

# VALORIZATION OF BY-PRODUCTS DERIVED FROM HORTICULTURAL PRODUCTION AND PROCESSING



**ValorTech**

ERA Chair for Food (By-) Products  
Valorisation Technologies

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Estonian University of Life Sciences*



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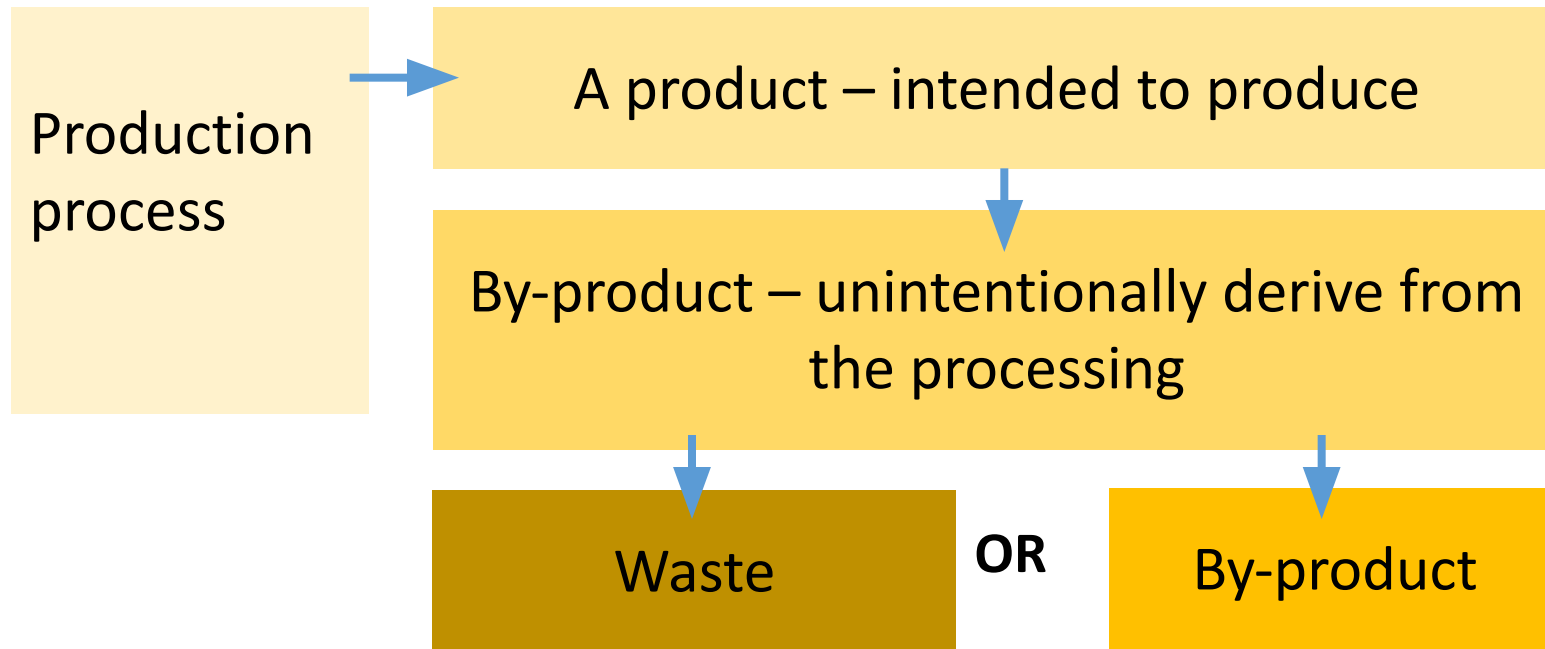
**ResTA**



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# What are we talking about – waste or by-product!?!?



- By-product (not waste) is a an unintentional product that derive from the production process that aimed other end-product than this.

