



*LIFE Environment and Resource Efficiency*

## **LIFECITRUS**

**LIFE14 ENV/ES/000326**

**B5\_Summary report of the National and International demonstration and disclosure initiatives for jams, jellies and canned foods companies**

**30 July 2018.**





This report collects information on the B5 action raised in the memory of the project “LIFECITRUS-LIFE14 ENV/ES/000326”.

## 1. INTRODUCTION

With the action B5 is intended to demonstrate that the new ingredient (purees obtained from citrus peel) can be applicable to all types of food and does not alter its organoleptic properties. In addition, the exceptional properties and composition of the innovative ingredient can substitute additives such as pectins in the production of fruit jams with the following achievements:

- Improvement of the integral use of citrus fruits;
- Total or partial replacement of the chemical additives used in the manufacture of fruit jams;
- Obtaining more natural products, improving the added value and the nutritional and functional properties of the processed foods;
- Offer the consumer a distinctive product with excellent sales prospects.

In 2017 it is known that the population chooses healthy breakfast, an option that in the last five years has increased by 20%. In addition, the consumer demands innovation, products with higher added value, a broader and more complete offer, the incorporation of new ingredients and formulations (return to more natural processes).

The two basic aspects of healthy products are the so-called 'light' (low in fat, sugar...) and functional. The trends have been changing according to the demands of the consumer and the willingness of the industry to create different needs, as well as the 'boom' of bifidus and omega 3, this year the stores have been invaded by lactose-free products, bakery and pastries without trans fats. Companies have had to link innovation with health to reach the consumer who is willing to pay a little more for a product with an adequate quality-price ratio and thus offer the public healthier products in which trans fats are replaced. Hydrogenated by vegetable oils (olive and sunflower) and new ingredients are used to complement the nutritional profile.

In this context is where we include the demonstrations with bakery and pastry companies in the framework of the LIFECITRUS project for the incorporation of a new natural ingredient in their recipes, with low caloric content and interesting content in dietary fiber, according to previous results. In addition, its content in hesperidin may be of interest, it is a flavonoid with antioxidant activity with health benefits. Its benefits are: protection of the stomach against ulcers, reduce the likelihood of suffering cardiovascular disease, anticoagulant and antiallergic activity.

The application of the natural innovative ingredient for the development of jams is a continuous choice because the LIFECITRUS project tries to substitute additives such as pectin. Pectin is obtained at an industrial level from citrus fruits, but makes use of unsustainable techniques and

extractions with chemical solvents are used. It is for this reason that jam processing companies or applications of it are of great interest to the project partners.

## 2. METHODOLOGY

According to the above mentioned information, we contacted numerous companies both nationally and internationally, working meetings were organized and demonstrative actions were raised on the floor of LIFECITRUS project.

Representative companies have been encouraged to test their products with a new ingredient or formulate new foods at the semi-industrial CTC plant. A total of 73 national and international companies have been contacted throughout this action. These companies are mainly Spanish and Italian, due to the contacts of the project partners, but it is noteworthy that the information is available to more than 500 companies given the number of companies included in the FIAB Associations and the Spanish Food Technology Centers as CNTA and AINIA have known the LIFECITRUS project in the organized meetings. List available in Annex I.

The first workshop was organized with national and international food companies on October 31, 2017 at the headquarters of FIAB, within the meetings of the working group on quality, production and sustainability of the FOOD FOR LIFE -Spain technology platform. This meeting was attended by 15 companies and national organizations that were exposed to the LIFECITRUS project to promote demonstrative actions using the new ingredient for the preparation of new foods. The second meeting with food companies was held on November 15, 2017 in Rome. This meeting was made to coincide with that of citrus and other fruit companies to turn it into an interesting event for international companies in Rome. This meeting was attended by staff from 6 companies and organizations:

- Confindustria Napoli
- ASSITOL
- ENEA (Bioag dept.)
- Ro.Na. Foodtech consulting
- Italcanditi SpA
- Ordine dei Tecnologi Alimentari Campania e Lazio

The theme of the WORKSHOP was: "Recovery of citrus byproducts from the agrofood production and opportunities of their reuse as additives and jellies"

As a result of the workshops and other dissemination activities, meetings with technicians from 3 national companies have been held to plan demonstration activities in the semi-industrial plant. In fact, 4 tests for 3 of them have been done and 6 new products made.

