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In-vitro Study of Rhizosphere Bacteria with Antagonistic Activity against Soft Rot Pathogen (*Pythium* spp.) of Ginger Field in Sikkim

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Abstract—*Zingiber officinale (Ginger) is important cash crop of Sikkim and has been under cultivation since time immemorial. This crop has developed susceptibility to number of diseases in the recent past of which the most widespread disease is "Soft Rot" caused by Pythium spp. Chemical pesticides are being used to control the precarious pathogen, but it has shown negative effects on environment and living organisms including human health. Sikkim is also declared as Organic State since the year 2014. Therefore, it is essential to strengthen biological control measures for plant protection through the use of antagonistic microorganism against ginger pathogen. Total 38 samples each of infected ginger rhizomes and rhizosphere soil were collected from ginger cultivating fields of Sikkim during the month of June and July 2016. Infected rhizomes were used for isolation of Pythium spp. and rhizosphere soils for isolation of bacteria having antagonistic property. Potato Dextrose Agar (PDA) and Corn Meal Agar (CMA) were used for in vitro culture of fungal spp. and morphological method was used in identification of Pythium spp. belongs to family Phycomycetes. Nutrient Agar (NA) and Starch Casein Agar (SCA) were used for isolation of bacteria from ginger rhizosphere soil using crowded plate method. Total one hundred and twenty six (126) bacteria were isolated from all samples. Dual culture technique was used to study antagonistic activity of all isolated bacteria against Pythium spp. Among them, nine (9) isolates showed 40-70% Percentage Growth Inhibition (PGI), this concludes that nine isolates significantly inhibited the Pythium spp. Gram staining technique revealed that seven (7) isolates were gram positive rod, one gram negative cocci and one gram negative rod. This investigation shows that isolated bacteria have potential to become a good biopesticide against ginger soft rot. Further studies are required for molecular identification of nine isolates and detailed in vivo study.*

Keywords*: Zingiber officinale, Pythium sp, antagonistic, rhizosphere, Sikkim.*