

NOW, BIO NITROGEN FOR COCONUT TOO

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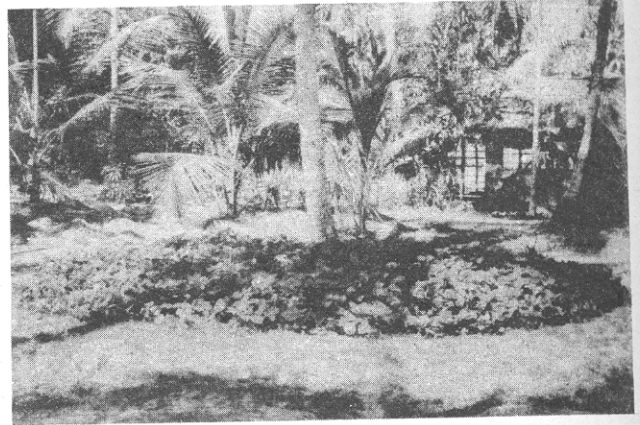
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Biological nitrogen fixation has become very important to researchers as well as farmers due to the enormous increase in the cost of nitrogenous fertilizers with the energy crisis. The concern for conservation of energy and foreign exchange and the fact that soil conditions deteriorate under intense cultivation with chemical fertilizers are some of the other factors responsible for the renewed interest in this topic. Biological nitrogen fixation is the process of conversion of inert nitrogen of atmosphere (about 80 per cent of air is nitrogen) to ammonia which the plants can absorb.

The conversion is carried out by certain groups of micro-organisms known as nitrogen fixing micro-organisms. On the basis of the type of association with the plants, these organisms can be classified into three groups:

Firstly symbiotic nitrogen fixers like rhizobium which fix nitrogen only when they are inside root nodules of certain plants called legumes. Secondly associative nitrogen fixers like azospirillum which form a sort of association with the roots of certain plants like grasses and cereals and thirdly, asymbiotic nitrogen fixers like azotobacter and beijerinckia, which can fix nitrogen in soil without the association of plants.

There is a lot of potential for exploiting the nitrogen fixing ability of micro-organisms for increasing supply of nitrogen to coconut. The nitrogen fixing potential of Rhizobium green manure legume symbiosis can be utilized for coconut by growing the legumes either as cover crops or green manure



crops. Cover crops are not incorporated into soil, but maintained only as a semi-permanent vegetation in the interspace. Fast growing creeping type of legumes are generally grown as cover crops.

When grown as green manures, the green plant material of legumes are incorporated or ploughed into soil at the maximum vegetative stage of growth. Incorporation should be done when the soil has enough moisture for the easy decomposition of green matter.

More benefits in terms of nutrient addition are obtained when the legumes are used as green manures as compared to the use as cover crops. Green manure legumes generally grown are creeping or bushy types having the ability to yield large quantities of green matter in a short period. The green manure legumes should have association with an efficient strain of rhizobium to add substantial quantities of nitrogen to the soil. In addition to supplying nitrogen, green manure legumes also contribute other available nutrients.

organic matter and bring about improvement in microbiological and physical properties of soil. The green manuring is also effective in controlling weed growth. Green manure also serve as a soil mulch and thus helps in conserving soil moisture.

Experiments conducted at the Central Plantation Crops Research Institute, Regional Station, Kayangulam revealed the feasibility of growing leguminous green manure crops in basins of coconut palms. The basin area comprising of 1.8 meter radius around the bole of the palm is generally not used for any purpose. Of the 10 different legumes tested, creeping legumes such as *Pueraria phaseoloides*, *Mimosa invisa* and *Calopogonium mucunoides* were found to be the most suitable legumes on the basis of green matter production and nitrogen



yield. Seeds of the legumes were sown with the onset of monsoons in June at the rate of 10 to 15 grams per basin. When harvested after four months growth, they contributed 15 - 30 kg of green matter and 150-200 grams of nitrogen in the basin of a coconut palm. This is about one third of annual nitrogen requirement of coconut palms.

The large shrubs or perennial type of legumes like *Lencaena* (Subabul), *Gliricidia* and some species of *sesbania* having association with rhizobium can be grown on borders of coconut gardens as hedges or live fences. The loppings can be periodically collected and used as a green manure and the plants can be used as live standard for training pepper and betel

vine. Subabul is a fast growing multipurpose legume having a lot of potential for use in coconut-based cropping systems.

Microbial cultures used for inoculating crops for increasing supply of nutrients in order to increase yield are known as biofertilizers or microbial inoculants. Lignite or peat serve as the carrier material for the supply of microbial inoculants to the farmers. A species of rhizobium can efficiently nodulate and fix nitrogen only on a particular group of legumes. All plants susceptible to nodulation by a rhizobium species constitute a cross inoculation group. Of the seven cross inoculation groups, green manure legumes are efficiently nodulated by rhizobium belonging to the cowpea group.

Studies conducted at CPCRI, Kasaragod showed that coconut roots have association with the associative nitrogen fixing bacteria, *azospirillum*. In addition, coconut soils also had the occurrence of asymbiotic or free living nitrogen fixing bacteria, *beijerinckia*. Two approaches could be followed to increase fixation of nitrogen by the associative and asymbiotic nitrogen fixing bacteria.

Inoculation with efficient bacterial bio-fertilizers in the nursery is a direct approach. But the benefits of bacterial inoculation is yet to be studied in coconut and other plantation crops. Manipulation of agronomic practices in the existing plantations to increase the incidence and activity of bacteria is an indirect approach. Investigations at this Institute has also revealed that a crop combination of coconut and cacao is an ideal habitat for the development of high population of *beijerinckia*.

Mixed farming system having guinea grass as a component crop has also favoured high numbers of *azospirillum* in coconut roots and *Beijerinckia* in the root region soil.

Of all the systems of biological nitrogen fixation, the Rhizobium - legume association has been found to be the most efficient system for nitrogen fixation. The use of green manure legumes, having the association with nitrogen fixing bacteria, form a non-expensive, simple and effective method for the supply of nitrogen for coconut palms.