Optimising agronomic practice at a sea-buckthorn plantation in the Pyrenees

Summary

Sea-buckthorn (*Hippophae rhamnoides*) is a thorny deciduous shrub found on the Eurasian continent. It is farmed to obtain nutriceutical molecules for the food and pharmaceutical industries. The main compounds extracted from it are antioxidants, polyphenols and fatty acids. Its adaptation to cold and its hardiness make it a potentially useful crop for mountain areas. The first crops were planted in the Cerdanya area, and provided good results. However, lack of technical know-how on crop management (pruning, irrigation and other cultural operations) and technology to optimise the nutriceutical compound content have limited their profitability. This operational group aims to generate technical knowledge to improve agronomic practices and use near infrared spectroscopy (NIR) technology to model and predict the content of nutriceutical compounds in fruit.

Objectives

The aim of the "The cultivation of sea-buckthorn (*Hippophae rhamnoides* L.) as a tool for revitalising high mountain agriculture: from agronomy to new tools for crop digitisation" project is to implement agronomic improvements and new technological tools in the cultivation of sea-buckthorn as a model crop for revitalising agriculture in high mountain areas. This general objective is divided into three specific objectives:

1. Improve the technical pathway of sea-buckthorn cultivation to maximise production of nutriceutical compounds.
2. Design new convenience food products based on sea buckthorn.
3. Digitise the crop: application of photonic technologies (NIR) to improve crop yields

Description of the actions planned in the project

The project is structured around the following four work areas, each one implemented in different tasks:

Action 1. Agronomic improvements in sea-buckthorn farming in the Pyrenees

Task 1.1. Effect of the amount of irrigation on yield and nutriceutical compound synthesis in sea-buckthorn.
Task 1.2. Pruning strategies for sea-buckthorn to improve productivity.
Task 1.3. Variation in the nutritional and nutriceutical quality of sea-buckthorn fruit during the ripening process.
Task 1.4. Benchmark analysis.

Action 2. Development of new processed products

Task 2.1. Design of new processed products.
Task 2.2. Chemical analysis.
Task 2.3. Sensory analysis.

Action 3. Crop digitisation: photonics applied to quality optimisation

Task 3.1. Near infrared spectroscopy (NIR) modelling of the content of nutriceutical compounds in the fruit.
Task A3.2. NIR modelling of the optimum state of maturity for harvesting the fruit.
Task A3.3. Exploring new photonics technologies by modelling the content of nutriceutical compounds in fruit.

Action 4. Dissemination of the results: sea-buckthorn as a crop to revitalise mountain farming
Task 4.1. Organising technical conferences.
Task 4.2. Guide to good practices in sea-buckthorn farming.
Task 4.3. Installation of an experimental plot with a collection of sea-buckthorn varieties.

Expected results and practical recommendations

Based on the work plan, the expected results of the operational group are:

Action 1. Agronomic improvements in sea-buckthorn farming in the Pyrenees
- R1.1. Design for irrigation strategies in sea-buckthorn farming.
- R1.1. Pruning manual for sea-buckthorn farming.
- R1.3. Guide to fruit ripening and harvesting strategies in industrial sea-buckthorn production.

Action 2. Development of new processed products
- R2.1. Developing new products.
- R2.2. Nutritional and sensory description of new processed products.

Action 3. Crop digitisation: photonics applied to quality optimisation
- R3.1. NIR-based models for predicting the content of nutriceutical compounds in fruit.
- R3.2. NIR-based models for predicting the optimal stage of fruit maturity for harvesting, depending on its industrial use.
- R3.3. Identifying new technologies with the potential to digitise sea-buckthorn farming and processing processes.

Action 4. Dissemination of the results: sea-buckthorn as a crop to revitalise mountain farming
- R4.1. Organising technical conferences to disseminate results.
- R4.2. Publication of a guide to good practices in sea-buckthorn farming.
- R4.3. Experimental plot with a representation of the existing genetic diversity of the species.

Leader of the Operational Group

ORGANISATION: RAICO AGROTECH, SL

Coordinator of the Operational Group

ORGANISATION: MIQUEL AGUSTÍ FOUNDATION

Other members of the Operational Group (not recipients of the grant)

ORGANISATION: INSTITUTE OF PHOTONIC SCIENCES (ICFO)

ORGANISATION: REVIURE LES VALLS

Subject area(s) of application

- ☐ Agricultural production system
- ☐ Agricultural practice
- ☐ Agricultural equipment and machinery

☐	Livestock farming and animal welfare
☒	Vegetable production and horticulture
☐	Landscape / Territorial management
☐	Pest and disease control
☐	Fertilisation and nutrient management
☐	Soil management
☐	Genetic resources
☐	Forestry
☐	Water management
☐	Climate and Climate Change
☐	Energy management
☐	Waste and by-product management
☐	Biodiversity and environmental management
☐	Food quality/processing and nutrition
☐	Supply chain, marketing and consumption
☒	Competitiveness and agricultural and forestry diversification
☐	General

Geographical area(s) of application

PROVINCE(S)	REGION(S)
Girona, Lleida	Cerdanya

Dissemination of the project (publications, conferences, multimedia, etc.)

- Three technical conferences will be organised for the agricultural and industrial sectors to explain the results from the research project and to transfer the knowledge on agronomy and new sea-buckthorn applications for the food sector. These will be held in different parts of the Catalonia Pyrenees mountains, specifically in La Cerdanya, L'Alt Berguedà and L'Alt Urgell. The workshops will be scheduled at the Annual Technology Transfer Plan (PATT) of the DACC.
- A guide to good practices in sea-buckthorn farming will be published, providing information on needs during different phases in the cultivation cycle.
- An experimental plot will be set up to consolidate research into sea-buckthorn, in which the different commercial varieties currently on the market will be planted. This experimental plot will be set up at the end of the first year of operation, based on research into the genetic diversity of commercial varieties.

Project website

https://fundaciomiquelagusti.cat/projectes/el-cultiu-de-larc-groc-com-a-eina-de-revitalitzacio-de-lagricultura-dalta-muntanya/

More information on the project

PROJECT DATES	TOTAL BUDGET
Starting date: July 2021	**Total budget:** €171,360.90

	DACC funding: €78,140.57
Current status: Under way	**EU funding:** €58,948.15
	Own funding: €34,272.18

With funding from:

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Order ARP/113/2021 of 20 May, approving the regulatory bases for grants for cooperation for innovation by promoting the creation of European Association for Innovation operational groups in the areas of agricultural productivity and sustainability and the execution of innovative pilot projects by those groups, and Resolution ACC/1660/2021, of 27 May, announcing the call for the grant.

Generalitat de Catalunya
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