When Innovation meets Tradition: Apple Derived Extracts from Italian Golden Delicious PDO (Val di Non, Trentino) for Human Well-being in the Context of Circular Bioeconomy

PDO

Golden, Red, RENETTA CANADA

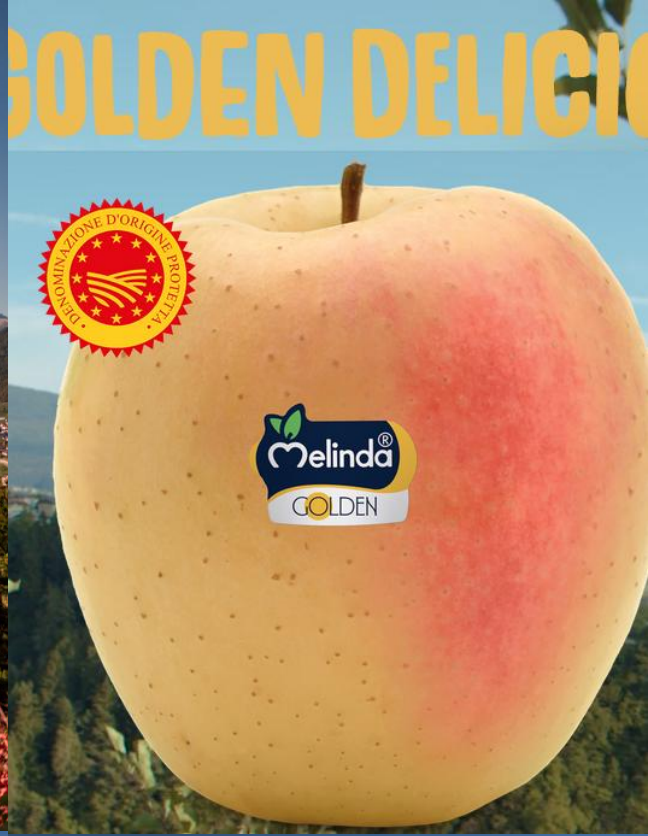
1994: DOP for golden, red e renetta

Disciplinary code of production of the P.D.O. Mela Val di Non

Disciplinary production code of Melinda

- quality of the apples (minimum standards of sugars, acidity and pureness),
- quantity of fruit produced (maximum yield/hectare)
- maximum number of trees/hectare

- Respect of the orchard as essential part of the valley's ecosystem
- Integrated Farming
- diversified picking according to the characteristics of the orchard
- manual packaging of the apples



SUSTAINABILITY

SUSTAINABILITY

1. USE ONLY RENEWABLE SOURCES

We use 100% renewable energy resources, 11% of which is self-produced by a photovoltaic system on our structure's roof. The rest is supplied by a hydroelectric power system.

2. NEVER WASTE EVEN A DROP OF WATER

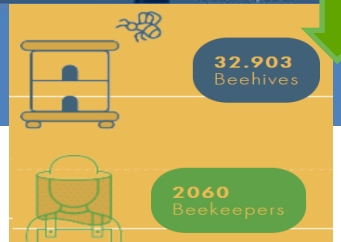
Melinda uses drop irrigation over 97% of its apple orchards. This system improves water distribution among the plants vs traditional overhead irrigation, with 30% less water consumption

3. RESPECT NATURE'S TIMING

Melinda Consortium famers are aware that good products like Melinda apples require time and effort. They have always grown them respecting the biological cycle of the orchard, the rhythm of the seasons and climate

4. BUILD AN ANIMAL-FRIENDLY ECOSYSTEM

In our orchards you can find a strong presence of fauna (insects, birds, wildlife), this is an index of the environment's wellness. In our valleys, apiculture and farming go arm in arm, and pollinating insects, like bees, are becoming more numerous for the increasing number of beehives and beekeepers.



SUSTAINABILITY

The use of apples not for the market to produce other food products:

