, perennial bushes to tree, about 2 m to 6 m high and 50 cm in diameter with a thick grey crown.
- The leaves are small, usually 6 to 8 cm long and 1 to 1.5 cm broad, alternate, linear, lanceolate in shape and covered with silvery stellate scales on the backside.
- Fruit ripening sets in during the month of October. The fruits (5 to 7 mm in size) are generally round, pale green in colour and turn golden-yellowish brown on ripening. The fruits have a soft skin covering the juicy pulp and a small, hard, oval seed.

2. Biochemistry and nutraceutical studies.

- Physico- biochemical studies of the fruit and fruit pulp and mineral analysis of the leaf such as Iron, calcium, potassium, magnesium, manganese has been already carried out.
- Nutritional studies & physico-biochemical analysison pulp of different trees samples/ accessions has been carried out.
- Storage and stability study of pulp at different temperature i.e. 40°C, room temperature, 4, -20°C (Parameters: Vitamin C, Titrable acidity, pH, total sugar & reducing sugar and microbiology) for six months has been carried out.
- In vitro antioxidant activity studies of different leaf extracts has been carried out.

林主要分布在平原、河流流域的沙质土壤中，在丘陵、石质土壤中没有分布。还对其资源分布、植物学和民族植物学利用进行了初步研究。

详细的研究分为以下几个目标：

植物学和物种多样性研究。

- Zemithang 地区柳叶沙棘自然生长种群是雌雄异株，落叶，多年生灌木乔木，高约 2－6 米，直径 50 厘米，冠厚灰色。
- 叶小，通常长 6－8 厘米，宽 1－1.5 厘米，互生，线形、披针形，背面被银色星状鳞片。
- 10 月份果实成熟。果实（5 至 7 毫米大小）一般为圆形，颜色淡绿色，成熟时呈金黄色。果实有一个柔软的皮覆盖着多汁的果肉和一个小、硬、椭圆形的种子。

生物化学和营养研究。

- 已经对果实和果肉进行了生理生化研究，并对叶子进行了铁、钙、钾、镁、锰等矿物质分析。
- 对不同树木样本 / 材料进行了营养研究和生理生化分析。
- 对果肉在不同温度（40° C、室温、4℃、−20℃）下（参数：维生素 C、可滴定酸度、pH、总糖和还原糖、微生物学）进行了 6 个月的储存和稳定性研究。
- 对不同叶提取物进行体外抗氧化活性研究。

3. Propagation and cultivation studies.

- Study on propagation of H. salicifolia through cuttings has been carried out.
- Plant material used for the propagation are soft/semi-wood and hard wood cuttings.
- Study shows that IBA (200 ppm) and IBA (100 ppm) is best for the male and female cutting respectively. Semi-hardwood cutting is better and male cuttings are more responsive than female cuttings.

4. Biotechnological aspects such as early detection of male and female plants.

- Being a dioecious perennial, male and female H. salicifolia trees cannot be differentiated until the berries appear, which generally requires 5–7 years after seed germination.
- Thus, to develop an easy-to-use molecular method to differentiate staminate from pistillate genotypes at the seedling stage was undertaken.
- This study was aimed at identifying gender-specific polymorphic genetic regions in ISSR fingerprints generated from male and female genomic DNA.

5. Nanoparticle studies: Green synthesis of nanoparticles using extracts of H. salicifolia leaves, pomace, roots and fabrication of nanocomposite for water treatment.

- Objective of the study was preparation and development of green nanocomposite using extracts of H. salicifolia leaves, roots and pomace for water treatment.
- Silver nanoparticle has been prepared using aqueous extracts of pomace and leaves of H. salicifolia.
- Antibacterial activity of nanoparticles was analyzed and found to show antibacterial activity against E coli.
- Characterization of nanoparticles is in progress.

6. Processing and shelf life studies along with value addition to the different product is going on.

繁殖与栽培研究。

- 对柳叶沙棘扦插繁殖进行了研究。
- 用于繁殖的植物材料是嫩枝 / 半木质化和硬枝插枝。
- 研究表明，IBA (200ppm) 和 IBA (100ppm) 分别对雄株和雌株的扦插效果最好。半木质化的扦插效果更好，雄株扦插比雌株扦插反应更灵敏。

生物技术方面，如早期鉴别沙棘雄株和雌株。

- 柳叶沙棘是雌雄异株的多年生植物，只有在浆果结实时才能区分雌雄，通常需要种子萌发后 5–7 年的时间。
- 需要建立一种易于使用的分子方法在苗期区分雄蕊和雌蕊基因型。
- 本研究旨在识别由雄性和雌性基因组 DNA 生成的 ISSR 指纹中具有性别特异性的多态遗传区域。

纳米颗粒研究：利用柳叶沙棘叶子、渣、根的提取物绿色合成纳米颗粒，并制备用于水处理的纳米复合材料。

- 本研究目的是制备和开发绿色纳米复合材料的水处理柳叶沙棘叶、根和渣。
- 利用柳叶沙棘渣和叶的水提取物制备了纳米银。
- 分析纳米颗粒的抗菌活性，发现其对大肠杆菌具有抗菌活性。
- 纳米粒子的特性正在研究中。

7. Extraction of oil from seeds and whole dried fruits and its characterization is going on.

4.2.3. University of Delhi, Delhi

Dr. Renu Deswal
Molecular Physiology and Proteomics Laboratory, Department of Botany, University of Delhi, Delhi-110007
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Comparative proteome mapping of seabuckthorn and exploring its biotechnological potential.

Seabuckthorn, grows in adverse environmental conditions and is tolerant to drought, salinity, UV radiation and freezing stress. However, molecular, genomic and proteomic aspects of its stress tolerance mechanism are hardly explored. Our laboratory is exploring the stress tolerance mechanism of different seabuckthorn populations using proteomics as a tool. Procedures have been established to grow seedlings under laboratory conditions. Cold/freeze modulated proteome in seabuckthorn seedlings had been deciphered and the proteo-map is available on world 2D-PAGE repository. Till date, proteomic analysis to understand its stress tolerance is limited to laboratory grown seedlings. Recently, our group is trying to understand the stress tolerance mechanism in naturally growing seabuckthorn. Comparative gel-based and gel-free shotgun proteomics approach was used to dissect stress acclimation strategies in high-altitude adapted Trans-Himalayan (H. rhamnoides, H. tibetana) and lower altitude adapted Sikkim (H. salicifolia) populations. A custom-built database was designed for better annotation of proteins. Label free proteomics (nanoLCMS/MS analysis) allowed identification of 4870 berry proteins clustered into 1035 protein

不同产品加工和保质期以及其他附加值产品研究都在进行中。

从种子和整个干果中提取油及其特性研究正在进行中。

4.2.3. 德里大学，德里

Renu Deswal 博士
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沙棘蛋白质图谱及其生物技术潜力研究。

沙棘生长在不利的环境条件下，耐旱、耐盐、耐紫外线辐射和耐冰冻胁迫。然而，从分子、基因组和蛋白质组学等方面对其抗胁迫机制的研究却很少。本实验室正在利用蛋白质组学研究不同沙棘种群的耐受性机制。已经建立了在实验室条件下培育幼苗的程序。沙棘幼苗的低温 / 冷冻调节蛋白质组已被破译，蛋白质图谱可在世界 2D–PAGE 知识库中获得。到目前为止，对其耐受性的蛋白质组学分析仅限于实验室培养的幼苗。最近，我们小组正在试图了解自然生长的沙棘的耐受性机制。采用比较凝胶和无凝胶的散弹蛋白质组学方法，分析了高海拔适应沙棘跨喜马拉雅种群 (H. rhamnoides, H. tibetana) 和低海拔适应沙棘锡金种群 (H. salicifolia) 的应激适应策略。为了更好地注

groups showing differential abundance of metabolic, regulatory and stress responsive proteins in Trans-Himalayan and Sikkim populations indicating their probable involvement in differential stress acclimation. Gene ontology and KEGG analysis showed their association with metabolic processes, stress signalling, defense responses, redox regulation, protein remodelling, and secondary metabolite or fatty acid biosynthesis. Validation of downstream metabolic signatures supported the proteomic plasticity and justified the better stress acclimation in Trans Himalayan populations. Being a cold tolerant shrub, seabuckthorn was also explored for the presence of antifreeze proteins (AFPs), which allows overwintering plants in tolerating freezing conditions. AFPs are ice binding proteins which prevent addition of water molecules to growing crystal planes by adsorbing in a non-colligative manner. Our group is focusing on purifying these potential AFP candidates from H .rhamnoides collected from Lahaul and Spiti valley, Himachal Pradesh. Techniques are optimised to detect antifreeze activity using Phase contrast microscopy coupled with Nanoliter osmometer and to purify the AFPs using Ice Affinity Chromatography. Higher antifreeze activity showed correlation with higher abundance of AFPs in Trans-Himalayan populations which further strengthened their role in stress acclimation. Dual functioning chitinase-AFPs were purified from seedlings, leaf and berry. Further, ice-affinity chromatography have been used for purification of AFPs from seedling (Polygalacturonase inhibitor protein, 41 kDa) leaf (low temperature induced protein, 41 kDa) and berry (disease resistance protein, 41 kDa). Seabuckthorn AFPs showed enhanced survival of cryopreserved rat RBCs by providing protection against their hemolysis. Efforts to scale up purification by overexpression are currently underway. Additionally, gold nanoparticles synthesized from H. rhamnoides allowed efficient remediation of dye contaminated waste water into

释蛋白质，设计了一个定制的数据库。无标记蛋白质组学 (nanoLCMS/MS 分析) 鉴定了 4870 个浆果蛋白，聚为 1035 个蛋白组，在跨喜马拉雅种群和锡金种群中显示了代谢、调节和胁迫响应蛋白的差异丰度，这表明它们可能参与了不同的胁迫适应。基因本体论和 KEGG 分析表明，它们与代谢过程、应激信号、防御反应、氧化还原调节、蛋白质重塑和次级代谢产物或脂肪酸生物合成有关。下游代谢信号的验证支持了蛋白质组学的可塑性，并证明跨喜马拉雅群体更好的应激适应是合理的。沙棘作为一种耐寒灌木，其抗冻蛋白 (AFPs) 的存在使其能够在耐寒条件下越冬。AFPs 是一种冰结合蛋白，通过非依数吸附的方式防止水分子加入到生长的晶面。我们的团队正专注于从喜马偕尔邦 Lahaul and Spiti 山谷收集的鼠李沙棘中纯化这些潜在的候选 AFP。采用相衬显微镜结合纳升渗透计检测抗冻活性，并使用冰亲和层析纯化抗冻蛋白的技术得到优化。在跨喜马拉雅沙棘种群中，较高的抗冻活性与较高的 AFPs 丰度相关，进一步加强了 AFPs 在胁迫适应中的作用。从幼苗、叶片和浆果中分离得到具有双重功能的 chitinase-AFPs。此外，冰亲和层析法还用于从鼠李沙棘幼苗 (聚半乳糖醛酸酶抑制剂蛋白，41 kDa)、叶片 (低温诱导蛋白，41 kDa) 和鲜果 (抗病蛋白，41 kDa) 中纯化 AFPs。沙棘 AFPs 通过对大鼠红细胞溶血提供保护，提高了红细胞的存活。

non-toxic byproducts with industrial applications. This is the first Proteomics analysis dissecting altitudinal gradient associated stress acclimation strategies in naturally growing seabuckthorn along with their multiple biotechnological applications. Fig. 13. is showing the biomedicinal and nanobiotechnological applications of a Himalayan shrub, *Hippophae rhamnoides.*

目前正在努力通过过度表达来扩大净化规模。此外，从沙棘中合成的金纳米颗粒可以有效地将染料污染废水修复为工业应用的无毒副产品。这是第一个蛋白质组学分析，剖析自然生长沙棘中海拔梯度相关的胁迫适应策略及其多种生物技术应用。图 13 展示了喜马拉雅沙棘灌木在生物医学和纳米生物技术中的应用。

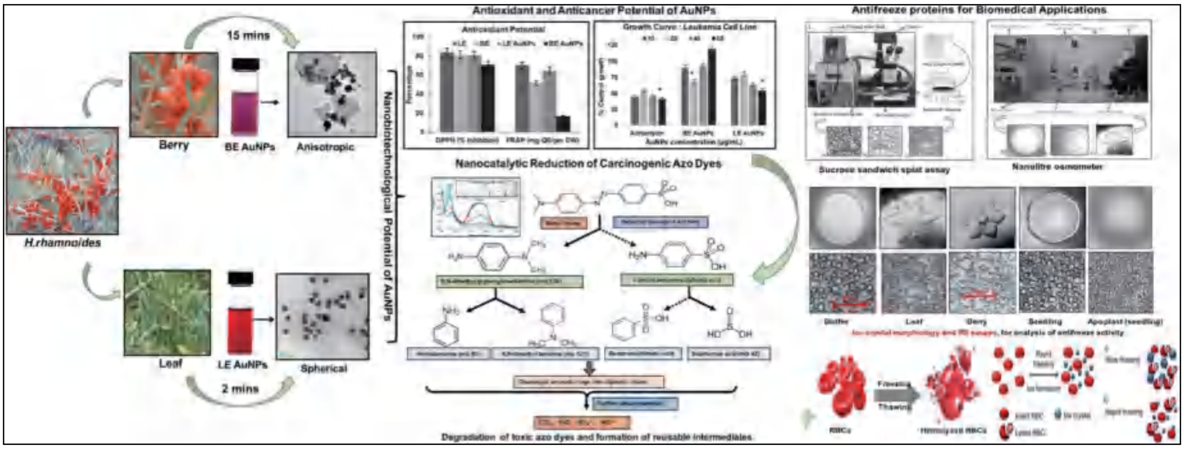


Fig. 13. showing the biomedic in a land nanobiotechnological applications of a Himalayan shrub, Hippophae rhamnoides.
图 13：展示了喜马拉雅沙棘灌木在纳米生物技术和生物医学中的应用。

4.2.4. Department of Biotechnology, TERI School of Advanced Studies, New Delhi

Shashi Bhushan Tripathi

Genetic diversity among accessions of Indian seabuckthorn as revealed by genotyping-by-sequencing (GBS-SNP) markers

Collaborating Institutes: IHBT, Palampur, CSK HPAU, Palampur, GBPUAT, Ranichauri, Gauhati University, TERI-NE, Guwahati, University of Jammu, SCST, Sikkim, TERI, New Delhi, and CPB,

4.2.4. 新德里 TERI 高等研究学院生物技术系

联系人 Shashi Bhushan Tripathi

研究专题：基于 GBS-SNP 标记的印度沙棘种质遗传多样性研究

合作机构：IHBT, Palampur, CSK HPAU, Palampur, GBPUAT, Ranichauri, Gauhati 大学，TERI- ne, Guwahati，查谟大学，

HAU, Hisar.

About 1000 accessions of seabuckthorn were collected from 5 Himalayan states, namely, Ladakh, previous under J&K, Uttarakhand, Sikkim and Arunachal Pradesh. The rooted accessions were conserved at Research Station of IHBT, Palampur at Tandi, Lahaul, HP.

Findings:

- The groupings obtained from transcriptome SNP data and mock reference SNP data were highly correlated (r2 = 0.95)
- The genetic diversity in H. rhamnoides was higher than that in H. salicifolia
- Clustering of accessions was mostly as per their geographical locations
- Partitioning of diversity was more among species than within species (Fig. 14)

SCST，锡金，TERI，新德里，CPB, HAU, Hisar。

从喜马拉雅 5 个邦：拉达克、前查谟克什米尔、北阿坎德邦、锡金和阿鲁纳恰（中国藏南地区）收集了大约 1000 份沙棘材料，根系部分保存在HP拉胡尔的Tandi Palampur IHBT研究站。

研究发现：

- 从转录组 SNP 数据和模拟参考 SNP 数据获得的分组高度相关 (r2 = 0.95)；
- 鼠李沙棘种的遗传多样性高于柳叶沙棘；
- 资源的聚集主要取决于其地理位置；
- 物种间的多样性差异大于物种内部（图 14)。

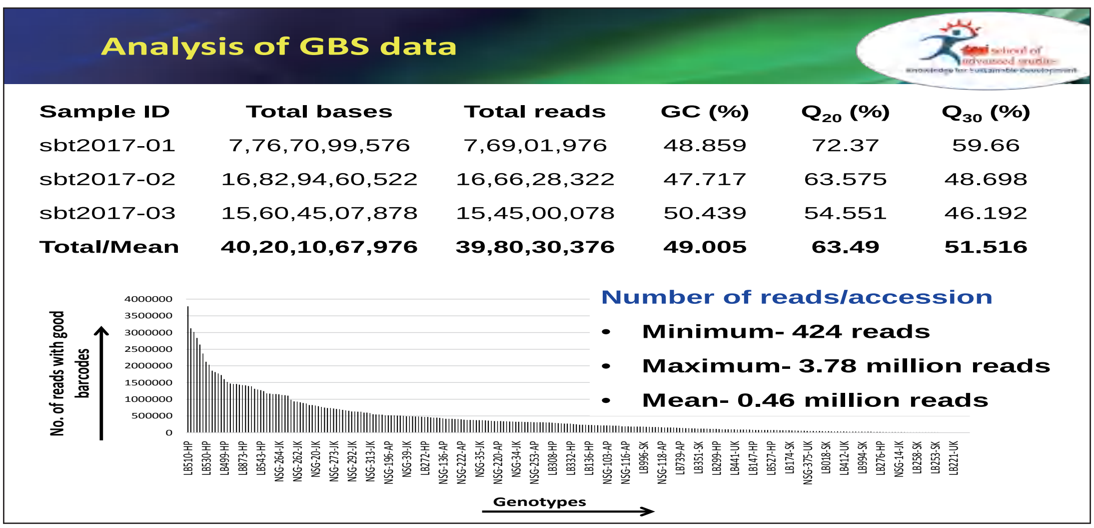
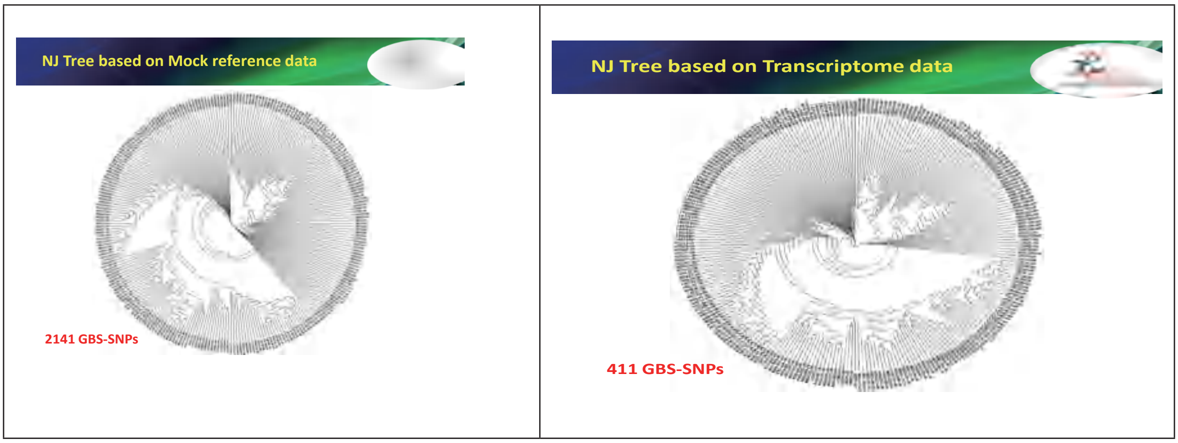


Fig. 14. Genetic diversity among accessions of Indian seabuckthorn in Himalayas
图 14：喜马拉雅地区印度沙棘种质的遗传多样性。



4.2.5. Guru Gobind Singh Indraprastha University, New Delhi

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The university is engaged in conducting research in the area of characterization of genetic and metabolome diversity in collections of two species of seabuckthorn, namely, Hippophae rhamnoides and Hippophae salicifolia originating from different geographic regions of Jammu & Kashmir, Himachal Pradesh, and Uttarakhand. We have developed and used a large number of microsatellite markers for the characterization of seabuckthorn diversity (Fig. 15). These microsatellite markers have been developed using our EST database and transcriptome assembly. Recently, we have exploited GC-MS and 1H NMR techniques for documenting complete metabolome of seabuckthorn, and deciphered the impact of environmental factors prevailing at different collection sites on metabolome diversity. Earlier, we identified a number of cold and freeze responsive elements in seabuckthorn using transcriptome analysis.

