Notice for the PhD Viva Voce Examination

Mr Boreddy Surya Prakash Reddy (Registration Number: 1870071), PhD scholar at the School of Engineering and Technology, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Friday, 31 March 2023 at 10.00 am in the CDI Conference Room, Block V, Bangalore Kengeri Campus, Bengaluru 560074.

Title of the Thesis	:	**Application of Hydrogel in Paddy Field for Soil Moisture Retention and Yield Optimization**
Discipline	:	**Civil Engineering**
External Examiner (Outside Karnataka)	:	**Dr Deepak Khare** Professor Department of Water Resources Development & Management Indian Institute of Technology, Roorkee Uttarakhand - 247667
External Examiner (Within Karnataka)	:	**Dr B Manu** Associate professor Department of Civil Engineering NITK Surathkal, NH 66, Srinivasnagar Surathkal Mangaluru Karnataka -575 025
Supervisor	:	**Dr Shibu K Mani** Associate Professor Department of Civil Engineering School of Engineering and Technology CHRIST (Deemed to be University) Bengaluru – 560074 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva.

Registrar

Place: Bengaluru
Date: 27 March 2023

ABSTRACT

Agricultural sustainability is essential to enhance food and water security, particularly in the context of climate change. To ensure food security and to protect water resources, agricultural and irrigation practices need to be amended with innovative technology that conserves water and increases productivity. In the recent past, applications of hydrogels in agriculture have received substantial attention among researchers as well as among farmers. Paddy is the core crop for the vast parts of the world. The present study elaborates on various aspects of hydrogels such as classifications, ideal properties for agricultural application, analysis of soil characteristic changes for pre and post crop season, irrigation water quality analysis for crop season. BPT 5204 and NDLR 07 varieties of paddy had been experimented in this study. This study aimed to evaluate the swelling properties of hydrogel and its effects of hydrogel application to the soil on plant. Paddy was chosen for plant growth assessment due to its large water footprint. Laboratory scale experiments were carried out in growth bags for control group (TC1) supplied with excess water supplied and treatment groups (20% - TC2, 40% - TC3, and 60% - TC4 deficit supply of water) amended with hydrogel under drip irrigation. Hydrogel exhibited an equilibrium swelling of 513.3 (TH1 - deionized water), 188.8 (TH2 - groundwater) and 121.9 (TH3 - 0.5 % saline water) times its dry weight respectively. The water retention time in hydrogel was maximum for saline water, followed by groundwater, and deionized water. Seed treatment of paddy showed the optimum dosage of hydrogel to be 1.25% by weight of seeds. The plant height at 2 weeks after sowing showed significant trend of increasing plant height in the order of TC1 (17 cm) > TC2 (23 cm) > TC3 (24 cm) > TC4 (28 cm). The results support the hypothesis that hydrogel can be advantageously used in soil conditioning as an effective way to protect irrigation water resources and to ensure food security. Percentage change in the Soil Parameters (Pre-crop to Post Harvest) is also calculated and analysed

Use of Hydrogel helped in retaining N, P, K, Organic Carbon, Iron and Manganese in the soil. Increase in the water holding capacity of the soil provides a conducive atmosphere for better growth of roots in well drained and gravely and sandy soils and ultimately increases yield. Higher dissolved oxygen levels in the root zone of most crops resulted in a higher root mass. Chloride in water is adsorbed by soil, therefore it moved in the transpiration stream and accumulated in the leaves. Water used for irrigation is with high TDS and it limited the nutrient intake of the plants partially and is balanced by increase in the soil water retention.

Keywords: Hydrogel, Sustainability, SDGs, Degradation, BPT 5204, NDLR 07, Paddy, SAP.

Publications:

1. **S. Prakash**, S. Vasudevan, A. Banerjee, A.C. Joe, K.N. Geetha, and S.K. Mani, "Sustainable irrigation through Application of Hydrogel: A Review," Alinteri J. of Agr. Sci., vol. 36, no. 2, pp. 38–52, Jul. 2021.

2. **S. Prakash,** S. Vasudevan, A. Banerjee, A.C. Joe, G. Reddy, K.N. Geetha, and S.K.Mani, "Sustainable water consumption of rice (Oryza sativa L.) as influenced by superabsorbent polymer in water stressed conditions," Int. J. Mod. Agr. vol. 10, no. 1, pp. 857– 866, 2021.

3. **B.S.P. Reddy**, S. Vasudevan, S.K. Mani, S. Uppaluri, and M. Sudakar, "Drought mitigation through hydrogel application in rice (Oryza sativa L.) cultivation," J. Exp. Biol. Agr. Sci. vol. 9, no. 6, pp. 727–733, 2021.