Source: Ministry of Environment

<https://www.envir.ee/ringmajandus/jaatmed/korvalsaadused>

2. BY-PRODUCT  
-PRESSCAKE,  
POMACE-



1. PRODUCT  
-JUICE-

Photo by R.Rätsep



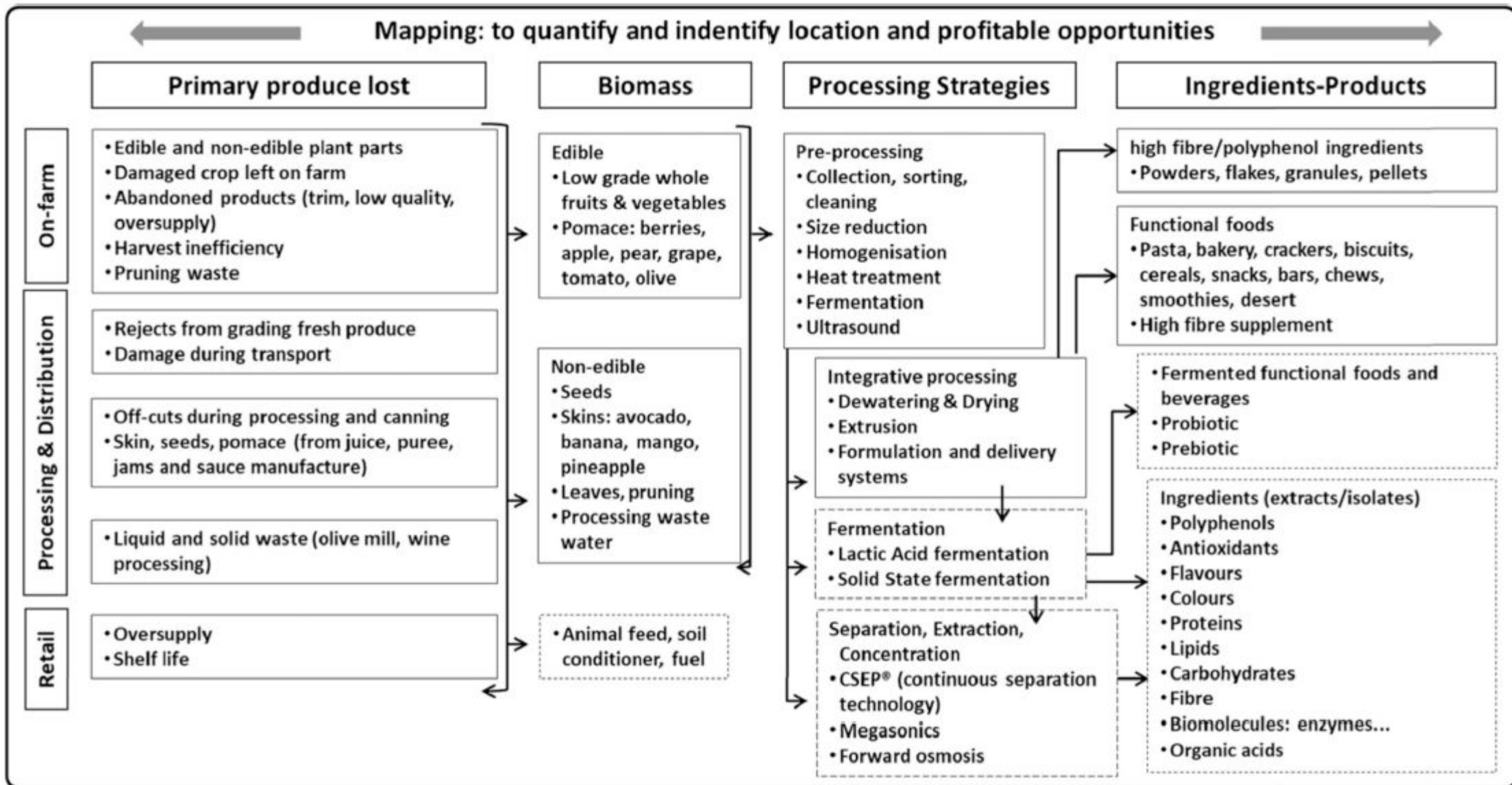
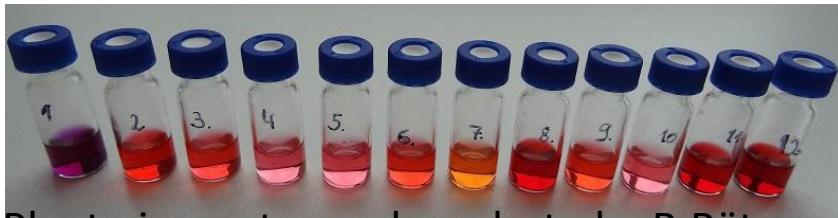


Fig. 1. Stabilisation and conversion of horticultural loss and waste into value added ingredients and food products.

