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This is the **published version** of the bachelor thesis:

Pons García, Maria. Fruit peel powder by using the Cavendish variety of *Musa acuminata* : a potential alternative to reduce food waste in Sant Cugat del Vallès. 2024. (Grau en Biotecnologia)

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**Fruit peel powder by using  
the Cavendish variety of  
*Musa acuminata*:**  
A potential alternative to  
reduce food waste in Sant  
Cugat del Vallès.



It is estimated that about **88 million tons of food are wasted each year in UE**, 1/4 of the total food production in the region (FAO, UNEP, & FOAG, 2014). **In Catalonia, 260,000 tons of food are wasted**, of which 58% comes from households. (ARC, 2022). **LAW 3/2020**, of 11 March, on the prevention of food losses and waste which appeals to the **Sustainable Development Goal 12.3**: responsible production and consumption. (ONU, 2024)

## The Big Challenge

How could a **sustainable food system** be promoted in Sant Cugat del Vallès to reduce **food waste**?

## Objectives

- **Learn** the dynamics of a multidisciplinary group.
- **Identify** The Big Challenge related to food waste in St.Cugat.
- **Gather** and **analyze** existing solutions in St. Cugat.
- **Resolve** doubts from the entities involved in food waste.
- **Propose** a sketch to reduce the impact of food waste in St.Cugat.

## The Challenge

How could the *Cavendish* variety of *Musa acuminata* fruit **be introduced into the diet** to reduce food waste in both **the industry and at home** and **make healthy profits too?**

- **Identify** The Challenge related to food waste in St. Cugat.
- **Observe** the existing solutions.
- **Find** methodologies to reuse of food or parts of it.
- **Propose** adapted solutions to develop at home and with health benefits.
- **Differentiate** and **highlight** the importance of the biotechnology in The Challenge.



PORTAFOLI

## Chemical interest

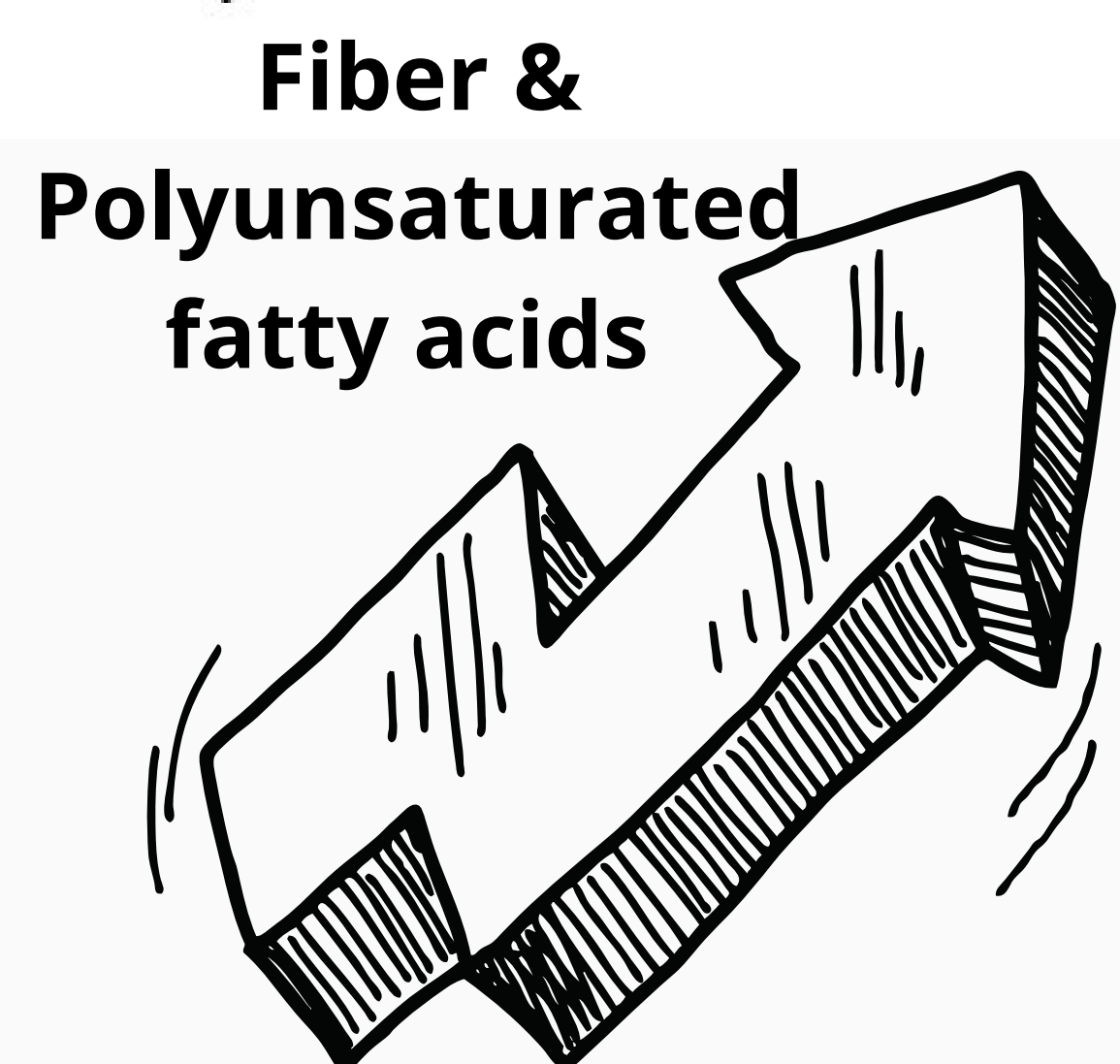
Table 1. Chemical composition fruit peel *Musa acuminata Cavendish* (Segura-Badilla et al., 2022)

