**International Journal of Agriculture and Food Science Technology (IJAFST)**
**ISSN No. 2249-3050, Volume 4 No. 2 (2013)**

# Biopotential of microbial antagonists against soilborne fungal plant pathogens

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## ABSTRACT

Microbial antagonists have been successfully reported to possess antagonistic activities against fungal plant pathogens, such as *Pseudomonas fluorescens*, *Agrobacterium radiobacter*, *Bacillus subtilis*, *B. cereus*, *B.amyloliquefaciens*, *Trichoderma virens*, *Burkholderia cepacia*, *Saccharomyces* sp, *Gliocadium* sp. Over the past forty years, research has lead to the development of a small commercial sector that produces a number of biocontrol products. Hence, the challenge is to develop a formulation and application method that can be implemented on a commercial scale, that must be effective, reliable, consistent, economically feasible, and with a wider spectrum.

Key Words : Biocontrol, *Trichoderma*, Antagonism, Fungal pathogens

## INTRODUCTION

Plant pests (harmful insects, parasitic weeds and pathogens) are among the most important biotic agents causing serious losses and damages to agricultural products. Plant pests need to be controlled to ensure food, feed and fiber production quantitatively and qualitatively. Diseases caused by viruses, bacteria, and fungi, as well as physiological disorders, are all found in crops globally. The major diseases caused by fungal pathogens are :i) Damping-Off and Wire-Stem It is normally caused by soil fungi such as *Pythium* and *Rhizoctonia*. ii) Black-Leg : Black-leg, caused by *Phoma lingam* (*Leptosphaeria macutans*), is of major concern in crucifer production. iii) Club-Root : Club-root, caused by *Plasmodiophora brassicae*, is a destructive soil-borne disease which affects nearly all cultivated, as well as many wild and weed members of the cabbage family. iv)Fusarium Yellows : Symptoms of Fusarium yellows or wilt, a soil-borne fungus, caused by *Fusarium oxysporum* f.sp.*conglutinans*, resemble those of black rot. v) Sclerotinia Blight :This disease, also known as white mold or white rot, is caused by the fungus *Scierotinia sclerotiorum.* vi) Downy Mildew : Downy mildew, caused by *Peronospora parasitica*, may be a serious foliar disease of all cruciferous crops. Disease management is important for producing acceptable yield and quality of cruciferous crops. Some of the world's great famines and human suffering can be blamed on plant pathogenic fungi. Plant pests need to be controlled in order to ensure food and feed production. A number of strategies are being employed to manage and control plant pests (Heydari *et al.*, 2007). Chemical fertilizers and pesticides are extensively used to prevent or control plant diseases. However, the environmental pollution caused by excessive use of such agrochemicals as well as the development of resistant pathogens have promoted the search for alternative approaches, i.e. the use of microorganisms or their metabolites (Ronel *et al.*, 1986; Montesinos, 2003). In the present scenario, numerous reports of earlier published research work are available on the potential use of biocontrol agents as replacements of agrochemicals (Schimizu *et al.*, 2000; Yang *et al.*, 2008). During the past 50 years, many studies were reported about bacterial and fungal plant diseases as well as the application of different microorganisms as biocontrol agents (Hoda *et al*, 2011). Antagonism, as a mode of action, could be considered as a method of inhibiting phytopathogenic fungi through secretion of substances that interfere with the life cycle of the target microorganism (Pliego *et al*, 2010).

## BIOCONTROL POTENTIAL : REVIEW

Antibiotic production by fungi exhibiting biocontrol activity has most commonly been reported for isolates of *Trichoderma, Gliocladium* (Howell, 1998) and *Talaromyces flavus* (Klöcker), although in the last few years antibiotics have been at least partially characterized in *Chaetomium globosum* (Kunze) (Di Pietro *et al*., 1992). *Minimedusa polyspora* (J. W. Hotson) Weresub & Le Clair (Beale and Pitt, 1995) and *Verticillium biguttatum* Gams (Morris *et al*., 1995). *Trichoderma* sp. is one of the most important biocontrol agent used for

management of different diseases (Harman, 2004). These free-living fungi are ubiquitous in the soil environment and are being successfully used and commercialized to combat a broad range of phytopathogenic fungi such as *Rhizoctonia solani*, *Pythium ultimum*, and *Botrytis cinerea* (Fravel, 2005). *Pseudsomonas, Bacillus* and *Stenotrophomonas maltophilia*, showed antifungal activity against *Verticillium dahliae* var. *longisporum in vitro* and were evaluated as potential biocontrol agents by Berg *et al.*(1998). Antagonistic activity of *Aspergillus* species *Penicillium* species and *Trichoderma* species against *Pythium debaryanum* were studied by in vitro dual culture experiment. All the species of *Trichoderma* showed the ability to inhibit the pathogen (Gomathi and Ambikapathy, 2011).

## CONCLUSION

In order to have more effective biological control strategies in the future, it is critical to carry out more research studies on some less developed aspects of biocontrol, including development of novel formulations, understanding the impact of environmental factors on biocontrol agents, mass production of biocontrol microorganisms and the use of biotechnology and nano-technology in improvement of biocontrol mechanisms and strategies. Future outlooks of biocontrol of plant diseases is bright and promising and with the growing demand for biocontrol products among the growers, it is possible to use the biological control as an effective strategy to manage plant diseases, increase yield, protect the environment and biological resources and approach a sustainable agricultural system.

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