# High potential for utilization

- by-products, left-overs or waste from fruit, berry and vegetable Industry
- Peels, seeds, pulp, leaves, etc.
- Biochemical compounds – antioxidants, pigments, fibers, protein, etc.



Plant pigment samples, photo by R.Rätsep



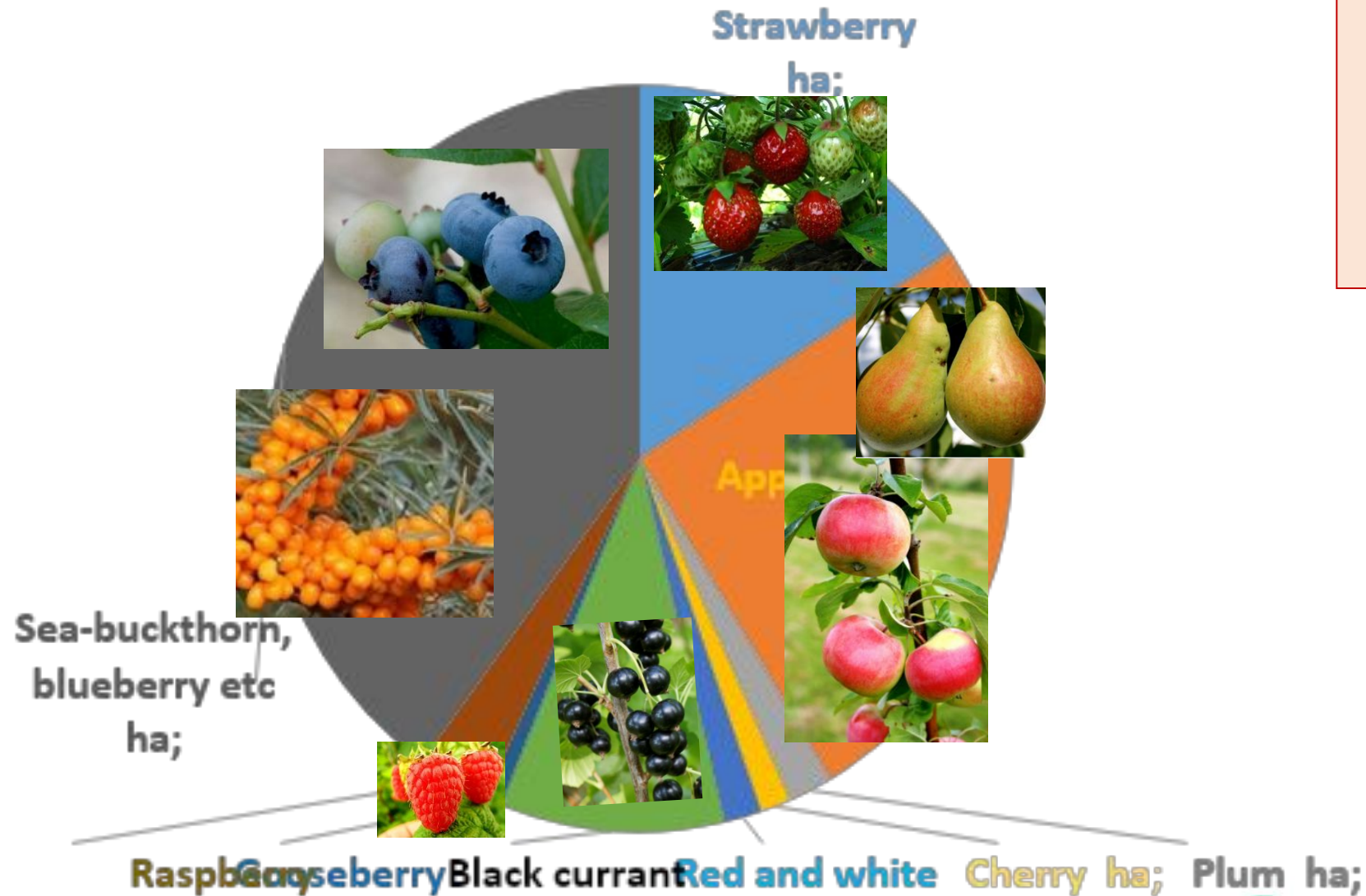
Apple pomace by U. Bleive



SBT leaves after harvesting by R.Rätsep



# What do we cultivate in Estonia?



!!!  
Our self-supply level of fruits and berries  
6%

Cultivation area of fruits and berries in Estonia in year 2021  
Source: Statistics Estonia

# By-product processing and shelf-life before and after use

- NB! Bioactives may be thermo sensitive. Microorganisms like low temp and high humidity.
- Drying methods – convective, condensation, infrared-vacuum, freeze drying, spray drying
- Extraction methods – obtaining bioactive substances for different purposes (food supplements, cosmetics etc)



*Spray dryer*

*Photo by Elmo Riig*



*SC CO2 extractor  
Photo by Elmo Riig*



# Valorization of apple pomace and low standard apples

- By-product pomace (~25%) from juice production
- Low standard apples for juice (~43% pomace, U.Bleive 2020)
- Usually for compost, landfill or animal feed
- Skins, flesh, seeds, stems
- Source of dietary fibre and pectin



Photo by U. Bleive



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# Valorization of sea-buckthorn

- Leaves after harvesting, usually left behind
- Fruits of different cultivars
- Skins, pulp, seeds
