SIDEROPHORES MEDIATED INTERACTIONS IN RELATION TO GROWTH OF *FUSARIUM OXYSPORUM* F.SP. *GLYCINE*, *BRADYRHIZOBIUM JAPONICUM* AND SOYBEAN PERFORMANCE UNDER IRON LIMITED CONDITIONS

ABSTRACT

Different concentrations (50,100,150 or 200 µL) of extracted siderophores produced by *Pseudomonas fluorescens* B, were added into the culture media of *Bradyrhizobium japonicum* ARC 501 or *Fusarium oxysporum* f.sp. *glycine*. The synthetic chelator ethylene diamine di-o-hydroxy phenyl acetic acid (EDDHA) with the high capacity to bind Fe, was also supplemented into concentrations of 200, 400, 600, 800, 1000, 1500, 2000 or 2500 mg/L of M9 medium. The treated media were used to grow *F.oxysporum* f.sp *glycine*,*F.solani* or *Rhizoctonia solani*. Data showed that *B.japonicum* ARC501 efficiently utilized the increased concentrations of *Ps. fluorescens* B siderophore for growth, but *F.oxysporum* f.sp. *glycine* gave concomittantly reduced biomass. The latter fungus along with *F. solani* and *Rh. solani*, also gave similar responses with increased concentrations of EDDHA. Iron starved *B.japonicum* ARC501 cells applied for soybean seedlings grown in test tube - sand culture supplemented with *Ps. fluorescens* B siderophore, showed gradual proliferation and induced levels of soybean root hair curling, to nearly similar those obtained from Fe-EDDHA treatment. Acid washed sand amended with Fe as Fe-EDDHA or Fe $(OH)_3$, was used to grow soybean inoculated with *B.japonicum* ARC 501, or in conjugation with either of 2 strains of *Ps. fluorescens* (B or 1) varied in their siderophore mediated antagonism to the root nodule bacterium. Developed plants were kept under net-house conditions and harvested after 45 days, to record shoot and root dry weights, nodulation and N as well as Fe uptake under different conditions. The effects of inoculation treatments were retested in sandy soil naturally limited in Fe content.Soybean grown in sand amended with Fe $(OH)_3$ and dually inoculated with *B.japonicum* ARC501 plus *Ps. fluorescens* B(the non-antagonist), gave positive responses, which were insignificantly different to those obtained from Fe-EDDHA treatment. However, the levels of enhancement were significant, as compared with the single inoculation with *B.japonicum* ARC501, or when conjugated with *Ps. fluorescens* 1(the antagonist). These findings were also reported in results obtained from plants grown in sandy soil naturally limited in Fe-content.

Keywords:Siderophore, *Fusarium oxysporum*, *Bradyrhizobium japonicum*, *Pseudomonas fluorescens*, Fe $(OH)_3$, Fe-EDDHA, Soybean Performance.

INTRODUCTION

The number of iron chelating siderophores produced by microorganisms were listed by **Ratledge and Dover (2000)** to exceed 500.Fluorescent psudomonads are amongst the most effective siderophores producing bacteria **(Cox,1980; Bezbaruah et al. 1996 ;Terano et al. 2002)**.This pronounced cabability has reflected in potential interactions with highly Fe demanding N2-fixing associations and phytopathogenic fungi.The role of siderophores produced by many *Psudomonas* has been clearly demonstrated in the control of *Pythium* and *Fusarium* species,either by

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