4.2.5. 新德里 Gobind Singh Indraprastha 大学

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该大学致力于研究两种沙棘的遗传和代谢组多样性特征，这两种沙棘分别来自查谟和克什米尔、喜马偕尔邦和北阿坎德邦的不同地理区域，即鼠李沙棘和柳叶沙棘。我们开发并使用了大量的微卫星标记来表征沙棘的多样性 (图 15)。这些微卫星标记是利用我们的 EST 数据库和转录组集成开发的。最近，我们利用 GC–MS 和 1H NMR 技术记录了沙棘的完整代谢组，并揭示了不同采集地点的环境因素对代谢组多样性的影响。早些时候，我们利用转录组分析在沙棘中鉴定了一些低温和冷冻相应成分。

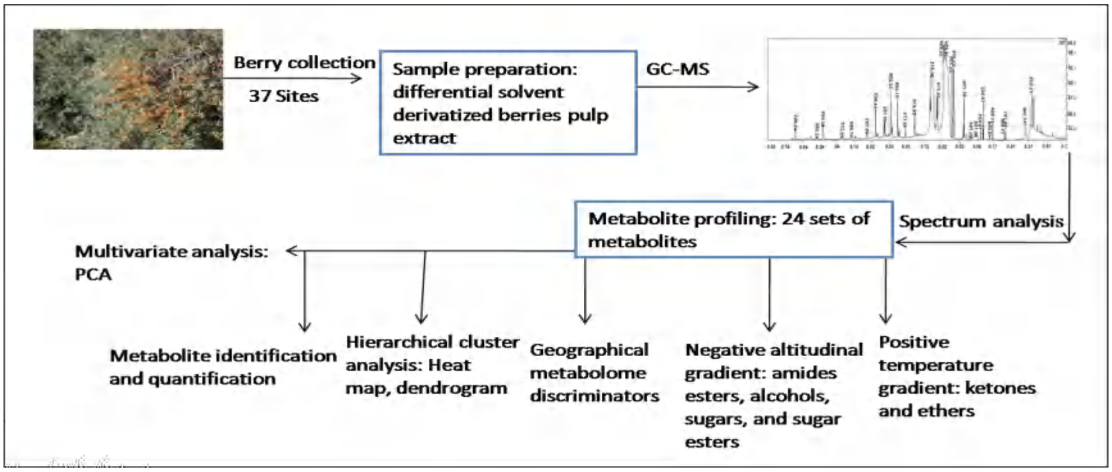

Fig. 15. Microsatellite markers for the characterization of seabuckthorn diversity
图 15：沙棘多样性的微卫星标记研究

4.2.6. Herbal Research and Development Institute

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In the state of Uttarakhand, two species of seabuckthorn are found i.e., Hippophae salicifolia and H. tibetana. H, salicifolia is distributed from 2200 to 3300 m. while H. tibetana is found above 4000 m in cold desert areas of district Pithoragarh, Chamoli, Uttarakashi and Bageshwar. In Chamoli seabuckthorn is distributed in Joshimath, Ghat, Dewal and Dasholi blocks mainly in Niti and Mana valley (Joshimath), while in Uttarakashi it is common in Yamunotri, Ganmgotri and Har-ki-Dun valleys. In Pithoragarh, it is found in Darma, Byans, Chaudas and Johar valleys of Dharchula and Munsyari blocks.

4.2.6. 草药研究与开发研究所

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在北阿坎德邦发现了两种沙棘，即柳叶沙棘和西藏沙棘。在 Pithoragarh、Chamoli、Uttarakashi 和 Bageshwar 地区的寒冷荒漠地区，柳叶沙棘分布在海拔 2200 ~ 3300 m，而西藏沙棘分布在 4000 m 以上。在 Chamoli，沙棘分布在 Joshimath、Ghat、Dewal 和 Dasholi 的 Niti 和 Mana 山谷，而在北塔卡什，沙棘常见于 Yamunotri、Ganmgotri 和 harki－dun 山谷。在 Pithoragarh，在达丘拉和 Munsyari 的 Darma、Byans、Chaudas 和 Johar 山谷也

In Munsyari, district Pithoragarh, HRDI has established a germplasm centre in 5 hectares land and at present more than 1000 mature mother plants brought from CSK Agricultural University, Palampur are growing well. More than 100 mature plants of 2 Russian varieties, also brought from Palampur University, are also being grown. The plants are grown from cutting taken from these mother plants. A second germplasm bank is being developed at Bhatka nursery in Dharchula block district Pithoragarh. During 2020-2021, HRDI awarded 5 projects in Chamoli and Pithoragarh districts for covering plantation of seabuckthorn in 10 hectares land. HRDI has developed 5 different products from seabuckthorn i.e., Pulp, Juice, Pickle, Herbal Tea, Face pack etc. HV project Gurgaon has come out to establish seabuckthorn processing unit in Uttarakhand. At present the Company is buying seabuckthorn pulp and tea from Uttarakhand State.

有沙棘分布。

在 Pithoragarh 区 Munsyari, HRDI 建立了一个占地 5 公顷的种质中心，目前从 Palampur 的 CSK 农业大学带来的 1000 多株成熟母株生长良好。同样引种了来自帕拉姆普尔大学的两种俄罗斯品种的 100 多株成熟植株。这些植株是从母树上采条无性繁殖的。另一个种质库正在达丘拉的皮托拉加尔区 (Pithoragarh) 的巴特卡苗圃建设。在 2020−2021 年期间，HRDI 批准了 Chamoli 和 Pithoragarh 地区的 5 个项目，包括建设 10 公顷的沙棘种植园。HRDI 以沙棘为原料，开发了果肉、果汁、泡菜、药茶、面膜等 5 种产品。通过 Gurgaon HV 项目已经在北阿坎德邦建立沙棘加工厂。目前公司正从北阿坎德邦购采购沙棘果肉和沙棘茶。

Propagation of seabuckthorn for cultivation by farmers 沙棘育苗，供农民种植

Displaying products from seabuckthorn at HRDI Mandal, Gopeshwar 沙棘产品展示

Fig. 16. Propagation of seabuckthorn for cultivation by farmers and demonstration of value added products. 图 16：沙棘苗木繁殖和产品示范。

4.2.7. Deference Institute of Bio-Energy Research, Haldwani

Dr. Madhu Bala
Director
DIBER, Haldwani, Uttarakhand
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DIBER has conducted extensive R & D on seabuckthorn on the following aspects:

i. Survey of the Seabuckthorn growing areas of Uttarakhand& Physicochemical analysis of collected fruit germplasm: DIBER has conducted extensive survey of the Seabuckthorn growing areas of Uttarakhand and collected about 70 fruit samples from different locations and conducted their physicochemical analysis. On the basis of these studies identified the promising germplasm which can be selectively propagated in the orchards.

ii. Introduction of Hippophae rhamnoides from Ladakh to DIBER Field Station, Auli (Joshimath): DIBER has introduced Hippophae rhomboids from Leh (Ladakh) at field station, Auli (Joshimath) in Chamoli district. Success of this species may prove highly useful for its orchards establishment in the state.

iii. Standardized technique for Hippophae rhamnoides leaf callus multiplication using seed germinated cotyledons in the laboratory conditions. This technique will provide a solution for the quality raw material throughout the year for the formulation of pharmaceutical and other value added products.

iv. Field gene bank of Seabuckthorn: DIBER has established a field gene bank of seabuckthorn at its field station Auli (Joshimath) at 3142m AMSL.

4.2.7. 位于 Haldwani 的国防生物能源研究所（DIDER）

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电子邮件：bala44@gmail.com

DIBER 对沙棘进行了广泛的研发，主要有以下几个方面：

i. 北阿坎德邦沙棘生长区调查及采集的果实种质资源的生理化学分析。DIBER 对北阿坎德邦沙棘生长区进行了广泛的调查，从不同地点采集了约 70 份果实样品并进行了生理化学分析。在此基础上，鉴定了有潜力的种质资源，可在苗圃中进行选择性繁殖。

ii. 沙棘从拉达克引进到 DIBER 奥利（乔希马斯）野外站。DIBER 在查莫利区奥利（乔希马斯）野外站引种了来自列赫（拉达克）的鼠李沙棘。这个沙棘种的引种成功对于在该邦发展沙棘种植园可能是非常有用的。

iii. 实验室条件下沙棘种子萌发子叶愈伤组织繁殖的标准化技术。这项技术将为制药和其他增值产品的配方提供全年优质原料的解决方案。

iv. 沙棘野外基因库。DIBER 在其 Auli (Joshimath) 野外站海拔 3142 米处建立了沙棘野外基因库。

v. **Hippophae salicifolia leaves** provided by Dr. V. Singh are being analysed for their Biochemical and Bioactive constituents.

v. 分析由 V. Singh 博士提供沙棘叶的生物化学成分和生物活性成分。

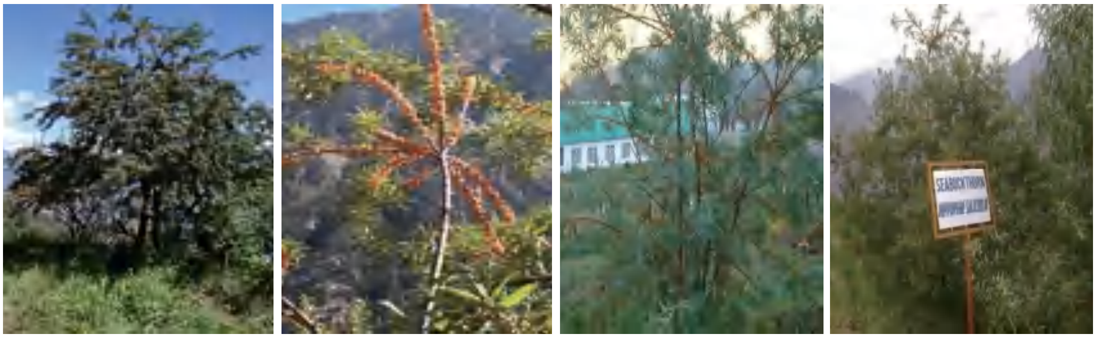

Fig. 17. Hippophae salicifolia germplasm at DIBER Field Station, Auli, Uttarakhand.
图 17: 北阿坎德邦奥利 DIBER 野外站的柳叶沙棘种质资源。

五 Human resources 人力资源

5.1. The total personnel involved in seabuckthorn research, manufacturing, marketing planting, public management, etc. in your country: The detail is given in Table 2.

5.1. 全国从事沙棘研究、生产、销售、种植、公共管理等工作的人员情况（见表 2）

Table 2. Total personnel involved in seabuckthorn research, manufacturing, marketing planting, public management in India
表 2：在印度从事沙棘研究、制造、销售、种植和公共管理的人员介绍

Sr. No.	State & Name 邦 / 姓名	Organization 单位名称	E-mail ID 电子信箱	Contact umber
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87	Dr. S.K. Sinha	Biotechnology, TERI-Northeastern Regional Centre, Express highway, Chachal, Guwahati-781036, Assam	sksinha@teri.res.in	0361-2334790 094351 15209 Fax. 0361 2334869
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98	Dr. Yogendra Kumar	DEBEL, DRDO, C.V. Raman Nagar, Bengaluru-560093	msyogendra@debel.drdo.in	080-25058390
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100	Dr. G. Muralikrishna	Chief Scientist & Professor, Department of Biochemistry and Nutrition, Central Food Technological Research Institute, Mysore-570020	krishnagm2002@yahoo.com	09480382199, +91-821-2514876 (O)
Orissa 奥利萨邦				
101	Dr. Gargi Dey	School of Biotechnology, KIIT, Deemed to be University, Bhubaneswar-751024, India,	drgargi.dey@gmail.com	

5.2. The members of National Seabuckthorn Association if provided, including institutional and individual members.

5.2. 国家沙棘协会会员(如有)，包括机构会员和个人会员。

N/A

无资料

5.3. A brief introduction of successful institutional members of seabuckthorn Association if provided.

5.3. 如能提供成功的沙棘协会机构成员简介。

N/A

无资料

六 Introduction of important activities, key events, successful stories and advanced persons in your country in the year of 2020.

介绍 2020 年全国重要活动、重大事件、成功事迹和先进人物。

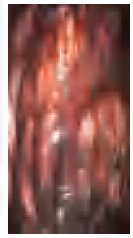
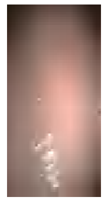
- First National Webinar on "Seabuckthorn: A Himalayan Wellness Crop" was organized by Prof. Brahma Singh Horticulture Foundation, New Delhi on 15th December 2020 in association with NAAS, New Delhi.
- The success stories are given in Table 3.

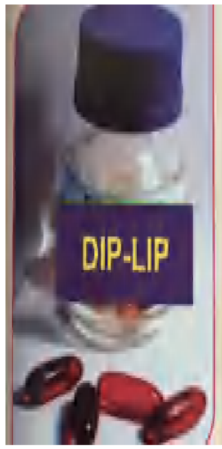
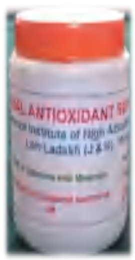
- 首届“沙棘：喜马拉雅健康作物”全国网络研讨会于 2020 年 12 月 15 日在新德里由 Brahma Singh 教授园艺基金会与 NAAS 联合举办。
- 表 3 汇总了一些成功案例。

Table 3. Success stories on seabuckthorn in India.
表 3：印度沙棘开发成功案例介绍

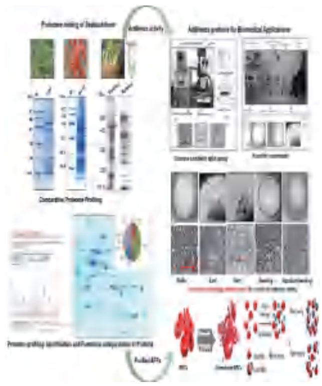
Dr. Virendra Singh and Dr. R.K. Rana Department of Biology & Environmental Sciences, CSK HPKV, Palampur 176062, HP, Virendra Singh 博士和 R.K. Rana 博士 喜马偕尔农业大学生物与环境科学系，Palampur 176062, HP	Email: virendrasingh1961 @yahoo.com Tel:7018420112, 9418045229	SBT cultivars: HPAU, Palampur has developed 2 exotic high yielding mild thorny cultivars namely, HI-2 and NX-12 with large fruits (>40 g/100), yield (5.5 kg/plant) and higher productivity (>10 tons/ha).There are total 14 Russian and 3 local selections of seabuckthorn. 沙棘品种：喜马偕尔农业大学已经开发了 2 个外来的高产、少刺品种，即 HI-2 和 NX-12，果实大 (40 克 /100)，产量 (5.5 公斤 / 株) 和更高的产量 (10 吨 / 公顷)。共有 14 俄罗斯引进沙棘品种和 3 个当地沙棘选育品种。	 

Dr. D. K.Vatsa Director of Research, CSKHPKV, Palampur 176062, HP D . K.Vatsa 博士 喜马偕尔农业大学研究主任	Email: erdkvatsa@rediffmail.com Tel: 9418015941	Fruit harvesters: Five seabuckthorn harvesting tools for seabuckthorn were standardized. Clipper with handle was the most effective tool, which collected 6.7 kg fruit/hr, as compared to 3.1 kg by traditional method. The clip wire has scope for fruit harvesting in Russian varieties. 果实采收机：标准化了五种沙棘收获工具。带手柄的剪果器是最有效的采集工具，每小时可采集 6.7 kg 果实，而传统的采集方法为 3.1 kg。这种夹果器在采收俄罗斯品种中有广泛用途。	
Dr. Y.S. Dhaliwal, Dr. Ranjana Verma, and Dr. V. Singh Department of Food Science, Nutrition and Technology, CSK Himachal Pradesh Agricultural University Palampur– 176062 (HP) 印度喜马偕尔农业大学食品科学、营养和技术系	Email: ysdhaliwal44@yahoo.co.in Tel: 9816082444	About 20 value added health food products like juice, RTS, jam, jellies, bakeries, powder, leaf tea and other beverages have been standardized along with packaging and storage technologies. The products are rich in vitamins and antioxidants. 果汁、RTS、果酱、果冻、面包店、粉末、叶茶和其他饮料等约 20 种增值保健食品以及包装和储存技术已经标准化。这些产品富含维生素和抗氧化剂。	 
Dr. Mandeep Sharma, Dr. Rajesh Chahota & Dr. Virendra Singh Department of Veterinary Microbiology, DGCN COVAS, CSK Himachal Pradesh Agricultural University, Palampur– 176062 (HP) Mandeep Sharma 博士 Rajesh chhota 博士和 Virendra Singh 博士 喜马偕尔邦农业大学兽医微生物学系，Palampur– 176062 (HP)	Email: mandeepsharma289@hotmail.com Tel: 09418045034	Developed the leaf extract and oil of seabuckthorn having antimicrobial activity and enhanced wound healing properties. Also Standardized the laboratory protocol for testing antimicrobial activities of plant extracts. 开发了具有抗菌活性和增强创面愈合作用的沙棘叶提取物和沙棘油，标准化了植物提取物抗菌活性测试的实验室规程。	 

Dr. S.P. Taygi, Dr. Amit Kumar and Dr. Virendra Singh Department of Vet Surgery & Radiology, DGCN COVAS, CSK Himachal Pradesh Agricultural University Palampur-176062 (S.P. S.P. Taygi 博士，Amit Kumar 博士，Virendra Singh 博士 喜马偕尔农业大学	Email: sptyagivet@gmail.com Tel: 0941841225	Seabuckthorn oil dose has been standardized with strong gastric ulcer healing in dogs. However, results are better for combinations with drugs available. Oil formulations for dogs have been standardized. The results in dogs have implications for clinical studies in human beings. 沙棘油的剂量已经标准化，在狗的胃溃疡愈合强烈。然而，与现有药物联合使用效果更好。犬用油的配方已经标准化。狗身上的研究结果对人类的临床研究具有启示意义。	  
Dr. Lily Ganju DIPAS, Lucknow Road, Tiamrpur, Delhi 110054 Lily Ganju 博士 国防生理与联合科学研究所，德里	Email: lganju@rediffmail.com Tel: 9810383160	DIP-HIP Adjuvant are used in combination with specific antigens to generate a more robust immune response than the antigen alone. These are designed to reinforce the immunogenicity of vaccines. DIP-HIP 佐剂与特定抗原联合使用，产生比单独抗原更强大的免疫响应。这些是为了加强疫苗的免疫原性。	
Dr. Asheesh Gupta and Dr. Geetha Suryakumar DIPAS, Lucknow Road, Tiamrpur, Delhi 110054 Asheesh Gupta 博士 Geetha Suryakumar 博士 国防生理与联合科学研究所，德里蒂阿姆普尔，勒克瑙路，110054	Email: heeshgupta2001@gmail.com Tel: 9999039307	Herbo Healer: It was developed in the form of topical cream, augments healing of acute and chronic non-healing wounds. It is highly effective, promotes rapid, aesthetic healing and has wide applications for skin tears, abrasions, incision, excision injuries, superficial/ deep burns, scalds, bruises and diabetic wounds. Herbo 药膏是以外用乳膏的形式开发的，可增强急性和慢性非愈合伤口的愈合。它具有高效、快速、美观的愈合作用，广泛应用于皮肤撕裂、擦伤、切口、切除损伤、浅 / 深烧伤、烫伤、瘀伤和糖尿病创面。	

Dr. Geetha Suryakumar DIPAS, Lucknow Raod, Tiamrpur, Delhi 110054, India Geetha Suryakumar 博士 国防生理与联合科学研究所，印度德里提阿姆普尔勒克瑙路，110054	Email: ethasuryakumar@yahoo.com Tel: 9811687801	DIP-91: A potent herbal anti-stress adaptogen is highly effective as health food supplements/ nutraceuticals, anti-stress agent to manage day-to-day stress and for overall health, and useful in adapting to adverse environmental conditions. DIP-91 是一种有效的草药抗压力适应原，作为健康食品补充剂 / 营养品非常有效，用于管理日常压力和身心健康，并有助于适应不利的环境条件。	
Dr. Geetha Suryakumar and Mrs. Meenakshi Basu DIPAS, Lucknow Road, Tiamrpur, Delhi 110054 Geetha Suryakumar 博士 Meenakshi Basu 女士 国防生理与联合科学研究所，印度德里提阿姆普尔勒克瑙路，110054	Email: ethasuryakumar@yahoo.com Tel: 9811687801	DIP-LIP: It is a hypolipidemic and anti-atherogenic agent reduces hypercholesterolemia and lowers atherogenic index, enhances HDL cholesterol and is a good vasorelaxant, cardioprotective and also improves hypoxic tolerance. DIP-LIP 是一种降血脂和抗动脉粥样硬化的药物，有助于降低高胆固醇血症，降低动脉粥样硬化指数，提高高密度脂蛋白胆固醇，是一种良好的血管松弛剂，并心脏保护、改善缺氧耐受性。	
Dr. Tsering Stobdan Defernce Institute of High Altitude Research Defence Research Leh, Ladakh-194 101 Tsering Stobdan 博士 国防研究所 高空研究国防研究 列城，拉达克 - 194 101	Email: ts_mbb@yahoo.com Tel: 9419176057,	Seabuckthorn food products A number of seabuckthorn beverages, juices, RTS, tea and blended mix food products, herbal antioxidant supplement, rich in natural vitamins have been developed. It is refreshing, rejuvenates the antioxidant system of the body, provides vital micronutrients and is fit for human consumption. 沙棘系列食品： 已开发出多种沙棘饮料、果汁、RTS、茶和混合食品、草药抗氧化补充剂、富含天然维生素。它能使人精神振奋，恢复身体抗氧化系统的活力，提供重要的微量营养素，适合人类食用。	 