- Source of carotenoids, ascorbic acid and fatty acids



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Photo by R. Rätsep



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# Valorization of sea-buckthorn (*Hippophae rhamnoides*) harvesting and processing by-products for horse feed additives

Trocus Trade OÜ in cooperation with EMÜ VLI and Polli Horticultural Research Centre



Graphical abstract by Marko Kass

Project actions in red box..



Euroopa Maaelu Arengu Põllumajandusfond: Euroopa investeringud maapiirkondadesse

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# Valorization of sweet rowanberry

- New or well forgotten old species
- By-product pomace from juice/ fruit wine production
- Skins, flesh, seeds
- Rich in antioxidants (polyphenols)
- Possible source of pectin



Photo by R. Rätsep



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# Valorization of sweet rowanberry



antioxidants



Article

## Antioxidants Characterization of the Fruit, Juice, and Pomace of Sweet Rowanberry (*Sorbus aucuparia* L.) Cultivated in Estonia

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<https://doi.org/10.3390/antiox10111779>

- 20 different polyphenols
- Most abundant – chlorogenic acids, anthocyanins
- Possible use in food and cosmetics



Photo by R. Rätsep



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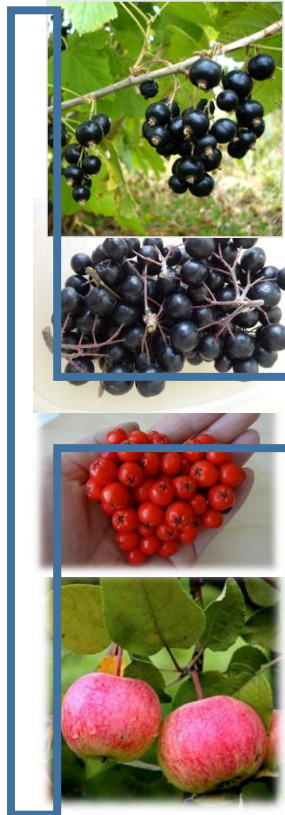
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# ResTA14 project „TAIMLOOMTOIT“ 2021-2023



