Determination of the nutritional composition of residues from an innovative food waste recycling system for utilization in aquafeed products

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Introduction

Globally, more than one-third of food is lost or wasted, contributing to 8% of greenhouse gas emissions when disposed of via landfill. Food waste is vitamin, mineral and nutrient rich, so there is great potential to adopt novel approaches to food waste management and enhance the environmental sustainability of the food production and supply chain. However food waste generates odours, is susceptible to pathogens and is difficult to handle at source. The focus of this study is to analyse food waste processed at source by the WasteMaster, to determine the potential for development of aquafeed products from food waste within a biorefinery setting.

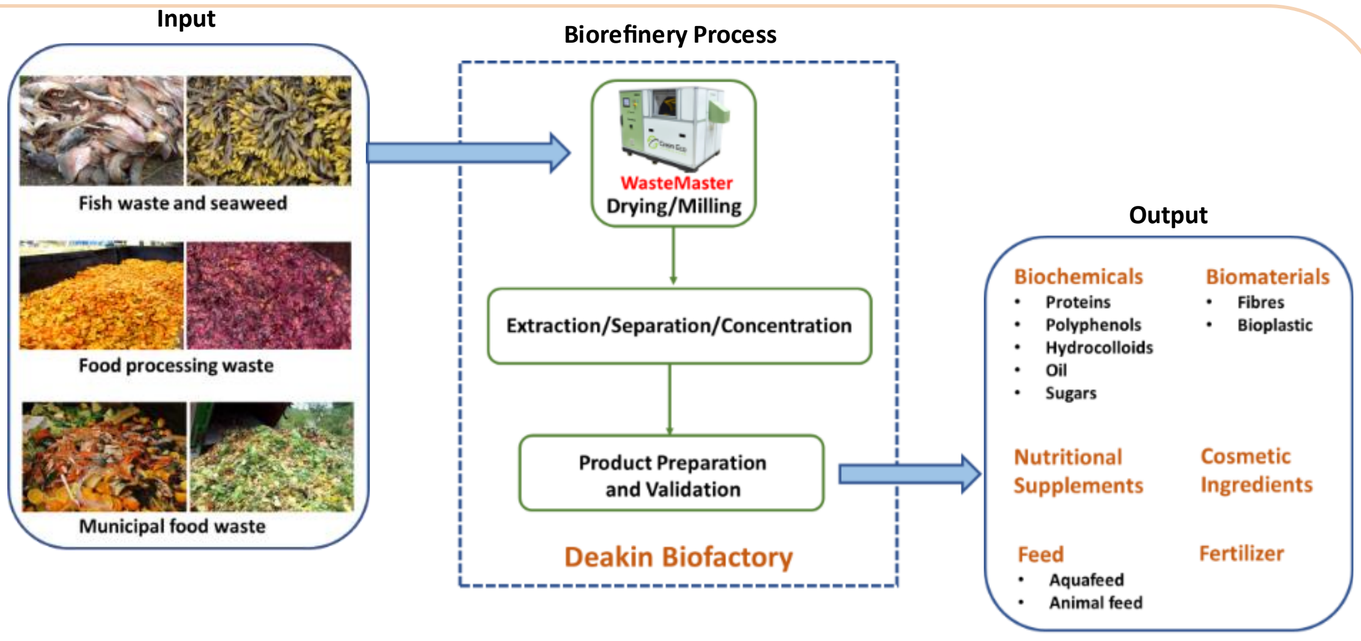

Figure 1. Treatment of food waste using the WasteMaster and development of value-added products using a Biorefinery approach

Why WasteMaster?

The WasteMaster is an at-source innovative food waste treatment and recycling system which blasts the cell walls of the food waste with charged oxygen to remove harmful bacteria and accelerate decomposition. Moisture is evaporated, leaving a dry, pathogen-free, and nutrient-rich residue that is of potential value for downstream applications.

Figure 2. WasteMaster: Green Eco Technologies

Aquaculture feed key nutritional profile

Protein is the most expensive component in fish feed, so protein levels in aquaculture feed varies on fish species;

Shrimp: 30 to 35 %, Catfish: 28-32 %, Tilapia: 35-40 %, Hybrid striped bass: 38-42 %, Trout and other marine finfish: 40-45 %.

Omega-3 fatty acid requirement in aquaculture feed; Marine fish: 0.5- 2.0 % and Freshwater fish: 0.5- 1.5 %.

Carbohydrate is incorporated to reduce feed cost and to increase binding during the manufacturing process (Craig et al, 2017)

These key nutrients are present in and discard with food waste.

Nutrition composition of processed materials

Figure 3. WasteMaster treated food waste residues

A selection of residues generated from single-origin and mixed food waste materials have been analysed for protein, lipid, carbohydrate, and phenolic content.

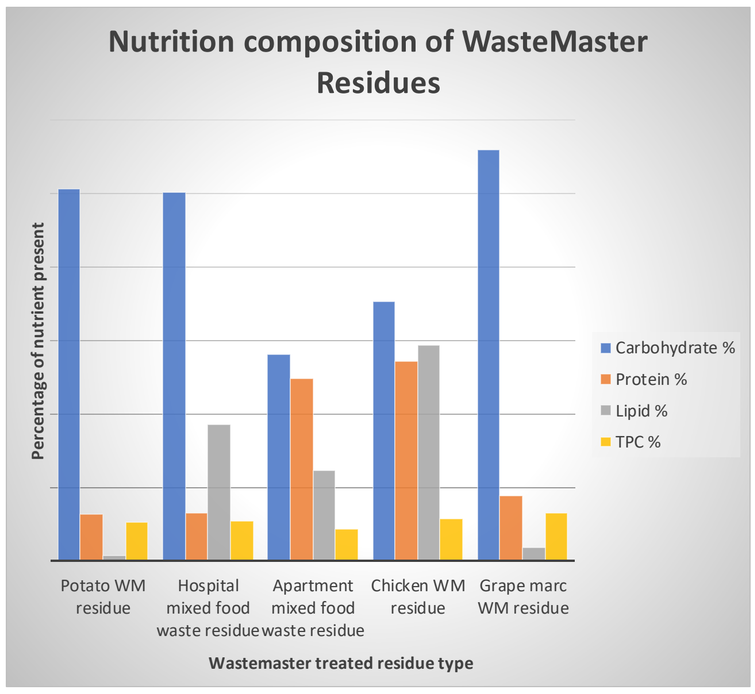

Figure 4: Nutrition composition analysis for WasteMaster treated food waste residues

- Protein and essential amino acids are retained.
- Significant amount of lipid is retained; TAG, FFA, MAG & DAG lipid classes are obtained; Sensitive fatty acids are obtained (omega-3 and omega-6).
- Phenolic compounds are intact.
- Carbohydrates can be included in the development of aquafeed.

Future analysis

- A comparison of the levels of minor bioactive compounds between processed WM residues of multiple origins.
- Understanding protein quality of WM residues
- Optimisation of nutrient extraction, separation and concentration techniques in a biorefinery setting

Conclusion

Single-origin and mixed food wastes can be processed using the WasteMaster to generate a dry, pathogen-free, and nutrient residue. When processed with the WasteMaster, each of the waste types studied is a suitable source of nutrients that can be separated for the formulation of aqua feeds within a Biorefinery.

References

Craig, S.R., Helfrich, L.A., Kuhn, D. and Schwarz, M.H., 2017. Understanding fish nutrition, feeds, and feeding.