Creating Incremental Revenue from Industrial Cherry Wastes

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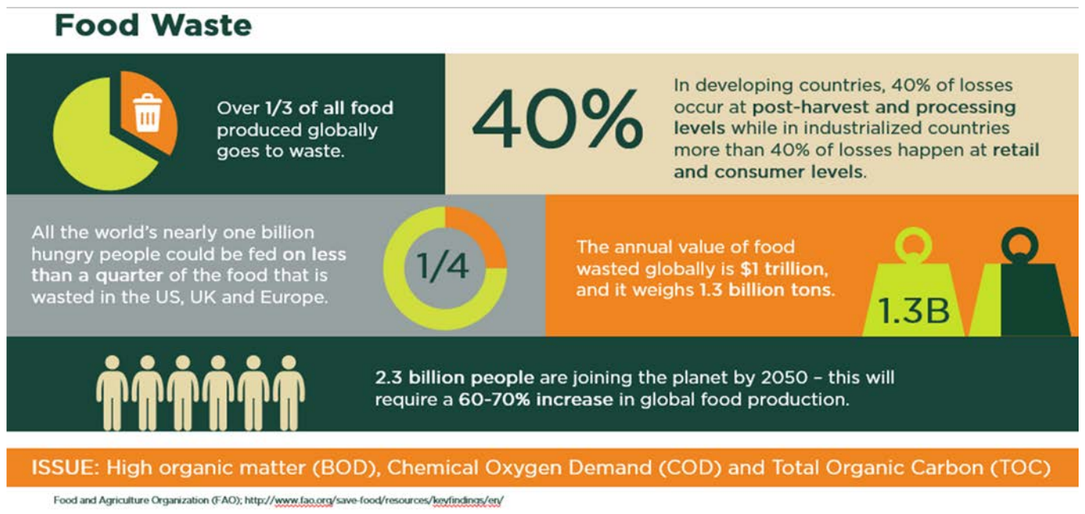
1. Research Project and Axia Theme

As reported by the United States Department of Agriculture (USDA), Michigan currently ranks 1st as a producer of tart cherries in the United States and 4th as a producer of sweet cherries in the United States, with the production of 94,500 and 21,300 tons in 2017, respectively.

Not surprisingly, the industrial production of cherry-based foods results in huge amounts of by-products, including cherry pomace, tar and pits. These residual substances, however, are rich in valuable intracellular compounds, including polyphenols with antioxidant properties which once recovered and valorized, represent an extremely viable untapped opportunity to realize economic and social benefits.

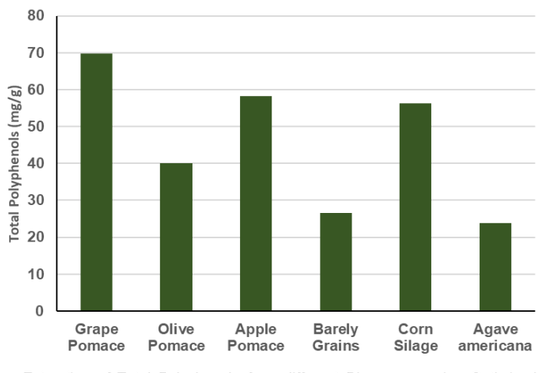
The aim of this project aligns well with the USDA goal of reducing food waste and improving food safety. As indicated by the U.S. Environmental Protection Agency (EPA), over 126 million metric tons of food were wasted in 2017 in the food supply chain. The USDA announced a goal to cut this waste in half by 2030. The use and valorization of wastes, still rich in nutrients, is a potential solution for minimizing the environmental impact generated by these nutrient rich by-products.



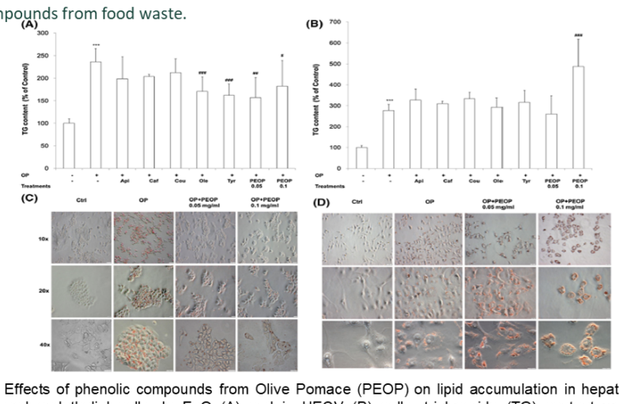
2. Value Created

One of the key opportunities for the recovery of these nutrient rich by-products is for use as antioxidants. The global antioxidants market is projected is expected to reach $4.531B by 2022. The market is experiencing modest growth at a CAGR of 6.42% during the forecast period of 2014–2020, which will be fueled primarily by the rising application of antioxidants in cosmetics and other skincare products. The food and feed industries are also showing increased proclivity for natural antioxidants.