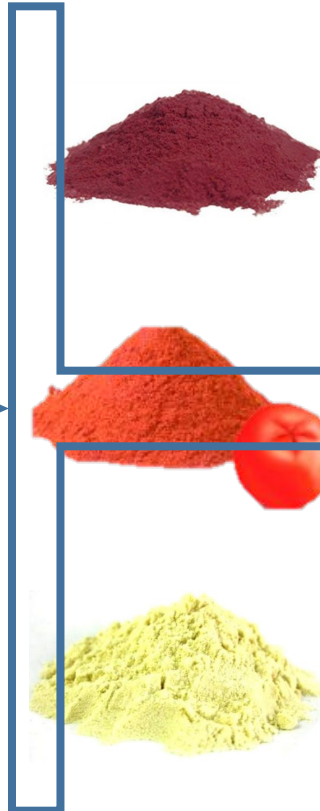
Local raw material



Processing by-products



Powder rich in bioactives



Enriched meat and fish products



Keywords: plant-based by-products; animal-based food; full valorization; food quality and safety; complex of analyses; new methods;



# ResTA14

## „TAIMLOOMTOIT“ 2021-2023



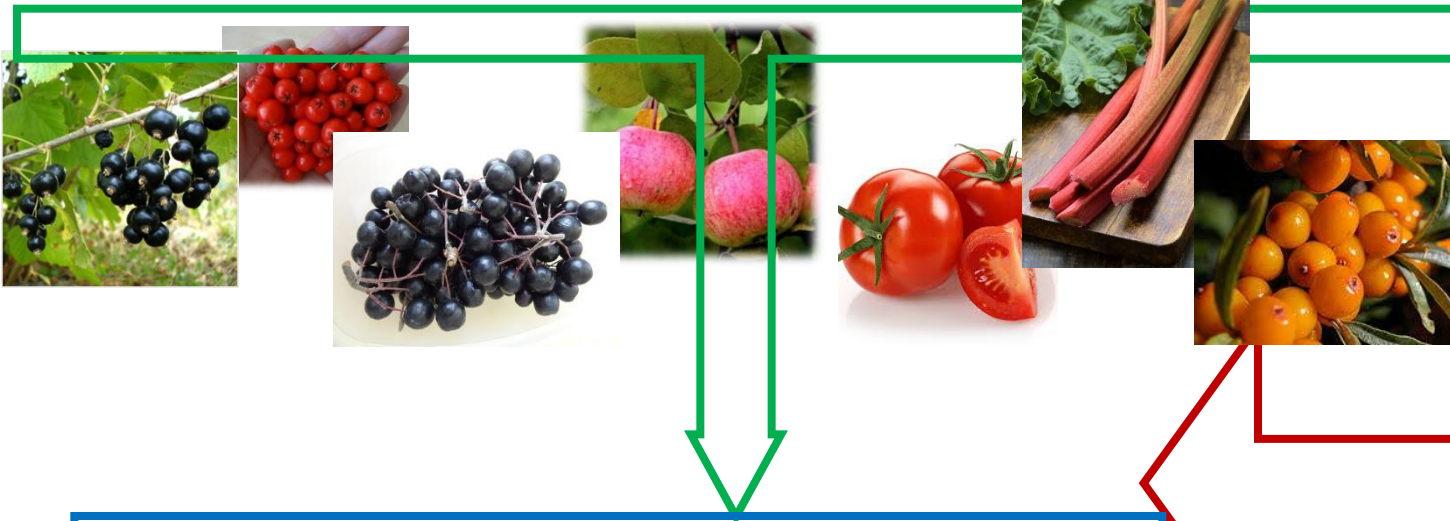
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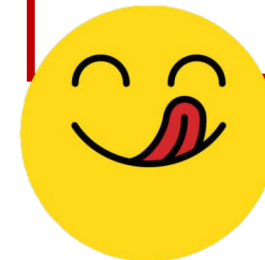


