

Deposition of manure nutrients in a “Mycoalgae” biofilm

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Abstract

We propose to develop a novel biofilm based technology to recover and reposition the nutrients in manure, producing biofilm fertilizer. Our preliminary study used anaerobically digested manure to grow the surface-attached composite biofilm which constitutes the selected polyphosphate accumulating soil fungi with / without nitrogen accumulating fresh water microalgae for efficient recovery of nutrients on a matrix for better biomass harvesting, making it a better bio-fertilizer. Under the tested conditions in lab-scale with the pretreated digested manure, the removal efficiency of the Nutrients by attached biofilm were in the range of 75 – 80 % P and N, and about 85% of the dissolved chemical oxygen demand, depending on the available carbon. The nutrient rich solid biofilm can be harvested by scraping off the biofilm from the matrix and the nutrient lean liquid can be discharged or further used for agriculture. The strain combination used for the nutrient (NPK) adsorption has already been tested at different conditions for P and N recovery in synthetic medium as well the digested manure in laboratory scale. The microbial biofilm assimilate the organic and inorganic components in manure and convert them in to cellular constituents together with N-P-K resulting in deposition of manure nutrients in biofilm which can be directly used as a bio-fertilizer. Even though animal manure is a valuable source of nutrients for plant growth and an attractive alternative to chemical fertilizer, it has some inherent shortcomings due to the unbalanced nutrient content leading to over application of certain components and are limited to the site close to the livestock production. The biofilm based fertilizer formulation addresses the limitations in conventional manure application and facilitates better manure management, minimizing the environmental impacts with better transportation to onsite application of biofilm fertilizer.