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Research Article

EFFICACY OF BIODEGRADED COIR PITH FOR THE CULTIVATION OF NITROGEN FIXING PLANTS

Anil K R and Ansi L*
National Coir Research and Management Institute (NCRMI), Trivandrum
**Author for Correspondence: Ansihidaya@gmail.com*

ABSTRACT
The main objective of the study was to find out whether the composted coir pith has a positive influence on the nodulation and germination of seeds in Black gram (*Vigna mungo*) and Green gram (*Vigna radiata*) crops in soil compared raw coir pith. Among the five different types of potting mixtures studied, it was found that a potting mixture having coir pith compost and soil in 9:1 ratio showed highest performance in terms of nodule formation, root development and overall vegetative growth for both the crops. More or less same results were obtained by the treatment having soil and composted coir pith in the ratio 1:1 and also in soil alone as potting medium showed comparable performance. Potting mixture having raw coir pith had least performance in seed germination with little or no nodule formation in the studied plants. This study concludes that coir pith compost alone can be use a good medium for soilless cultivation of leguminous plants. Addition of source of nitrogen fixing bacteria, even in small quantity can induce nodule formation, nitrogen fixation and hence over all plant growth..

Keywords: *Nodulation, Composted Coir Pith, Black gram, Green gram*

INTRODUCTION
Nitrogen is a critical limiting element for plant growth and production. It is a major component of chlorophyll, the most important pigment needed for photosynthesis, as well as amino acids. It is also found in other important biomolecules, such as ATP and nucleic acids. Even though it is one of the most abundant elements in nature, plants can only utilize the reduced forms of Nitrogen. Plants acquire these forms of "combined" (reduced) nitrogen by the addition of ammonia or nitrate fertilizer or manure to soil by the release of these compounds during organic matter decomposition, or through the conversion of atmospheric nitrogen into the compounds by natural processes - such as lightning, and major part is reduced by biological nitrogen fixation. Biological nitrogen fixation is mainly carried out by free-living soil bacteria such as *Azotobacter*, bacteria that form associative relationships with plants such as *Azospirillum*, and most importantly bacteria such as *Rhizobium* and *Bradyrhizobium*, that form symbioses with legumes and other plants (Postgate 1982). Soil is one of the major sources of these nitrogen fixing bacteria. In leguminous plants nitrogen fixation is done by a partnership between a bacterium and plant, through forming small growth on the roots called nodules (Lodolini, 2017). Within these nodules, nitrogen fixation is done by the bacteria, and the NH_3 they produce is absorbed by the plant.
Coirpith is the spongy dusty material, generated in huge quantities during coir fiber extraction from coconut husk. It is lignin rich recalcitrant agriculture waste with little nitrogen and with high content of tannin and phenolic compounds (Ulmer *et al*, 1984, Pincelot, 1974). Among the several methods suggested for narrowing down the C:N ratio, composting has been found to be the most effective method with certain advantages (Bhowmie and Debnath,1985). Composted coir pith gained importance owing to its properties for using as a growth medium in agriculture with high water holding capacity, enhanced rooting quality, and reduced pathogens.
Coirpith compost provides more space for the growth of root system (Prabhu,2002).Application of coir-pith compost increase root length of plants. It is suggested that coir-pith compost has improved the growth of black gram by increasing the rate and activity of nodulation and the availability of P and K.

(Jayakumar, 2012) The young and appropriate new roots are one of the key factor for sufficient infectivity by Bradyrhizobium in most of the legumes, by attaching to new roots and root hairs, producing root hair curling followed by infection thread development for nodulation (Bellone *et al*, 1997). The objective of work was to study the efficacy of coir pith compost on nodulation of leguminous plants and enhancement of the rooting property

MATERIALS AND METHODS

This study was conducted with five types of potting mixtures including controls as given below.
T_1 - Soil as control (Organic soil collected from NCRMI campus)
T_2 - Coir pith compost alone: Coir pith composted with *Trichodema harzianum* and urea
T_3 - Coir pith compost and soil in 9:1 ratio - Here soil was the inoculum source of nitrogen fixing bacteria in order to study whether, an additional inoculums can increase nodule formation, when coir pith compost is used as potting medium
T_4 - Coir pith compost and soil in 1:1 ratio - In this setup quantity of soil was increased than T_3 such as soil and coir pith compost in same ratio since previous studies have shown that coir pith compost and soil is an excellent potting mixture which performed best in terms of vegetative growth and fruit set.
T_5) Old coir pith (not composted) – This treatment was used 1yr old coir pith
Crops used for experiment: Green gram *(Vigna radiate)* and Black gram *(Vingna mungo)*

Seeds of Green gram and Black gram obtained from market. Statistical design was CRD and for each treatment three replications were used. Each type of potting mixture were taken into three polypropiline bags and sown with 24hrs soaked seeds. Germination status of each crops on each potting media were noted after five days in order to observe whether the type of potting media can influence the germination of seeds positively or negatively. After one month growth, whole plant was uprooted and noted for extend of root development and number of nodules. This study also checked the effect of different medium on over all plant growth which was measured by taking dry weight of whole plant (Dried at 60^0C till to get a constant weight).

