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Integrated Nutrient Management in Soybean

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Pulses, popularly known as 'poor man's meat' constitute the major source of dietary protein of the large section of vegetarian population of the world. Pulses have unique characteristic of maintaining and restoring soil fertility through biological nitrogen fixation. India grows total pulses on an area of 293.60 lakh ha with 245.06 lakh tonnes production and productivity of 835 kg ha-1. Soybean (Glycine max L.) belongs to family Leguminaceae or Fabaceae and Sub-family Papilionaceae. It is famous as the 'golden bean' of the 20th century which is also used as food beverage. It is containing 38-42% protein, 20-22% edible oil in the seed and 26% carbohydrates, 4% minerals, 2% phospholipids, rich in poly unsaturated fatty acid, vitamin C, 5-6% crude fibre and lysine amino acid. Soybean is the excellent source of oil as well as protein and also improves soil fertility by fixing atmospheric nitrogen @ 65-115 kg ha-1 in available form in the plant through phenomenon of symbiosis in root nodules. Soybean being a highly nutrient exhaustive legume requires higher amounts of nutrients, particularly phosphorous and potassium for its optimum production. Estimated production of soybean in world is 364.33 million tones and area were 127.19 million hectares whereas in India it was 12.10 million tonnes production from an area of 10.80 million hectares and in Rajasthan, 1.16 million tonnes production from an area of 0.93 million hectares.

Integrated Nutrient Management (INM)

Integrated nutrient management (INM) includes the use of organic manures, biofertilizers and inorganic fertilizers to achieve sustain crop production and maintain the soil health. INM is the best approach for better utilization of resources and to produce crops with less expenditure. The primary goal of INM is to combine old and new method of nutrient management economically viable and ecologically good farming system that utilizes available organic and inorganic sources of nutrient in a judicious and efficient way. INM holds out great promise for meeting the growing nutrient demands of intensive agriculture and maintaining crop productivity at higher levels with an overall improvement in the quality of the resource base. INM are to ensure the efficient and judicious use of all the major sources of plant nutrients in an integrated manner, to obtain maximum economic yield without diminishing soil fertility in order to sustain agricultural productivity, farm profitability and soil health.

Organic Manures

Organic manures are used to supply both macro and micronutrients and sustain amount of humic substances particularly humic and fulvic acid that helps to maintain soil pH. Organic matter forms a very important source of plant nutrients. Organic sources of nutrients are derived from animal excreta (manure), human excreta, and vegetable matter (e.g. compost

and crop residues). Use of organic manures alone or in combination with chemical fertilizers will help to improve physico-chemical properties of the soils. The efficient utilization of applied fertilizers helps for improving grain yield and quality. The use of manures from livestock is an important way of recycling of nutrient to the soil. Organic manures influence soil productivity through their effect on soil physical and biological properties. It is well known that neither organic manure alone nor the exclusive application of chemical fertilizers can achieve yield sustainability at an optimum level under modern farming conditions, where the nutrient turnover in the soil–plant system is quite high.

Chemical Fertilizers

Long-term fertilizer trials have clearly shown the positive role of organic sources in combination with chemical fertilizer in maintaining the productivity of the soil by enhancing soil fertility and improving physical properties. We cannot replace chemical fertilizers but certainly capable of reducing their input through use of FYM, compost and biofertilizers for maintenance of the soil fertility, productivity and soil health. Seed inoculation with effective Rhizobium inoculant is recommended to ensure additional nodulation and N2 fixation for maximum growth and yield of soybean crop.

Vermicompost

Vermicompost is rich organic manure consists of macro and micronutrients, plant growth promoting substances, beneficial micro-organisms that are necessary for plant growth.Vermicomposting is nourishing organic fertilizer having high amount of humus, nitrogen 1–3%, phosphorous 1.55–2.25%, potassium 1.85–2.25%, traces in micronutrients, more beneficial soil microbes like ‘nitrogen fixing bacteria’ and mycorrhizal fungi. Microbial population of nitrogen-fixing bacteria and Actinomycetes increases by the application of vermicompost. The amplified microbial activities improve the availability of soil phosphorous and nitrogen. Vermicomposting is an aerobic, biological method and is proficient to convert eco-friendly organic substances. Vermicompost stimulates to influence the microbial activity of soil, increases the availability of oxygen, maintains soil temperature, increases soil porosity and infiltration of water, improves nutrient content and increases growth, yield and quality of the plant.

Biofertilizer

The prices of fertilizers are increasing day by day and therefore, it is necessary to reduce the cost of fertilizes by using Rhizobium and PSB inoculation to increase yield of legume crops. Rhizobium japonicum improving soil fertility by fixing atmospheric nitrogen, both, in association with plant roots and produces plant growth substances in the soil. They are in fact being promoted to harvest the naturally available, biological system of nutrient mobilization.

Soil Health

Soil health being an attribute of physical, chemical and biological properties of soil is constantly declining and is often cited as one of the reasons for deteriorating or decreasing crop yields and low input use efficiency. For sustainable crop production, it is essential for all concerned to understand the soil environment in which plants grow in totality, to recognize the limitations of that environment and to ameliorate wherever possible without damaging the soil quality. The degradation of soil physical, chemical and biological health along with inadequate and imbalanced nutrient use and avoidance of organic manures is the cause of multi-nutrient deficiencies in many areas with time.

Conclusion

Integrated nutrient management practices applied for soybean contributes to the sustainable growth of yield and quality, influences soil health and reduces environmental risks. The use

of organic manures with an optimum rate of fertilizers under intensive farming system increased the turnover of nutrients in the soil-plant system. The organic manures along with biofertilizers help in reducing the dose of inorganic fertilizer; which in turn reduces the cost of cultivation and help in improving the soil health. Balanced fertilization can play a major role to enhance the present yield level. Experimental evidence revealed that the crop is highly responsive to different fertilizers and its yield can be increased remarkably through judicious fertilization Although soybean can fix atmospheric N in the soil, this element is necessary for better yield. In recent years, a concept of integrated nutrient supply involving the use of organic manures and inorganic fertilizers has been developed to obtain sustained agricultural production.