



Soil Rhizobia Health: Best Indicator of Eco-friendliness of Human Activity

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Mini Review

Despite continuous increase in human population, it is believed that now there is the great need to save life support system, when the nature is in decline because of human activity [1]. Several survey-based studies confirm that there is a tremendous decline in fauna and flora species number. A study based on thousands of vertebrate species conducted by Zoological Society of London and some other organizations, concluded that overall animal populations fell 52% between 1970 and 2010 [2]. According to a UN report, the average abundance of native species in most land-based habitats has fallen by at least 20% since 1900, many within decades [3]. More than 40% of amphibian species, almost 33% of reef-forming corals and more than a third of all marine mammals are now threatened with extinction [3]. The report from Birdlife International finds that 40% of the world's 11,000 bird species are in decline, with one in eight now under some threat of extinction [4]. A recent scientific review on insect number, conducted by an Australian team led by Dr. Francisco Sanchez-Bayo finds one-third of insect species including - bees, ants and beetles - are endangered, and dramatic rates of decline of insect number may lead to the worldwide extinction of 40% of insect over the next few decades [5].

As far as rhizobias in soil rhizosphere are concerned, Abd-Alla et al. [6] conclude that harsh environmental conditions may have depressive effect and can arrest their growth, multiplication and survival [6]. According to David Linden Mayer, a researcher at Australian National University, big old trees which store an enormous amount of carbon and continue to sequester it as they grow, even in their old age, are declining rapidly in all types of ecosystems worldwide forests, rainforests, boreal forests, woodlands, agricultural areas, cities and savannahs [7]. That means, the forests and woodlands nowadays are too scattered to save the lives of trees and of all creatures. Quite contrary to all fauna and flora number decline, human population is currently (2019-20)

growing at a rate of around 1.08% that means 82 million people per year of course down from 1.10% in 2018, 1.12% in 2017 and 1.14% in 2016 [8]. In this context, it appears that life support systems are of two types: natural and manmade. The provision of natural safety to entire biosphere appears to be ever available, if human activity is perfectly in accordance with nature. But when the humans act against the nature and apply techniques for their own interests, the entire biosphere perhaps has to face its consequences.

The scientific and technical development in the form of simplification of human labor - initiated in 1850s when sewing machine, mechanical washing machine and electric bulb were invented - now has entered the nuclear and spacecraft era. The quest of earth-like life supportive environment in other planets, particularly mars, probably, has been one of the objectives of human space research activities. The earth-like life supportive environment, as explained by space research agencies, is represented by regenerative natural cycles like oxygen cycle, nitrogen cycle, water cycle etc. [9]. How the environment of our planet earth supports life; it is explained by NASA (National Aeronautical and Space Administration) space authorities as follows. 'Earth is the ultimate life support system with a multiplicity of biogeochemical cycles which operate to maintain the balance of nature; natural products are recycled by the system as one organism's waste is another organism's food [9]. Regenerative Life Support is the discipline dealing with the development of the physicochemical and bio-regenerative systems and is required to accomplish tasks of man ventures beneath the sea or into the space [9]. This is the point of contradiction; the technical activities of human being on the planet earth are leading to disturbance in naturally available life support system, self-proven by tremendous fall in animal and plant populations within five decades, then how manmade regenerative life support system would strengthen nature in other planets and save the presumed life there. Various

eco-friendly technologies have been developed to reduce the deleterious effects of pollutants and radiations, released in modern human activities, on fauna and flora living on the earth. But their limitations, despite using regenerative systems, are well known. For example, a technique coined as electro-flotation has been developed for the separation of hydrocarbons from oil field waters (patent # 209854 & SPE update- 21-Nov-2007), which can claim to improve the BOD (biological oxygen demand) and COD (chemical oxygen demand) of the treated effluent to considerable extent [10]. But it appears that the condition of survival of biosphere on earth is, perhaps, the availability of air, water and food in purest forms set by the natural order or regenerative cycle system.

According to Pandit Deen Dayal Upadhyay, propounder of integral humanism principle, the integral humanism system does not think of merely a single aspect of human life to thrive on exploitation of nature but thinks of all aspects to sustain nature and in turn it being nourished [11]. However the litmus test to the level of human integrity to biosphere, proposed by him, is; the humans should consume the same kind (quality) of food, water and air which all the creatures do (universal consumption pattern for eatables); that means humans should avoid drinking treated and RO (reverse osmosis) water (of course, water may be supplied from water resources rivers, wells etc. to homes via pipelines after filtration) and eating specially grown safe foods like organic foods and living in air conditioned premises [12].

The author of this article opines that the soil health (mineral contents) and the rhizobia health (rhizobia number) might be best indicator of eco-friendliness of human activity and evolved

technology; because rhizobia are essential for flora health as well as fauna health (fauna-flora mutual dependence is well known).

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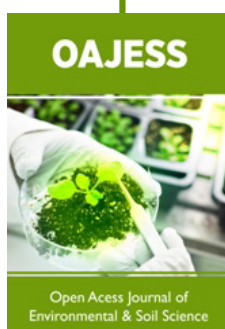
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