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Influence of *Crotalaria laburnifolia* L. on microflora for increasing soil fertility

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SUMMARY

Legume plants are of utmost importance to soil fertility as they are symbiotically associated with soil microflora. They are noted for nitrogen fixation and increase in soil fertility. Nodule formation is a pre-requisite to ensure colonization of symbiotic nitrogen fixation in higher plants. For the study, *crotalaria laburnifolia* was selected to increase yield of *Arachis hypogea.* The results emphasized the importance of *crotalaria laburnifolia* as bioorganic manure, which helped to increase the microbial count in soil by log 1, nodulation 20-10 g/plant, growth in biomass and yield in groundnut increased by 8 and 4 g/plant over control and traditionally used farm yard manure, respectively. Conservation and utilization of such wild legume plants needs special attention as they can be effectively used as bioorganic manure.

Key words : Wild legume, *Crotalaria laburnifolia,* Nodulation, Microbial count, Yield

Legume plants are of immense importance because primarily they are used as dietary proteins and are required by the body as a source of essential amino acids and of the nitrogen needed for the denovo synthesis of non-essential amino acids and other nitrogen containing compounds.

More importantly weed leguminous plants are being used as bioorganic manure for increasing soil fertility. They add to the soil plenty of humus which is an important ingredient of rich lands. *Crotalaria laburnifolia* a leguminous plant is a common weed in Karnataka. It is found in open areas, along the road sides and forest areas. But they may be comparatively harmless by themselves but may become a host for pathogens. Green leaf manure (legume) production is a common practice. Green leaf manure is one of the best known organic farming for sustainability of land Kannaiyan (2006). Excellent compost can be made out of nodulated leguminous plants. This is also used as green leaf manure in fields, the nodules on the root system indicates presence of symbiotic nitrogen fixers, having nif genes which fix nitrogen from the atmosphere and in turn increase soil fertility.

MATERIALS AND METHODS

Pot culture experiments were conducted during 2008 at Karnatak Science College, Dharwad, Karnataka, India. Light red sandy loam soil was filled (10kg) into pots. Different organic manures such as Crotolaria green bioorganic manure and farm yard manure (FYM) were added to soil at the rate of 5t/ha and mixed thoroughly to get homogenous concentration. The experiments consisted of three treatments laid in completely randomized block design with 10 replications. Groundnut seeds were sown, water was added at 60% water holding capacity and maintained through out the experiment at that level.

Chlorophyll content in leaves of all treatments was measured (AOAC, 1980). Nodule number and weight were recorded, weight of biomass, pods, kernels and shells were recorded, length of shoot and root were measured. Microbial count was analyzed by taking soil from treated pots. Three samples from each pot were collected from three points which, were then mixed. An aliquot of the mixture was placed in a sterile container, taken to the laboratory and used for microbial analysis. The microorganisms enumerated were bacteria, fungi and actinomycetes by pour plate technique on Tryptone Yeast Extract Glucose Agar, Potato Dextrose Agar and Starch Casein Agar, respectively (APHA, 1984). The results obtained were subjected to Analysis of Variance.

RESULTS AND DISCUSSION

Though *Arachis hypogea* produce large number of root nodules, it is very exhaustive compared to other legumes, as very little portion of root system containing nodules is left in the soil after harvesting (Varde and Urkude, 1982). Organic matter content in soil has attained paramount importance because of its contribution to soil moisture holding capacity, physio-chemico biological properties, in regulating humification, soil fertility status and ultimately the productivity.

Amongst different bioorganic manures tested Crotolaria green bioorganic manure proved best over farm yard manure (FYM) and control by showing increase in bacterial count which was more prominent than fungi and

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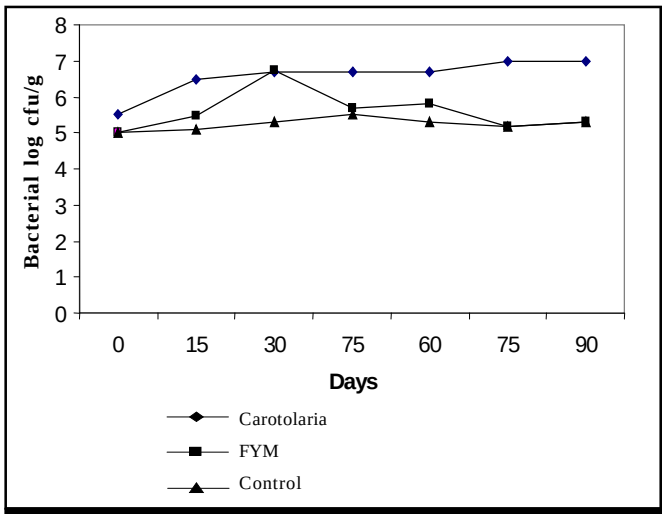

