

TRAINING MATERIAL

Title:

The use of **alternative biomass** as fertilizer

Training:

Main features of the subcategory

Alternative biomass refers to microalgae based biofertilisers from wastewater by heterotrophic microalgae process. It is a solid fertilizer (powder). Algae are a diverse group of aquatic organisms that have the ability to conduct photosynthesis. Duckweed (the Lemnaceae) is a family of aquatic plants that rich in protein. Both of them can make use of nutrients in solutions to produce biomass by algae cultivation which can be used as crop fertilizer. With the use of microbial fertilizers obtained from microalgae, the amount of soil organic matter and the water holding capacity are improved and have positive effects on soil, plants and therefore environment. As an organic fertilizer, microalgae have the potential to prevent nutrient losses through a gradual release of N, P and potassium (K), which is attuned to the plant requirements.

Input material

Fruit and vegetables processing industry waste water

How to produce?

The LIFE ALGAECAN project proposes a sustainable treatment model of high loaded and salty effluents that combines cost-effective heterotrophic algae cultivation with spray drying of the collected microalgae to obtain a product of commercial interest as raw material for the production of biofertilisers, animal feed, etc.

The treatment system prototype is composed of three main steps: 1) a two-phase microalgae growing system, which consumes the organic matter and nutrients contained in the effluent; 2) a separation step to recover the clean water (that will comply with reuse standards), and; 3) a drying step to recover the dry microalgae (sub-product as biofertiliser or animal feed).

This system is placed in two containers with solar panels that provide energy to the whole system. In case that there is not enough solar radiation, this technology will be supported by energy from biomass.

Typical nutrient content and availability for plants

N in the microalgae biomass ranges between 1-10% and P concentration can range from 0.03% to more than 3%. Microalgae also have nutrient concentrations of K, lower than N and P. The typical NPK concentration for microalgae cultivated in food processing wastewater is around 6:2.5:1.5 %.

Examples of alternative biomass products available on the NUTRIMAN Farmer Platform

- https://nutriman.net/farmer-platform/product/id_255 (Spain)



Figure 1: Alternative biomass from ALGAECAN process (ID 255)



Figure 2: ALGAECAN technology (ID 253)

Fields of application in agriculture: crop, dosages, application method and practical recommendations.

Microalgae can be used in organic farming in almost all crops. The application dose is depending on N%, N-vulnerability of the region, type of soil, crop...

The product is solid and has to be applied as other chemical fertilizers, by adapted machinery for applying small doses of fertilizers. The application is by preference before or at the moment of seeding/planting. However, it may also be advisable to mix the microalgae powder with other nutrients by blending to meet the nutritional requirements of the crops.

Benefits for farmers

Algal biomass as a new bio-fertiliser contains macronutrients and micronutrients, some growth regulators, polyamines, natural enzymes carbohydrates, proteins and vitamins implemented for improving vegetative growth and yield. It can improve soil characteristics that have favourable effect on nutritional status of plants. Microalgal fertilisers improve the fruit quality through an increase in sugar and carotenoid content. Some studies had demonstrated that the performance of algal materials was similar to that of a conventional synthetic fertiliser or even higher.

Bottlenecks of application. Potential risk or limitation.

The main bottleneck is that the nutrient composition of the microalgae is often lower than the requirements of the crop. Furthermore, these nutrients can vary throughout the production process and between different facilities. Therefore, it is important to know the exact composition before fertilisation.

Legal framework for using

The valorization of wastewater-grown microalgae for food or feed purposes is legally restricted, but not for use as fertiliser.

Economic evaluation of the application of the products

Microalgae dry biomass has a market price as biofertilizers ranging from 1 to 10 €/l, typically around 10€/l (ID 255). The incomes from the utilization of the biomass for agriculture products is highly positive whatever the final product and quality considered.

Best management practice guideline, taking into account of specific conditions of the given territory, for the use of the product to the specific applications (soil improvers, growing media, organic fertilisers etc.).

The alternative biomasses are organic fertilizer and the dosage of application is in general depending on the N%, the type of soil, crop, etc.

How to store, apply to land, machinery needs.

Microalgae powder should be stored in closed tanks and in a dry, light-free place and can be applied to the field by adapted powder sprayer.

For more information:

- https://nutriman.net/farmer-platform/product/id_255 (Spain)