

Determining the optimal harvest time for yellow Golden Delicious and red Gala apple cultivars to satisfy consumers and adapt to new preservation technologies - PICKBEST

Summary

Consumers' apple preferences have changed over time. In particular, there is a move toward a yellower skin for the Golden Delicious cultivar and a redder colouring for the Gala cultivar. These demands mean the trend is towards a crop with more mature characteristics than two decades ago. In addition, the introduction of 1-MCP technology applied pre- and post-harvest has made it possible to maintain the quality of the climacteric fruit during storage and prolong its commercial life. At the same time, new preservation technologies have been established using dynamic atmosphere systems that reduce the range of difference in the fruit and extend the preservation period while maintaining quality. This background has led to the detection of the need to **establish new pre- and post-harvest parameters and dynamic atmosphere conservation techniques suitable for the new consumption trends**, using Golden Delicious and Gala as study varieties.

The project also includes the development of tools for technical advisors, producers and harvest workers, to decide on when to harvest once the optimal parameters for satisfying consumers' demands have been obtained.

Objectives

The main objective of the project is to **define new pre- and post-harvest parameters to obtain apples that adapt to new consumption trends**, with the following specific objectives:

- Establish harvesting parameters that maximise consumer satisfaction, including new trends based on the technical pathway set by new technologies (1-MCP pre- and post-harvest, dynamic atmosphere and new cultivars)
- Develop tools to determine optimal harvesting time based on established harvesting parameters:
 - semi-automated starch index determination using image analysis and AI (machine learning) algorithms
 - Adjusting the DA-meter to the new harvesting parameters
 - Developing a visual scale with the appropriate shade of red for harvesting highly coloured Gala cultivars

Description of the actions planned in the project

The project is divided into three main actions, in line with the objectives and expected result of each:

- Action 1. Establishing harvesting parameters that maximise consumer satisfaction, including new trends based on the technical pathway set by new technologies (1-MCP pre- and post-harvest, dynamic atmosphere and new cultivars). During this action, pilot plots will be selected and the pre-harvest treatment with 1-MCP will be carried out. Five different harvest dates will be scheduled, depending on the variety (Gala or Golden Delicious), during which the following actions will be carried out: an analysis of the harvest quality parameters (colour, acidity, brix, firmness, etc.); a post-harvest treatment with 1-MCP; an analysis of the post-harvest quality parameters; and finally a sensory and statistical analysis.
- Action 2. Establishing new, reliable and easy-to-implement maturity measurement parameters for technicians and harvesters, adapted to the new harvesting criteria for Gala apples. In this activity, a new relationship between fruit colour and maturity will be established to define a new red shade scale for highly coloured Gala cultivars. Adaptation of the DA-meter to the new harvesting parameters defined between the two actions will also be studied.

- Action 3. Dissemination, training and transfer. A dissemination action will be carried out for the results transfer and training will be given for harvesters to provide them the technical knowledge for the fruit sector. Therefore, this action includes plans to prepare a harvesting protocol for each variety and to prepare training courses and seminars for transferring the results to the sector.

Expected results and practical recommendations

The expected projects results are listed below:

- Establishing a harvest criterion with new quality parameters that satisfy consumers
- Creating a colour chart adapted to Gala apples for technicians and harvesters
- Assessment of the technical feasibility of measuring apple maturity using NIR technologies and image analysis
- A specific harvesting protocol for Golden Delicious and Gala apples, incorporating the new criteria established from the results
- Training courses for harvesters with best practice recommendations for quality harvests

Leader of the Operational Group

ORGANISATION: GIRONA FRUITS, SCCL

Coordinator of the Operational Group

ORGANISATION: GIRONA FRUITS, SCCL

Other members of the Operational Group (grant recipients)

ORGANISATION: GIROPOMA COSTA BRAVA, SL

ORGANISATION: FRUCTÍCOLA EMPORDÀ, SL

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

ORGANISATION: IRTA - Institute of Agrifood Research and Technology

Subject area(s) of application

- | | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | Agricultural production system |
| <input checked="" type="checkbox"/> | Agricultural practice |
| <input checked="" type="checkbox"/> | Agricultural equipment and machinery |
| <input type="checkbox"/> | Livestock farming and animal welfare |
| <input checked="" type="checkbox"/> | Vegetable production and horticulture |
| <input type="checkbox"/> | Landscape / Territorial management |
| <input type="checkbox"/> | Pest and disease control |
| <input type="checkbox"/> | Fertilisation and nutrient management |
| <input type="checkbox"/> | Soil management |
| <input type="checkbox"/> | Genetic resources |
| <input type="checkbox"/> | Forestry |
| <input type="checkbox"/> | Water management |
| <input type="checkbox"/> | Climate and Climate Change |
| <input type="checkbox"/> | Energy management |
| <input type="checkbox"/> | Waste and by-product management |
| <input type="checkbox"/> | Biodiversity and environmental management |
| <input type="checkbox"/> | Food quality/processing and nutrition |

<input checked="" type="checkbox"/>	Supply chain, marketing and consumption
<input type="checkbox"/>	Competitiveness and agricultural and forestry diversification
<input type="checkbox"/>	General

Geographical area(s) of application

PROVINCE(S)	REGION(S)
Girona	Baix Empordà and Alt Empordà

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

As the project progresses, a dissemination activity will be carried out to publicise the results from the project in the fruit sector. Activity 3 relates to this: *Publicity, training and transfer*, including different dissemination conferences at the end of each trial season. The project results and implementation will be disseminated by technical conferences, preparing a specific technical harvesting protocol for each variety (Gala and Golden Delicious) and preparing technical courses for training harvesting personnel.

Project website

<https://www.gironafruits.com/>

More information on the project

PROJECT DATES	TOTAL BUDGET
Starting date: June 2022	Total budget: €130,380.00
	DACC funding: €60,294.60
Current status: Under way	EU funding: €45,485.40
	Own funding: €24,600.00

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.