Moisture	3.56
Ashes	11.86
Protein	6.41
Fat	10.22
Crude fiber	14.38
Carbohydrates	57.13

Table 2. Amino acids *Cavendish* variety (Tsado et al., 2021)

Amino acid	Fruit peel [g/100g protein]
Leucine*	7.76
Lysine*	7.90
Isoleucine*	5.24
Phenylalanine*	4.79
Norleucine	0.03
Tryptophan*	0.58
Valine*	5.67
Methionine*	1.60
Proline	3.25
Arginine	4.99
Tirosine	3.96
Histidine*	2.11
Cystine	0.85
Alanine	6.22
Glutamic acid	12.72
Glycine	3.94
Threonine*	5.38
Serine	4.05
Aspartic acid	8.68
<b>TOTAL</b>	<b>89.71</b>

\*Essential amino acids



>40 phenolic compounds  
**ANTIOXIDANT PROPERTIES**

## Healthy benefits

- **Enhance** in the **eGI control** and **improve** of **glucose and LDL absorption** in liver.
- **Antimicrobial activity** against *Staphylococcus aureus*, *Bacillus subtilis*, *Bacillus cereus*, *Salmonella enteritidis*, and *Escherichia coli*, due to the presence of **bioactive compounds** such as **glycosides, flavonoids, terpenoids, and tannins** (Zaini et al., 2022).

6 of the 9  
ESSENTIAL  
AMINO ACIDS

Fruit by-products  
(Peel residues)

