

SUSTAINABLE VALORISATION OF COFFEE PROCESSING AND SISAL DECORTICATION WASTE THROUGH INTEGRATION OF FOOD, BIOPRODUCTS AND BIO-ENERGY PRODUCTION

K. Tsigkou¹, P. Ghofrani-Isfahani¹, I. Angelidaki^{1,*}

¹Department of Chemical and Biochemical Engineering, Technical University of Denmark, Kgs Lyngby DK-2800, Denmark

(*iria@kt.dtu.dk)

ABSTRACT

In the equatorial East African region agriculture accounts for 80%, with coffee and sisal as the most important crops with 600 kiloton coffee and 100 kiloton sisal ropes produced annually. The related crop processing generates huge quantities of organic residues. More specifically, almost 90 % of coffee berries finally end up as waste^[1] in the form of coffee pulp, mucilage, husk, silver skin, and wastewater. Referring to the sisal plant, after the decortication of its leaves for fibers extraction and yarn production, it has been estimated that only 2% of the biomass is utilized^[2] while the rest ends up as solid sisal residues and sisal wastewater.

The aforementioned waste streams are rich in organic matter, which needs to be explored and valorized. For instance, the solid coffee residues are usually characterized by high protein, cellulose, hemicellulose, and lignin content, however, also by phenolic compounds (in coffee pulp up to 2.6%^[3]), which can be phytotoxic or antinutritional if not treated properly before being discarded to lands or used as livestock feed, respectively.

The main objective of the current project is to develop new platform technologies to strengthen the circular economy and contribute to capacity building in East African countries. The liquid and solid residues derived from coffee and sisal processing will be evaluated for the production of high-value compounds and energy under a zero-waste approach. More specifically, coffee waste has been tested as a substrate for mushroom cultivation with a focus on enzyme synthesis, as well as for phenolic compounds extraction, so far with promising results. On the other hand, high-performance biocomposites have been constructed by sisal yarn residues. Finally, both solid waste and wastewater from coffee and sisal processing have been tested as monosubstrates and under co-digestion schemes for enhanced production through the process of anaerobic digestion.

Research capacity strengthening in East African countries is expected through the valorization of coffee and sisal processing residues, in the areas of biotechnology, materials technology, and sustainability. Additionally, new opportunities are explored for closing the loop concerning both the coffee and sisal value chain.

REFERENCES

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