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### ANALYSES

- Microbiology
- Freshness
- Cooking loss
- Lipid oxidation
- Sensory evaluation



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# ResTA14

## „TAIMLOOMTOIT“ 2021-2023



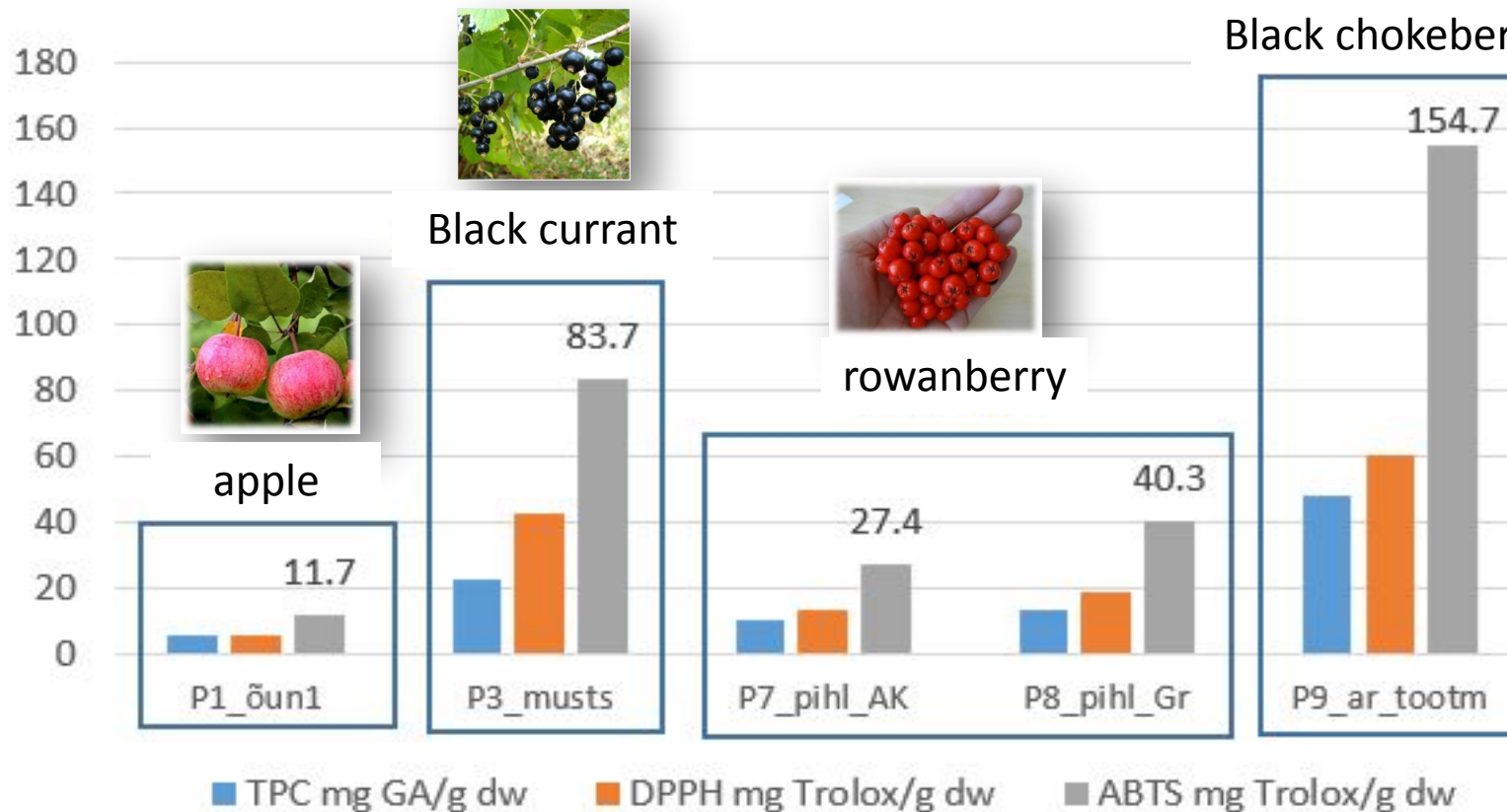
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Black chokeberry



- Plant-based by-products more rich in bioactives than the initial product (Fierascu jt, 2020).
- Dietary fiber, plant pigments



Total polyphenols (TPC) and antioxidant activity (DPPH, ABTS) of some tested juice pressing residues, 2021