Fig. 1 : Effect of different organic manures on bacterial population

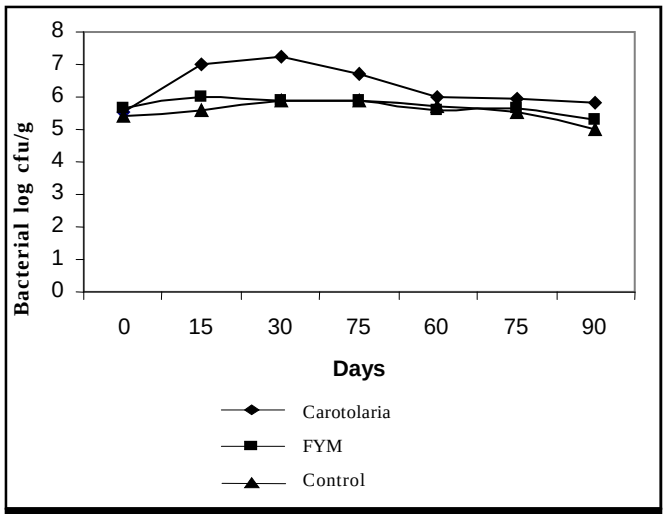

Fig. 2 : Effect of different organic manures on fungal population

actinomycetes (Fig. 1, 2 and 3). Showing that bacteria also had symbiotic association with *Arachis hypogea*. From Table 1 it is seen that the non-symbiotic association bacterial count was log 5.5 on 0 day which steadily increased by nearly 2 logs at 75 days and was maintained as such till 90th day. This shows the rich nutrient potential of Crotolaria green bioorganic manure to sustain the microflora and in turn increased soil fertility. While in FYM and control bacterial count showed negligible increase. However, it did not improve drastically the counts of fungi and actinomycetes till the end of 90 days.

The symbiotic association was manifested by nodule formation on the root system which showed to be 13 and 15g/plant more than that of FYM and control as shown in Table1. Similar increase in nodulation was observed on green gram by application of compost using weed biomass (Tiwari *et al.,* 1988; Yadav *et al.* (1992). Addition of

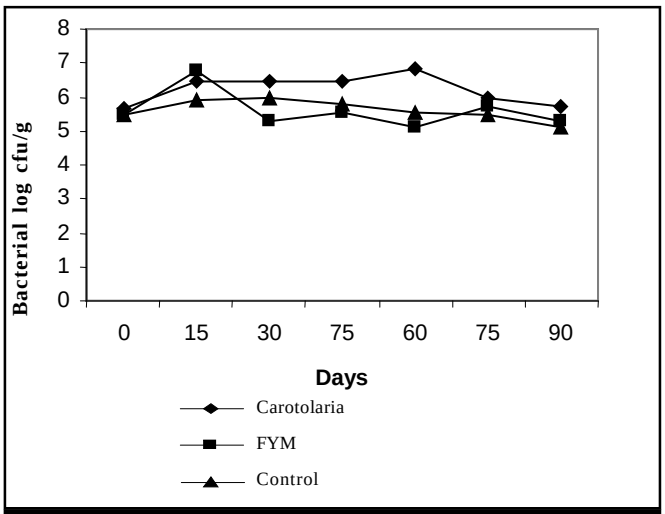

Fig. 3 : Effect of different organic manures on actinomycete population

Table 1 : Effect of different organic manures on microbial population

Days Microorganisms	0	15	30	45	60	75	90
Crotalaria green bioorganic manure							
Bacteria	5.50	6.47	6.69	6.71	6.7	7.0	7.6
Fungi	5.51	7.0	5.23	5.69	5.69	5.67	5.61
Actinomycetes	5.65	6.47	5.47	5.44	5.83	5.79	5.73
FYM							
Bacteria	5.0	5.47	6.73	5.7	5.3	5.2	5.3
Fungi	5.65	6.0	5.9	5.9	5.6	5.64	5.32
Actinomycetes	5.46	6.74	5.3	5.54	5.11	5.7	5.3
Control							
Bacteria	5.0	5.47	6.73	5.7	5.3	5.2	5.3
Fungi	5.65	6.0	5.9	5.9	5.6	5.64	5.32
Actinomycetes	5.46	6.74	5.3	5.54	5.11	5.7	5.3

Table 2 : Effect of different bioorganic manures on growth of *Arachis hypogea*

Treatments	Shoot length (cm/plant)	Root length (cm/plant)	Shoot biomass (g/plant)	Root biomass (g/plant)	Total biomass (g/plant)	No. of nodules (wt/plant)	Chlorophyll percentage
Crotalaria green bioorganic manure	18.15	36.25	16.57	3.10	19.69	56.80	0.9
FYM	19.55	34.00	14.89	1.53	16.42	43.15	0.55
Control	18.50	32.56	14.91	1.42	16.33	31.00	0.7
C.D. (P=0.05)	NS	16.82	NS	1.21	NS	23.87	-
SEM	3.06	5.07	1.46	1.01	1.70	2.10	-

NS-Non significant

Table 3 : Effect of different bioorganic manures on yield of *Arachis hypogea*

Treatments	No. of pods (g/plant)	Weight of pods (g/plant)	Kernel (Percentage)	Shelling (Percentage)
Crotalaria green bioorganic manure	17.30	14.54	88.47	15.52
FYM	15.00	12.13	85.72	14.21
Control	15.61	8.63	85.39	14.60
C.D. (P=0.05)	6.25	NS	19.85	NS
SEM	1.93	3.05	2.0	3.01

NS-Non significant

symbiotic nitrogen fixers in soil has also showed increase in nodulation S.S.Singh (2002). In the study addition of Crotolaria green bioorganic manure also showed increase in nodulation in *Arachis hypogea* proving its nutrient value. The non symbiotic bacteria obtain their energy from decomposing organic matter from soil, bacterial count increase is clearly noticed as they are the index of soil fertility. This has led to an increase in chlorophyll by 0.4% and 0.2 %, root length by 2 cm and 4 cm, total biomass by 3g and an ultimate increase in yield by 2g over FYM and Control, respectively as shown in Table 2 and 3. The results clearly show that easily available wild *Crotolaria laburnifolia* legume plant should be conserved to protect and increase soil fertility. This shows the rich nutrient potential of Crotolaria green bioorganic manure to sustain the microflora and in turn increase soil fertility.

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