Dr. Madhu Bala The Director DIBER (DRDO), Haldwani, UK Madhu Bala 博士 国防研究与发展组织生物能源研究所，北阿坎德邦，哈尔德瓦尼 263139	Email: bala44@gmail.com Tel: 9899443775	Ultraviolet (UV) radiation protective formulation has been developed in INMAS. It is meant for protecting the health, by countering skin injuries and thereby renders help in improving the efficiency of soldiers deployed at High Altitude locations. The Trade name UMBRIEL® is registered by DRDO. 在 INMAS 中研制了紫外线防护配方。它的目的是通过抗皮肤损伤来保护健康，从而有助于提高部署在高海拔地区的士兵的效率。UMBRIEL® 商号由 DRDO 注册。	
		Seabuckthorn as a protector of Gut microbiota in the event of exposure to ionizing radiation. Gut microbiota is the population of microorganisms inhabiting the mammalian gastrointestinal tract and has a very specific composition. The team thereafter developed a unique herbal preparation from Seabuckthorn which can ensure minimum disturbance to gut microbiota and therefore, ensure the health. 沙棘是暴露于电离子辐射时肠道微生物群的保护者。肠道菌群是栖息在哺乳动物胃肠道内的微生物群，具有特定的组成。该团队从沙棘中开发了一种独特的草药制剂，可以确保将对肠道微生物群的干扰降到最低，从而确保人体健康。	
Dr. Farhath Khanum Defence Food Research Laboratory, Mysore, Karnataka Farhath Khanum 博士 国防食品研究实验室，卡纳塔克邦迈索尔	Email: farhathkhanum@gmail.com Tel: 9449851403, 821 2470364	Seabuckthorn Juice Powder– A ready to use juice powder that can be used instantly for preparation any food product. Seabuckthorn yoghurt and squash, leaf tea bags, jam, also has high potential for commercialization 沙棘果汁粉 – 一种可立即用于制备任何食品的现成果汁粉。沙棘酸奶和南瓜、茶叶袋、果酱，也具有很高的商业化潜力	

Prof. Renu Deswal Molecular Plant Physiology & Proteomics Laboratory, Department of Botany, University of Delhi, Delhi –110007 Renu Deswal 教授 德里大学植物系分子植物生理与蛋白组学实验室	Email: renudeswal@yahoo.co.in Tel: 09711742276	Anti-freezer: Maintaining texture of food during low temperature storage, Aquaculture (cold tolerant fishes), Cryopreservation of cells, tissues, cell lines & organs, Gold nanoparticles for efficient remediation of dye contaminated waste water. 抗冷冬剂：在低温保存状态保持食物质地；保存水产品的组织、细胞、器官；用于印染污水处理的黄金纳米粒子。	
Dr. Gargi Dey School of Biotechnology, KIIT, Deemed to be University, hubaneswar-751024, Orissa Gargi Dey 教授 印度理工学院附属生物技术学院，印度 Orissa 邦 –751024	Email: drgargi.dey@gmail.com Tel: 9937238440	Probiotic-fortified beverages-Developed non-dairy matrices for functional probiotic-fortified beverages. The product has huge potential as probiotic-fortified beverages in Indian market. 益生菌强化饮料。开发功能性益生菌强化饮料的非乳制品基质。该产品作为益生菌强化饮料在印度市场具有巨大的潜力。	

七 The policies, documents related with seabuckthorn and research papers in the year of 2020 in your country 印度 2020 年有关沙棘的政策、文件和研究论文。

Policy decision:

Ministry of Food Processing, Government of India wide notification No. F. No. FM 11/134/2020/FME, dated 26.11.2020 has approved One District One Product (ODOP) scheme to promote commercialization one product of each of 700 districts of India and seabuckthorn for the district Lahaul-Spiti in Himachal Pradesh and Leh district

政策文件：

印度政府食品加工部公告（编号第 No. F. No. FM 11/134/2020/FME）于 2020 年 11 月 26 日批准了“一区一产品 (ODOP) 计划”，以促进印度 700 个地区每个地区一种产品的商业化，以及喜马偕尔邦 Lahal – Spiti 地区和拉达

in Ladakh. These two districts will get special financial and policy assistance for development and commercial utilization of seabuckthorn.

克列城地区的沙棘产品开发。这两个地区将得到特别的财政和政策支持，以开发和商业化利用沙棘。

Publications in 2020

- Lamo, K. and S. P. Singh Solanki 2020. Seabuckthorn a boon for Trans-Himalayan Region of Ladakh: A Review. Agricultural Reviews 40 (4):289-295.

- Masoodia, K.Z., W. Wania , Z.A. Dara , S. Mansoora, S.Anam-ul-Haqa , I. Farooqb , K. Hussainc, S. A. Wania, F. A. Nehvia and N. Ahmeda 2020. Seabuckthorn (Hippophae rhamnoides L.) inhibits cellular proliferation, wound healing and decreases expression of prostate specific antigen in prostate cancer cells in vitro. Journal of Functional Foods 73 (14): 1-11.

- Prabhudesai, M. S., Pavan M. Paraskar, R. Kedar and R. D. Kulkarni 2020. Seabuckthorn oil tocopherol extraction's by-product utilization in green synthesis of polyurethane coating. European Journal of Lipid Science and Technology 122 (4): https://doi.org/10.1002/ejlt.201900387

- Singh, R., S.K. Dwivedi and M. Bala 2020. Survey, Identification and Evaluation of biodiversity of Seabuckthorn (Hippophae salicifolia) in hills of Uttarakhand. bioRxiv preprint doi: https://doi.

2020 年发表的论文

- Lamo, K. 和 S. P. Singh Solanki 2020，沙棘是拉达克跨喜马拉雅地区的福音：综述。农业综述 40(4):289–295。

- Masoodia, K.Z, W. Wania, Z.A. Dara, S. Mansoora, S. anam –ul– haqa, I. Farooqb, K. Hussainc, S. A. Wania, F. A. Nehvia 和 N. Ahmeda 2020，沙棘(Hippophae rhamnoides L.) 在体外抑制前列腺癌细胞的繁殖、伤口愈合和降低前列腺特异性抗原的表达。功能性食品学报 73(14):1–11。

- Prabhudesai, M. S.， Pavan M. Paraskar, R. Kedar 和 R. D. Kulkarni 2020，沙棘油生育酚提取副产物在绿色合成聚氨酯涂料中的应用。欧洲油脂科学与技术学报 122 (4):https://doi.org/10.1002/ejlt.201900387

- Singh, R.， S.K. Dwivedi 和 M. Bala 2020，北阿坎德邦山地沙棘

org/10.1101/2020.10.26.354951.

- Singh, D.N., P.K. Shukla, A. Bhattacharyya, Debashis Roy, Y. Singh and P.K. Rout 2020. Effect of dietary supplementation of seabuckthorn leaf meal in coloured breeder and their post hatch chicks on growth performance and serum biochemical attributes during summer season. Indian Journal of Animal Research 54 (12): 1505-1511.

生物多样性调查、鉴定与评价，bioRxiv preprint doi: https://doi.org/10.1101/2020.10.26.354951。

- Singh, D.N., P.K. Shukla, A. Bhattacharyya, Debashis Roy, Y. Singh and P.K. Rou 2020, 夏季饲料中添加沙棘叶粉对彩色种鸡及其孵化后雏鸡生长性能和血清生化特性的影响，印度动物研究学报 54(12):1505–1511。

5. Country Report of Kyrgyzstan

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The Current State of Seabuckthorn Research in Kyrgyzstan
吉尔吉斯斯坦的沙棘研究现状

In recent years, the interest in useful plants has increased significantly all over the world, as far as the production of pharmacies based on them is environmentally friendly, and also, such drugs either have no side effects at all, or have, but not in significant measure. Moreover, some of them are very profitable for the country's economy.

近年来,世界各地对有用植物的兴趣显著增加,因为以它们以环境友好为基础的可以生产基础药物，而且这些药物基本没有副作用，即使有副作用，也不是很严重。此外，其中一些对国家经济非常有利。

In the field of pharmacology, this kind of research is very relevant. They make it possible to largely meet the needs for medicinal preparations produced from plant materials.

在药理学领域，这类研究是非常密切的。它们在很大程度上满足了对植物原料药物制剂的需求。

Sea buckthorn occupies an important place among useful and medicinal plants. The value of its fruits as a raw material for obtaining medicinal products and vitamin food products is due to the richness and variety of biologically active substances included in its composition.

沙棘在药用植物中占有重要地位。其果实作为药用产品和维生素食品原料的价值在于其成分中含有丰富多样的生物活性物质。

Under the influence of increasing anthropogenic factors, natural and technogenic overloads, the areas of many valuable medicinal plants are sharply reduced, and some of them are already on the verge of complete extinction. Therefore, an assessment of the current state of especially valuable medicinal plants and industrially useful plants will contribute to the development of measures to prevent negative changes in the Republic, optimize the use of plant objects.

在不断增加的人为因素、自然和技术因素的影响下,许多有价值的药用植物的面积急剧减少,其中一些已经处于完全灭绝的边缘。因此，对特别有药用价值的植物和工业上有用的植物的现状进行评估将有助于制定一定的措施，防止发生不利变化，优化植物的使用。

One of the most pressing problems in our time is the development of effective ways to combat industrial erosion, in connection with which sanitary and preventive reclamation is of particular importance, i.e. landscaping and consolidation with vegetation of all areas of the technogenic landscape free from mining operations. Shrubs are recognized as promising for this purpose, including the so-called "suckers": buckthorn (as well as narrow-leaved elk), which also enriches the soil with bound nitrogen. They can be planted on rather steep slopes, up to 35 - 38 degrees. On old compacted dumps, terracing is the best planting option.

在现在这个时代，最紧迫的问题之一是利用有效的方法来对抗工业侵蚀，在这方面，卫生和预防性的复垦特别重要，即采取植被措施巩固没有采矿作业的景观的所有地区。灌木被认为是很有希望达到这一目的的，包括所谓的“萌孽”沙棘，它也可以用于固氮丰富土壤。可以种植在高达 35 − 38 度的相当陡峭的斜坡。在旧的压实的垃圾场，梯田是最好的种植选择。

The area of sea buckthorn (Hippophae rhamnoides L.) - this plastic, polymorphic species, is very extensive. The western border is the coastal strip of southeastern England, and the eastern border is the western parts of Heibei China. The area of sea buckthorn in longitude stretches between 2 and 115 ° east longitude, in latitude - between 27 ° and 58 ° 50 north latitude [1], ie. is a typical representative of the flora of the Eurasian Continent.

沙棘这一多形态、适应性强的物种在全世界的分布是非常广泛的。西部可到达英格兰东南部的沿海地带，东部边界是中国北部。沙棘分布在东经 2° ~115° 之间、北纬 27° ~58° 50 之间，是欧亚大陆植物区系的典型代表。

Due to the intensive development of floodplain lands for various agricultural lands, during the construction of highways, etc., natural phytocenoses have disappeared, or are on the verge of extinction.

由于用于各种农业用地，在建设公路等过程中对冲积平原土地的集约开发，沙棘自然植物群落已经消失，或濒临灭绝。

A large amount of work on the study of the form diversity of wild-growing sea buckthorn, the biochemical composition of fruits and some issues of the introduction of varieties from Altai have been carried out in the Chu valley and Issyk-Kul region [2, 3]. In the wild thickets of sea buckthorn in the

我们在 Chu valley 和 Issyk-Kul 地区对野生沙棘形态多样性、果实生化组成及引进阿尔泰品种的一些问题进行了大量的研究 [2,3]。在 Jergalan, Tyup, Aksu 河泛滥平原的野生沙棘灌木丛中，研究人员 T.V. maleny[3] 鉴定

floodplains of the rivers Jergalan, Tyup, Aksu, the researcher T.V. Malenoy [3] has identified more than 40 forms. The paper provides data on the content of biologically active substances for 9 selected forms of sea buckthorn.

出了 40 多种沙棘类型。研究论文揭示了 9 种沙棘品种生物活性物质含量的数据。

Employees of the Institute of Organic Chemistry of the Academy of Sciences of the Kyrgyz SSR, under the leadership of Academician A.A. Altymyshev [4], carried out work on the study of the biochemical composition (both wild and introduced varieties), as well as the influence of some biologically active substances from the fruits of the Issyk-Kul sea buckthorn on the body animals. Data on the mineral composition of fruits, the possibility of obtaining press oil, as well as pectin compounds from the wastes of the production of juice and sea buckthorn oil are widely covered in the literature [5, 6, 7].

吉尔吉斯 SSR 科学院有机化学研究所的工作人员在 A.A. Altymyshev[4] 院士的领导下，进行了野生沙棘和引进品种生化组成的研究，以及采自 Issyk–Kul 地区的沙棘果实中某些生物活性物质对动物身体的影响研究。文章中广泛涉及的数据包括关于水果的矿物组成，榨油的可能性，并从果汁和沙棘油生产废料提取出的果胶化合物 [5,6,7]。

Despite its rather wide distribution in Kyrgyzstan, sea buckthorn is extremely poorly studied. From the works of recent years, it is necessary to note the monograph by Z.Kh. Sarymsakov "Sea buckthorn in southern Kyrgyzstan" [8], where the author for the first time in southern Kyrgyzstan highlights the phytocenology of the species, gives characteristics of the main formations and associations of sea buckthorn. The biomorphological characteristics of 43 forms of sea buckthorn of the local population identified by the author are given.

尽管沙棘在吉尔吉斯斯坦的分布相当广泛，但对它的研究极其贫乏。从近年来的著作来看，有必要注意 Z. Kh. Sarymsakov 的专著《沙棘在吉尔吉斯斯坦南部》[8]，作者首次在吉尔吉斯斯坦南部重点介绍了沙棘的植物群落学，并给出了沙棘的主要组成和群丛特征，给出了作者鉴定的 43 种沙棘当地种群的生物形态特征。

In Kyrgyzstan, sea buckthorn is found everywhere, in the Issyk-Kul, Kochkor, Chui, Talas, Suusamyr, Ketmentyubinsk, At-Bashinskaya and other valleys, in the floodplains of large rivers and other small rivers and etc.

在吉尔吉斯斯坦，沙棘随处可见，在伊塞克－库尔河、科奇科尔河、Chui 河、塔拉斯河、苏萨米尔河、Ketmentyubinsk 河、At–Bashinskaya 河等山谷中，在大河和其他小河的漫滩上等等。

According to the accounting data of the forest fund (2010), in the floodplain forests of the republic, sea buckthorn grows on an area of 6.3 thousand hectares.Currently, the Issyk-Kul and Naryn valleys, the state of natural populations of sea buckthorn as a whole is in an unsatisfactory state [9].

根据森林基金 (2010 年) 的核算数据，在吉尔吉斯斯坦的漫滩森林中，沙棘林面积达 6,3000 公顷。目前，在伊塞克 – 库尔和纳林山谷，沙棘自然种群整体状态处于不理想状态 [9]。

Sea buckthorn has long occupied vast areas along the entire coast of Lake Issyk-Kul and in the floodplains of large and small rivers of the region. For many years, the sea buckthorn forests remained no man's land, were not protected, and as a result, the areas occupied by them decreased, which led to the disappearance of habitats of plants and animals, and the disruption of the coastal ecosystem as a whole.

沙棘长期以来占据了整个伊塞克 – 库尔湖沿岸的广大地区以及该地区大大小小的河流的泛滥平原。多年来，沙棘林处于无人之地，没有受到保护，其占地面积减少，导致动植物栖息地消失，整个沿海生态系统遭到破坏。

As noted by V.M. Tkachenko, L.M. Andreichenko [10], Zhumadylov A.T. [11], sea buckthorn thickets in Kyrgyzstan are gradually disappearing as a result of anthropogenic impact on them (felling, fires, overgrazing, gravel and sand extraction, rice paddies, hayfields and crops, etc.).

正 如 V.M. Tkachenko、L.M. Andreichenko[10]、Zhumadylov A.T.[11] 所指出的，吉尔吉斯斯坦的沙棘灌木丛正在逐渐消失，原因是人为的影响，包括砍伐、火灾、过度放牧、采石和取沙、稻田、干草田和农作物等。

At present, in the Issyk-Kul and Naryn valleys, the state of the natural populations of sea buckthorn is generally in an unsatisfactory state, thickets of sea buckthorn are preserved due to its natural renewal.

目前，在 Issyk–Kul 和 Naryn 山谷中，沙棘自然种群的状态普遍不理想，沙棘灌丛通过自然更新而得以保存。

In this regard, with the assistance of the Bioversity International / UNEP-GEF project: "Insitu / on-farm conservation of agrobiodiversity (fruit crops and their wild relatives) in Central Asia" in the north of Kyrgyzstan, surveys of local residents were conducted, a series of training seminars and an agrobiological assessment of molded the diversity of wild sea buckthorn plantations in the Issyk-Kul and Naryn regions (Tables 1, 2).

在这方面，在生物多样性国际环境规划署 – 全球环境基金项目 : 在中亚吉尔吉斯斯坦北部的就地 / 农场异地生物多样性保护 / 农场（水果作物及其野生亲缘）的协助下 , 对当地居民进行了调查并在 Issyk–Kul 和 Naryn 地区开展了一系列的培训研讨会和野生沙棘种植农业评估（表 1、2)。

The results of the survey showed that the majority of residents of these regions use sea buckthorn fruits both for food and for medicinal purposes.

调查结果表明，这些地区的大多数居民以沙棘果实作为食用和药用原料。

Table 1 Productivity and stock of sea buckthorn fruits
表 1：沙棘果实的产量和存贮

Vegetation 沙棘分布地区	Area of the vegetation, ha 沙棘林面积	Average yield from one bush, kg 每丛平均产量	Weight 100 pcs. fruits, g 百果重	Stalk length, mm 果柄长
the village of Ak–Bulak Issyk–Kol region Ak–Bulak 村	5	2.240	20	2
Semenovka gorge Issyk–Kol region Semenovka 峡谷	1	2.3	22	3
Salkyn–Tor gorge Naryn region Salkyn–Tor 峡谷	1	2.142	21	3.2
Salkyn–Tor gorge Naryn region	2	2.5	23	3
Tosh–Bulak Naryn region Tosh–Bulak 村	0.5	2.1	19	2.8

Studies have shown that, on average, from 2.1 to 2.5 kg of fruits can be collected from one bush, with a mass of 100 pcs. fruits from 19 to 23 g. The length of the stalk also varies from 2 to 3.2 mm.

研究表明,平均来说,一株沙棘灌木可以收集2.1到 2.5 公斤的水果，百果重为 19 – 23 克。果柄长从 2 到 3.2 毫米不等。

Table 2 Morphological characteristics of the identified forms of sea buckthorn
表 2：沙棘已鉴定类型的沙棘形态学特征

District of Growth 生长区域	Height above sea level 海拔	Plant community 植物群落	Height of plants, m 植物高度	prickliness, scores 棘刺得分	Length and width of sheet Plates, mm 叶片长 mm	Fruits 果实				
						Color 颜色	Taste 味道	Shape 形状	Length mm 纵径	Width, mm 横径
the village of Ak–Bulak Issyk–Kol region	1932	buckthorn–barberry 沙棘 – 伏牛花	3.5	3	5.9–5	Yellow–orange 橙黄	Sour 酸	silky Ovated 卵圆 形	8	6

S e m e n o v k a gorge Issyk-Kol region	1852	Wi llow-sea-buck-thorn-barberry 柳树 - 沙棘 - 伏牛花	5.5	3	4.4-6	Yellow-orange 橙黄	Sour 酸	Globular 球状	6	6
S a l k y n - T o r gorge Naryn region.	2272	Willow sea buckthorn 柳树 - 沙棘	2.44	3	4.1-4	Orange 橙色	Sweet sour 酸甜	globular 球状	8	8
S a l k y n - T o r gorge Naryn region	2270	Willow sea buckthorn 柳树 - 沙棘	3	3	5.1-4	Yellow-orange 橙黄	К и с л ы й	Globular 球状	9	8
Tosh-Bulak Naryn region	2004	Willow sea buckthorn 柳树 - 沙棘	2.5	4	4-4	Yellow-orange 橙黄	К и с л ы й	globular 球状	6	5

From table. 2, it can be seen that the height of plants varies widely: from 2.4 to 5.5 m in height, prickliness from 3 to 4 points with a 5 point scale. The length of the leaf blade ranges from 4 to 5.9 mm, with a width of 4 to 6 mm. The fruits are mainly yellow-orange and orange in color, the taste is sour and sweet-sour, the shape is spherical and ovoid, the length of the fruit ranges from 6 to 9 mm, with a width of 5-8 mm.