# ResTA14

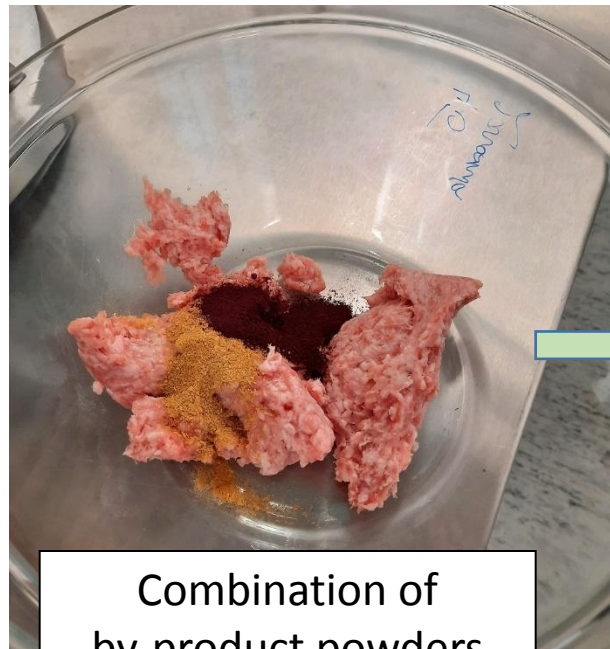
## „TAIMLOOMTOIT“ 2021-2022



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Combination of  
by-product powders



Preparation and mixing



Meatballs ready for  
sensory evaluation



# ResTA14

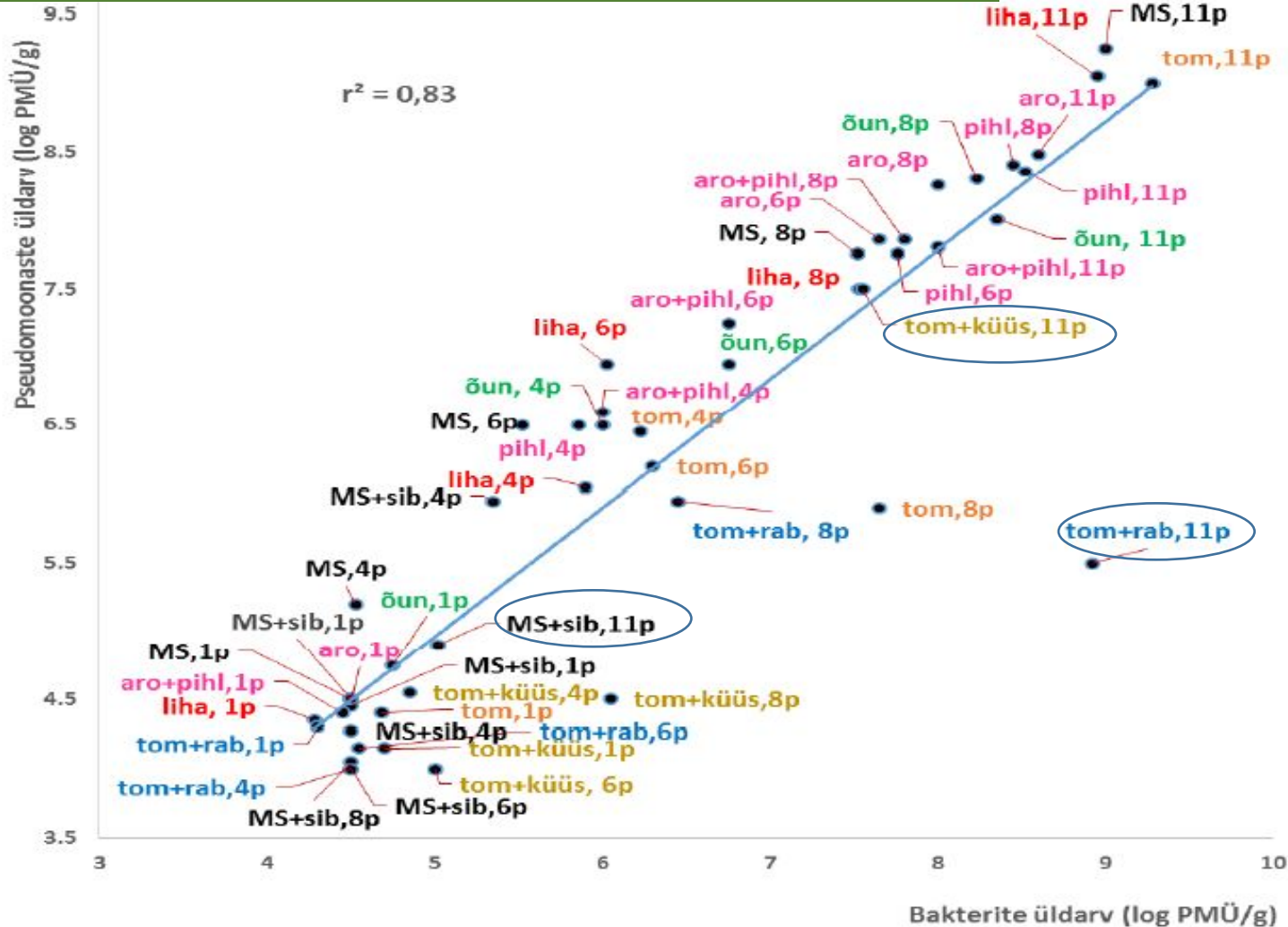
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• Inhibition of bacterial growth in the minced meat

