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Potassium Bio-fertilizers

Viable Technology for Sustainable Agriculture

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POTASSIUM (K) is quite abundant in many soils in the world, however it is one of the major nutrients limiting the plant growth and crop productivity. It is major constituent of several soil minerals, i.e. mica, illite and orthoclase. Potassium is one of the most important plant nutrients after nitrogen (N) and phosphorus (P). It plays an essential role in enzyme activation, protein and photosynthesis. Due to intensive agriculture across the globe, available K level in soil has dropped due to mining through crop removal without replenishing the soil through fertilization. Most of the farmers mainly focused on application of N and P through urea and diammonium phosphate, respectively for crop production. Such imbalanced nutrient management leads to K deficiency in soil and impair the productivity of crop. The crop removes 1.5 times more K than N and P, it leads to K deficiency in soil. The easily weathered K bearing minerals in Indo-Gangetic Plains are now showing K deficiency in rice-wheat cropping system. Farmers seldom apply K fertilizers for crop production, which also promote fast depletion of available K from soil. The situation of K fertilizer in India, China and Africa are worst because no reserve of K-bearing minerals is suitable for manufacturing of conventional K fertilizers (murate of potash and sulphate of potash), therefore the whole consumption of K-fertilizers is imported. Thus, there is a need to find alternative sources of K fertilizers to sustain agriculture and to minimize the dependency on costly K-fertilizers.

There are some microorganisms in the soil which are able to solublize unavailable form of K bearing minerals such as mica, illite and orthoclase to bring the K into available form through excreting organic acids, which either directly dissolves rock K or chelating silicon ions to bring the K into solution. These microorganisms are commonly known as potassium solubilizing microorganisms (KSM). Though KSM include both fungi and bacteria but bacteria are mainly considered as potassium solubilzer, widely known as potassium solubilizing bacteria (KSB). There are no reserves of K-bearing minerals suitable for manufacturing of conventional K-fertilizers in India, China and Africa Therefore, the whole consumption of K-fertilizers is imported. Hence, potassium bio-fertilizers could be an alternative and viable technology for sustaining crop production and maintaining the soil fertility. Some research attempt has been made on the use of potassium dissolving bacteria known as biological potassium bio-fertilizer, particularly in China and South Korea to investigate the bio-activation of soil K-reserves so as to alleviate the shortage of K-fertilizer. So, it is very important to see the microbial solubilization of K-bearing minerals in soils and their potentiality as K-fertilizer in sustainable crop production.

Potassium Solubilizing Bacteria (KSB)

Fundamentally, KSB is a heterotrophic bacterium which is obtaining their all energy and cellular carbon from pre-existing organic material. In addition, this gram positive aerobic bacterium can produce number of substances that stimulate plant growth or inhibit root pathogens. Moreover, KSB is specifically well known for its capability to solubilize rock K mineral through the production and excretion of organic acids. In this way, KSB plays a role to increase K availability in soils besides increasing

*Biological potassium fertilizers are mostly being used in China and South Korea to alleviate the shortage of potassium (K) fertilizer through bio-activation of soil K-reserves. In India, whole consumption of K fertilizer is imported due to non-availability of suitable K bearing minerals for commercial K fertilizer production. A group of microorganisms (*Bacillus mucilaginosus, B. edaphicus *and* B.circulans*) in the soil are able to solubilize unavailable forms of K bearing minerals such as micas, illite and orthoclase. These are commonly known as potassium solubilizing microbes.*