从表 2 可以看出，植株的高度变化很大，高度从 2.4 m 到 5.5 m 不等，棘刺形状得分从 3 到 4 不等（满分为 5）。叶片长 4 ~ 5.9 mm，宽 4 ~ 6 mm。果实以黄橙、橙为主，味酸、甜、酸，形状为球形、卵球形，果长 6 ~ 9 毫米，宽 5 ~ 8 毫米。

With regret, it must be noted that not a single hectare of cultivated sea buckthorn plantations have been created in the republic, at least in the forestry system, even before 2017.

遗憾的是，在 2017 年之前，全国也没有建立一公顷的沙棘种植园，至少在林业系统中没有。

In early May (May 6, 2017), we received 3141 seedlings within the framework of a joint project of the State Agency for Environment and Forestry under the Government of the Kyrgyz Republic and the Japan International Cooperation Agency (JICA):

2017 年 5 月 6 日，在吉尔吉斯共和国国家环境和林业局和日本国际协力机构 (JICA) 的一个联合项目“在吉尔吉斯斯坦共和国发展以林产品为基础农业产业” 框架下，我们接收了 3141 株沙棘品种苗木，这些沙棘品种由俄罗斯西伯利亚 MA Lisavenko 园艺研究所培

"Development of agricultural business based on forest products in the Kyrgyz Republic" cultivars of sea buckthorn, bred by the Research Institute of Gardening of Siberia named after MA Lisavenko, belonging to three female varieties: Elizaveta, Inya, Dzhemovaya and one male variety: Gnome. All varieties were distributed among forestry enterprises (Chuysky, Balykchinsky, Issyk-Kulsky, Tyupsky, Karakolsky and Bakai-Atinsky), on the basis of which fruit nurseries were established.

育，分别是三个雌性品种 :Elizaveta, Inya, Dzhemovaya 和一个雄性品种 :Gnome。所有品种都分发到在当地林业企业中 (Chuysky, Balykchinsky，Issyk–Kulsky，Tyupsky，Karakolsky 和 Bakai–Atinsky) 预先建立的果树苗圃。

Characteristics of varieties.

三个沙棘品种的特点：

Dzhemovaya. Originator: NIISS (Siberian fruit research institute) named after M.A. Lisavenko, Authors: E.I. Panteleeva, T.M. Pletneva, Yu.A. Zubarev, T.M. Chepurnova, V.V. Kurdyukova The variety was bred at NIISS by selection among seedlings from free pollination of the Excellent variety. Year of sowing seeds 1985. Adopted for the state variety test in 2001. The bush is weak, with a rounded crown of medium density. Shoots are light brown, straight. There is no thorny shoots. Leaves are medium-sized, dark green, lanceolate, the leaf blade is slightly concave. Fruits are oval, orange-red, with a bright, large spot on the top of the fruit and at the base of the peduncle. The mass of 100 fruits is 60.0-73.0 g. The nature of tearing is semi-dry, the pulling force is medium. The fruit ripens later in the summer. They contain: sugars - up to 5.8%, acids - up to 1.3%, vitamin C - up to 154.0 mg%, carotenoids - up to 29.3 mg%, oils - up to 10.2%. Winter resistance is high.

1. Dzhemovaya 品种：由 NIISS(俄罗斯西伯利亚利萨文科园艺研究所) 培育，品种所有人 E.I. Panteleeva, T.M. Pletneva, Yu. A. Zubarev。该品种是由 NIISS 从优良品种的自由授粉后代实生苗中选育而成的。1985 年播种，2001 年通过国家品种鉴定，树体较弱，树冠圆润、中等密度。枝条浅棕色，树干直，没有顶刺，叶中等大小、深绿色、披针形，叶片边缘稍凹。果实椭圆形、橙红色、顶部和花序梗的基部有一个明亮的大斑点。果实百果重为 60.0–73.0 克。分离性质为半干性，拉力为中等。果实于夏末成熟，主要成分含量：糖 – 高达 5.8%，酸 – 高达 1.3%，维生素 C – 高达 154.0 毫克 %，类胡萝卜素 – 高达 29.3 毫克 %，油 – 高达 10.2%。抗寒性强。

Productivity at 6 years old - up to 6.0, at 7 years old - up to 16.0 t / ha (with a planting scheme of 4 x 2 m). The beginning of fruiting is in the 4th year

6 年生时产量可达 6.0 吨 / 公顷，7 年生时产量可达 16.0 吨 / 公顷 (种植方式为 4 × 2 米)。在种植后第 4 年开始结果，属于多种用途品种。

after planting. A variety of universal use. Products of fruit processing are of high quality. Advantages of the variety: high yield, high content of oil, carotenoids and vitamin C, high technological qualities of the fruit.

Elizaveta. Originator: NIISS named after M.A. Lisavenko. Authors: E.I. Panteleeva, T.M. Pletnev The variety was bred at NIISS using the method of chemical mutagenesis. The seeds of the Panteleevskaya variety were treated in 1981 with the DES mutagen at a concentration of 0.05%. Accepted for state test in 1997. The bush is medium-sized, with an oval crown of medium density. The bark of the skeletal branches is dark brown. Thorniness is very weak. Shoots are straight, greenish-gray, internodes of medium size. Leaves of medium size, lanceolate. The leaf blade is concave. Fruits are large, the weight of 100 fruits is 81.5-110.0 g, cylindrical, orange. The stalks are long (5.0-6.0 mm), the fruits are loosely located on the branches. The nature of separation is semi-dry, the force of separation of fruits is average. The taste is sweet and sour, with a pleasant aroma. They contain: sugars - 5.9-8.9%, acids - 1.1-1.6%, vitamin C - 71.3-100.0 mg%, oils - 4.4-5.1%. High winter hardiness. Productivity at 6 years old - 14.7, at 8 years old - 18.0 t / ha (with a planting scheme of 4 x 2 m). Beginning of fruiting in the 4th year after planting. A variety of universal use. The fruits are suitable for fresh consumption and for various types of processing. Advantages of the variety: high yield, fruits of good taste, high content of vitamin C.

Inya. Originator: NIISS named after M.A. Lisavenko. Authors: E.I. Panteleeva, I.P. Kalinina, T.M. Pletneva, E.E. Shishkina. The variety was

果品加工产品质量高。品种优势：产量高，油脂、类胡萝卜素和维生素 C 含量高，果实加工品质高。

2. Elizaveta 品种：由 NIISS(俄罗斯西伯利亚利萨文科园艺研究所)培育，品种所有人 :E.I.Panteleeva, T.M. Pletnev。该品种是在 NIISS 采用化学诱变方法育成的。1981 年，用浓度为 0.05% 的 DES 诱变剂对 Panteleevskaya 品种的种子进行了处理。在 1997 年通过国家品种测试。植株中等大小，树冠椭圆形、冠幅中等密度。树干树皮呈深褐色的。棘刺很少。枝条直、灰绿色，节间中等大小。叶片中等大小、披针形，叶片边缘凹陷。果实大，百果重 81.5–110.0 克，呈圆柱形、橙色。果柄长 5.0–6.0 毫米，果实松散地分布在枝条上。分离性质为半干性，果实的分离力平均。味道酸甜，有怡人的香气。主要成分：糖 – 5.9–8.9%，酸 – 1.1–1.6%，维生素 C – 71.3–100.0 mg%，油 – 4.4–5.1%。高抗寒性。6 年生产量 – 14.7 吨，8 年生产量 – 18.0 吨 / 公顷（种植密度 4 × 2 米）。种植后第 4 年开始结果。属通用型品种。果实适合鲜食消费和各种类型的加工。品种优势：产量高，果实口感好，维生素 C 含量高。

3. Inya 品种：由俄罗斯西伯利亚利萨文科园艺研究所培育，品种所有人 :E.I. Panteleeva, I.P. Kalinina, T.M. Pletneva, E.E.

bred at NIISS using the method of chemical mutagenesis by processing in 1981 the seeds of the Panteleevskaya variety with nitrosodimethyl at a concentration of 0.012% at the Institute of Chemical Physics of the USSR Academy of Sciences. Included in the State Register in 2001, approved for use in the West Siberian region. Bush-tree-like, medium-sized, with a flat-rounded, sparse crown. The bark of the skeletal branches is brown. Thorniness is weak. Shoots are straight, brown on the sunny side, slightly pubescent, internodes are medium. The leaves are large, lanceolate, yellowish green. The leaf blade is flat. Fruits are large, the weight of 100 fruits is 74.5-95.6 g, broadly oval, red, with large brightly colored spots at the calyx and base of the peduncle. The pulp is dense, the taste is sweetish-sour, with aroma. Fruits on the branches are loose. The length of the peduncle is 3-5 mm. The nature of the separation is semi-dry. The force of separation of the fruits is average. The fruits ripen on September 1-10. They contain: sugars - 4.4-6.7%, acids - 1.6-2.9%, vitamin C - 60.0-126.4 mg%, carotenoids - 12.9-30.3 mg% , oils - 3.6-4.9%. Winter resistance is high. Productivity at 5 years of age is 38.4 t / ha (with a planting scheme of 4 x 2 m). The early maturity is high. Begins to bear fruit in the 2nd year after planting. Technical grade. The fruits are suitable for various types of processing. Advantages of the variety: high early maturity, high yield, large-fruited, dense pulp. Disadvantages: the presence of minor thorns.

Below are some small characteristics of mother nurseries in the forestry enterprises of Kyrgyzstan.

The Tokmak section of the Chuy forestry is located at an altitude of 802 m above sea level. in the

Shishkina。该品种于1981年在NIISS用化学诱变的方法在苏联科学院化学物理研究所对Panteleevskaya品种的种子进行处理，亚硝基二甲基浓度为0.012%。2001年列入国家登记，批准在西西伯利亚地区使用。灌木状的，中等，具一扁平圆形，稀疏的树冠。树干的树皮是棕色的。Thorniness是弱的。芽直，向阳面棕色，稍短柔毛，节间中等。叶大，披针形，黄绿色。叶片是平的。果大，100个果重74.5–95.6克，宽椭圆形，红色，花萼和花梗基部有大而鲜艳的斑点。果肉致密，口味酸甜，有香气。树枝上的果实是松散的。花梗的长度为3–5毫米。分离的性质是半干的，水果的分离力是平均的。果实在9月1日至10日成熟。它们含有：糖－4.4–6.7%，酸－1.6–2.9%，维生素C－60.0–126.4毫克%，类胡萝卜素－12.9–30.3毫克%，油－3.6–4.9%。抗寒性高。5龄产量38.4 t / ha(种植方案4 × 2 m)，早熟性高。种植后第二年开始结果。技术等级。水果适合各种类型的加工。品种优势：早熟高，产量高，果实大，果肉密实。缺点：有少量刺。

以下是部分吉尔吉斯斯坦林业苗圃的一些特点。

Chuy林业苗圃Tokmak分部：海拔802米，位于托克马克市西部。苗圃面积约1000平方米。矩形地块(西宽10米，东宽22米，两侧长100米)。母本苗木配置方式为3x0.6 m。种植前苗木根系用溶液处理，以

western part of Tokmak city. The nursery area is about 1000 m². Plot of rectangular shape (width from the west 10 m, from the east 22 m, length on both sides 100 m). Scheme of placement of seedlings of female specimens 3x0.6 m. The roots of plants before planting are treated with a solution of root to improve root formation and survival.

Balykchy forestry. The nursery is located at an altitude of 1642 m above sea level. in the eastern part of Balykchi. Due to the harsh natural and climatic conditions, the landing pattern was 1.5x0.5 m.

Site of Tegirmenty of Issyk-Kul forestry. The nursery is located at an altitude of 2002 m above sea level. In the nursery, sea buckthorn was placed according to the 3x0.5 m scheme.

The site of the May-Chunkur-Tyup forestry. The nursery is located at an altitude of 1765 m above sea level. Planting scheme for seedlings 3x1 m.

The site of the Kara-Zhal Karakol forestry. The nursery is located at an altitude of 1787 m above sea level. Planting scheme for seedlings 3x1 m.

Site of Ken-Aral of Bakai-Ata forestry. Landing scheme 3x1 m.

For the purpose of better survival, as well as compliance with all agro technical measures for growing sea buckthorn seedlings, monthly periodic monitoring visits to the pilot sites were carried out over the next two years, especially the first months after planting the seedlings. Scientific consultations were given on the conduct of phenological observations, adjustment of irrigation, foliar dressing, treatment with growth stimulants, as well as pest and disease control.

促进生根和苗木成活。

Balykchy 林业苗圃：海拔 1642 米，位于 Balykchi 市的东部。考虑到当地恶劣的自然和气候条件，整地模式为 1.5x0.5 m。

Issyk-Kul 林业苗圃 Tegirmenty 基地：海拔 2002 米，沙棘苗木按照 3x0.5 m 定植。

May－Chunkurt－Tyup 林业苗圃：海拔 1765 米，苗木种植方案 3x1 m。

Kara-Zhal Karakol 林业苗圃：海拔 1787 米，苗木种植方案 3x1 m。

Bakai-Ata 林业苗圃 Ken-Aral 基地：苗木种植方案 3x1 米。

为了提高苗木成活，以及遵守种植沙棘幼苗的所有农业技术措施，在种植后两年内，特别是在种植沙棘幼苗后的头几个月，对试验示范点进行了每月定期监测调研，就开展物候观察、调整灌溉、树体修整、使用生长激素处理以及防治病虫害等问题进行了科学咨询协商。

Responsible persons in charge of caring for the nursery have kept logs of records of agricultural activities carried out on the site, as well as meteorological data (maximum and minimum air temperature, relative humidity, precipitation, cloudiness).

苗圃负责人保存了现场农业活动的记录，以及气象数据（最高和最低气温、相对湿度、降水量、云量）。

In the fall of 2017, we carried out an inventory of established seedlings by varieties and areas (Table 3)

2017 年秋季，我们按品种和地区对种植苗木进行了清查（表 3）。

Table 3 The number of live seedlings without prickly varieties of sea buckthorn by forestry enterprises, October 2017

表 3：2017 年 10 月林业苗圃无刺沙棘品种成活苗木数量

Forestry 林业苗圃名称	Varieties 各品种数量（株）				General Quantity, pcs. 总数（株）
	Elizaveta, pcs.	Inya, pcs.	Dzhemovaya, pcs.	Gnome, pcs.	
Chuisky	124	134	148	27	433
Bakai–Atinsky	94	63	85	9	251
Issyk–Kul	82	40	61	36	219
Balykchinsky	57	35	68	10	170
Tyup	101	87	116	28	332
Karakol	19	3	12	13	47
Total: 合计	477	362	490	123	1452

As can be seen from Table 3, the total number of sea buckthorn seedlings that have taken root by the fall is 1452 pieces, out of those planted in the spring of 2017, which is 46.23%.

从表 3 可以看出，截至秋季，已生根的沙棘幼苗共 1452 株，占 2017 年春季种植的幼苗总数的 46.23%。

For forestries, the maximum number of settled ones was noted in the Chuy forestry enterprise - 433 pcs., Then in Tyup - 332 pcs. and the most minimal - in the Karakol forestry enterprise, only 47 units. The rest of the leshozes range from 170 units. up to 251 pcs.

在林业苗圃方面，在 Chuy 林业苗圃定植的最多，433 株。然后在 Tyup 苗圃 332 株。最少的是 Karakol 林业苗圃，只有 47 个单位。其余的有 170–251 株。

The variety Elizaveta in terms of survival rate is

Elizaveta 品种的成活率最高的是在 Chuysky

maximal in the Chuysky forestry enterprise - 124 pcs., Then Tyupsky - 101 pcs. and Bakai-Atinsky - 94 pcs. They have taken root in the Karakol forestry enterprise - only 19 pieces.

林业苗圃，达到 124 株。然后是 Tyupsky 苗圃，101 株和 Bakai−Atinsky 苗圃 94 株。在 Karakol 苗圃生根的只有 19 株。

The Inya variety in terms of survival rate is maximal in the Chuy forestry enterprise - 134 pcs., Then Tyupsky - 87 pcs. and Bakai-Atinskiy - 63 units, and in Karakolkom - only 3 units.

Inya 品种的成活率是最高的是在 Chuysky 林业苗圃中，达到 134 株，然后是 Tyupsky 苗圃，87 件。Bakai−Atinskiy 苗圃有 63 株，Karakolkom 苗圃只有 3 株。

The variety Dzhemovaya did not take root badly in the Chuy forestry enterprise - 148 pcs., Then Tyupsky - 116 pcs. and Bakai-Atinskiy - 85 units, and in Karakolkom - only 12 units.

Dzhemovaya 品种在 Chuysky 林业苗圃中生根严重不良，仅有 148 株，然后是 Tyupsky 苗圃 116 株，Bakai−Atinskiy 苗圃有 85 株，Karakolkom 苗圃只有 12 株。

The male variety Gnome, according to the survival rate, is maximal in the Issyk-Kul forestry enterprise - 36 pcs., Then Tyup - 27 pcs. and Chuysk - 26 units, and in Karakolk - only 13 units.

雄株品种 Gnome 的成活率在 ssyk−Kul 林业苗圃中最大，36 个，然后 Tyup 苗圃 27 个，Chuysk 苗圃 26 株，Karakolk 苗圃只有 13 个单位。

In our opinion, the survival rate of sea buckthorn seedlings was influenced by the timing of planting - the beginning and mid-May, when the daytime air temperatures were hot, as well as the lack of preparedness in some forestry sites for planting.

我们认为，沙棘幼苗的成活率受到种植时间的影响——在 5 月初和中旬日间气温炎热，以及一些林场缺乏种植准备。

Sea buckthorn cultivation using lignified cuttings. In the early spring of 2018, we prepared cuttings for cultivation of sea buckthorn with lignified cuttings from uterine nurseries. By September 2018, the number of rooted cuttings was counted by forestries (Table 4).

硬枝插枝栽培沙棘。2018 年早春，我们用苗圃里进行了沙棘硬枝扦插栽培。截至 2018 年 9 月，按不同苗圃统计生根的插条数（表 4）。

Table 4 Results on rooting by lignified cuttings, Chui forestry enterprise
表 4：在 Chui 林业苗圃硬枝插枝生根试验结果

Varieties 品种名称	Spring planting, pcs. 扦插枝条（株）	Quantity rooted, pcs. 生根枝条数量（株）	% ratio 百分比 %
Gnome	43	7	16.27
Inya	519	125	24.08
Elizaveta	153	27	17.65
Dzhemovaya	259	52	20.08
total	974	211	21.66

In the spring of 2018, 974 lignified cuttings were cut. 10-12 cm long, which were laid for storage in wet sawdust in the basement before the onset of positive temperatures. The planting was timed to coincide with the flowering time of sea buckthorn in natural conditions. Cuttings were planted in specially prepared areas, with the introduction of organo-mineral fertilizers. Before planting, the cuttings were soaked in a root solution. During the growing season, they were regularly watered, weeded, foliar top dressing, shaded with an agro net. The results for the Chuy forestry enterprise are given in table. 4. Unfortunately, the percentage of rooted cuttings in this leshoz turned out to be low - on average 21.66%.