300.000 tons

5%

15.000 tons

- Succhi
- Snack
- Mousse
- Aceto di mele

- **… and in the next future other innovative food products ?**

- OUR GOAL

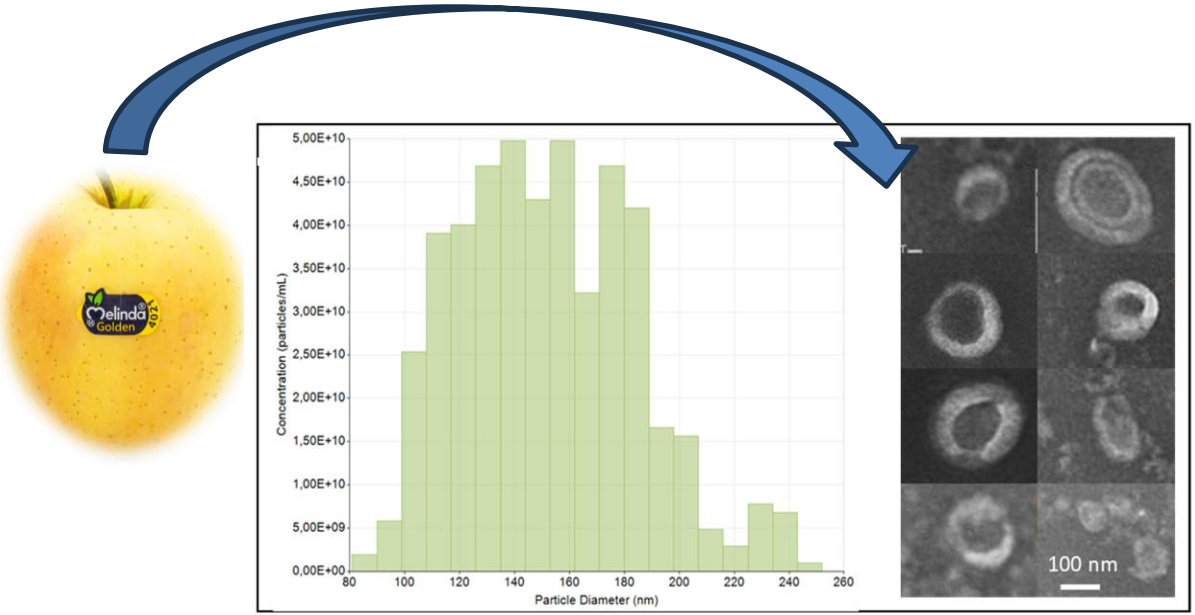
The Golden Delicious PDO apple serves as a case study to examine how bioactive compounds, apple derived vesicles, extracted through innovative green processes, contribute to health and well-being.

In this project, the Consorzio Melinda, which represents the apple producers, provides the raw materials and extracts, while UNIFE and Maria Cecilia Hospital-Gruppo Villa Maria evaluates the biological properties, and UNINA analyzes their chemical composition and metabolite profiling.

Plant-derived extracellular vesicles are lipid bilayer vesicles with protein receptors on the outside that determine:

- **the sender** (cells from the source)
- **the recipient** (cell designated to receive them)

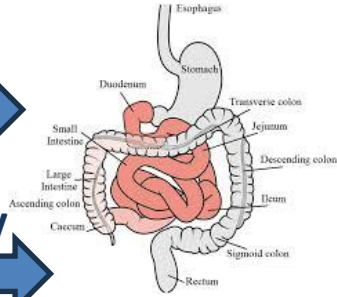
high information content, mainly consisting of miRNA instructions to change the biological behavior of the receiving cell

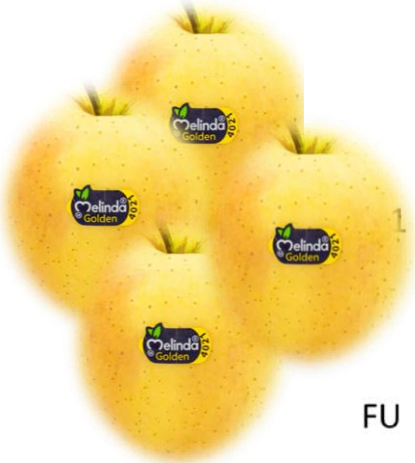


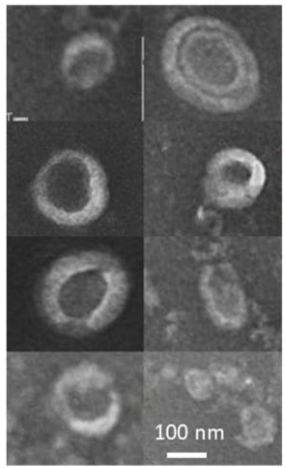
PDNVs carry:
small RNAs – miRNA,
messenger RNAs,
cytosolic proteins,
Vitamin precursors