Source: Püssa jt, 2022. Hakklihatoodete riknemise pidurdamine taimsete tootmisjäakidega. Terve Loom ja Tervislik Toit 2022 (55–70). Vali Press OÜ.



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# Grapevine valorization

- Grapevine shoot pesto
- Cider Rosé with grapes from Tori Siidritalu
- Viinamärdi cheese fermented in grape skins
- Fermented grapevine leaves - animal feed supplement





# „Development of cultivation, harvesting and processing technologies for new fruit and berry cultures “

- Seedri Puukool OÜ (Elmar Zimmer) + Polli Horticultural Research Centre (Liina Arus)
- 01.07.2016 – 31.12.2022, PRIA MAK 2014-2020 measure 16.2.

The main aim: from plant to product



SEEDRI  
PUUKOOL



Euroopa Maaelu Arengu  
Põllumajandusfond:  
Euroopa investeringud  
maapiirkondadesse



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# STRATEGIES REGARDING THE VALORIZATION OF HORTICULTURAL AND AGRICULTURAL BY-PRODUCTS AS FUNCTIONAL FOODS IN THE CONTEXT OF A CIRCULAR ECONOMY

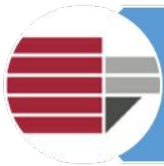
project no. 2020-1-RO01-KA203-080172



University of Life Sciences "King Michael I"  
from Timisoara, Romania BUAS (LP)



University of Agriculture and Veterinary  
Medicine Cluj Napoca, Romania (P1)



University of Calabria, Italy (P2)

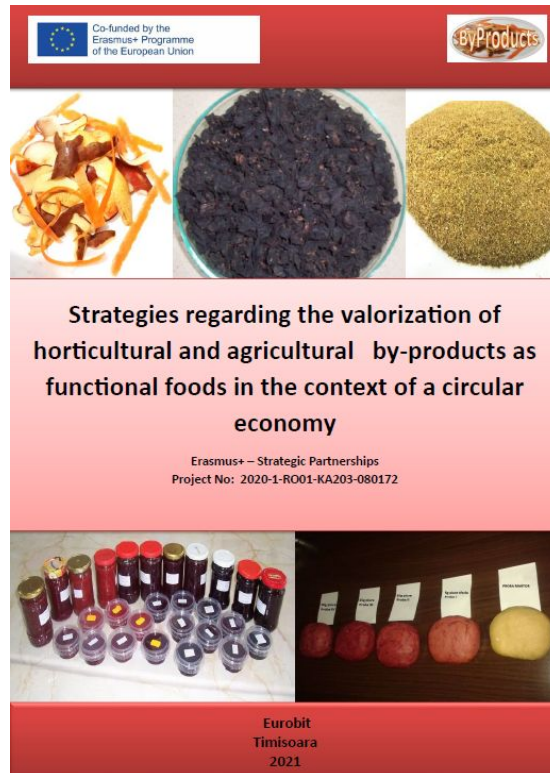


Estonian university of life sciences EESTI  
MAULIKOOL (P3)



Romanian Association of Milling and  
Bakery (ROMPAN), Romania (P4).

- curriculum and course
- students blended mobility
- awareness of the population



Book in English,  
Romanian, Italian  
and Estonian  
language



Co-funded by the  
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# Thank You!



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