SUMMARY AND CONCLUSION
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Cyanobacteria also called blue-green algae evolved very early in the history of life. They have the unique potential to contribute to productivity in a variety of agricultural and ecological situations. Also they have been reported from a wide range of soils, thriving both on and below the surface. They offer an economically attractive and ecologically sound alternative to chemical fertilizers for achieving the ultimate goal of increased productivity, especially in rice cultivation.

In India, considerable progress has been made in the development of cyanobacteria based biofertilizer technology. However, the technology needs to be improved further for better exploitation under sustainable agriculture systems. In order to make it one step closer to the goal, the investigation was carried out to utilize solid waste, coir pith, as carrier material for cyanobacteria and thus cyanobacteria treated coir pith was used as biofertilizer for improved crop production.

This work was carried out to confirm the lignin degrading ability of the cyanobacterial species *Oscillatoria annae* on coir pith and to verify the growth promoting ability of cyanobacteria treated coir pith as foliar and basal biofertilizer. Chlorophyll *a* estimation was performed to verify the growth status of *O. annae* in presence of coir pith. The result showed significant increase in chlorophyll *a* content in *O. annae* when exposed to coir pith. *O. annae* while grown in urea medium with coir pith showed maximum chlorophyll *a* content when compared to other media like BG11, NPK and Complex.

In order to determine the biochemistry of coir pith biodegradation, estimations for the presence of reducing sugar, phenols, protein, lipids, nucleic acids, nitrate and ammonia were carried out. The presence of reducing sugar in the supernatant was influenced by lignolytic activity of *O. annae* and this may be due to cleavage of complex polymers in coir pith to simple polymers. Spectral analysis and phenol quantification of the media supernatant confirmed the degradation of coir pith. Increase in protein content, lipids, DNA/RNA, nitrate and ammonia in coir pith treated cyanobacterial samples showed an enhanced rate of metabolic activity during the degradative action of cyanobacteria on coir pith. The percentage of lignin content in cyanobacteria treated coir pith was found to be reduced during the process of degradation. It was estimated that 28 % of the lignin from the total lignin was found to be reduced in 7 days. Probably, the degradative ability of cyanobacteria is due to the strong oxidative activity and the low substrate specificity of their ligninolytic enzymes which was confirmed by induction in polyphenol oxidase activity in cyanobacteria exposed to coir pith by native PAGE.

Comparing the morphological, biochemical and physiological response of *O. annae* in response to exposure to coir pith, it was observed that *O. annae* exhibited maximum growth and lignolytic activity while grown in urea media along with coir pith.
This could be due to faster access to nitrogen in urea when compared to other media like BG11, NPK and complex. Comparing the lignolytic activity of *O. annae* in lab and field conditions there was no much variation. Thus urea media was selected as the optimum media for mass cultivation of *O. annae* along with coir pith.

The growth promoting ability of coir pith based cyanobacterial biofertilizer as foliar and basal biofertilizer was studied in *Oryza sativa* and *Allium cepa var. aggregatum*. The morphometric parameters and yield of *Oryza sativa* were observed in comparison with recommended dosage of chemical fertilizer. Varying concentrations of chemical fertilizer ranging from 0 – 100 % in combination with coir pith based cyanobacterial biofertilizer were verified during the study. Results indicated that coir pith based cyanobacterial biofertilizer could be used as an effective biofertilizer for paddy when compared to chemical fertilizer. Similar results were observed in *Allium cepa var. aggregatum* also. Morphometric, biochemical and yield comparisons revealed that application of coir pith based cyanobacterial basal and foliar spray increased the bulb yield and flavour content.

Thus this coir pith based cyanobacterial biofertilizer plays a spectrum of remarkable roles in agriculture especially in sustainable integrated agro ecosystems. Degraded coir pith with cyanobacteria was used to promote plant growth and was found to enhance crop yield and especially soil productivity. By this appropriate method, it was possible to utilize the coir waste in a profitable manner to reduce environmental hazards.

On the other hand both the coir pith and cyanobacteria add nutrients to soil, release growth promoting substances, increases soil organic content, improves soil structure and water holding capacity, reduces soil crusting problems, reduces erosion from wind and water, and improves buffering capacity against fluctuations in pH levels of soil. Among these, the release of micro and macro nutrients from the cyanobacteria supported the plant growth and improves the quality and quantity of the crop yield.

The above study confirmed the ability of the *O. annae* in coir pith degradation and further study in utilizing the degraded coir pith with *O. annae* as biofertilizer showed the immense potential as bioinoculant in cultivation of *Oryza sativa* and *Allium cepa var. aggregatum*. This method of farming system which primarily aimed at cultivating the land and raising crops in such a way as to keep the soil alive and in good health by the use of organic wastes like coir pith with cyanobacteria succeeded in releasing nutrients to crops for increased sustainable production in an eco-friendly and pollution free environment.