EGU22-10211
https://doi.org/10.5194/egusphere-egu22-10211
EGU General Assembly 2022

Utilization of microbial strains and communities as a precept of recycled organic fertilization

Jukka Kivelä[1,2] and Elias Hakalehto[1,3]
[1]University of Helsinki, Agricultural Sciences, Helsinki, Finland (jukka.kivela@helsinki.fi)
[2]Ekosovellus Oy, Raasepori, Finland (ekosovellus@gmail.com)
[3]Finnoflag Oy, Kuopio, Finland (finnoflag@finnoflag.com)

The by-products of food and forestry industry are usually considered as waste causing significant environmental problems. However, these by-products can be processed by using microbes to produce valuable chemicals as well as recycled fertilizers.

Microbial processes funded by the Finnish Ministry of Agriculture and Forestry have provided prime organic fertilizers from industrial side streams. In earlier greenhouse trial cellulosic deposits of the forest industries were upgraded with lactic acid and nitrogen-fixing bacteria providing 50% increased plant growth compared with the standard method. Another trial, the chicken manure treatment, consisted of microbiologically processed mix of manure, wood chips, and egg industry and slaughterhouse wastes. For example, this process yielded valeric acid and other valuable short-chain fatty acids (SCFA's). Simultaneously, both the methane yield and fertilizer nutritional value for the plants of the recycled residual fractions were remarkably upgraded by the microbiological treatments.

In Kasimir -project we are processing microbiologically by-products of industrial sauce production (Puljonki Oy, Nestle Professional). We get three different products out of this process: bone, fat, and protein fractions. Fat and protein fractions are processed further in biogas plant and bone fraction is processed as recycled fertilizer. In the case of microbiologically processed sauce industry wastes, the treatments with selected micro-organisms:

- separated bone material from soft tissues
- degraded and pulverized bones
- eliminated and processed foam

Pulverized bones are used as component of recycled fertilizer, as they have quite a lot of plant nutrients. Total mineral contents of the organic bone meal were nitrogen (N) 3,9 %, phosphorus (P) 11 % and calcium (Ca) 22 %. Bone meal has been as a part of recycled fertilizer which has been used as fertilizer in field trials.

Besides the soil improvement, various food-grade chemicals, such as lactate and mannitol, were formed in some processes. All the microbial waste treatments produced high amounts of plant

nutrients corresponding to standard mineral fertilizers but in a sustainable fashion.

Recycling food, paper and pulp industry by-products with microbiological biorefinery methods gives possibility to replace mineral oil-based materials. In addition, the microbiological nutrient recycling is more effective, and we can get more sustainable agriculture and food processing. With their accelerative effect in a bioprocess, the soil-derived microbial strains boost the agricultural circulation of substances and integrate the processing of industrial side streams into the soil ecosystem.