RESULTS AND DISCUSSION

Germination of seeds

It was observed that 99% seeds were germinated in all potting media except seeds in non composted coir

Table 1: Growth average of crop Green gram in experimented conditions

Treatment	Replications	No.of nodules	Average	Dry weight(g)	Average
T1	1	12	18	5.007	3.99
	2	20		2.998	
	3	22		3.970	
T2	1	15	13.66	2.2931	2.62
	2	13		2.8631	
	3	13		2.7141	
T3	1	32	35	1.8326	2.29
	2	30		2.4871	
	3	43		2.5432	
T4	1	48	31.66	1.5729	2.09
	2	24		1.8636	
	3	33		2.8408	
T5	1	1	1.33	0.0940	0.29
	2	2		0.0998	
	3	1		0.6749	

pith which took few more days for germination and only 90% of seeds were germinated. The reduced germination status of raw coir pith was due to phenolic compounds present in raw coir pith.

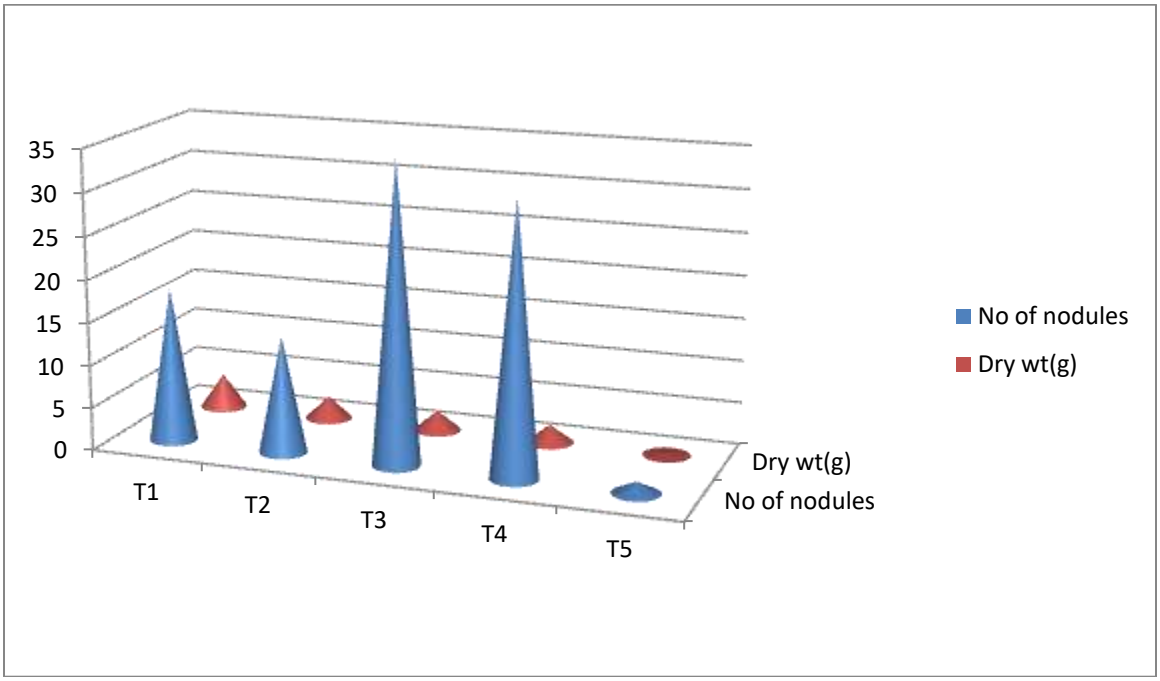

Table 2: Growth average of crop Black gram in experimented conditions

Treatments	Replications	No. of nodules	Average	Dry weight (g)	Average
T1	1	22	25	0.8860	1.182
	2	28		1.4324	
	3	25		1.2278	
T2	1	12	12.6	1.3189	1.382
	2	16		1.2086	
	3	10		1.4590	
T3	1	57	44.33	1.4189	1.961
	2	32		1.8812	
	3	44		2.5834	
T4	1	28	31.66	2.510	2.107
	2	31		1.920	
	3	36		1.892	
T5	1	1	1.5	0.1897	0.625
	2	-		0.3359	
	3	2		1.3501	

