

EFFECTIVENESS OF BIO-GEL BASED POWDER FORMULATIONS OF BACTERIAL BIOCONTROL AGENTS IN CONTROLLING ROOT ROT DISEASE OF BEAN CAUSED BY *Sclerotium rolfsii*

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ABSTRACT

Natural polymers(biogel) along with inert carriers were used to formulate two antagonistic bacterial isolates of *Pseudomonas fluorescens* and *Bacillus subtilis*. Four different formulations i.e. biogel- vermiculite based powder (F1), biogel-talc based powder (F2), biogel- charcoal based powder (F3) and biogel wettable powder (F4) were developed. These formulations were tested for their shelf life efficiency as storage substrates of the two bioagents for 24 month and their ability to control root-rot disease of bean caused by *Sclerotium rolfsii*. Viability of *P. fluorescens* propagules in biogel- vermiculite based powder and biogel wettable powder was stable for up to 16 months and decreased sharply after 20 months .The populations in biogel-talc based powder and biogel- charcoal based powder were decreased beyond 1 year of storage. *B.subtilis* populations of viable propagules were stable for up to 2 years with minor differences in populations either in formulation types or the storage periods tested. Active colonization of bean rhizosphere was occurred by *P. fluorescens* and *B. subtilis* following seed coating or soil amendment with different formulations. The highest population of *Ps. fluorescens* and *B. subtilis*, was found in seed coating treatment than soil amendment. Biogel- vermiculite based powder gave the highest rhizosphere population followed by biogel wettable powder for both bacteria. In general, seed coating treatment gave an obvious results than soil amendment in reducing root rot disease incidence. Seed coating with *B. subtilis* applied in biogel-vermiculite based powder was the most effective one in reducing the disease incidence . Soil treatment was more effective than seed coating in reducing the sclerotia formed by *Sclerotium rolfsii*. Soil treatment with *B. subtilis* applied in biogel-vermiculite based powder was the most one in reducing the number of sclerotia formed. However, Soil amendment with *B. subtilis* in biogel- vermiculite based powder was the most effective treatment than other formula.

Keywords: Bean, root rot, *P. fluorescens* , *B. subtilis*, formulation

INTRODUCTION

Biological control using natural antagonistic microorganisms i.e. *Trichoderma* spp., *Pseudomonas* spp. and *Bacillus* sp. has become a very important alternative strategy for plant disease control (Cook and Baker, 1983; Weller, 1988; Kumar, 1998 and Schisler *et al.*, 2004, Masoud and Abbas, 2009). These strategies has been used especially to overcome many problems such as chemical hazardous, environmental pollution and resistance to chemicals fungicides (Lumsden and Vaughn, 1993 and Koch, 1999), Recently, successful production of effectiveness formulations has become essential for the stable and economical development of biopesticides (Burges, 1998 and Jayaraj, *et al.*, 2005).

Microorganisms and other biocontrol agents are not very resistant to harsh natural conditions, has weak bioactivities and short shelf life compared to synthetic agrochemicals and very fragile to hostile conditions (Burges,