BIOFILM BIOFERTILIZERS FOR INCORPORATING BIODIVERSITY BENEFITS AND REDUCING ENVIRONMENTALLY HARMFUL SUBSIDIES IN AGRICULTURE

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Any natural ecosystem (e.g. a forest) is composed of a food web-based network of interactions of organisms. Nutrients in natural ecosystems are conserved by cycling them in the producers-consumers-decomposers loops in these systems. Thus, food web-based network of interactions of microbes, flora and fauna is the key to ecosystem sustainability. As long as all the interactions are intact, the ecosystem is equilibrated and sustainable.

There are some microbes and insect fauna, which contribute to the structure or stratification of plants within a forest ecosystem by consuming seedlings of the same species that grow at high densities on the forest floor thereby thinning them. This allows seedlings of other species too to emerge in the same manner, leading to a remarkable diversity in the seedling stratum in natural forests. In forest conversion to conventional agriculture, stress factors, like forest clearing, tillage and chemical inputs, reduce biodiversity of the functional flora, fauna and microbes. Most of the negatively affected biodiversity enter into an inactive or dormant phase to bypass the stress factors, by forming 'seeds', which are stored in the soil seed bank. Then, the natural food web collapses in agroecosystems. In the absence of other plants in conventional croplands, those forest structuring and diversifying remnant microbes and insects start feeding on our crops. This is how pathogens and pests originate in agroecosystems. Eventually, all the above anthropogenic activities lead to collapse the sustainability of the agroecosystems.

To address the above, beneficial biofilms have been formulated to be used in agriculture as biofertilizers that are called biofilm biofertilizers (BFBFs). The BFBFs render numerous biochemical and physiological benefits to plant growth, and to improve soil quality. Thereby, the application of environmentally harmful, subsidized chemical fertilizer (CF) NPK use could be reduced by 50% in various crops. The role of BFBFs is to reinstate the sustainability of degraded agroecosystems through breaking dormancy of the soil microbial seed bank, thereby restoring microbial diversity and ecosystem functioning. As such, this contributes to a more eco-friendly agriculture with an array of benefits to our health, economics and to the environment.