2018 年春天，共采集了 974 硬枝插条。插条长 10–12 厘米长，在地表升温开始前，放在地下室的湿木屑中储存。在自然条件下沙棘开花时，开展扦插种植。在特别准备的地区，种植插枝应用有机矿物肥料。在种植之前，插枝浸泡在生根溶液中。在生长季节，定期浇水、除草、叶面追肥、用农用网遮荫。Chuy 林业苗圃所得结果如遗憾的是，其扦插生根率较很低，平均为 21.66%。

Table 5 Results of rooting by lignified cuttings, Bakai–Ata forestry
表 5 Bakai–Ata 林业苗圃硬枝插枝生根效果

Varieties 品种名称	Spring planting, pcs. 扦插枝条（株）	Quantity rooted, pcs. 生根枝条数量（株）	% ratio 百分比 %
Gnome	87	80	91.95
Inya	141	114	80.85
Elizaveta	435	245	56.32
Dzhemovaya	196	153	78.06
total	859	592	68.92

In the Bakai-Ata forestry (Table 5) the percentage of rooted cuttings is generally higher than the average - 68.92% percent, with the male variety Gnom reaching 91.95%, varieties Inya and Dzhemovaya up to 78.06-80.85%.

表 5 表明，Bakkai – Ata 林场苗圃扦插生根率普遍较高，平均为 68.92%，其中雄性品种 Gnom 达到 91.95%，品种 Inya 和 Dzhemovaya 达到 78.06–80.85%。

Table 6 Results on rooting by lignified cuttings, Balykchy forestry
表 6 Balykchy 林业苗圃硬枝插枝生根效果

Varieties 品种名称	Spring planting, pcs. 扦插枝条（株）	Quantity rooted, pcs. 生根枝条数量（株）	% ratio 百分比 %
Gnome	16	11	68.75
Inya	28	18	64.29
Elizaveta	55	28	50.91
Dzhemovaya	66	56	84.85
total	165	113	68.48

In the spring of 2018, 165 pieces were planted for rooting in the Balykchy forestry cuttings. The percentage of rooted cuttings was higher than the average, on average 68.48 percent. The Dzhemovaya variety had the maximum rooting - 84.85% (Table 6).

2018 年春天，在 Balykchy 苗圃扦插了 165 株，扦插生根率高于平均水平，平均为 68.48%。Dzhemovaya 品种生根率最高，为 84.85%(见表 6)。

Table 7 Results on rooting by lignified cuttings, Tyup forestry
表 7 Tyup 林业苗圃硬枝插枝生根效果

Varieties 品种名称	Spring planting, pcs. 扦插枝条（株）	Quantity rooted, pcs. 生根枝条数量（株）	% ratio 百分比 %
Gnome	33	20	60.61
Inya	219	147	67.12
Elizaveta	219	133	60.73
Dzhemovaya	330	158	47.88
total	801	458	57.18

801 pcs were planted in Tyup forestry. cuttings in the soil specially prepared in the greenhouse. The percentage of rooted cuttings was above average - 57.18 percent. Moreover, in this leshoz, good results were obtained in feeding with organic fertilizers - Econat.

Tyup 林业苗圃扦插了 801 株。插条插在在温室内专门准备的土壤中。扦插生根率高于平均水平，达到 57.18%。此外，施用有机肥 Econat 的效果也较好。

We were also interested in the release of standard cuttings for planting in the spring of 2019. For this, we carried out calculations in sea buckthorn mother gardens for all leshozes, the results of which are shown in Table 8.

我们对 2019 年春季移栽种植合格的扦插苗也很感兴趣。为此，我们对所有沙棘品种扦插育苗情况进行了统计，结果如表 8 所示。初步计算表明，Tyup 林业苗圃可采购的合格插枝苗木数量最多，为 13104 株，然后是 Chuysky 林业苗圃，7020 株。Karakol 最少，只有 717 株。

Preliminary calculations show that the maximum number of standard cuttings can be procured in the Tyup forestry enterprise - 13104 pcs., Then in the Chuysky forestry - 7020 pcs. The least in the Karakol forestry enterprise - 717 pcs.

Table 8 The output of standard cuttings by forestry’s in assortment:
表 8 不同林业苗圃可提供合格沙棘扦插苗木产量

Forestry 林业苗圃名称	Varieties 不同品种扦插苗的数量（株）				General Quantity, pcs. 扦插苗总量（株）
	Elizaveta, pcs.	Inya, pcs.	Dzhemovaya, pcs.	Gnome, pcs.	
Chuisky	2286	2706	1701	327	7020
Bakai-Atinsky	173	816	1329	927	4845
Issyk-Kul	1836	852	1494	459	4641
Balykchinsky	1224	669	1521	414	3828
Tyup	3612	3432	4203	1857	13104
Karakol	336	24	78	279	717
Total:	11067	8499	10326	4263	34155

By varieties, the greatest output is planned for the Elizaveta variety - 11067 pcs., Then Dzhemova - 10326 pcs. and Inya - 8499 pcs. Male variety Gnome - 4263 pcs., Which corresponds to 12.48% of female cuttings.

按品种计算，Elizaveta 品种计划最大产量为 11067 株， Dzhemova – 10326 株， Inya – 8499 株。雄性品种 Gome – 4263 个，相当于雌性扦插苗的 12.48%。

At present, in accordance with the National Forest Policy of Kyrgyzstan and the Concept for the Development of Forestry, in the near future, the forestry of the republic should follow the path of integrated development. Along with the solution of the main forestry problems, the so-called “collateral use of the forest” is acquiring of wild fruits, nuts, medicinal and industrial plants. The need of medical institutions and the population of the republic for medicines at this time is covered mainly by import from abroad and is quite expensive for the population of our republic.

目前，根据吉尔吉斯斯坦国家森林政策和林业发展理念，在不久的将来，共和国林业应该走综合发展的道路。随着主要林业问题的解决，所谓的“森林综合利用”就是获取天然果实、坚果、药用植物和工业应用植物。当前，国民和医疗机构对药品的需求主要通过从国外进口来满足，对我国人口来说，药品相当昂贵。

The success of the business in this area will largely depend on the education of the local population, which will be engaged in the cultivation, collection and processing of sea buckthorn raw materials.

该地区商业的成功很大程度上取决于当地居民的教育，他们将从事沙棘原料的种植、采集和加工。

The potential for the development of small and medium-sized businesses in the regions is the rational use, conservation and cultivation of promising varieties for the development of the processing and medical industry, which will contribute to the creation of new jobs in the field and raise the prestige of farms and peasant farms in the republic.

本地区中小企业的发展潜力在于合理使用、为加工和医疗行业的发展培养有前途的沙棘品种，这将有助于创造新的就业岗位，提高农场信誉和共和国农民的农场水平。

Literature:

1. Trofimov T.T. Sea buckthorn in culture. - M.: Publishing house of Moscow State University, 1976.-- 223 pp.

2. Bazhetskaya A.A. Fruiting of sea buckthorn in nature and culture (Chuy valley) // Sea buckthorn. - Frunze: "Ilim", 1983. – pp.45-58.

3. Malena T.V. Formal diversity of sea buckthorn in the Issyk-Kul depression // Sea buckthorn. - Frunze: "Ilim", 1983. – pp. 36-40.

4. Panteleeva E.I. Sea buckthorn (Hippophae rhamnoides L.). - Barnaul, 2006 - 249 pp.

5. Altymyshev A.A. Gorelkina O.I. Sea buckthorn // Sea buckthorn. - Frunze: "Ilim", 1983. – pp. 3-5.

6. Efendiev M.G. Press oil from waste products of sea buckthorn juice // Sea buckthorn. - Frunze: "Ilim", 1983. - pp. 23-26.

7. Aimukhamedova G.B. and others. Pectin substances of sea buckthorn // Sea buckthorn. - Frunze: "Ilim", 1983. - pp. 30-33.

8. Lykova R.V., Chigireva E.A. Influence of some factors on the chemical composition of sea buckthorn fruits // Sea buckthorn. - Frunze: "Ilim", 1983. - pp. 13-19.

9. Shalpykov K.T., Asanbaev A.M. Recommendations on the technology of reproduction and cultivation of sea buckthorn (Hippophae rhamnoides L.) in the conditions of Kyrgyzstan. - Bishkek, 2011 - 36 pp.

参考文献

1. Trofimov T.T. 沙棘栽培，M: 莫斯科国立大学出版社，1976 . p.223 页。

2. Bazhetskaya A.A，Chuy 河谷自然和栽培状态下的沙棘果实 // 沙棘 , Frunze: Ilim，1983 年，—pp.45–58。

3. Malena T.V，Issyk–Kul 洼地沙棘形态多样性 // 沙棘 , Frunze: Ilim，1983 年 , pp.36–40 页。

4. Panteleeva E.I., 沙棘 , Barnaul, pp.2006 – 249 页

5. Altymyshev A.A. Gorelkina O.I. 沙棘 // 沙棘 , Frunze: Ilim，1983 年 , pp.3 – 5。

6. Efendiev M.G., 从沙棘汁加工的废料中榨油 // 沙棘，Frunze: Ilim，1983 年，p. 23 页。

7. Aimukhamedova G.B. 等， 沙 棘 的 果 胶 物 质 // 沙 棘，Frunze: Ilim，1983 年，pp.30–33 页。

8. Lykova R.V., Chigireva E.A., 对沙棘果实化学成分的影响因素 // 沙棘，Frunze: Ilim，1983 年，pp.13 – 19 页。

9. Shalpykov K.T., Asanbaev A.M., 吉尔吉斯斯坦条件下沙棘繁殖与栽培技术建议，比什凯克，2011，p. 36 页

10. Sarymsakov Z.Kh. Sea buckthorn in southern Kyrgyzstan (issues of phytocenology, form diversity, resources, protection and use). - Jalal-Abad, 2004 .-- 130 pp.

10. Sarymsakov Z.Kh.，吉尔吉斯斯坦南部沙棘植物群落学、形态多样性、资源、保护与利用问题，贾拉拉巴德，2004 年，p.130 页

11. Tkachenko V.I., Andreichenko L.M. Once again about sea buckthorn // Introduction and acclimatization of plants in Kyrgyzstan. - Bishkek: Ilim, 1996 .-- pp. 65-67.

11. Tkachenko V.I.，Andreichenko L.M.，再谈沙棘 // 吉尔吉斯斯坦植物的引种与驯化，比什凯克，Ilim，1996， pp. 65−67 页。

12. Zhumadylov A.T. Floodplain forests of sea buckthorn in the Issyk-Kul region // Introduction, conservation of biodiversity and use of plants. - Bishkek, 2010. - pp. 101–109.

12. Zhumadylov A.T.，Issyk−Kul 地区冲积平原的沙棘林 // 生物多样性保护和植物利用，比什凯克，2010，pp. 101 − 109 页。

Photo1: Fruits of cultivated Altai varieties of sea buckthorn grown in Kyrgyzstan and fruits of wild forms.
照片 1：生长在吉尔吉斯斯坦果实栽培的阿尔泰品种沙棘和野生状态沙棘的果实比较

Photo2：Green cuttings of seabuckthorn in a container and in the ground in a greenhouse with automated water spraying。

照片 2：全光喷雾温室大棚中沙棘嫩枝容器扦插育苗和大条扦插育苗

Photo3: Harvesting lignified blackberries and seabuckthorn mother plant.

照片 3：从黑莓和沙棘母株上采集硬枝插条

6. Country Report of Latvia

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Country Report of Seabuckthorn Development of LATVIA in 2020
2020 年拉脱维亚沙棘发展报告

The total area of seabuckthorn plantations in Latvia in 2020 was about 850 ha, 130 ha of them have been certified as organic. The total production of seabuckthorn fruits in Latvia in 2020 was about 400 tons, as most of the fruits still have been damaged by seabuckthorn fly Rhagoletis batawa.

Compared to 2019, in 2020 the development rates of seabuckthorn culture have decreased. This was due to the uncertain situation in the fight against flies. The only insecticide that Latvian sea buckthorn growers and the State Plant Protection Service managed to certify in 2019 was banned in the European Union in 2020. No one could say whether an alternative would be available in the future or not. And if yes, no one knows, for how long it would stay unbanned. As you might know, the European Union is currently implementing a so-called 'green course', banning many conventional pesticides, most of which have no organic alternatives. If they are, however, they are not effective enough to be used in commercial agriculture. This is also the case with sea buckthorn in Latvia, as the certified organic pesticide TRACER provides only 50% protection against flies. This may be enough for hobby growers, but for commercial growers it not only does not make a profit, but brings losses.

Therefore, the main focus in Latvia is on the fight against seabuckthorn flies, as the extent of their damage threatens the continuation of sea buckthorn growing not only in Latvia, but in all Baltic countries. Actually the situation in other Baltic States is even worse, as in Lithuania and Estonia due to weaker lobbies there are no allowed sea buckthorn fly insecticides at all.

This critical situation has been reported to the ISA Board and Scientific Council in the past, but there

到 2020 年，拉脱维亚共有沙棘种植面积约为 850 公顷，其中 130 公顷已获得有机认证。拉脱维亚 2020 年沙棘鲜果总产量约为 400 吨，大部分果实仍受到沙棘蝇的破坏。

与 2019 年相比，2020 年沙棘栽培的发展速度有所下降，这是由于在抵御沙棘蝇的交锋中不确定的情况所致。拉脱维亚沙棘种植者和国家植物保护署在 2019 年设法认证的唯一一种杀虫剂在 2020 年被欧盟禁用。没有人能说将来是否会有另一种替代杀虫剂。如果是的话，没人知道它能禁用多久。你可能知道，欧盟目前正在实施一项所谓的“绿色进程”，禁止许多传统的农药，其中大多数没有有机替代品。然而，如果它们是有机产品，它们就不足以有效地用于商业农业杀虫中。拉脱维亚的沙棘也是如此，因为经过认证的有机农药 TRACER“示踪剂”只能提供 50% 的防蝇保护效果。这对业余的沙棘种植者来说可能足够了，但对商业种植者来说，这不仅不赚钱，而且会带来损失。

因此，拉脱维亚的主要重点是防治沙棘蝇，因为它们的破坏程度不仅威胁到拉脱维亚，而且威胁到所有波罗的海国家沙棘的持续增长。实际上，其他波罗的海国家的情况更糟，如立陶宛和爱沙尼亚，由于其游说团体的力量减弱，根本不允许使用沙棘蝇杀虫剂。先前我们曾向国际沙棘协会理事会和技术委员会报告过这种

is still no solution.

First attempts to limit the damage by alternative organic methods have been taking place in Latvia privately. The first results will be presented at the EuroWorkS-OnAir-3 on 23.11.2021. It is planned to continue these researches at the Latvia University of Agriculture.

Projects on various topics related to sea buckthorn have been started in Latvian scientific institutions:

- "Processing of sea buckthorn vegetative biomass biorefining";

- "Development of an insecticide application plan in accordance with the principles of organic farming Rhagoletis sea buckthorn is ready for containment in sea buckthorn plantations in order to increase the quality of organically grown sea buckthorn crops";

- "Comparing Vital Capitals: An anthropological analysis of the global value chains of sea buckthorn and raspberries".

Within the framework of scientific research, in cooperation with the entrepreneur, a project on oil extraction technologies from various components of sea buckthorn berries has been completed. The results of the study on the chemical composition of oils are summarized in a scientific manuscript submitted for publication in an internationally cited journal.

The funding attracted by the Latvian Investment and Development Agency has been used to launch a cooperation project in which innovative products based on sea buckthorn berries are being developed. At the request of the entrepreneur, work is being done on the development of various sea buckthorn shots, the study of changes in the chemical composition of products during storage in various packages.

危急情况，但目前仍然没有解决办法。

拉脱维亚私下里首次尝试用其他有机方法来限制损害。首批结果将于 2021 年 11 月 23 日在 EuroWorkS-OnAir-3 上公布。计划在拉脱维亚农业大学继续这些研究。

拉脱维亚各科学机构已开始进行与沙棘有关的各种专题项目：

1.“沙棘植物生物量生物炼制加工”；

2.“根据有机种植原则制定一项杀虫剂施用计划，以便在沙棘种植园遏制沙棘蝇，以提高有机种植沙棘作物的质量”；

3.“比较重要的资本：沙棘和覆盆子全球价值链的人类学分析”。

在科学研究的框架内，与企业家合作，完成了一个关于从沙棘浆果的各种成分中提取沙棘油技术的项目。对沙棘油脂化学成分的研究结果已经在一份科学手稿中进行了总结，该手稿已提交国际引用期刊发表。

拉脱维亚投资和开发署所吸引的资金已用于发起一个合作项目，正在开发以沙棘浆果为原料的创新产品。应企业家的要求，人们正在开发各种沙棘丸，研究产品在储存过程中、不同包装的化学成分变化。

Participation in EuroWorkS-OnAir-3 on 23.11.2021 is planned to inform the public about the performed scientific research. New interesting sea buckthorn product is available on the market. (https://www.facebook.com/satori.alfa/photos/a.1397059090602269/2569862539988579/?type=3)

我们计划于 2021 年 11 月 23 日参加欧洲沙棘线上交流会议 EuroWorkS-OnAir-3，向公众通报已完成的科学研究。沙棘新产品可以通过以下链接的线上市场购买。

(https://www.facebook.com/satori.alfa/photos/a.1397059090602269/2569862539988579/?type=3)

Seabuckthorn Plantation, Variety Mary
沙棘种植园（拉脱维亚沙棘品种 Mary）

Seabuckthorn Nursery
沙棘苗圃

7. Country Report of Pakistan

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Seabuckthorn Research and Development in Pakistan in 2020
2020 年度巴基斯坦沙棘研究与开发报告

一 Seabuckthorn in Pakistan in 2020 Distribution 沙棘资源分布

Seabuckthorn is distributed throughout Gilgit Baltistan & Chitral (GBC) with 5700 hectares of natural populations. In Pakistan, it is mostly found in Gilgit, Ghizar, Ganche, Astore, Skardu, shigar valley and Hunza with most of the locations consisting of patches of Seabuckthorn thickets away from residential areas, used and harvested to only a limited extent about (285 ha; ~5%). There is not a single Seabuckthorn orchard established on commercial scale in Pakistan. The naturally occurring populations are found on river belts, mountains and roadsides in Gilgit, Hunza, and Baltistan. There is only one subspecies of Sea buckthorn i.e Turkestanica reported in Pakistan. There was an introduction of Chinese genotype Sinences in very small areas of Baltistan but it has no significant area and yield to report. However this variety has been established in Rawalakot, Azad Jammu and Kashmir on experimental stage. There is not an increase in Seabuckthorn cultivation area for the year 2019 in Pakistan.

在巴基斯坦，沙棘天然林分布 Gilgit Baltistan & Chitral (GBC) 地区，总面积 5700 公顷。通常分布在 Gilgit, Ghizar, Ganche, Astore, Skardu, Shigar, Hunza 的河谷地区，大多呈块状灌丛分布，因远离居民区，其采收利用的面积很有限，只有 5%（258 公顷）。目前，巴基斯坦还没有商业意义上的沙棘种植园。文献报道中唯一的天然沙棘林种群中亚沙棘亚种分布在 Gilgit, Hunza, and Baltistan 地区的河边、路边和山区。在 Baltistan 地区小面积引种过中国沙棘亚种（类型），但是，也没有沙棘产量和推广的有关报道，该植物材料在 Rawalakot, Azad Jammu and Kashmir（查谟与克什米尔）地区处于试验阶段。2019 年，巴基斯坦没有新增沙棘种植面积。

Fig–1 (a) and (b) Seabuckthorn is found in Gilgit Baltistan and main areas of Sea buckthorn populations in Gilgit Baltistan

图 1–（a）、(b)： 沙棘种群在巴基斯坦 Gilgit Baltistan 的主要分布区

二 Berry Yield 沙棘果实产量

The annual production of fresh berries has been estimated 3000 tons for the year 2019. However there are many wild forests of Sea buckthorn which are still unexplored and data has not been recorded from such wild populations established in distant areas of Karakorum Mountains. There was 800 tons harvested for the year 2019 from Northern Areas of Pakistan. The rest of plant populations are not harvested due to lesser market value, non availability of market, laborious harvesting methods, lack of training and storage of berries.

据估计，2019 年巴基斯坦沙棘鲜果总产量约 3000 吨。但是，由于许多野生沙棘资源未被利用，该数据不包括地处喀喇昆仑山区的野山沙棘。2019 年，在巴基斯坦北部地区，采收了 800 吨，其余的因为市场价格低、或远离市场、人工采收方法不当、缺乏技术培训和保鲜条件等原因，没有采收。

Fig: 2 (a) and (b) Seabuckthorn plant populations and fruit in Northern areas of Pakistan. (Shah, 2005).
图 2- (a)、(b)： 在巴基斯坦北部地区的沙棘种群和果实 (Shah, 2005 年)

三 Genetic Resources 沙棘种质资源

Multiple studies have provided the evidence of significant genetic diversity among the Sea

基于其形态学、生物化学和分子水平的许多研究表明，巴基斯坦的沙棘种群具有重要的

buckthorn plantations in Pakistan. This genetic diversity has been reported on the basis of morphological, biochemical and molecular level (Shah et al., 2007, 2009), (Nawaz et al., 2018). Since there is no commercial variety available and recorded information about the establishment of Sea buckthorn as crop in these areas, the genetic diversity has been sustained and conserved in these natural populations. It has been observed that genotypes vary in berry size, color, plant height, leaves shape and size etc. The biochemical contents in berries and leaves vary among the plant populations. The AFLPs study (Shah et al., 2009) revealed that geographic distance had least impact on genetic diversity of Sea buckthorn plant populations.