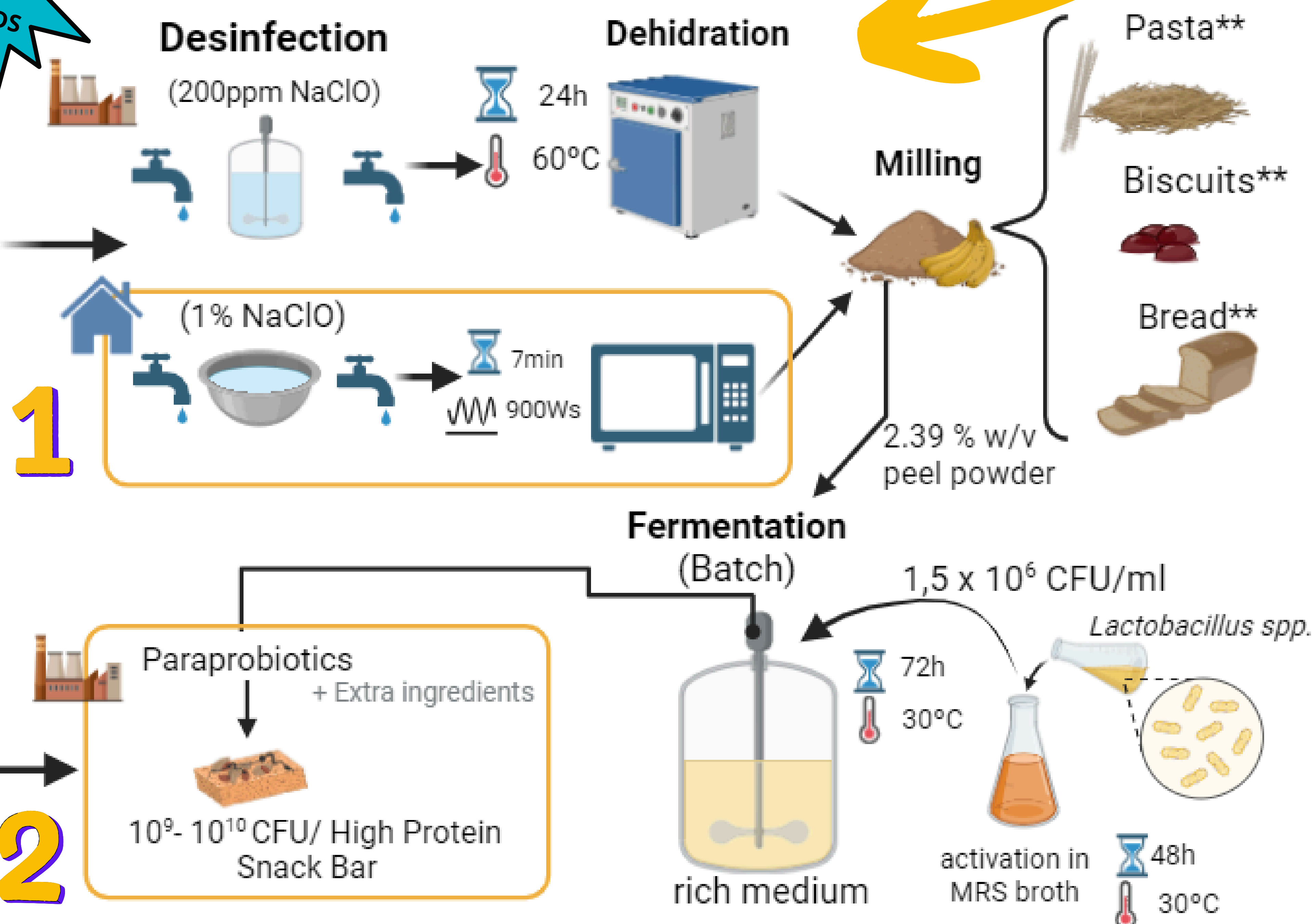


Fig 4. Sketch of application in fruit *Musa acuminata Cavendish* fruit. (Zaini et al., 2022) made by using BioRender. \*\*with 5-20% of peel powder content

## Methodologies

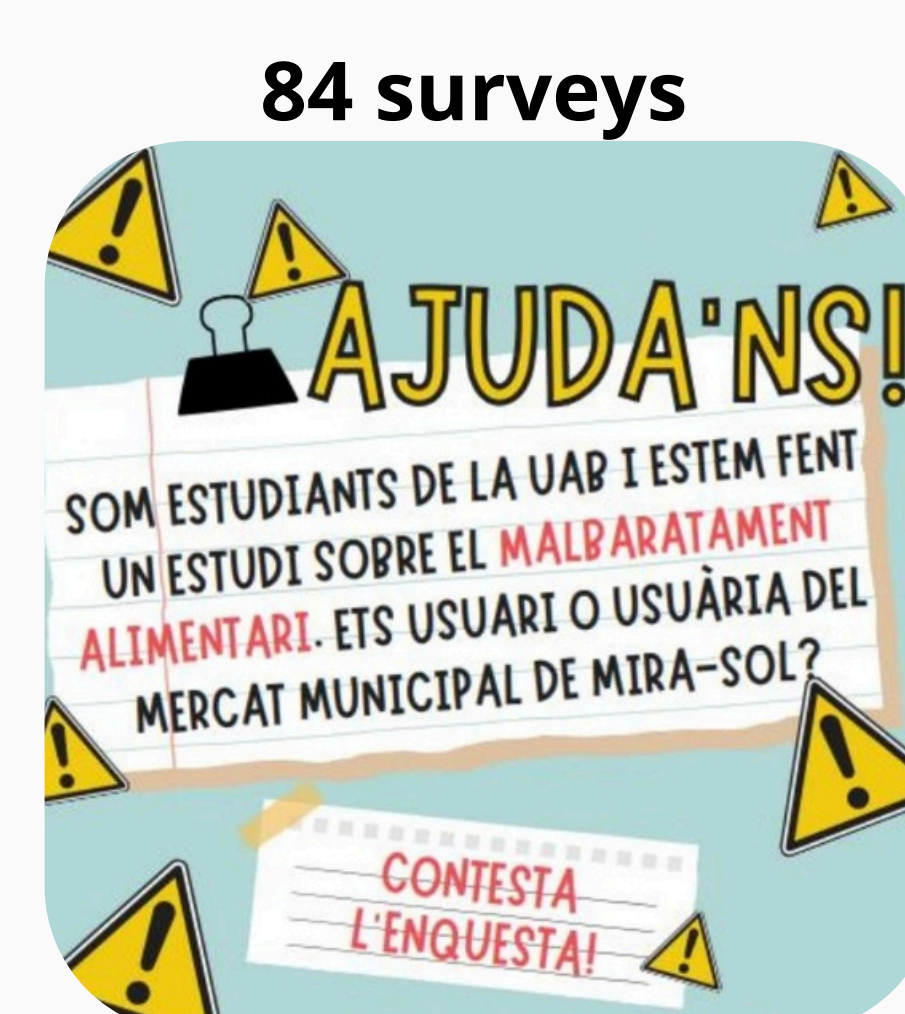


Fig 1. Cartell de difusió enquestes.



Fig 2. Components del grup amb Isaac Peraire, director de l'ARC



Fig 3. Stats. Open. Now.

Up to **57%** of food waste at home consist in **Fruits & Vegetables**

## Proposal solutions

**SOLUTION 1**  
Obtaining *Cavendish* powder at home

**SOLUTION 2**  
High-protein energy bars with paraprobiotic

## Conclusions

Identified sub-challenge utilizing *Musa spp.* fruit peels for waste reduction and health promotion. Developed innovative waste alternative through reuse cooking, creating original, nutritious solutions. Solutions include making banana flour for **household use** and incorporating peels into value-added food products.

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