



## Impact of soil temperature, pH and carbon dioxide on the population and efficiency of fluorescent pseudomonad in the rhizosphere soil of *Pokkali* rice

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### ABSTRACT

The present study was aimed at the evaluation of soil temperature, pH and carbon dioxide evolution on the number and efficiency of fluorescent pseudomonads around the root system of *Pokkali* rice at Vayalath in Ernakulam district of Kerala. Two plots (40 m<sup>2</sup>) comprising control (without application of *Pseudomonas fluorescens*) and *P. fluorescens* treated plants were used for the field experiment. The isolates of fluorescent *Pseudomonads* or *Pseudomonas fluorescens* were counted and their efficiency was assessed for IAA, ammonia, HCN and siderophore production. Simultaneously, soil temperature, pH, and carbon dioxide evolution were also recorded. A total of 6 fluorescent pseudomonads (VPAU1, VPAU2, VPAU3, VPAU4, VPAU5 and VPAU6) were found during the crop period. All the isolates produced IAA and ammonia with varying degrees of intensity. Three isolates (VPAU1, VPAU3 and VPAU4) produced HCN, and no microbial isolates produced siderophore. The effect of soil temperature, pH, EC and carbon dioxide evolution was correlated with the number of fluorescent pseudomonads in the soil. The bacteria were significantly affected by pH and EC, whereas soil temperature and CO<sub>2</sub> evolution did not show any effect on the number of fluorescent pseudomonads. There was no significant influence of soil temperature, pH, EC and carbon dioxide evolution on indole acetic acid production, ammonia, and HCN production. Inoculated *Pseudomonas fluorescens* did not survive in *Pokkali* rice fields. However, further studies are needed for at least three seasons in *Pokkali* soils to confirm the results of the present study.

### Introduction

Upadhyay *et al.* (2011) reported that saline-tolerant PGPR can alleviate soil salinity stress during plant growth and exopolysaccharide (EPS) secreted by the bacteria. Different bacterial genera have been proposed to alleviate salt stress in plants, such as *Agrobacterium*, *Arthrobacter*, *Azotobacter*, *Azospirillum*, *Bacillus*, *Burkholderia*, *Klebsiella*, *Pseudomonas* (Costa-Gutiérrez *et al.*, 2020; Lami, *et al.* 2020), *Rhizobium*, and *Serratia*. Earlier studies have reported that the potential PGPR with plant growth-promoting traits should be able to

efficiently colonize the rhizosphere and survive under field conditions for effective use as bioinoculants (Amaya-Gómez *et al.*, 2020). Fluorescent *Pseudomonads* are the most promising plant growth-promoting rhizobacteria involved in the biocontrol of plant diseases, produce phytohormones, hydrogen cyanide (HCN), siderophores, indole-3-acetic acid (IAA), and antibiotics. Matsuguchi and Sakai (1995) reported that the total bacteria and gram-negative bacterial population did not change significantly but total

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