遗传资源多样性 (Shah et al., 2007, 2009), (Nawaz et al., 2018)。由于缺乏商业栽培沙棘品种和建立沙棘作经济作物种植园的有关资料，这些沙棘遗传资源尚在自然状态之中。通过“扩增片段长度多样式”（AFLPs）研究 (Shah et al., 2009) 表明，地理因素对巴基斯坦的沙棘植物种群遗传资源多样性影响甚微。

Fig: 3 (a) and (b) Turkestanica berries from Skardu and plantation of UK genotype in AJK (Pictures provided by Dr. Asad Hussain Shah)

图 3–（a）、(b)：Skardu 地区的中亚沙棘和在 AJK 地区人工种植来自英国的沙棘

However the nutritional value increased or decreased with the variation of altitudes and areas. This biochemical diversity can be based on environmental factors. There is another Chinese species Sinences with negligible plant populations in Skardu and Rawalakot, Azad Jammu and Kashmir. There are 300-500 plants at Rawalakot with moderate fruit set.

沙棘的营养成分随分布区的海拔变化而变化，其生物化学多样性因环境因素决定。在 Skardu and Rawalakot, Azad Jammu and Kashmir 地区种植一小块的中国沙棘（亚种），其中，在 Rawalakot 地区有 300–500 株，结实状况适中。

Fig: 4 (a) and (b)Subspecies Sinences being propagated through seeds and cuttings at Rawalakot (Asad Shah)

图 4–(a)、 (b)： 在 Rawalakot 地区中国沙棘（亚种）种子繁殖和扦插繁殖育苗

The Subspecies Sinensis was brought from China in late 1990s in a project run by Ministry of National Food Security and Research. The plant populations and nursery was developed at Muree Pataryata area of Northern Rawalpindi but unfortunately the plant populations could not be maintained. Sea buckthorn Turkestanica was transported from Skardu and 5000 plants were planted in Rawalakot and Baloch areas of AJK by University of Poonch and local NGO Sukhi Development Foundation. Unfortunately the plants did not survive. A small plant population of Sea buckthorn was established in Baloch Azad Jammu and Kashmir from UK's Sea buckthorn seeds by Department of Biotechnology, University of Kotli Azad Jammu and Kashmir. However this population was burnt in forest fire and there is not a single plant survived of this variety. Our research group working on Sea buckthorn at University of Kotli Azad Jammu and Kashmir has planted few Sea buckthorn plants from United Kingdom at Rawalakot area and plants are showing promising growth. It has been planned to propagate these plants through soft and hard wood cuttings during late July and in December respectively. The multiplied plants will be planted at Tolipir and Nakyal areas of AJK in near future.

In addition a research group has been engaged to develop Sea buckthorn products from oil, pulp and berry powder.

中国沙棘（亚种）是 1990 年代通过巴基斯坦粮食安全与研究部实施项目引进的，当时的沙棘种群和苗圃建在拉瓦尔品第 Rawalpindi 北部的 Muree Pataryata 地区。很遗憾的是，这些种群没有保存下来。中亚沙棘（亚种）移栽到了 Skardu 地区，其中 5000 株由 Poonch 大学和当地的非政府组织 Sukhi 发展基金会种植在 AJK 的 Rawalakot 和 Baloch 地区，很可惜，也没有存活下来。Kotli Azad Jammu and Kashmir 大学生物技术系在 Baloch Azad Jammu and Kashmir 建立了小规模来自英国的沙棘种群，可惜被一场森林大火烧得一株不留。我们 Kotli Azad Jammu and Kashmir 大学生物技术系的沙棘研究团队在 Rawalakot 地区建立了小规模来自英国的沙棘种群，植株长势良好。我们计划在 7 月和 12 月通过嫩枝和硬枝扦插繁殖苗木。这些苗木将分别栽种在 AJK 的 Tolipir 和 Nakyal 地区。

此外，一个研究团队在开展沙棘油、果肉、果粉等产品的研究与开发。


Fig:5 (a) and (b) Seabuckthorn sub species sinences bearing fruit at Rawalakot and collection of leaves from Sinences plant population at Rawalakot for analysis.
(Pictures courtesy of Dr. Asad Hussain Shah
图 5 –(a) and (b)：中国沙棘亚种在 Rawalakot 地区结实情况和采集中国沙棘叶片做分析。

四 Breeding of Seabuckthorn in Pakistan 沙棘育种

There have been few proposals submitted to Pakistan Science Foundation and Higher Education Commission by Department of Biotechnology, University of Kotli Azad Jammu and Kashmir however the proposals have not been funded. The basic study to characterize the genotypes on the basis of morphological, nutritional and molecular markers has been made and germplasm for breeding local Seabuckthorn genotypes has been selected. This gene pool needs to be used for cultivar development soon.

It can be concluded that there is not a single project being carried out on Sea buckthorn breeding.

Kotli Azad Jammu and Kashmir 大学生物技术系曾经向巴基斯坦科学基金会和高等教育委员会申报过项目，但是没有获得经费资助。已经开展的基础研究包括基于形态学、营养学和分子标记的基因型特征，以及以选育当地沙棘品种为目标的种子资源。这一基因库需要很快应用于培育沙棘新品种。

总之，巴基斯坦还没有开展沙棘育种项目。

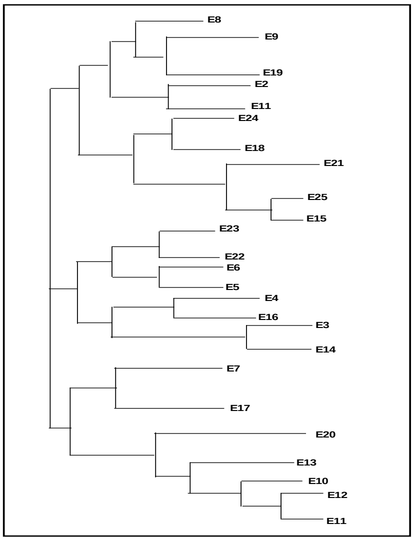

Fig: 6 (a) and (b) Dendrogramic representation of Seabuckthorn Germplasm from Pakistan Using AFLP(Shah et al., 2009) and Seabuckthorn micropropagation in University of Kotli AJK.

图 6–(a)、(b)：利用 AFLP 分析巴基斯坦沙棘种子资源的树状图及 Kotli AJK 大学开展的沙棘微繁殖。

五 Seabuckthorn Annual harvest and Market 沙棘年产量及市场

In Asia, with 740,000 ha (wild collection) and 300,000 ha (cultivated), China is the leading producer and exporter; a total annual yield of about 8.5 million t has been reported to lead to revenues of 1.43 billion US$ (Ecue et al.,2011). Mongolia is the second leading producer with 13,500 ha (wild collection) and 6000 ha (cultivated) leading to an annual yield of between 1200–1600 t earning 5 million US$ (Bartish et al., 1999,2000). In India, the species is only marginally utilized with 13,000 ha (wild collection) and a total annual yield of 600 t (Raun 2004). Pakistan in contrast harvests a comparatively low share on approximately 5700 ha harboring an estimated 12 million individuals. These populations are mainly concentrated in the northern region of Gilgit-Baltistan where most of this area consists of patches of sea buckthorn thickets away from residential areas, used and harvested to only

据报道，在亚洲有野生沙棘资源 74 万公顷、人工种植 30 万公顷（译者注：原文有误）。其中，中国是沙棘生产与出口的领先国家，每年产量约 850 万吨（译者注：原文有误。截止 2019 年，中国的沙棘果实年产量约 10 万吨），产值约 14.3 亿美元 (Ecue et al.,2011)。蒙古国紧随其后，由天然沙棘资源 13500 公顷和人工栽培 6000 公顷，年产沙棘果 1200–1600 吨，产值 500 万美元 (Bartish et al., 1999,2000)。在印度，13000 公顷天然沙棘资源只是少部分得到利用，年产沙棘果 600 吨 (Raun 2004)。相比在巴基斯坦，沙棘果实采收比例较低，大约总的资源面积 5700 公

a limited extent (about 285 ha; ~5%; (Rongsen Lu, 1992).The total berry production per anum is 2500 tons and annual harvest is 800-1000 ton. The annual business is estimated 80 million rupees or 0.5 million US dollars which is very less to its business potential. However due to awareness campaigns by local and international NGOs the export of dry berries has been increased from 500 tons to 750 tons in the year 2019. The reasons for this low use are manifold: First, the utilization as a food crop seems to be rather recent as it is unknown to the traditional local cuisine. Second, the thorny nature of the plants makes easy harvest within the stand thickets difficult. Third, alternating bearing behavior prevents a reliable annual yield; this may be partly related to the effects of harsh environmental conditions. Fourth, there are areas with a high share of male plants that do not bear fruits at all, though they are important reservoirs of genetic diversity. Fifth, fruit sale revenues are generally low due to the oligopoly of a few middlemen and for value added products due to low customer demand. Sixth, knowledge on suitable stand management as well as harvesting and post-harvesting practices are lacking on a broad scale, though some training units are offered by non-government organizations (NGOs) and extension services.

Apart from the limited use of berries in Gilgit-Baltistan, harvesting and handling techniques also differ significantly among villages. Sophisticated harvesting and handling techniques have been rather recently introduced and promoted by local NGOs, foremost the Agha Khan Rural Support Program (AKRSP) In conclusion the reported and expected annual production is approximately 2500 tons with only 800 tons are used for drying the berries for export and making products like jams, juices, pulp, restaurant cuisines etc on small scale. There are few local small enterprises named, Pak Sea buckthorn International, Hunza Organic, Pakistan Hunza Sea buckthorn Enterprises limited, Sea buckthorn berry Islamabad, Awan nutraceuticals, Munawwar Enterprises Lahore and few more with limited aspect of Sea buckthorn business.

顷、1200 万株沙棘。这些资源主要集中分布在 Gilgit-Baltistan 北部地区，大多呈块状灌丛分布，因远离居民区，其采收利用面积只有 5%（258 公顷）(Rongsen Lu, 1992)。每年鲜果产量约 2500 吨，实际采收量 800-1000 吨，年产值约 8000 万卢比（约合 50 万美元），远低于其潜在商业价值。得益于当地和国际非政府机构的大力宣传，2019 年沙棘干果出口由 500 吨增长为 750 吨。造成目前沙棘资源利用率的原因是多方面的，第一是由于对沙棘的传统食用价值认识不足，作为粮食作物应用只是近期的事。第二，沙棘刺多，进入沙棘块状林采果困难。第三，也许因为部分受恶劣生长环境影响，沙棘结果大小年现象造成年产量不稳定。第四，一些的区域雄株所占比例过高，尽管雄株是沙棘遗传多样性的重要组成。第五，因市场需求不旺盛，一些中间商市场垄断导致沙棘果及附加值产品的销售收入普遍较低。第六，尽管一些非政府组织和推广服务机构提供有关培训，仍然缺乏实用的沙棘林管理知识，采收加工规模不大。

除了 Gilgit-Baltistan 地区沙棘果实的有限利用，在不同乡村的沙棘采收和处理方法也天差地别。最近，由“阿加汗乡村扶持计划”Agha Khan Rural Support Program (AKRSP) 等非政府机构引进和推广了沙棘采收和处理技术。总之，有报道和预计的巴基斯坦每年沙棘果实总产量大约为 2500 吨，只有 800 吨用于加工成干果出口，或小规模加工成果酱、果汁、果浆和餐饮食品等产品。以下是巴基斯坦的几家小规模的沙棘企业：Pak 国际沙棘公司、Hunza 有机食品公司、巴基斯坦 Hunza 沙棘有限公司、伊斯兰堡沙棘果公司、 Awan 营养品公司、拉合尔 Munawwar 公司等。

Figure:7 Sea buckthorn plant population in Skardu

图 7：生长在 Skardu 地区的沙棘

Figure 8. Different harvesting and drying methods and their effects on seabuckthorn berry quality during 2017－2018 in Gilgit–Baltistan, Pakistan. (a) Simple, non–standardized harvesting tools including a wooden stick and a plastic bag; (b) threshing of seabuckthorn berries from semi–dried branches cut prior and transported home; (c) spread of berries on the roof of a house; cloth between clay surface and berries reduces contamination by foreign particles; (d) spread of berries on concrete floor in an experimental green house; (e) physical quality reduction through browning and dust particles; (f) rancidness of seabuckthorn berries (black spots) due to improper storage. (Nawaz et al., 2020)

图 8： 2017－2018 年在巴基斯坦 Gilgit–Baltistan 地区不同采收和干燥方法对沙棘果实质量的影响 。(a) 简单、非标准化采收工具：木棍敲打加塑料袋包装；(b) 剪枝、运回家中后，从半干果枝脱粒；(c) 在水泥屋顶铺垫布，晾晒沙棘果实，减少外部杂物污染； (d) 在试验日光温室水泥地面晾晒沙棘果实；(e) 通过风吹除尘提高沙棘果实物理品质； (f) 因储存不当导致沙棘果实腐败（黑斑）。

六 Seabuckthorn Products in Pakistan 巴基斯坦沙棘产品介绍

Sea buckthorn in Pakistan has not been exploited to its potential in Pakistan. However few of the products being used in local and national market are as follows.

- Seabuckthorn pure pulp: The pure pulp extracted by Pak Sea buckthorn International and Mountain Areas Farmers Organization in Gilgit Baltistan is sown in local and national market. This pulp is diluted in water and used as drink in Pakistan.

- Seabuckthorn Seeds: Sea buckthorn seeds are dried and sold for extraction of oil in Pakistan,

- Seabuckhorn Jam: The berry juice is used to make Sea buckthorn jam being used in local market and tourists also purchase the local products but still there is no utilization of Sea buckthorn Jam on national level in Pakistan.

- Seabuckthorn Oil; The crude oil extracted from Sea buckthorn berries and seeds is packed and sold in local and national market.

- Seabuckthorn Tea: This tea is made from Sea buckthorn leaves and sold in local market.

- Seabuckthorn dried berries: Sun or air dried berries are exported from Pakistan. There were 20 containers of dried berries exported from Pakistan in the year 2019.

- Seabuckhorn Juice Powder:

尽管巴基斯坦的沙棘资源优势尚未开发出来，还是生产了以下沙棘制品推向当地和全国市场。

- 沙棘原浆：Pak 沙棘国际公司和 Gilgit Baltistan 山区农民组织开发，深受当地和全国市场欢迎。沙棘原浆兑水后作为饮料。

- 沙棘种子：干燥后售卖给沙棘油加工企业。

- 沙棘果酱：沙棘果加工成果汁、果酱在当地市场销售，或卖给游客。目前，还没有巴基斯坦全国范围的产品。

- 沙棘油：从沙棘种子和果实中初步提取的毛油，包装后在当地和巴基斯坦国内市场销售。

- 沙棘茶：沙棘叶制成沙棘茶后在当地销售。

- 沙棘干果：通过阳光或空气干燥的沙棘干果出口到其他国家。2019 年，巴基斯坦共出口 20 个标准集装箱的沙棘干果。

- 沙棘果粉：

Figure: 9. Seabuckthorn products developed in Pakistan

图 9：巴基斯坦开发的沙棘产品

七 Seabuckthorn Research in Pakistan 沙棘研究

7.1 Institutes working on Seabuckthorn:

There are no specific institutes for exclusive research on Sea buckthorn in Pakistan. University of Kotli Azad Jammu and Kashmir has been working on medicinal and edible aspects of Sea buckthorn.

7.1 巴基斯坦从事沙棘研究的机构

目前，巴基斯坦没有专门完全从事沙棘研究的机构。Kotli Azad Jammu and Kashmir 大学在从事沙棘药用和食品研发工作。

7.2 Scientists working on Seabuckthorn in Pakistan.

7.2.1 Dr. Asad Hussain Shah, Associate Professor, Department of Biotechnology, University of Kotli Azad Jammu and Kashmir

Dr. Asad Hussain Shah has been working on Sea buckthorn from last 17 years and earned his Ph.D on Sea buckthorn research with the title of “Genetic Characterization of Sea buckthorn (Hippophae rhamnoides Ssp turkestanica) genotypes from Northern Areas of Pakistan in relation to valuable Biochemical Constitutes”

Publications: Dr. Shah has published more than 10 research papers on Sea buckthorn research on multiple areas of research ranging from genetic, biochemical, molecular, environmental and health aspects. The research has been based in following main areas.

A-1- Quite recently a project has been started to develop Silver Nano-particles from Sea buckthorn pulp and leaves to be used against bacterial infections including Tuberculosis. The nano particles have been developed and trials for tests are to be started in few days.

7.2 巴基斯坦从事沙棘研究的专家

7.2.1 Asad Hussain Shah 博士 , Kotli Azad Jammu and Kashmir 大学生物技术系副教授

Asad Hussain Shah 博士从事沙棘研究 17 年，并以沙棘研究论文“巴基斯坦北部地区中亚沙棘遗传特性及基因型与其珍贵生物化学组分关系研究”（Genetic Characterization of Sea buckthorn (Hippophae rhamnoides ssp turkestanica) genotypes from Northern Areas of Pakistan in relation to valuable Biochemical Constitutes）获得博士学位。

A– 他的主要研究领域

Shah 博士已经发表了 10 多篇有关沙棘研究的论文，涉及遗传学、生物化学、分子学、环境与健康等，重点领域包括：

A–1– 近期将启动开展沙棘果肉和叶片中纳米微粒应用于防治肺结核的研究项目。

A-2- Genetic Characterization of Sea buckthorn using Morphological, Biochemical and Molecular Markers

A-3- Nutritional Profiling of Sea buckthorn Genotypes from Pakistan.

A-4- Genetic improvement experimentation for New Sea buckthorn Cultivar in Pakistan and isolation of Vitamin C and Iron genes from Sea buckthorn for biofortification of Cereals.

A-5- Anti oxidants, anti coagulant and anti diabetic potential of Sea buckthorn pulp and leaves.

A-6- Effect of Sea buckthorn on brain disorders with collaboration in University of Karachi, Pakistan.

A-7- Optimizing and Developing Sea buckthorn Products in AJK.

A-8- Introduction of Germplasm from UK and China and broadening the genetic base to evolve cultivars.

A-9- Creating awareness using electronic and print media in masses and governmental organizations.

A-10- Establishing Sea buckthorn in barren and steep slopes of Azad Jammu and Kashmir

A-11- Micropropagation of Sea buckthorn for somacolonal variations in Sea buckthorn.

In addition He has visited UK twice for developing collaborative research projects on Sea buckthorn and developed international linkages with University of Sussex, Aberstywth University, TARRC UK and Dalian National Universities of China
Few publications are mentioned below:

B-1- Biochemical and nutritional evaluations of sea buckthorn (hyppophae rhamnoides L. Spp.