### 3. TESTING AT THE DEMONSTRATION PLANT

4 tests have been done with national food processing companies, potential consumers of the new ingredient for the development of jams and industrial pastries.

The new ingredient has been properly integrated into processed foods to offer interesting products for consumers and designed by participating companies.

#### COMPANIES' TEST. Dulcesol (cakes)



The Dulcesol Group, also known as Dulcesol, is a Spanish food group that markets more than 200 products and is committed to improving health and nutrition. In addition, its vision is to be a leading, innovative food company, with international projection and oriented to all its customers and consumers. It has a Nutrition Innovation Center (CIN) to promote the 5 Health commitments related to consumer welfare.

The demonstration was based on the development of two products of pastries, muffins and chocolate chip cake using the new ingredient obtained product of clementine.

In the chocolate chip muffins, the following ingredients were used: flour, sugar, orange, olive oil, baking powder, eggs, clementine puree and chocolate. In the clementine cake the same ingredients were used, but the chocolate chips were not incorporated. Table 1 shows the nutritional analysis of these two products.

Table 1.- Nutritional characteristics of chocolate cake and clementine cake

	Chocolate cake (clementine puree)	Clementine cake (clementine puré)
pH	6.93	7.05
Total sugars (g/100g)	36.0	27.8
Moisture (g/100g)	19.2	33.0
Total fats (g/100g)	18.6	11.4
Total carbohydrates (g/100g)	54.4	47.8
Proteins (g/100g)	5.9	5.3
Dietary fiber (g/100g)	0.4	1.3
Calories (kcal/100g)	409	318
Sodium chloride (g/100g)	0.68	0.74
Hesperidine (mg/Kg)	2427	1039
Quality	Nice taste and texture	Nice taste and texture

Results in fresh weight

In these two products a high content of dietary fiber was not observed, but its hesperidin content and taste acceptance were interesting. With these results, the company made comments about its interest, but it needs the innovative ingredient to be on the market to work on the development of new more sustainable bakery products.

**COMPANIES' TEST. Dulcesol (jams)**

The demonstration was based on the preparation of two strawberry jams using the new ingredient obtained from lemon by-product and obtained from apple by-product.

The two jams were formulated using the new ingredient as a 100% substitute for pectin by 15%. The percentage of fruit used in the jams was 60% and a product of 50 Brix was formulated. Table 2 shows the nutritional analysis of these two products.

Table 2.- Nutritional characteristics of strawberry jams

	<b>Strawberry jam-lemon (pH: 3.52)</b>	<b>Strawberry jam-apple (pH: 3.27)</b>
Total sugars (g/100g)	44.7	46.5
Moisture (g/100g)	46.3	47.5
Total fats (g/100g)	0.1	0.1
Total carbohydrates (g/100g)	51.8	50.6
Proteins (g/100g)	0.6	0.6
Dietary fiber (g/100g)	0.9	0.9
Calories (kcal/100g)	212	208
Sodium chloride (g/100g)	0.04	0.05
Quality	Nice visual appearance, taste, smell and texture (Bostwick 3 cm)	Nice visual appearance, taste, smell and texture (Bostwick 1 cm)

Results in fresh weight

The comments to highlight are that the two jams present a very similar nutritional analysis despite including an ingredient of lemon origin and another of apple origin. These data support the application of the new ingredient obtained in the LIFECITRUS process and the standardization facility. In addition, a high content of dietary fiber is not observed, but the flavor of the jams is acceptable and positive, so the new ingredient can be used to formulate fillings for bakery products, if it exists as a marketable ingredient.

Another issue would be the need to assess the storage in refrigeration and freezing of the new ingredient with high moisture content, so storage costs have to be valued and will be significant. The purchase of the ingredient in powder form could be more viable.

