Integrating bio-fertilizers for Health, Safety and Sustainable Livelihood

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ABSTRACT

The over application of fertilizers and poor management of resources have damaged the soil environment and human health besides making the crop cultivation highly expensive. Nitrate leaching and eutrophication due to excess phosphorus (P) entry in water bodies is contaminating the underground water and marine environment. In India, harsh climatic conditions, population pressure, land constraints have also added to reduced soil fertility leading to yield stagnation. Pesticide residues in the food chain have endangered the life sustaining system and causing spread of deadly diseases in human beings.

As agriculture is a soil based industry where soil is the primary material for drawing nutrients, effective and efficient nutrient management approaches will be required to maintain and increase crop productivity in long term. A shift to sustainable agricultural practices is the need of hour. Existing natural resources should be used to improve the productivity by low cost technologies which are not only cost effective but safe for human consumption. The present paper throws light on some of the important aspects of natural resource management to improve soil health through generating awareness among farming community.

1. INTRODUCTION

With the rapid increase in population globally, the demand of food and agricultural yield has been rising tremendously. This is the reason why statistics show that almost 40-60% of agricultural crops are grown with the use of different types of fertilizers. Not only this, more than 50% people feed on crops that are grown as a result of using synthetic fertilizers. On the other hand, there are organic fertilizers that consist of manures and animal wastes. The problem is that humans tend to use too much of fertilizers in the soil because they have to cater to the global demand of food. As mentioned already, more than half of the total yield production is out of synthetic or inorganic fertilizers which contain components like nitrogen, potassium, sulfur, calcium, magnesium, and so on. These chemicals and minerals, although help in boosting the growth of plants, they also have their drastic side effects in the long run. Some of the effects of fertilizers on environment and human health are discussed below;

2. DEPLETION IN THE QUALITY OF THE SOIL

Using too much of fertilizers in the soil can alter the fertility of the soil by increasing the acid levels in the soil. Which is why it is recommended to get a soil test done at least once in every 3 years tot decide whether or not one is using the right amount of fertilizers.

3. ALTERATION IN THE BIOLOGY OF WATER BODIES

Too much use of fertilizers in the soil leads to eutrophication. Fertilizers contain substances like nitrates and phosphates that are flooded into lakes and oceans through rains and sewage. These substances are toxic for the aquatic life, thereby, increasing the excessive growth of algae in the water bodies and decreasing the levels of oxygen. This leads to a toxic environment and leads to death of fish and other aquatic fauna and flora. Indirectly, it contributes to an imbalance in the food chain as the different kinds of fishes in the water bodies tend to be the main food source of various birds and animals in the environment.

4. AFFECTS ON HUMAN HEALTH

The nitrogen and other chemicals present in the fertilizers can also affect the ground waters and waters that are used for the purpose of drinking. One of the most common problem is the development of blue baby syndrome which occurs in infants whose skin tissues are low in oxygen and their skin appears to be blue or purplish in color. Studies reveal that the use of fertilizers and pesticides can cause health risks like cancer and chronic diseases in humans, especially in children.

5. CLIMATE CHANGE ACROSS THE GLOBE

Fertilizers consists of substances and chemicals like methane, carbon dioxide, ammonia, and nitrogen, the emission of which has contributed to a great extent in the quantity of greenhouse gases present in the environment. This in turn is leading to global warming and weather changes. In fact, nitrous oxide, which is a byproduct of nitrogen, is the third most significant greenhouse gas, after carbon dioxide and methane.

Exploitation of natural resources in the form of microbial inoculants and improving organic matter status of soil by organic fertilizers may help to restore the soil health and improve crop productivity. Integrated approach of using bio-fertilizer and low input of nutrient specific chemical fertilizer may provide a sound package of environmentally safe and low costs farming technology. The low application of inorganic fertilizers in combination with organic fertilizers not only conserves the nutrients in soil but makes nutrient uptake more efficient.

6. BIOFERTILIZERS

Bio-fertilizers or the microbial inoculants are the formulations of living cells that on addition to soil improve the soil health by providing the specific nutrient. The constituent micro-organisms

biologically interact with the soil, root and seed of plants and promote the growth of plant by recycling nutrients. As chemical fertilizers cause a deterioration of the soil vitality over time, bio-fertilizers are attractive alternatives, benefiting both plant and soil health.

Different types of Biofertilizers include

1. **Symbiotic nitrogen fixers**
   Rhizobium, Bradyrhizobium for leguminous crops
2. **Free living Nitrogen fixers**
   Azospirillum, Azotobacter for cereals
3. **Nitrogen fixers for rice**
   Cyanobacteria and Azolla
4. **P mobilizing biofertilizers**
   AM fungi
   Phosphate solubilizing microorganisms (PSM)
5. **Biofertilizers for micronutrient**
   Silicate and zinc solubilizers
6. **Plant growth promoting rhizobacteria**
   Psudomonas fluroscence

The ever increasing cost of chemical fertilizer is a major financial constraint on a marginal farmer. But the farmers still rely on inorganic fertilizers and pesticides for crop cultivation. To optimize the crop yield, bio-fertilizers are the best option. The bio-fertilizers being cheap and non bulky can partially fulfil the demand of fertilizer consumption.

7. BENEFITS OF BIO-FERTILIZERS ON SOIL AND HUMAN HEALTH

1. Due to absence of chemical constituents, they do not exert any ill effects on soil health and environment.

2. Besides their role in fixation of atmospheric nitrogen and P solubilisation, *Azotobacter* and phosphobacteria secrete plant growth hormone such as Indole acetic acid, cytokinin and gibberline that favour germination and root growth.

3. On application to soil, a small packet of 200-500 g carrier based inoculums is sufficient to save the consumption of chemical N and P fertilizer by 20-25 % as each g of carrier contains 10 million population of specific strain.

4. Improve the soil, physical, chemical and biological properties of soil and help to conserve the soil.

5. The cost benefit ratio of bio-fertilizer is always higher so their use is always acceptable for cultivation under diverse agro-climatic conditions.

6. Some bio-fertilizers provide micronutrients also and enhance the level of secondary metabolites as phenol that control pathogens and pests leading to low incidence of disease.

7. Algal bio-fertilizers enhance the chlorophyll content enhancing the higher photosynthesis rate.

Biological alternatives still occupy only 1-2 % of the total crop production market. The factors that limit the bio-alternative use include availability and accessibility, efficacy of the product, awareness among farmers for these technologies and knowledge of their proper application. Using chemical fertilizer, the health of a farmer is always at the risk of pesticide exposure (65% of respondents), musculoskeletal problems during various process (16.6%-75.9%), and injuries (1.1%-83.2%). Biological fertilizers do not contain chemicals that can cause reproductive, endocrine, immune and nervous system damage. Some examples of biological or organic fertilizers include horse and cow manure, peat moss, mulch, sewage sludge and compost. Algae and seaweed are also used in areas where these two plants are plentiful. Therefore, indiscriminate use of fertilizers is not harmful to our environment and also the health of human beings and other animals in the food chain.

These facts are alarming and a serious step needs to be taken as soon as possible to avoid more severe consequences. So we must educate the farmers to use the fertilizers in moderation and allow soil to replenish its nutrients naturally by giving it a break from crop production, adopting proper crop cycle, avoid using fertilizers during the rains and use the alternatives like bio-fertilizers. A small step can also make a big difference. Lets hope for a healthy and safe tomorrow

We are what we eat. Appropriate use of bio-fertilizers and bio-pesticides by farmers can protect them from the health hazards experienced during pesticide application and also save soil health from chemical abuse and human lives by providing pollutant free food.

REFERENCES

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