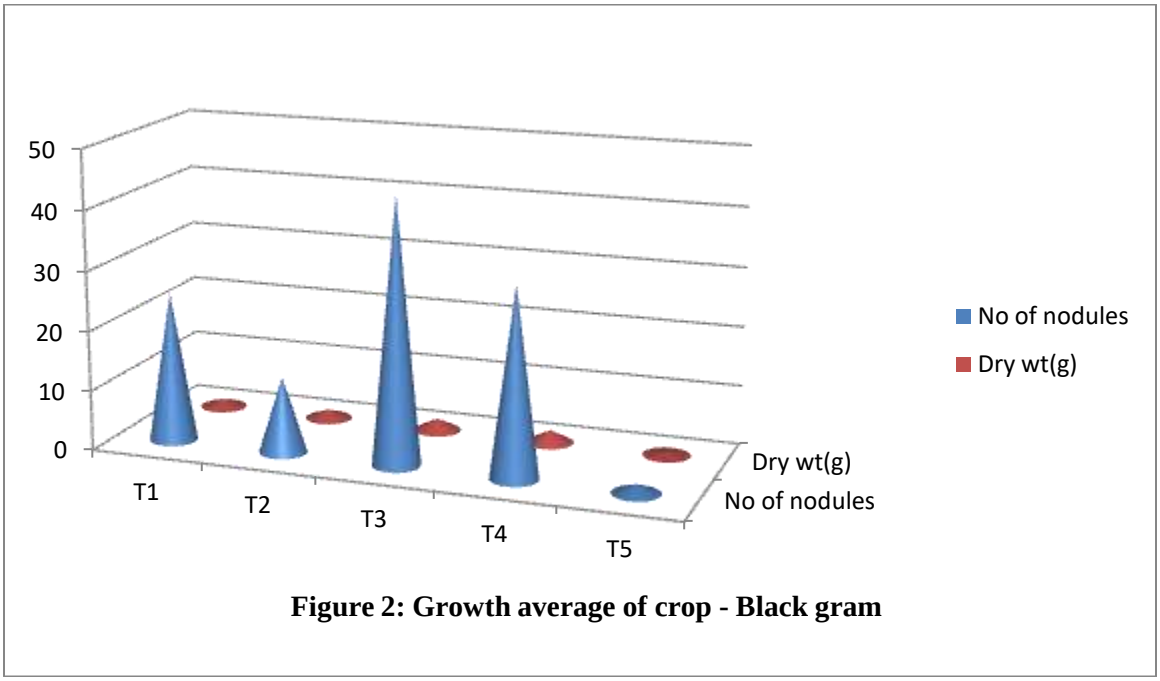

Figure 2: Growth average of crop - Black gram

The results show that coir pith compost has a positive influence on nodule formation when used with soil on both crops. It was found that plants uprooted from pots having coir pith and soil possessed an extended root system with numerous root hairs and nodules which is the indication of good nitrogen fixation in leguminous plants. The treatments having coir pith and soil in 9:1 and 1:1 ratio as potting mixture showed better performance compared to others. The experiments with soil as potting mixture also showed good performance but inferior to treatments T3 and T4 which have both soil and coir pith compost as potting medium. The pots having coir pith compost alone had less number of nodules compared to T1, T3 and T4. However, plants in T5 treatment, which used raw coir pith (non composted pith) had the least growth. The results indicate that a source of nitrogen fixing bacteria is necessary irrespective of potting media, when coir pith alone is used as potting medium for leguminous plants. In this study soil is acted as inoculum for nitrogen fixing bacteria in T1, T3 and T4. The vegetative growth of both crops was found satisfactory in all experimental pots except in raw coir pith as potting medium.

This study concludes that coir pith compost is a good medium for soilless cultivation of leguminous plants. Addition of very small quantity of soil can be act as source of nitrogen fixing bacteria which favourably enhances nodule formation and hence increased nitrogen.

REFERENCES

Bhowmie BB and Debnath CR (2004). Potentiality of Coir fiber products. *Indian Coconut Journal* 7-10.

Burton JC (1972). Nodulation and symbiotic nitrogen fixation. *Alfalfa Science and Technology* 229-246,

Jayakumar M, **Eyini M and Velmurugan R (2012).** Effect of seed Rhizobium-pelleting treatment and addition of coir-pith compost to soil on growth and nodulation of fluoride-water-irrigated Blackgram (Phaseolus mungo) *Indian Journal of Agricultural Sciences* **67**(12) 601-603**.**

Lodolini EM, F Pica, **F Massetani** and **D Neri (2017).** Physical, Chemical and Biological Properties of some Alternative Growing Substrates. *International Journal of Soil Science*, **12**(1) 32-38.

Poincelot RP (1974) A scientific examination of the principles and practices of composting. *Compost Science* **15** 24-3.
Postgate (1982). Philosophical transactions of the Royal Society of London. *Series B, Biological Sciences* **296(**1082).
Prabhu S R and Thomas GV (2002): Bioconversion of coirpith into value added organic resources and its application and its current status in agri horticulture: Current status, prospects and perspectives: *Journal of Plantation Crops* **30** 1-17.
Ulmer DC, Leilosa MS (1984) possible induction of lingo cellulolytic system of Phanerochaetum crysosporim. *Journal of Biotechnoloy* **1** 13-24.