**COMPANIES' TEST. Lorusso y Saez (jams)**

Lorusso and Saez S.L. is a company of Spanish and Italian origin located in Almería, which is dedicated to the production and marketing of artisanal jams, delicatessen jams, gourmet jams, gourmet jams, delicatessen jams ... with 80% fruit, of exquisite quality, high nutritional value and with extraordinary flavour and aromas.

In the demonstration plant a 40 Brix strawberry jam was developed with 80% fruit and with different concentration of the new ingredient from lemon byproduct, 13% and 25% respectively. In table 3 the nutritional analysis is indicated and in figure 1 the person in charge of the company that visited us.

Table 3.- Nutritional characteristics of strawberry jams

	Strawberry jam-lemon 13 (pH: 3.25)	Strawberry jam-lemon 25 (pH: 3.31)
Soluble solids (Brix)	40.9	40.6
Acidity (% citric acid)	0.86	0.85
Total sugars (g/100g)	38.6	37.5
Moisture (g/100g)	58.0	58.4
Total fats (g/100g)	0.2	0.2
Total carbohydrates (g/100g)	39.6	38.7
Proteins (g/100g)	0.7	0.7
Dietary fiber (g/100g)	1.1	1.5
Calories (kcal/100g)	165	162
Sodium chloride (g/100g)	0.06	0.03
Hesperidine (mg/Kg)	189	262
Quality	Nice taste, smell and texture (Bostwick 4 cm)	Nice taste, smell and texture (Bostwick 2 cm)

Results in fresh weight



Figure 1.- Jam produced by Lorusso and Saez in the demonstration plant LIFECITRUS

From the beginning of the LIFECITRUS project, the technicians of Lorusso and Saez were interested in the development of the new ingredient because they seek to offer their customers artisan products. In the jam of a greater proportion of the ingredient, it is possible to increase

values of fiber content, flavonoids, etc., but the grain of the new ingredient is noticeable and the jam has less luminosity than desired.

Therefore, once the demonstration ends, the company is very interested in the new ingredient, but since its products are destined for a gourmet market and the customer requires a different product appearance, they would not use this ingredient of the LIFECITRUS process. They prefer to work on their own development because there are many citrus crops in the area of Andalusia with which to contact to have raw materials and manufacture the new natural ingredient, so that they would take advantage of this opportunity for their products.

### COMPANIES' TEST. Membrillo el Quijote (jams)

## Membrillo



Membrillo El Quijote S.A. is a company located in Andalusia and specialized in quince products, but adapting to the new demands of the market, has innovated through a process of in-depth research and its range of products is broader and includes jams.

During their visit to the CTC pilot plant, they were able to develop a strawberry jam and compare it with a new jam with the innovative ingredient made from an organic lemon by-product, with spreadable consistency. The organic lemon puree was used as a substitute for pectin and other additives, for the gelling of the jam and to offer the company an ecological product.

The jams were formulated for 50 Brix, with 50% fruit and 18% of the new organic ingredient. Table 4 shows the characterization of commercial and novel jams.

Table 4.- Nutritional characteristics of strawberry jams

	Strawberry jam commercial (pH: 3.41)	Strawberry jam-lemon organic (pH: 3.33)
Acidity (% citric acid)	0.55	0.51
Colour (CieLab)	L= 24.22, a= 7.69, b= 6.51	L= 23.36, a= 9.62, b= 6.78
Total sugars (g/100g)	46.5	47.1
Moisture (g/100g)	46.6	45.5
Total fats (g/100g)	0.1	0.1
Total carbohydrates (g/100g)	49.8	48.4
Proteins (g/100g)	0.4	0.4
Dietary fiber (g/100g)	2.9	5.4
Calories (kcal/100g)	208	207
Sodium chloride (g/100g)	0.036	< 0.0125
Quality	Nice visual appearance, taste, smell and texture	Nice visual appearance, taste, smell and texture

Results in fresh weight

The company has been able to see how the percentage of dietary fiber in the new recipe for strawberry jams increases. If the product were on the market, it could acquire it because it works



on products with a high fiber content, achieved through the addition of soluble food fibers (inulin and oligofructose).

