

## 2. INTRODUCTION

*Fusarium* spp. are widespread cosmopolitan group of fungi commonly colonize aerial and subterranean plant parts, either as primary or secondary invaders. They have been isolated from permafrost in the arctic and from the sand of the Sahara (Booth, 1971). Most of the *Fusarium* spp. are seed-borne, seed transmitted, soil-borne and soil transmitted plant pathogens on a variety of host plants. The serious wilts, such as Panama disease of bananas caused by *F. oxysporum* are amongst the most devastating plant diseases in the world. *F. moniliforme*, *F. graminearum*, *F. avenaceum* and *F. culmorum* are serious pathogens of family Poaceae causing pokkah-boeng of sugarcane, bakanae disease of paddy, pre- and post-emergence blight of cereals and many others. Strains of *F. solani* are also of worldwide occurrence as root rots and cankers of hardwood trees (Neergaard, 1979). Although seed-borne nature of *Fusarium* spp. is well known but their association and pathogenicity in sunflower has not been well documented. Therefore, pathogenic nature of some seed-borne *Fusarium* spp. is observed in this study in sunflower seedlings at various inoculum levels to study systemic transmission from seed to plant.

Apart from pathogenic activity *Fusarium* spp. are toxigenic and produce mycotoxins which act as potent carcinogens, mutagens, teratogens and oestrogens result in the development of several diseases in poultry, animals and man. Some of

these diseases are caused by direct effect, others by consumption of food and feeds made toxic by *Fusarium* spp. The outbreaks of alimentary toxic aleukia (ATA) in USSR in 1930s were found to be associated with consumption of wheat grains invaded by *Fusarium* spp. (Sarkisov, 1954), years later shown to produce trichothecenes (Mirocha and Pathre, 1973). Necrosis and hemorrhaging of internal organs are often caused by T2 toxin intoxication. Extracts of *F. sporotrichioides* containing T2 toxins when added in chicks food, produced severe clinical and pathological changes in organs and tissues in addition to severe hematopoietic damage, similar to that observed in humans affected by ATA (Joffe and Yagen, 1978).

The interest in toxigenic *Fusarium* spp. is increasing worldwide due to growing number of naturally occurring *Fusarium* mycotoxins (Marasas *et al.*, 1984). Under favorable conditions *Fusarium* spp. produce mycotoxins belonging to trichothecenes, zearalenone, zearalenol, moniliformin, fumonisins, beavericin and butenolide (Thiel *et al.*, 1991; Schaafsma *et al.*, 1993; Apsimon, 1994; Pineiro and Silva, 1997; O'Donnell *et al.*, 1998). Three of them *viz.*, deoxynivalenol, zearalenone and fumonisins are agriculturally important mycotoxins since they are found in harvested seeds (Miller and Mackenzie, 2000).

A single feature of toxigenic *Fusaria* in contrast to the toxigenic *Aspergilli* and *Penicilli* is that wild strains have the genetic potential to produce several families

of compounds, some of which overlap across species and others are species specific (Miller *et al.*, 1991). Identification of mycotoxins secreted by *Fusarium* spp. in food and feedstuff and economic losses produced are well documented (Siame and Lovelace, 1994; Altomare *et al.*, 1995). An expensive side effect of mycotoxin problem is the economic loss incurred due to increased costs in curing, drying and handling techniques of the agricultural commodity, chemical testing, segregation, elimination of contaminated lots and detoxification of toxic lots for other than edible uses.

Profiles of mycotoxins and other secondary metabolites have been used as taxonomic criteria in the identification of *Aspergillus* spp. (Frisvad, 1985), triverticillate *Penicillium* spp. (Frisvad, 1981; Frisvad and Filtenborg, 1983, 1990) and *Fusarium* spp. (Hashmi and Thrane, 1990; Hashmi and Ghaffar, 1992; Fakhrun Nisa, 1998). The present work is an effort to study various patterns of secondary metabolites found in toxigenic *Fusarium* spp. isolated from seeds of various crops.

For the effective control of toxigenic and pathogenic *Fusarium* spp. various microorganisms such as bacteria and fungi including filamentous and non-filamentous yeasts are used as bio-control agents (Chuang and Yang, 1993). As a group of microorganisms yeasts have a cosmopolitan distribution that have been isolated from almost all natural substrates. They play their part in dynamics of