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Role of Native Strains of Rhizobium in pulse Production

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The world today faces a tough challenge, for ensuring food security with provision of balance diet for everyone. Overcoming hunger and malnutrition in the 21^{st} century means increasing food quantity as well as quality, while making sure we produce food sustainably and efficiently. Pulses have been a secondary choice, mostly confined to the rainfed ecology. Over the last four years, the on-going National Food Security Mission (NFSM) has been converged with multi–pronged strategies to enhance the production and productivity of pulses in the country. Thanks to government's comprehensive policy, there has been a leap frog in production since 2016-17, where in 'Five Year Roadmap' was adopted. The production of pulses to the tune of 25.23 million tonnes during 2017-18 is close to self-sufficiency in pulses (Annual report on pulses, 2016-2017). The country is now confident of meeting the projected demand of 35 million tonnes by 2030. An improvement in pulses production technology can reduce the cost of production and ensure higher productivity resulting in affordable prices to consumers.

To achieve this target the consumption of nitrogenous fertilizer is increasing., Between 1960 and 2009 global fertilizer consumption increased tenfold by 10.8 Mg (metric tons) per year to 113 million Mg per year. Nitrogenous fertilizer applied through inorganic sources results in increase in yield but simultaneously promote sizable nitrogen loss, while addition of nitrogen through biological processes enhance more soil available nitrogen as well as crop yield. The biofertilizers, when applied as seed or soil inoculants, multiply and participate in nutrient cycling and leads to crop productivity. Generally, 60% to 90% of the total applied fertilizer is lost and the remaining 10% - 40% is taken up by plants. Hence biofertilizers can be important component of integrated nutrient management systems for to sustaining agricultural productivity and a healthy environment. The application of N fertilizer quickly inhibits both the formation and N fixation activity of nodules. Many agricultural soils contain a high level of residual N which limits legume nodulation and N fixation. Furthermore, farmers frequently apply N fertilizer to the seed bed of legumes to help with crop establishment. This practice is likely to inhibit legume nodulation until the soil N supply has been depleted. Therefore, understanding of how legumes sense and signal their N supply status to regulate nodulation is of fundamental importance for developing more sustainable agriculture using lower inputs of chemical fertilizer. In leguminous plants, bioinoculation with *Rhizobium* as a substitute for costly N fertilizer contributed for crop growth stimulation. Thus, emphasis should be given for establishment of efficient symbiotic N_2 fixation in legume. Different field studies indicated that the legume seed, inoculated with *Rhizobium* culture increased the crop yield from 20-80% and the beneficial effect on the subsequent crop yield also observed significantly. On a global basis these symbiotic association between legume and *Rhizobium* may reduce about 70 million tons of atmospheric nitrogen to ammonia per annum.

The utilization of native *Rhizobium* as inoculants promote ecologically sustainable management of agricultural ecosystem and enhance legume production due to their growth promoting traits and adaptability to soil and environmental stress .Furthermore, crop production using inoculants could be cheaper and more affordable to the resource – poor smallholder farmer. The ability of native strains to interact positively with the resident soil micro biota and their adaptability to the local agroecological climatic conditions often elucidates their superior performance over the exotic commercial strains. The present study contributes to the understanding of the native rhizobial population diversity nodulation. This will contribute to the development of future course of action for cultivation technology so as to enhance production and improve grain quality of such an important pulse crop. The study also provides important information regarding the nodulation patterns, presence or absence of root nodulating bacteria in agricultural soils and suitable strains for augmentation in rhizobia deficient soils.

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