A−2− 利用形态学、生物化学和分子标记分析沙棘遗传特性。

A−3− 巴基斯坦沙棘基因类型的营养成分分析。

A−4− 巴基斯坦沙棘优良类型遗传改良试验和沙棘维生素、铁基因分离及强化谷物。

A−5− 沙棘果和沙棘叶的抗氧化、抗凝结、抗糖尿病潜力研究。

A−6− 与巴基斯坦卡拉奇大学合作研究沙棘对大脑疾病的效果。

A−7− AJK 地区沙棘产品研发与优化。

A−8− 从英国和中国引进沙棘种子资源，扩大遗传基础，培育沙棘新品种。

A−9− 通过政府组织和电子、纸质媒介大规模宣传沙棘知识。

A−10− 在 Azad Jammu and Kashmir 地区进行荒山沙棘造林。

A−11− 利用沙棘体细胞群体变异进行沙棘微繁殖。

B− 他发表的部分论文

B−1− 巴基斯坦不同分布区中亚沙棘的生物化学和营养学评价 , Pak. J. Bot 39 (6), 2059−2065

Turkestanica) from different locations of Pakistan lPak. J. Bot 39 (6), 2059-2065

B-2- Evaluation of phylogenetic relationship among Sea Buckthorn (Hippophae rhamnoides L spp. turkestanica) wild ecotypes from Pakistan using amplified fragment length polymorphism …
Pak J Bot 41 (5), 2419-2426

B-3- Chemical and nutritional constituents of sea buckthorn (Hippophae rhamnoides ssp. turkestanica) berries from Pakistan Italian journal of food science 17 (4), 455

B-4- Oral supplementation of Sea buckthorn (Hippophae rhamnoides L. Spp. Turkestanica) fruit extract modifies haloperidol induced behavioral deficits and increases brain serotonin. Journal of Food and Drug Analysis 17 (4), 257-263

B-5- Determination of optimum harvesting time for Vitamin C, oil and mineral elements in berries sea buckthorn (Hippophae rhamnoides) Pak J Bot 42 (5), 3561-3568

B-6- Evaluation of antidepressant-like effects of aqueous extract of sea buckthorn (Hippophae rhamnoides L. ssp. turkestanica) fruits in experimental models of depression
Pak. J. Bot 43 (3), 1595-1599

B-7- Possible anxiolytic profile of aqueous fruit extracts of a medicinal plant sea buckthorn (Hippophae Rhamnoides L. spp. Turkestanica) in experimental models
F Batool, AH Shah, SD Ahmed, ZS Saify, DJ Haleem
Pakistan Journal of Botany 41 (6), 2791-2800

B-8- Protective effects of aqueous fruit extract from Sea Buckthorn (Hippophae rhamnoides L. Spp. Turkestanica) on haloperidol-induced orofacial dyskinesia and neuronal alterations …
F Batool, AH Shah, SD Ahmed, ZS Saify, DJ Haleem

B-2- 应用扩增片段长度多态性（AFLP）方法对巴基斯坦中亚沙棘不同自然生态型的系统繁育相关性评价，Pak J Bot 41 (5), 2419-2426

B-3- 巴基斯坦中亚沙棘果实化学和营养成分分析，Italian journal of food science 17 (4), 455

B-4- 口服中亚沙棘果实提取物减轻氟轻哌啶醇（haloperidol）诱发功能缺失、提高大脑血清素（5-羟色胺 serotonin）研究，Journal of Food and Drug Analysis 17 (4), 257-263

B-5- 基于维生素 C、油和微量元素含量的沙棘果实采摘时间优化，Pak J Bot 42 (5), 3561-3568

B-6- 中亚沙棘果实水溶性提取物抗抑郁效果实验模型研究，Pak. J. Bot 43 (3), 1595-1599

B-7- 中亚沙棘果实水溶性提取物的抗焦虑实验模型研究，Pakistan Journal of Botany 41 (6), 2791-2800

B-8- 中亚沙棘果实水溶性提取物对氟轻哌啶醇（haloperidol）诱发运动障碍和神经元改变 (orofacial dyskinesia and neuronal alterations) 的保护作用研究，Medical

Medical Science Monitor 16 (8), BR285-BR292

B-9- Molecular cloning and transcript profiling of ascorbate oxidase gene at different growth development stages from therapeutically important plant Sea buckthorn Hippophae rhamnides Pak. J. Bot 49 (3), 1143-1154

7-2-2. Dr. Syed Dilnawaz Ahmed Gardezi:, Professor and Vice Chancellor, University of Kotli Azad Jammu and Kashmir.

Dr. Gardezi initiated the research on Sea buckthorn in Azad Jammu and Kashmir and brought Chinese variety Sinences to establish at Rawalakot which are growing successfully. Dr. Gardezi has been working professor emirates in University of Poonch Rawalakot AJK. He has published quite a few papers and had also completed one research project of Sea buckthorn improvement in Pakistan.

7-2-3. Dr. Farhat Batool: Professor Biochemistry: Department of Biochemistry, University of Karachi Pakistan.

Being involved in neuro science research Dr. Farhat Batool has been involved in using Sea buckthorn against neurological degradation and diseases. She has published more than 5 research papers on Sea buckthorn and has used Sea buckthorn pulp and oil successfully to mediate the brain disorders.

7-2-4. Dr. Syed Mubasher Sabir: Associate Professor, University of Poonch Rawalakot Azad Jammu and Kashmir.

Dr. Syed Mubasher Sabir has been engaged in analyzing Sea buckthorn biochemical profiling and

Science Monitor 16 (8), BR285-BR292

B-9- 沙棘植物不同生长发育阶段抗坏血酸氧化酶（ascorbate oxidase）的基因分子克隆和转录分析 , Pak. J. Bot 49 (3), 1143-1154

7-2-2. Syed Dilnawaz Ahmed Gardezi 博士，Kotli Azad Jammu and Kashmir 大学副校长、教授

Syed Dilnawaz Ahmed Gardezi 博士开创了 Azad Jammu and Kashmir 的沙棘研究，并把中国沙棘亚种成功引种到巴基斯坦 Rawalakot 地区。Dr. Gardezi 博士曾是 Poonch Rawalakot AJK 大学终身教授，他发表了一系列沙棘研究论文，并主持完成了一项有关沙棘改良的研究项目。

7-2-3. Farhat Batool 博士，巴基斯坦卡拉奇大学生物化学系教授

Farhat Batool 博士长期从事神经科学研究，并应用沙棘治疗神经功能退化疾病。她发表了 5 篇以上沙棘研究论文，并成功运用沙棘果肉和沙棘油缓解大脑疾病。

7-2-4. Syed Mubasher Sabir 博士：Poonch Rawalakot Azad Jammu and Kashmir 大学副教授

Syed Mubasher Sabir 博士曾经从事沙棘生

nutritional analysis and has published multiple papers on Sea buckthorn.

7-2-5. Dr. Alamzeb, University of Malakand Chakdara, Pakistan

Mr. Alam Zeb is working on Biochemical diversity of Pakistani Sea buckthorn.

7-2-6. Dr. Arsalan Nawaz, has worked on Diversity of Sea buckthorn from Northern Pakistan. Though working in University of Kassel in Germany but he has published his research on Pakistani Sea buckthorn.

In addition to the above mentioned scientists, there are quite a few researchers who have published their work on Sea buckthorn in Pakistan.

The latest papers published on Pakistan Sea buckthorn genotypes has been mentioned below.

Title: Morphological and Livelihood Profiling of Hipophae rhamnoides from Yarkhoon Valley Chitral Pakistan: A Climate Change Perspective. Sadiq Ali and Tehmina, Journal of Biology and Todays World, 2020, Vol.9, Issue 8, 001-004. They concluded that there was great diversity across varieties in Tehsil Mastuj based on the color of berries of sea buckthorn. These verities are five including orange code 024A, red code 033A, yellow code 012A, and orange-red code 033B, yellow-orange code 015A based on RHS coloring. This research suggests that a complete assessment chain development

化成分、营养成分分析，并发表了多篇沙棘研究论文

7-2-5. Alam Zeb 博士，巴基斯坦 Malakand Chakdara

Alam Zeb 博士曾经从事分布在巴基斯坦的沙棘生物化学多样性研究。

7-2-6. Arsalan Nawaz 博士，从事巴基斯坦北部沙棘的多样性研究。尽管他身处德国 Kassel 大学工作，他仍然发表了有关巴基斯坦沙棘研究的论文。

除了上述沙棘研究人员，还有其他一些巴基斯坦的专家发表了沙棘研究论文。以下是最新发表的一些论文介绍。

1. 作者：Sadiq Ali and Tehmina. 论文题目：展望气候变化的巴基斯坦 Yarkhoon 河谷沙棘形态学及生境分析 Morphological and Livelihood Profiling of Hipophae rhamnoides from Yarkhoon Valley Chitral Pakistan: A Climate Change Perspective. 发表在《生物学与世界今日》杂志 Journal of Biology and Todays World，2020 年第 9 卷、第 8 期 Journal of Biology and Todays World 2020, Vol.9, Issue 8, 001-004。作者认为，在 Tehsil Mastuj 地区，依据果实颜色，沙棘种类具有极其丰富多样性。包含 5 种颜色类型：橙色、红色、黄色、橙红色和橘黄色。该研究将为后期评估沙棘生境和多样性、开发高附加值沙棘产品奠定良好基础。

programmed can be established on the promotion of its value-added products its role in livelihood and diversification.

Title: Sea buckthorn Hippophae rhamnoides a non-conventional source of edible oil, Sabiha Rashid, Amina Arif , Amna Tabasum , Hina Zain , Shahana Ehsan and Muhammad Shafeeq Ur Rahman. Pure Appl. Biol., 9(1): 1040-1048, March, 2020. They concluded that oil from the seeds of Sea Buckthorn were characterized and studied for its fatty acid composition by gas chromatography. The oil contained fatty acid, palmetic acid, oleic acid, linoleic acid, linolenic acid and stearic acid. Lipid classes were determined by means of thin layer chromatography the result showed that lipid classes present in the oil are hydrocarbon, waxes, triglycerides, free fatty acid, diglycerides, sterols and monoglycerides. The peroxide value, free fatty acid value, acid value of the oil are higher but after refining the oil may be well within the range of edible oil values while the saponification and iodine value shows the trend of the Rashid et al. 1047 edible. Considering the experimental data it is suggested strongly that oil can be used for edible purpose after refining due to its ideal physico chemical values and health promoting fatty acid composition. Although the yield of the oil is not enough but the quantity is more enough to use the extracted oil after blending the oil with other edible oils (Canola, Sunflower, Soya beans and palm etc.).

Potential of sea buckthorn-based ingredients for the food and feed industry – a review,Arnau Vilas-Franquesa, Jordi Saldo & Bibiana Juan

2. 作　者：Sabiha Rashid , Amina Arif , Amna Tabasum , Hina Zain , Shahana Ehsan and Muhammad Shafeeq Ur Rahman. 论文题目：沙棘，一种非传统食用油资源 Sea buckthorn Hippophae rhamnoides a non-conventional source of edible oil, 发表在 2020 年 3 月《应用生物学杂志》Pure Appl. Biol., 9(1): 1040-1048, March, 2020. 作者通过气相色谱对沙棘籽油脂肪酸成分和特性分析认为，沙棘油含有：脂肪酸 fatty acid、棕榈油酸 palmetic acid, 油酸 oleic acid, 亚油酸 linoleic acid, 亚麻酸 linolenic acid 和硬脂酸 stearic acid。通过薄层色谱对沙棘油脂类成分分析得出，沙棘油中包含碳水化合物 hydrocarbon、蜡质 waxes、甘油三酯 triglycerides, 游离脂肪酸 free fatty acid, diglycerides, 甾醇 sterols and monoglycerides. 分析认为，沙棘油的过氧化值 The peroxide value、游离脂肪酸值 , free fatty acid value, 酸价 acid value 较高，但通过精炼后可符合食用油标准要求。鉴于沙棘油丰富的有益于人体健康的脂肪酸成分和生化价值因此，精炼后沙棘油可推荐为食用。虽然沙棘油产量不足，但是通过与菜籽油 Canola、葵花籽油 Sunflower、豆油 Soya beans 和棕榈油 palm 等其他食用油混合可以解决不足问题。

3. 作　者：Arnau Vilas-Franquesa, Jordi Saldo & Bibiana Juan，论文题目：基于沙棘营养成分的食品和饲料工业开发潜力综　述 Potential of sea buckthorn-based ingredients for the food and feed industry – a review.

7-3.Pakistan Council for Scientific and Industrial Research (PCSIR)

Pakistan Council for Scientific and Industrial Research (PCSIR) is a governmental organization involved in pulp and oil extraction at Sakardu but it has to build more capacity and develop diverse range of marketable products. There are few NGOs involved in trainings of Sea buckthorn cultivation and harvesting in Northern Pakistan.

7-3. 巴基斯坦科学与工业研究理事会

巴基斯坦科学与工业研究理事会：是一个从事 Sakardu 地区沙棘果肉、沙棘油提取的政府机构，，不足是应该扩大产能，开发一系列适销对路的沙棘产品。还有一些非政府组织从事巴基斯坦北部地区沙棘种植和采收技术培训。

7-4.Agha Khan Rural Support (AKRSP)

Agha Khan Rural Support (AKRSP) has helped the residents of Northern Areas of Pakistan a great deal for establishing Sea buckthorn as enterprises.

7-4. 阿加汗农村帮扶组织（AKRSP）

阿加汗农村帮扶组织（AKRSP）：已经极大帮助巴基斯坦北部地区居民建立沙棘加工企业。

7-5.Pak Sea buckthorn International

Pak Sea buckthorn International has played an important role for developing products from Sea buckthorn in Northern Pakistan. Mr. Ghulam Nabi Shigri the chairman of this company has the credit to establish the market of Sea buckthorn products in local areas and also exporting the dry berries from Pakistan.

7-5. Pak 国际沙棘公司

Pak 国际沙棘公司：在巴基斯坦北部地区沙棘产品开发中发挥了重要作用。Ghulam Nabi Shigri 先生作为该公司董事长，在当地沙棘产品销售和沙棘干果出口到国外建立了良好声誉。

7-6.Hunza Organics

Hunza Organics: A company in Hunza is exporting the dry berries of Sea buckthorn from Northern Pakistan and also making local products for national market.

7-5. Pak 国际沙棘公司

Hunza 有机食品公司：作为设在 Hunza 地区的企业，把沙棘干果从巴基斯坦北部地区出口到国外，在加工的沙棘产品销往全国。

7-7.Munawar Industries Enterprises Lahore

Munawar Industries Enterprises Lahore is exporting the dry berries of Sea buckthorn from Pakistan from more than 10 years. There is an increased market of export for the year 2019. Due to covid-10 pandemic the export has been reduced significantly in recent months.

7-7. 拉合尔 Munawa 实业公司

拉合尔 Munawa 实业公司：从事巴基斯坦沙棘干果出口业务 10 多年，2019 年出口市场规模有所增长。但由于新冠肺炎疫情影响，近期出口规模大幅减少。

八 Policy making for seabuckthorn 相关政策

There is no policy document or live project from Pakistani Government for establishment and processing of Sea buckthorn in Pakistan.

目前，没有巴基斯坦政府专门制定有关沙棘的政策，没有正在运行的由巴基斯坦政府资助建立的沙棘加工企业。

九 Conclusion 结论

Seabuckthorn is an important multipurpose plant in Pakistan with 5700 hectares of wild populations distributed in Northern Pakistan. Unfortunately the plant has been under utilized in Pakistan due to less awareness, poor planning and policy from government, non availability of improved cultivars, lack of research on Seabuckthorn breeding, poor harvesting practices, lack of training for processing and limited people and organizations involved in Research and Development in Pakistan. Following are the proposals for developing Seabuckthorn industry in Pakistan.

1-Awareness about Seabuckthorn's importance for human health, nutrition, industry and environment in higher altitudes of Pakistan through electronic, print/social media, Universities, Schools and colleges.

2-Developing Seabuckthorn genotypes from selected germplasm from Pakistan. The plants with larger berry size should be crossed and hybrids should be evolved for improving yield per plant.

3-Maintaining the male and female plants ratio in balanced numbers to allow female plants to flourish more and using male plants only as pollinators and lesser in number.

在巴基斯坦，沙棘是一种重要的多功能植物，有天然沙棘资源面积 5700 公顷，分布在巴基斯坦北部地区。很可惜的是，由于知名度不高、规划和政府优惠政策能力弱、缺乏优良品种、没有育种研究、采收技术落后、技工技术培训短缺，以及参与研究开发的人员有限等原因，沙棘在巴基斯坦没有得到有效利用。以下是针对巴基斯坦沙棘产业发展的设想。

9–1. 通过纸质、电子文档和社会媒体、中小学、大学，向巴基斯坦政府高层宣传普及有关沙棘对人体营养健康、产业开发和环境保护的重大意义。

9–2. 从巴基斯坦沙棘种质资源圃选择优良基因类型，通过杂交育种培育具有果实大品种，提高果实产量。

9–3. 控制沙棘雌雄株比例，减少雄株比例以维持授粉需求，增加雌株开花结实。

4-Developing modern tools to harvest Sea buckthorn plants to allow more harvest and reduce the labor cost.

5-Developing Sea buckthorn fruit processing units in Northern Pakistan to develop diverse range of export quality products.

6-More oil expeller units should be installed in Pakistan to utilize the oil for export and market in country.

7-Involving beverages and food industries of Pakistan to make products from Sea buckthorn.

8-Cosmetic industry should bring in the business of Sea buckthorn products in cosmetics.

9-Air drying facilities can help to process the berries on scientific manner and more marketable berries can be exported or processed.

10- Government should provide funds to scientists working on Sea buckthorn breeding and genetic improvement and efforts should be made to establish Sea buckthorn in Azad Jammu and Kashmir to sustain the soil conservation and boost the economy on sustainable basis.

9–4. 开发现代化沙棘果实采收设备，增加采收率，减少劳力支出。

9–5. 开发适于巴基斯坦北部地区沙棘果实加工的设备，加工满足出口质量标准的沙棘系列产品。

9–6. 在巴基斯坦增加沙棘油提取设备，生产更多用于出口和国内市场的沙棘油。

9–7. 吸引投资在巴基斯坦建立沙棘食品、饮料等产品加工企业。

9–8. 引进化妆品企业投资生产沙棘化妆品。

9–9. 改进空气干燥设备，促进沙棘果实科学处理，以便适应沙棘干果出口和再加工的市场需求。

9–10. 政府应向从事沙棘育种与遗传改良的科学家提供资助，更加支持 Azad Jammu and Kashmir 地区的沙棘种植，促进当地水土保持和经济可持续发展。

References 主要参考文献

1. Asad Hussain Shah, Dilnawaz Ahmed, Mubasher Sabir, Shazia Arif, Ishtiaque Khaliq and Farhar Batool, 2007.Pak. J Bot:. J. Bot 39, 6 2059-2065

2. AH Shah, SD Ahmad, I Khaliq, F Batool, L Hassan, RS Pearce, 2009. Evaluation of phylogenetic relationship among Sea Buckthorn (Hippophae rhamnoides L spp. turkestanica) wild ecotypes from Pakistan using amplified fragment length polymorphism … Pak J Bot 41 (5), 2419-2426

3. F Batool, AH Shah, SD Ahmed, DJ Haleem 2009. Oral supplementation of Sea buckthorn (Hippophae rhamnoides L. Spp. Turkestanica) fruit extract modifies haloperidol induced behavioral deficits and increases brain serotonin …Journal of Food and Drug Analysis 17 (4), 257-63

4. S Arif, MR Khan, SDA Gardezi, MF Khan, A Hamid, AH Shah, GM Ali 2017. Molecular cloning and transcript profiling of ascorbate oxidase gene at different growth developmental stages from therapeutically important plant Sea buckthorn (Hippophae rhamnoides). Pak. J. Bot 49 (3), 1143-1154

5. Muhammad Arslan Nawaz , Asif Ali Khan , Usman Khalid , Andreas Buerkert and Martin Wiehle. 2019. Superfruit in the Niche—Underutilized Sea Buckthorn in Gilgit-Baltistan, Pakistan
Sustainability, 11, 5840; doi:10.3390/su1120584

6. Afnan Altaf 2019. Phytochemical analysis and determination of anti oxidant properties of Sea buckthorn (Hippophae rhamnoides L.) leaves. M.Phil thesis, Department of Biotechnology, University of Kotli Azad Jammu and Kashmir.

7. Hu, I.; Xia, J.; Tu, X. 2008 Achievements and experiences of construction and development of Hippophae rhamnoides resource in China. Sci. Soil Water Conserv., 6, 98–102. 36.

8. Oyungerel, D.; Juuperelmaa, U.; Nasanjargal, D.; Altangoo, G.; Battumur, S. 2014. Distribution and genetic resource of Mongolian natural wild sea buckthorn (Hippophae rhamnoides L.). Mong. J. Agric. Sci., 13, 55–59.

9. Gonchigsumlaa, G. 2016. Competitiveness of Pastoral Livestock Production and Sea Buckthorn Farming in Mongolia: Application of Policy Analysis Matrix. Ph.D. Thesis, Georg-August-Universität Göttingen, Göttingen, Germany.

10. Stobdan, T.; Phunchok, T 2017 . Value Chain Analysis of Seabuckthorn (Hippophae rhamnoides L.) in Leh Ladakh; Ministry of Agriculture and Farmer Welfare, Government of India: New Dehli, India.

11. Rongsen, L.: 1992 Seabuckthorn A Multipurpose Plant Species for Fragile Mountains, 20th ed.; International Centre for Integrated Mountain Development: Kathmandu, Nepal. pp. 18–20.

12. Lecoent, A.; Vandecandelaere, E.; Cadilhon, J.-J. 2010, Quality linked to the geographical origin and geographical indications: Lessons learned from six case studies in Asia. RAP Publ., 4, 85–112.

13. Stobdan, T.; Angchuk, D.; Singh, S.B. Seabuckthorn 2008: An emerging storehouse for researchers in India. Curr. Sci. 8, 94, 1236–1237.