Fig. 2. Proof of Concept – Extraction and characterization of bioactive compounds from food waste.



Extraction of Total Polyphenols from different Biomasses using Optimized condition of High Pressure - Temperature Extraction [3-9]



Effects of phenolic compounds from Olive Pomace (PEOP) on lipid accumulation in hepatic and endothelial cells. In FaO (A) and in HECV (B) cells, triglyceride (TG) content was quantified by spectrophotometric assay in control and steatotic cells incubated in the absence (OP) or in the presence of the single phenolic compounds. Neutral lipid accumulation was assessed in situ in Oil Red O (ORO) stained FaO (C) and HECV (D) cells incubated in the absence (OP) or in the presence of PEOP extract (0.05 and 0.1 mg_{CAE}/mL).

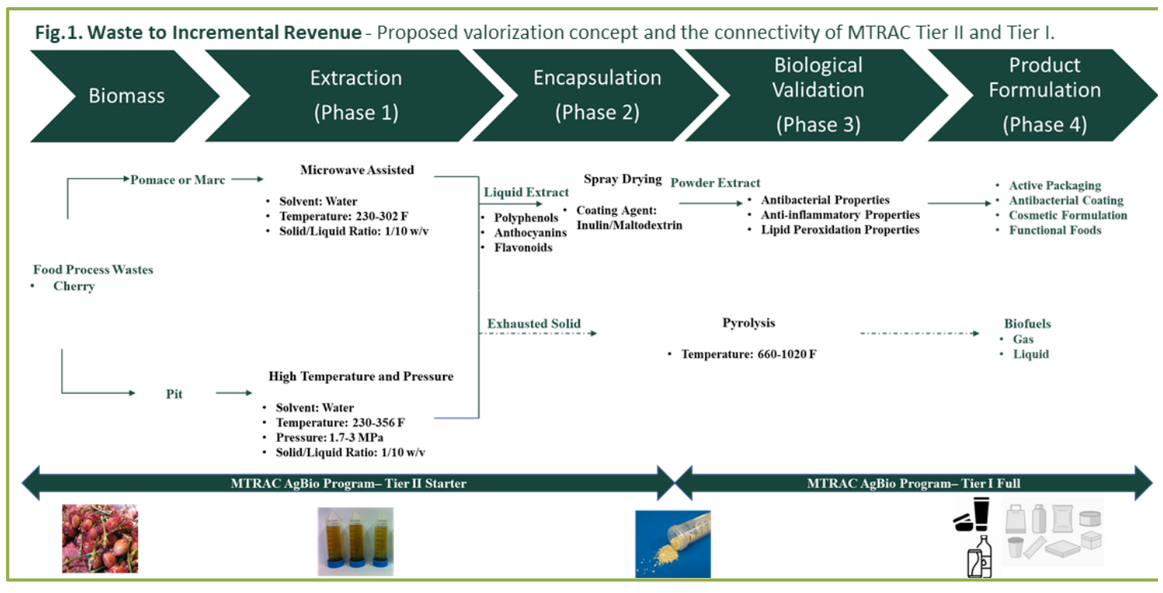
*[Figure from L. Vergani, G. Vecchione, F. Baldini, E. Grasselli, A. Voci, P. Portincasa, P.F. Ferrari, **B. Aliakbarian**, A.A. Casazza, P. Perego, (2018). Polyphenolic extract attenuates fatty acid-induced steatosis and oxidative stress in hepatic and endothelial cells. European Journal of Nutrition, 1-13.]*

3. Results and Future Directions

The proposed research focuses on optimizing the extraction and micro-encapsulation of bioactive compounds with antioxidant properties from the by-products of cherry industries, as follows:

- Extraction (Phase 1)
- Encapsulation (Phase 2)
- Biological Validation (Phase 3)
- Product Formulation (Phase 4)

Fig.1. Waste to Incremental Revenue - Proposed valorization concept and the connectivity of MTRAC Tier II and Tier I.



The selection of the extraction and encapsulation techniques and the operative parameters for each technique is based on the type of the biomass and the application of the extracts.

4. Project Plan

Q1- 4 Months

Optimization of the extraction parameters (time and temperature) of antioxidants from cherry pits using HPTE extraction and the encapsulation parameters.

Q2 – 2 Months

Economic viability analysis to develop a value-based pricing model for the technology including potential profitability requirements and to provide a business entry plan and go-to market strategy.