

## EMBOCHEESE: development of new concept of packed cheese and the ripening process

### Summary

The dairy sector is a strategic sector in the Catalan agrifood industry, due to both its economic importance and its contribution to the development and attachment of the rural population, which has been in a crisis since the end of the dairy quotas system, leading to the closure, transformation and diversification of several companies in the sector.

The increase in the demand for locally produced, high-quality innovative products means that dairy companies are considering developing new products to add value to milk and open up new markets for sales, both in Spain and internationally.

At present, cheeses can have various shapes depending on the mould that the curd is placed in for ripening. These are usually round, cylindrical or square, but there are also other shapes, such as a bag. In Italy, the production of some cheeses involves the shaping, ageing and ripening process being carried out while the cheese is hanging off the ground.

MONTBRÚ, a livestock farming company and producer of goat's milk and dairy products in El Moianès region, has gone a step further in the development of innovative products. Taking the idea for processing a cured meat sausage, MONTBRÚ aims to innovate in its system for ripening cheese, which uses the packing technique (the shape and drying system for cured sausages) to make the cheese it produces maintain or improve its sensory and nutritional characteristics when compared to a cheese ripened according to the current production system.

In order to bring this product to market, a number of activities are planned to develop/improve the manufacturing technology and the ripening system of a product that is obtained using forming technology. Casings and alginates adapted to these types of products will also be used in order to pack the curd.

Non-invasive techniques to classify the product are increasingly widely used by agrifood companies. The best known technique is NIR, which requires analysis of a specific pattern curve for the product. This technique enables the curd's moisture levels during the forming process to be determined, thereby ensuring that a product which starts the ripening process always has the same moisture levels, and preventing subsequent problems in the ripening process.

The standard curve for the end product will also be produced, as it can be monitored during the ripening process and the technological conditions can be adjusted depending on the product's development, thereby improving the production process.

### Objectives

This project aims to create new and innovative high quality cheeses bound with string, with the texture and taste of large format ripened cheeses, with a shorter ripening time, and to obtain new markets and business channels for the dairy sector.

The specific objectives set out in this project are:

- Development of new and innovative cheeses bound with string.
- Development of new casings for packing cheese curd.
- Development of alginates as a material for packing cheese curd.
- Development of moisture checks in the process using a portable NIR spectrometer.

The intrinsic aims are:

- Shorter ripening times of the cheese, with the consequent reduction in energy consumption by the ripening chambers.
- Reduced handling of cheese during the ripening process.
- Diversification of the cheese producers' business with no need for a large investment.
- Added value for livestock farming and cheese production establishments.
- Introduction of sensor technology for process quality control in the cheese industry.
- Obtain results transferable to the traditional dairy sector.

## Description of the measures planned in the project

### Activity 1. Physicochemical and microbiological classification of the raw material and the finished product.

Physicochemical classification (fat, protein, lactose, dry extract,  $a_w$  and pH) and microbiological classification (total aerobes, enterobacteria, coliforms, *Listeria monocytogenes*, *Staphylococcus* and *E. coli*) of the raw material (goat's milk, finished product and cheese produced according to the forming technology) at different times of the year.

### Activity 2. Cheese production process with packing technology.

#### Task 2.1. Pilot plant tests: forming cheese with casings and alginate

Tests in a pilot plant in order to adjust the production parameters to the system for forming and ripening cheese curd with casings and alginate.

#### Task 2.2. Industrial testing: production of formed cheese with casings and alginate

Industrial tests at the MONTBRÚ facilities in order to adjust the results obtained in task 2.2.

### Activity 3. Cheese ripening process and monitoring of ripening chambers.

#### Task 3.1. MONTBRÚ technical advice on ripening chambers

Optimisation and standardisation of current ripening processes in order to achieve product improvement.

#### Task 3.2. Ripening of the cheese and monitoring

The ripening of the products obtained in activity 2.2 will take place both in the MONTBRÚ facilities and in the IRTA-Monells facilities using the temperature and moisture conditions defined in task 2.1.