14. Yadav, V.; Sharma, S.; Rao, V.; Yadav, R.; Radhakrishna, A. 2016. Assessment of morphological and biochemical diversity in sea buckthorn (Hippophae salicifolia D. Don.) populations of Indian Central Himalaya. Proc. Natl. Acad. Sci. India Sect. B Biol. Sci. 86, 351–357

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The Current State of Seabuckthorn Development in Romania
罗马尼亚沙棘发展现状

In Romania, there are the largest areas of wild sea buckthorn in Europe, from the subspecies Hippophae rhamnoides subsp. rhamnoides and Hippophae rhamnoides subsp. Carpatica, spread over about 1,500,000 ha in the Oriental Carpathians and the Danube Delta, which was and will remain an inexhaustible genetic resource for breeding activity.

在罗马尼亚，野生沙棘的面积在欧洲是最大的，分类上属于鼠李沙棘亚种和喀尔巴阡山沙棘亚种，分布在东喀尔巴阡山脉和多瑙河三角洲，总面积约 150 万公顷（编者注：作者笔误，预计为 15000 公顷），过去是，将来也是继续开展育种研究取之不尽的遗传资源。

In the last 15 years, due to the promotion and support activity of the Center of Excellence for Sea Buckthorn Cultivation (CECC) in Arad, which created suitable varieties and implemented cultivation technology, the area occupied by new sea buckthorn plantations has exploded from "insignificant" to over 2500 ha. For a European country this means a significant progress.

在过去的 15 年里，由于阿拉德沙棘种植卓越中心 (CECC) 的推广和支持，创造了合适的沙棘品种和实施栽培技术，沙棘新种植面积从“微不足道”快速增加到 2500 多公顷。对于一个欧洲国家来说，这意味着重大进步。

Of the more than 500 growers who started on this road in 2005-2010, some gave up out by ignorance and misunderstanding of the phenomenon, and their plantations were abandoned. Another part practices "sufficient" technologies and produce to the same extent, for their or their friends' consumption. But about 1500 - 1700 ha are well cultivated and are well organized in farms of 20-40 ha, equipped with a range of tractors and specialized equipment. They produce practically the entire quantity of fruits on the profile market. Some growers even perform well in the production and marketing of fruit production, and can always host and hold a conference on how they do it.

从 2005 年到 2010 年，在这个时期开始进入的 500 多名沙棘种植者中，有些人因为对沙棘的认识不深和误解而放弃了，他们的种植园也被放弃了。另一部分人采用“足够”的技术，并维持一定的生产规模，供他们自身或他们的朋友消费。其中约 1500–1700 公顷的沙棘种植园得到精心栽培，每 20–40 公顷组成一个良好的沙棘农场，配备了一系列拖拉机和专门设备，其生产的产品几乎占据整个沙棘鲜果市场。一些种植者在沙棘鲜果生产和销售方面表现良好，并且经常主持和举行会议，讨论交流相关成功经验。

The most cultivated varieties, with a market share of 95-98%, are Clara, Mara, Cora and Dora, with Andros as a pollinator. These varieties were created in CECC Arad and produce in normal maintenance

在罗马尼亚种植最多的品种是 Clara、Mara、Cora 和 Dora，市场份额为 95–98%，Andros 为传粉品种。这些品种均由 CECC 培

conditions over 22-25 tons of fruits / ha in the year of harvest.

The fruits are harvested everywhere by the technique of freezing the detached branches, are of premium quality, extremely demanded in the established industry in Western Europe. In 2020, about 16,000-18,000 tons of fruit were harvested, mainly for export to Western Europe. The productions processed in Romania are under 1000 tons. Unfortunately, the Romanian manufacturing industry did not follow the same extremely upward trend, and the enthusiasm of the growers was affected.

育。在正常栽培管护条件下，沙棘鲜果年产量可超过 22−25 吨 / 公顷。

在罗马尼亚各地，采收沙棘鲜果采用的都是枝条冷冻分离技术，其果实品质优良，在西欧的成熟产业中是非常受欢迎的。2020 年，罗马尼亚收获了约 1.6 万 −1.8 万吨沙棘鲜果，主要出口西欧。遗憾的是，罗马尼亚的沙棘产业加工并没有随之大力发展，种植者的热情因此受到了影响。

Seabuckthorn nursery 沙棘育苗

Seabuckthorn nursery 沙棘苗木抚育

Seabuckthorn nursery 沙棘育苗

The first year of seabuckthorn plantation
新建沙棘种植园

Sea buckthorn plantation
第二年的沙棘种植园

Sea buckthorn plantation
高标准沙棘种植园

Seabuckthorn plantation
即将进入结果期的沙棘种植园

Seabuckthorn plantation in winter
冬天的沙棘种植园

Seabuckthorn plantation in winter
沙棘园冬景

Seabuckthorn berries
饱满的沙棘果

Fruiting plans of seabuckthorn 丰产沙棘园

Seabuckthorn fruiting 沙棘果实累累

9. Country Report of Russia

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Seabuckthorn Development of Russia in the Year of 2020
2020 年俄罗斯沙棘发展报告

一 Cultivation and processing 沙棘资源种植、产品加工情况

Minor growth of industrial seabuckthorn plantations have been noted in Russia in 2020. New areas in Uljanovsk oblast as well as in Bashkortostan have been established. As usual, Altai region is most famous from the point of view of seabuckthorn. Something about 200 hectares have been established there in 2020.

2020 年，俄罗斯沙棘工业化种植园小面积增长，在乌尔扬诺夫斯克 Uljanovsk 和巴斯科尔托斯坦 Bashkortostan 地区新种植了沙棘 。与常年一样，阿尔泰地区仍然是沙棘领域最受关注地区，在 2020 年新建了约 200 公顷沙棘。

No any significant changes have been reported on local seabuckthorn market. Prices for raw material at the same level, market demands on the same level compare to the year 2019. It is interesting to know that within several years we note the tendency of increasing fresh eating of seabuckthorn compare to processing. But of course in total it is only minor amount. In processing industry, we note insignificant shifting from focusing on seabuckthornt oil to seabuckthornt juices.

俄罗斯的沙棘产品加工情况没有明显变化，与 2019 年相比，其原料价格、市场需求保持原有水平。我们发现一个有意思的现象，近些年来沙棘直接鲜食量的增长趋势明显大于加工量。当然，从总量上看，鲜食量只是很少一部分。我们还发现，沙棘加工的主要产品正在不明显地从沙棘油转向沙棘果汁。

The total area of seabuckthorn industrial plantations up to the year of 2020 we estimate at the same level as in 2019 – approximately 2500-3000 hectares. Annually about 3000 tons of berries are collected. But in the year 2020, the productivity of industrial plantations was lower compare to average level and only 2000 tons were collected. It was mainly because of unfavorable climate conditions.

据估计，到 2020 年俄罗斯沙棘工业化种植园总面积与 2019 年基本持平，为 2500–3000 公顷，常年采收沙棘鲜果约 3000 吨。但是，2020 年由于气候异常，沙棘种植园产量低于常年水平，只采收了 2000 吨。

Unfortunately, there is no chance to estimate wild seabuckthorn orchards area in Russia. They are located along of the river banks in Altai region, Buryatia, Krasnoyarskiy krai, Irkutskaya oblast,

很遗憾，我们无法估算全俄罗斯的沙棘天然林面积。在俄罗斯，沙棘天然分布在阿尔泰边疆区、布里亚特 Buryatia、克拉斯诺亚斯基夫 Krasnoyarskiy krai、伊尔库斯克 Irkutskaya oblast、图瓦 Tyva 等州，只有一部分天然沙

Tyva etc. Only some of them are under harvesting, but the rest is nobody estimated. Nevertheless, from wild seabuckthorn orchards about 3000 tons of berries are collected annually.

Biggest seabuckthorn industrial plantations, as already have been mentioned, situated in Altai Region. “Sibirskoye” JSC – 600 hectares, “Yagodnoye” LLC – 400 hectares, Peasant Farm “Artemyev Dmitry Mikhailovich” – 200 hectares, Peasant Farm “Zhdanov Sergey Vladimirovich” – 100 hectares, and many other enterprises occupied up to 100 hectares.

棘果实得到采收，其余的均无人关注。尽管这样，每年仍然从天然沙棘林采收约 3000 吨沙棘鲜果。

正如以前介绍的，俄罗斯最大面积的沙棘种植园集中在阿尔泰地区，包括：“Sibirskoye” JSC 公司、面积 600 公顷，以及“Yagodnoye” LLC 公司、面积 400 公顷，“Artemyev Dmitry Mikhailovich”农庄、面积 200 公顷，“Zhdanov Sergey Vladimirovich” 农庄、面积 100 公顷。其他公司或个人农庄合计还有 100 公顷。沙棘种植园原、果实产量、产品加工企业等情况参见附表。

A brief introduction of main seabuckthorn enterprises and plantations
附表：俄罗斯主要沙棘企业和种植概况

Company / Direction 公司名称 / 主营方向	Volumes of produc-tion / processing, t/ year 果实产量 / 加工量（t/ 年）	Contacts 联系人 / 方式
Altai region 阿尔泰地区		
Lisavenko Research Institute of Horticulture for Siberia / Berries production 西伯利亚里沙文科园艺研究所 / 生产鲜果	50–70 / 0	Kanarskiy Alexandr niilisavenko@yandex.ru +7 906 949 1304
Agrofirma “Cvety Altaya”农庄 / Berries production 生产鲜果	40–50 / 0	Kenig Eduard cvetialtaya@mail.ru +7 903 992 97 78
Peasant Farm “Prishvin Vladimir Nikolaevich” 农庄 / Berries production 生产鲜果	20–30 / 0	Prishvin Vladimir +7 903 949 1583
“Sibirskoye” JSC / 公司 Berries production, berries processing to oil 鲜果生产、从果实提取油	700–800 / 700–1000	Pipunyrov Sergey +8 903 990 0112
“Sadovod Altaya” LLC 有限公司 / Berries production 鲜果生产	50 / 0	Sobakin Oleg olegsobakin@yandex.ru +7 905 980 4573
“Alsu” LLC / 有限责任公司 / Berries processing to oil, juice, powder 浆果加工成油、汁、粉	0 / 500	Surkov Alexandr surkovalex67@gmail.com +7 961 982 0858
“Yagodnoye” LLC / 有限责任公司 / Berries production, berries processing to oil 生产鲜果、从果实提取油	400–600 / 800	Zotov Nikolay n-zotov@mail.ru +7 923 720 3914

Peasant Farm “Artemyev Dmitry Mikhailovich” 农庄 / Berries production 生产鲜果	300 / 0	Artemyev Dmitry +7 963 532 5065
“Altayvitaminy” JSC / 公司 Pharmaceutical direction 制药方向	0 / range of products 系列产品	http://www.altayvitamin.ru/contact/
Peasant Farm “Zhdanov Sergey Vladimirovich” 农庄 / Berries production 生产鲜果	100 / 0	Zhdanov Sergey
“Altai-Zanddorn” LLC 有限公司 / Berries processing to oil, juice, powder 浆果加工油、汁、粉	0 / 70-100	Baklanova Tatyana +7 913 099 4485
“Altayskiy Buket” LLC 有限公司 / Berries production, berries processing to oil, juice, bio-additives 生产鲜果，浆果加工到油、果汁、生物添加剂	30 / 100	Mukhortov Sergey +7 962 819 0507
“Yantarnoye” LLC 有限公司 / Berries production 鲜果生产	30 / 0	Kaluzhnaya Elena +7 906-941-27-77
“Sibir” LLC 有限公司 / berries production 生产鲜果	100 / 0	Khvostov Anatoliy +7 905-980-7807
Peasant Farm “Kuznetsov Igor Alexandrovich” 农庄 / Berries production 生产鲜果	10 hectares of young plantations 新建 10 公顷沙棘幼林沙棘园	Kuznetsov Igor +7 905 980 83 86
Other regions 其他地区		
“Sava” LLC 有限责任公司 / Berries processing to oil, juice etc (Tomsk city) / 浆果加工到油、果汁等（托木斯克市）	0 / 1500	Nikitin Andrey +7 3822 609 725 add. 202 sava@tpksava.ru
“Sady Baraby” LLC 有限公司 / Berries production (Novosibirsk region) 生产鲜果（新西伯利亚地区）	40-50 / 0	Nevolina Nadezhda 8 (913) 722-11-13
“Sady Sibiry” LLC 有限公司 / Berries production (Novosibirsk region) 生产鲜果（新西伯利亚地区）	15-20 / 0	Lutov Vladimir 8 (913) 908-92-65
“Sadi Elizavety” LLC 有限公司 / Berries production (Uljanovsk region) 生产鲜果（乌尔扬诺夫斯克地区）	10 hectares of new plantations in 2020 2020 年新建 10 公顷沙棘种植园	Puzrakov Ilya +7 951 098 1001
“Stolypino” LLC 有限公司 / Berries production 生产鲜果 (Bashkortostan region 地区）	10 hectares of young plantations 新建 10 公顷沙棘幼林种植园	Radmir +7 927 311 4157
“Vetluga” LLC 有限公司 / Berries production(Nizhniy Novgorod Region) / 生产鲜果（下诺夫哥罗德地区）	12 hectares of young plantations 新建 12 公顷沙棘幼林种植园	Schavlev Sergey +7 (831) 281-98-02

As regards genetic resources of seabuckthorn, it is necessary to inform that most widely developing one is Hippophae rhamniodes ssp. mongolica. All seabuckthorn cultivars bred at Altai (more than 50) and most of varieties bred in Russia (more than 100) are on the base of ssp. mongolica. Only some of them (bred in European part of Russia) could be on the basis of ssp. rhamnoides (no exact information).

俄罗斯天然分布有蒙古沙棘亚种（亚洲部分）和海滨沙棘亚种（欧洲部分）。应该说，蒙古沙棘是应用最广的沙棘种质资源，在阿尔泰地区杂交培育出的所有沙棘品种（50 多个）和全俄罗斯培育的 100 多个沙棘品种中，绝大部分出自蒙古沙棘。只有少量在欧洲部分杂交培育的新品种出自海滨沙棘（没有准确资料）。

In 2020, there is no any cultivar has been released. Nevertheless, a lot of promising varieties under selection have been proposed. Some pictures of them are available by following link https://www.oblepiha22.ru/gallery-3eng.html

2020 年，俄罗斯没有审定沙棘新品种。但是，有一批具有良好应用前景的试验材料在观测选育中。其照片可访问 https://www.oblepiha22.ru/gallery-3eng.html

Most of research activity on seabuckthorn is carried out by Lisavenko Research Institute of Horticulture for Siberia. It covers such directions as selection and genetics, propagation technologies, cultivation technologies, pest and disease control, processing technologies, biochemistry analyses.

俄罗斯沙棘研究主要集中在西伯利亚里沙文科园艺研究所，涵盖沙棘选种与遗传育种、育苗繁殖、园艺栽培、病虫害防治、果实加工、生物化学分析等领域。

There are also several institutions fragmentary involved in seabuckthorn research…

此外，还有以下几个知名研究机构开展沙棘某一领域的研究：

1.Institute of Cytology and Genetics – cultivation technologies, focused on leaves productivity.

2.Biysk Technological Institute – processing technologies.

3.Nizhnyi Novgorod Agricultural Academy – selection.

4.Northern Research Institute of Forestry – introduction.

5.Botanical Garden of Moscow University – selection

6.East Siberia State University of Technology and Management – processing technologies.

1. 细胞与遗传研究所（侧重于沙棘栽培技术、沙棘叶生产加工）；

2. 比斯克技术研究所（侧重于沙棘加工技术）；

3. 下诺夫哥罗德农业科学院（侧重于沙棘选种）；

4. 北方林业研究所（侧重于沙棘引种）；

5. 莫斯科大学植物园（侧重于沙棘选种）；

6. 东西伯利亚州立技术与管理大学（侧重于沙棘加工）

The total personnel involved in seabuckthorn research in Russia are about 10-15.

全俄罗斯沙棘研究人员预计有 10−15 人（编者注：加上沙棘种植、加工、销售等，估计全俄罗斯沙棘从业人员应为 100−200 人）。

三 Several papers regarding seabuckthorn research have been published in the year 2020. 沙棘论文发表、主要专家、学术交流情况

Several papers regarding seabuckthorn research have been published in the year 2020.

（一）2020 年俄罗斯专家发表的主要科技论文

1. Zubarev Y.A., Gunin A.V., Panteleeva E.I., Vorobieva A.V. New large-fruited varieties of seabuckthorn of Altai selection // Bulletin of the Altai State Agrarian University. - 2020. - No. 6 (188). - P. 42-49.
https://www.oblepiha22.ru/assets/zubarev-novie_krupnoplodnye_sorta.pdf

2. Zubarev Y.A., Gunin A.V., Panteleeva E.I., Vorobieva A.V. Water-retention and turgor-restorative capacity of green seabuckthorn cuttings and their relationship with rooting processes // Bulletin of the Altai State Agrarian University. - 2020. - No. 4 (186). - P. 17-25.
https://www.oblepiha22.ru/assets/zubarev-vodouderzhivayuschaya_sposobnost.pdf

3. Kondratyeva I.A., Borodulina I.D., Zubarev Y.A. The content of carotenoids in the fruits of seabuckthorn in the forest-steppe zone of the Altai Territory // Problems of Botany of South Siberia and Mongolia, 2020. - V. 19, No. 2. - P. 11-14.
http://journal.asu.ru/bpssm/article/view/pbssm.2020065/7062

1. Zubarev Y.A., Gunin A.V., Panteleeva E.I., Vorobieva，从阿尔泰优良类型中选育的大果沙棘新品种，阿尔泰州农业大学学报，2020. − No. 6 (188). − P. 42−49. 有关信息详见：
https://www.oblepiha22.ru/assets/zubarev-novie_krupnoplodnye_sorta.pdf

2. Zubarev Y.A., Gunin A.V., Panteleeva E.I., Vorobieva A.V. 沙棘嫩枝持水和膨胀修复能力及其与生根过程关系，阿尔泰州农业大学学报，− 2020. − No. 4 (186). − P. 17−25. 有关信息详见：
https://www.oblepiha22.ru/assets/zubarev-vodouderzhivayuschaya_sposobnost.pdf

3. Kondratyeva I.A., Borodulina I.D., Zubarev Y.A. 阿尔泰边区森林草原地带沙棘果实类胡萝卜素含量，南西伯利亚及蒙古植物研究，2020. − V. 19, No. 2. − P. 11−14. 有关信息详见：
http://journal.asu.ru/bpssm/article/view/pbssm.2020065/7062

In Russia, there has not been established National Seabuckthorn Association, but two members of International Seabuckthorn Association are providing their activity.

Natalia Demidova – member of International Seabuckthorn Association Board, http://sevniilh-arh.ru/lab/Sotrudniki/demidova.php

Yury Zubarev – vice president of the International Seabuckthorn Association, https://www.oblepiha22.ru/zubarev-eng.html

Under their leadership several events have been conducted in 2020.

September 17-18, 2020 All-Russian Workshop "Seabuckthorn – Technologies and development prospects". The brief information is available by following link:
https://www.oblepiha22.ru/news-18.09.2020.html

December 3, 2020 International Workshop on Seabuckthorn "The status of seabuckthorn industry in Russia, Germany and Latvia. Key problems and ways to their overcome". The brief information is available by following link:
https://www.oblepiha22.ru/news-03.12.2020.html

（二）目前俄罗斯没有成立全国沙棘协会组织，两名沙棘知名专家在国际沙棘协会理事会任职：

1. Natalia Demidova 博士，俄罗斯北方林业研究所高级研究员、国际沙棘协会理事。有关信息详见：
http://sevniilh-arh.ru/lab/Sotrudniki/demidova.php

2. Yury Zubarev 博士，俄罗斯西伯利亚里沙文科园艺研究所高级研究员、国际沙棘协副主席。有关信息详见：
https://www.oblepiha22.ru/zubarev-eng.html

（三）2020 年组织开展的重要沙棘活动

1. 2020 年 9 月 17-18 日，举办"全俄罗斯沙棘技术与开发展望研讨会"。有关信息详见：
https://www.oblepiha22.ru/news-18.09.2020.html

2. 2020 年 12 月 3 日，俄罗斯西伯利亚里沙文科园艺研究所联合德国沙棘协会、拉脱维亚沙棘协会，举办国际沙棘学术研讨会，交流"俄罗斯、德国和拉脱维亚沙棘加工现状、问题及解决途径"。有关信息详见：
https://www.oblepiha22.ru/news-03.12.2020.html