#### **4. CONCLUSION**

The challenge of the LIFECITRUS project is to obtain purees from citrus peel that can be applied to all types of food and does not alter their organoleptic properties. Once the puree is obtained, a wide range of possibilities opens up to any company in the sector that is looking for the development of increasingly natural foods.

This new ingredient has been tested positively in the development of new foods from the bakery and pastry sector. In addition, they have been evaluated nutritionally, according to the EU Regulation 1169/2011 on the food information provided to the consumer.

Finally, in Action B5, with 4 demonstration actions, 6 food products have been developed that could easily enter the market if the new ingredient was manufactured at industrial level and the following conclusions have been obtained:

1. Companies bought the new ingredient if it was on the market, but in powder form it is easier to use and store.
2. Companies participating in the demonstrations prefer to privately evaluate the ingredient to obtain gourmet products.

In summary, the innovative ingredient is interesting for national companies that sell in international markets, but it is not yet in the market and the standardization of the new ingredient has to be achieved.



## Annex I

ANTONIO Y PURI TORRES	SEAM START-UP	SANT'ORSOLA SPA
AGRICOLA FORESTAL DE NERPIO	INSTITUTO DE SOSTENIBILIDAD	ENEA (BIOAG DEPT.)
LORUSSO Y SAEZ, S.L.	MAPAMA-DGIA (SERVICIO DE CALIDAD INDUSTRIAL. SUBDIRECCIÓN GENERAL DE FOMENTO INDUSTRIAL E INNOVACIÓN. DIRECCIÓN GENERAL DE LA INDUSTRIA ALIMENTARIA. MINISTERIO DE AGRICULTURA Y PESCA, ALIMENTACIÓN Y MEDIO AMBIENTE)	RO.NA. FOODTECH CONSULTING
AGROINDUSTRIAS TROPICALES	AINIA	ITALCANDITI SPA
DULCESOL (JUAN Y JUAN)	ANICAV ASSOCIATION	POLENGHI GROUP
AGRICOLA ROCAMORA	AIIPA ASSOCIATION	AGRICONSULTING SPA
ENCURTIDOS EL ZALAO	AZ AGRICOLA CAPPELLINO	ORDINE DEI TECNOLOGI ALIMENTARI CAMPANIA E LAZIO
CASA RUFINO S.L	UNINDUSTRIA CALABRIA CROTONE	ACEITUNAS CAZORLA
JUMEL ALIMENTARIA S.A	UNINDUSTRIA CALABRIA CATANZARO	MEMBRILLO EL QUIJOTE
MULTIFRUTICOS LA BODEGA	UNINDUSTRIA CALABRIA VIBO VALENTIA	PULPI EYA
OPEN COOK 2010	UNINDUSTRIA CALABRIA COSENZA	GALLINA BLANCA
POLGRI	UNINDUSTRIA CALABRIA REGGIO CALABRIA	EURECAT
HUERTO GOURMET	CONFINDUSTRIA RAGUSA	UNIVERSIDAD DE ALICANTE
UNIVERSIDAD DE GRANADA	CONFINDUSTRIA PALERMO	FUNDACIÓN CENTRO DE INVESTIGACIÓN Y DESARROLLO DEL ALIMENTO FUNCIONAL (GRANADA)
CNTA	CONFINDUSTRIA CATANIA	FUNDACIÓN PARQUE CIENTÍFICO DE MADRID
LINK-IDI	CONSORZIO APEO SICILIA	ASINCAR
BIOPLAT	CONFINDUSTRIA SALERNO	UNIVAR
TEPRO CONSULTORES AGRÍCOLAS	CONFINDUSTRIA NAPOLI	INNOFOOD I+D+I
LEITAT	IAMB - CIHEAM BARI	DOMCA
CDTI	DNV GL	DERETIL
XARTA	CLUSTER DARE APULIA	SITRA
BETELGEUX, S.L.	FRESH PLAZA JOURNAL	IRCONFORT
PONS IP	ASSITOL	FIAB
AVES NOBLES-CASA MATACHÍN	ASSOLOMBARDA	
ACCIONA SERVICE	ZUEGG SPA	