

## Local production of high-quality flour with a high whiteness index

### Summary

Colour is a parameter that can determine the quality of flour and affect consumers' acceptance of products made from it. Flours with a high whiteness index have an L value greater than 95.

There are several factors that can affect the colour of flour, such as:

- Flour extraction rate or percentage
- Presence and concentration of the enzyme polyphenol oxidase (PPO) present in the aleurone layer of soft wheat grain
- Flour granulometry
- Genetic differences between varieties
- Crop cycle
- Nitrogen fertilisation
- Application of fungicidal products

Obtaining flours with such a high whiteness index seems to require changes in producers' cultural practices, so that they sow varieties that are characterised by producing flours with high L values and apply cultivation pathways in which nitrogen fertilisation and phytosanitary protection produce high hectolitre weights and all other requirements demanded from the production of flour for use in the manufacture of flour-based products. The whole industrial process, especially flour extraction, is very important and must take into account the specificities of each batch (variety, production area, etc.).

This project addresses the demand for local, quality flours with a high whiteness index, which could provide an opportunity for quality wheat production in Catalonia, promoted by this operational group, led by the flour mill PANIFICADORA ALIMENTÀRIA SL.

### Objectives

The main objective is the production of quality soft wheat for the manufacture of flours with a high whiteness index (L higher than 95) for the production of flour-based food products, in the main cereal-growing areas of Catalonia.

The following specific objectives are set:

1. Assess the suitability of commercial soft wheat plant material available to produce white flour for the preparation of food products.
2. Determine the impact of cultural practices of the luminosity and whiteness of soft wheat flour.

3. Study the effect of the flour extraction level on its final colour
4. Establish pilot plots for the production of soft wheat for the specialist flour production industry.
5. Transfer the results to the winter and spring cereal production industry.

### Description of the actions carried out in the project

The activities and tasks proposed for the project are described below:

**Activity 1.** Evaluation of soft wheat varieties in terms of their ability to produce flours with a high whiteness index.

**Task 1.1.** Trial of long-cycle soft wheat varieties

**Task 1.2.** Trial of short-cycle soft wheat varieties

**Activity 2.** Impact of cultural practices on the brightness and whiteness of soft wheat flours.

**Task 2.1.** Impact of nitrogen fertilisation

**Task 2.2.** Impact of the application of fungicidal products

**Activity 3.** Establishment of pilot plots for farmers to grow soft wheat for the production of white flour.

**Activity 4.** Evaluation of the impact of the flour extraction percentage on the whiteness index.

**Activity 5.** Transference of the results to the sector.

### Final results and practical recommendations

The last 3 years of trials with long-cycle soft wheat have shown that only the IPPON variety presents L values over 95, as required for the production of white flours. However, the CAMARGO, NUDEL and RGT TOCAYO varieties also present high values.

The IPPON variety has the highest whiteness ( $L > 95$ ) and a higher protein content (13.6%).

With regard to short-cycle soft wheat, in the last three trial campaigns, only the RGT TOCAYO variety presents approximate L values of 95, as required for the production of white flours. However, ARTUR NICK also present high values.

The results suggest that, unlike long-cycle varieties, some of the whiter short-cycle soft wheat varieties are among those with lower protein content.

Regarding the impact of nitrogen fertilisation, the ARTUR NICK variety studied during the 2017-18 and 2018-19 seasons showed an increase in the percentage of protein as the amount of nitrogen added to the crop increased. A higher protein content was also observed when nitrogen was added to the second covers. In most of the plots, the protein content was higher when surface nitrogen fertiliser was fractionated and part of it was applied in the flag leaf stage, compared to when it was all added at the start of caning.

In the 2019-20 season, the RGT TOCAYO variety was studied and no increase in yield was found in relation to the nitrogen fertiliser added. One reason for this could be lack of rainfall at the start of the flag leaf stage.

By contrast, late fertilisation increased the protein content.

The analysis of the impact of applying fungicidal products to crops in the 2017-18 and 2019-20 seasons found productive responses in most fungicidal treatments despite the low pressure of foliar diseases. By contrast, in the 2018-19 season, there was also low pressure from foliar diseases but no increase in yield was observed with fungicidal treatments.

For the ARTUR NICK variety tested during the three seasons, the Lovit Comet treatment (6.25% epoxiconazole + 8.5% piraclostrobin) was found to provide better results both in protein content and L values, which exceeded 95 for the 2017-18 season and the Caramba treatment (metaconazole 9%) for the 2018-19 season. Pekar staining and test results from the last 2019-20 season are still to be evaluated.

In applying knowledge generated from pilot plots and studying quality and yield parameters for the varieties, it was observed that the colouration of the tested long-cycle soft wheat varieties was more variable (94.6 and 95.4) than short-cycle varieties (average of 95), although none reached a strength over 200. The results obtained in the last 2019-20 season are still to be evaluated.

The study of the impact of the flour extraction processes on whiteness shows that a higher L value is obtained in the second milling for both the long-cycle and short-cycle soft wheat varieties.

## Conclusions

The project has progressed satisfactorily, resulting in a range of soft wheat varieties for the production of a quality flour with a high whiteness index, also offering a number of parameters beyond those strictly related to colour (value L > 95):

- a hectolitre weight > 75 kg/hL
- flour strength values (W) > 200
- a balanced P/L ratio
- protein content > 13 %
- a falling number > 300 seconds
- etc.

These varieties are suitable for the peculiarities of the different production areas without compromising the profitability of cereal farms.

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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)
Girona Barcelona Lleida	La Selva El Gironès Pla de l'Estany Baix Empordà Alt Empordà Osona La Segarra

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

A guide has been produced on the production of quality wheat for producing flours with a high whiteness index, available at:

[http://extensius.cat/wp-content/uploads/2020/09/Guia\\_Farines-blanques.pdf](http://extensius.cat/wp-content/uploads/2020/09/Guia_Farines-blanques.pdf)

**More information on the project**

PROJECT DATES	TOTAL BUDGET
Start date (month-year): June 2018	Total budget: €196,105.63
Completion date (month-year): September 2020	DARP funding: €80,144.30
Current status: Executed	EU funding: €60,459.74
	Own funding: €55,501.59

**With funding from:**

Project funded through Operation 16.01.01 (Cooperation for Innovation) through the Catalan Rural Development Programme 2014–2020.

*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/1868/2017, of 20 June, announcing the call for the grant.*



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Departament d'Agricultura,  
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