Physicochemical checks (dry extract,  $a_w$  and pH) and microbiological checks (total aerobes, enterobacteria, coliforms, *Listeria monocytogenes*, *Staphylococcus* and *E. coli*) will be carried out throughout the entire ripening process of the cheeses, at 3 points in the ripening: ( $t_0$ ) at the beginning, ( $t_2$ ) in the middle of the ripening and ( $t_3$ ) at the end of the process. The physicochemical parameters for fat, protein and lactose will be included in this latter sampling time ( $t_3$ ), in order to obtain the nutritional characterisation of the end product. MONTBRÚ will carry out the analytical checks (in duplicate) of the cheeses ripening at its facilities, and IRTA of the cheeses ripening at its facilities, also in duplicate.

### Activity 4. Assessment of the finished product and consumer study.

#### Task. 4.1. Quality control of the finished product

Useful life studies at 4 sampling points (start of cold chamber period ( $t_0$ ), 2 intermediate checks ( $t_2$  and  $t_3$ ) and end of useful life ( $t_4$ )) for the products ripened at both MONTBRÚ and IRTA.

Physicochemical checks (dry extract,  $a_w$  and pH), microbiological checks (total aerobes, enterobacteria, coliforms, *Listeria monocytogenes*, *Staphylococcus* and *E. coli*), and sensory analysis will be performed at each sampling time.

#### Task 4.2. Consumer study

A consumer study (with approx. 100 consumers) in order to ascertain their perception and the acceptability of the innovative products.

### **Activity 5. Product control by portable NIR technology.**

#### Task 5.1. Determination of curd moisture by NIR technology

Various curds with different moisture points will be produced in order to obtain the standard curve for the calibration of the NIR, and they will be compared with the classic moisture analysis at the same time.

#### Task 5.2. Determination of cheese moisture during the ripening process using NIR technology

The curds used in task 5.1 will be ripened under the defined conditions.

Various readings with the NIR and moisture analyses will be taken during the ripening in order to obtain the standard curve for the cheese, and monitoring will be carried out in duplicate at 4 sampling points (beginning of ripening ( $t_0$ ), 2 intermediate checks ( $t_2$   $t_3$ ) and end of ripening ( $t_4$ )).

#### Task 5.3. Use of NIR technology in industrial production

Moisture checks in both curds and in cheese during ripening, to confirm the NIR in four industrial batches. These data will be used to characterise and verify the industrial process.

### **Activity 6. Dissemination**

Activities to disseminate results by means of:

- A video describing the production, which will be used as a tool for consultation, and which will be conveyed via social networks, lectures, presentations and/or technical seminars.
- Participation in technical innovation seminars.
- Dissemination on social networks and websites.
- Participation in sector fairs (Lactium, Vic; Artisan Cheese Fair, La Seu d'Urgell).

## Expected results and practical recommendations

The expected results and practical recommendations are outlined below

- Report on the alginate packing process (IRTA) and the casings used (FIBRAN AND EDICAS), with the most important characteristics obtained for the production of cheeses with forming technology.
- Report on the ripening process, obtaining data from the moisture checks and chamber temperatures, and quality control and microbiological checks of the ripened products.
- Report on the useful life and consumer study of the perception and acceptability of the finished product(s).
- Report of the NIR calibration process, with the data obtained from the final product evaluated

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**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)
Area of application in the provinces of Barcelona and Girona.	Area of application in El Moianès, El Baix Empordà and El Ripollès regions.

### Dissemination of the project (publications, seminars, multimedia, etc.)

The dissemination plan for the project is presented below.

- Organisation of 3 Annual Technology Transfer Plan seminars, presenting the point of departure, the basic cornerstones and the results obtained from the project.
- Explanation of the project, monitoring and results in the FoodService and Gourmet Clusters.
- Explanation of the project during the Cheese Production Course held annually at the IRTA-Torre Marimon.
- Two dissemination/demonstration seminars for trainees.
- Updated websites of each member, and social media (LinkedIn, Twitter and Facebook) for sharing experiences, photos and results.
- Production of an information video in Catalan and subtitled in Catalan, Spanish and English for the YouTube platform.

### More information on the project

PROJECT DATES	TOTAL BUDGET
Start date (month-year): July 2019	Total budget: €177,020.00
Completion date (month-year):	DARP funding: €72,344.40
Current status: Underway	EU funding: €54,575.60
	Own funding: €50,100.00

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*Order ARP/133/2017 of 21 June, 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 ARP/1282/2018, of 8 June announcing the call for the grant.*