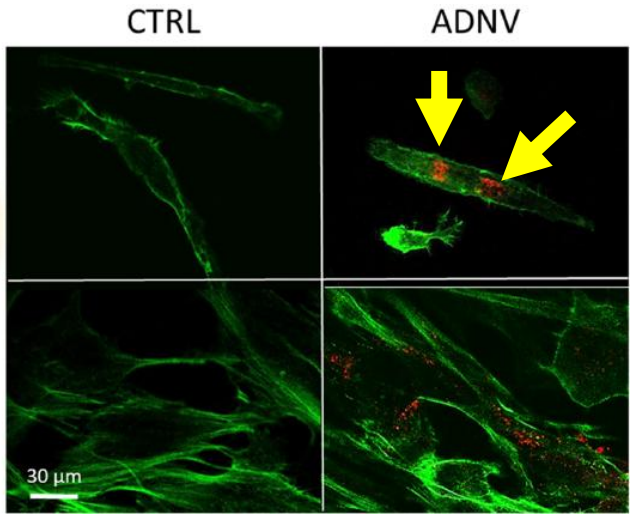
the vescicles are stabel in

Are absorbed by

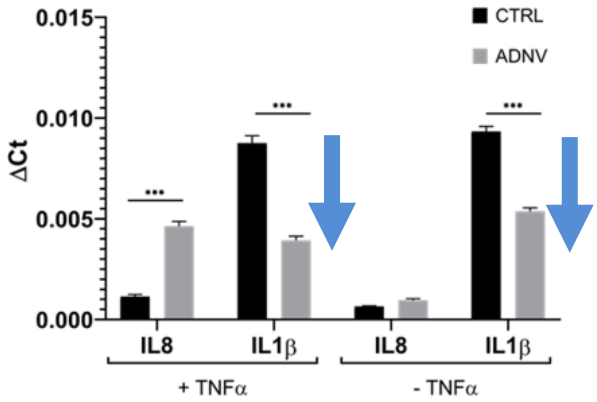








ADNVs stained with fluorescent dye (in red) have been absorbed by THP-1 derived macrophages and fibroblasts (FU) stained in green



IL-1b is a potent pro-inflammatory cytokine, which stimulates:

- prostaglandin synthesis
- neutrophile activation
- cytokines productions

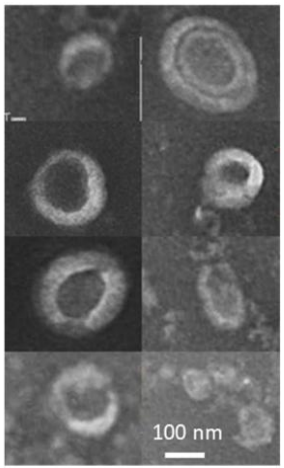
biomedicines

MDPI

Article

An Apple a Day Keeps the Doctor Away: Potential Role of miRNA 146 on Macrophages Treated with Exosomes Derived from Apples

Martina Trentini [1,2], Federica Zanotti [1], Elena Tiengo [1], Francesca Camponogara [1], Margherita Degasperi [3], Danilo Licastro [3], Luca Lovatti [2] and Barbara Zavan [1,*]



Food Bioscience 62 (2024) 105052

Contents lists available at ScienceDirect

Food Bioscience

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Apple vescicles: Revolutionary gut microbiota treatment for Inflammatory Bowel Disease

cells

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Article

Apple Derived Exosomes Improve Collagen Type I Production and Decrease MMPs during Aging of the Skin through Downregulation of the NF-κB Pathway as Mode of Action

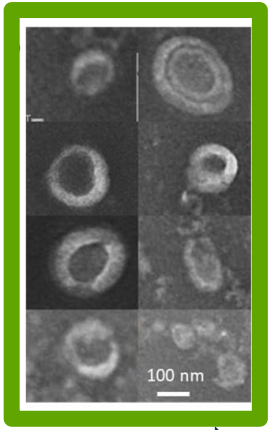
cells MDPI **2024**

Inflammation: The Cause of All Diseases

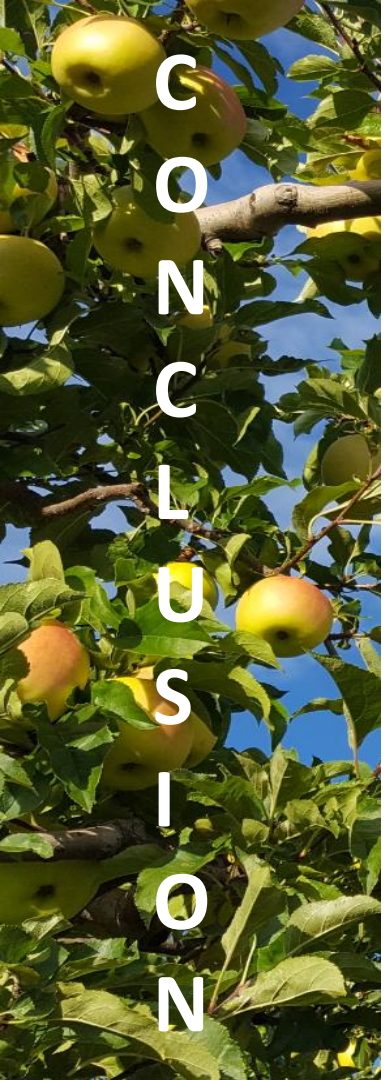
chronic tissue damage

development of chronic diseases:

- type-2 diabetes
- cancer
- chronic obstructive pulmonary disease
- cardiovascular diseases
- ....



Feb. 23, 2004 **2025**



- **Sustainability:** “meeting the needs of the present without compromising the ability of future generations to meet their own needs”

- **Circular bioeconomy**: “the production of renewable biological resources and the conversion of these resources and waste streams into value-added products.

PROJECT: **Apple-derived vesicles**, obtained from by-products of the **Golden Delicious PDO apple**, are being developed in a **circular bioeconomy**, with **collaborative research efforts** between industry, private research organizations, and academia driving innovations

Maria Cecilia Hospital
Cotignola

a model for how tradition and modernity can coexist, offering a sustainable path for

- **primary production systems**
- **food manufacturing industry**
- **market and consumers**

- An HISTORY OF COOPERATION

- THANK YOU FOR THE ATTENTION

Maria Cecilia Hospital
Cotignola