Nematode Management in Mushroom

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ABSTRACT

The cropping pattern of mushrooms is characterized by a quick succession of fleshes at intervals of 6–8 days within a short duration of 6–8 weeks. Often the mushrooms are consumed fresh immediately after harvest. Thus, a specific management strategy needs to be planned for nematodes associated with this crop. Use of heat has been the most successful method of nematode control in mushroom cultivation. Biological control, if exploited, has a great potential in this crop. The possible biocontrol agents, advantageous to mushrooms are microorganisms, materials/ extracts, tolerant strains, and host resistance.

INTRODUCTION

M*acrobasidiomycetes* are filamentous fungi which includes both mushrooms and toadstools. A mushroom is a spore- bearing fruiting body of a fungus. Although there are several hundred species of mushrooms including edible and non-edible forms in India, three main types are cultivated on a commercial scale. They are white button mushroom *Agaricus bisporus*, oyster mushroom *Pleurotus* spp. and tropical paddy straw mushroom *Volvariella* spp. Nematode problems in mushroom are unique in that not only have the nematodes adapted themselves fully to the ecological requirements of the crop but also, they multiply very rapidly inflicting up to 100% crop losses. The following symptoms of nematode attack appear in the affected beds in succession. Mycelial growth is sparse, patchy and mycelium turns stingy. The compost surface sinks. Whiteness of spawn-run slowly changes to brown. Sporophore flushes are poor and delayed. Alternate medium and low yields are obtained in succession of flushes depending on the initial population density of nematodes and stage at which infestation occurs. There is a decline in sporophore yields and suddenly there is no mushroom production. There are extremely poor yields in the later flushes finally leading to total failure of total sporophore production thus reducing the total yields and the duration of the crop. Thus, a specific management strategy needs to be planned for nematodes associated with this crop.

CONTENT

Predatory nematodes, mites, fungi, and bacteria are the possible microorganisms, which can be used in checking the nematode menace in mushroom. Two nematophagous fungi, *Arthrobotrys irregularis* and *Candelalretta musiformis* isolated from spent compost, have been demonstrated as highly effective in checking nematode multiplication on mushroom mycelium. Use of heat has been the most successful method of nematode control in mushroom cultivation. Its use during composting for sterilization of casing material and disinfecting the mushroom house after cropping is of utmost importance. It is recommended that for the compost to be free of nematodes, air and bed temperature in the pasteurization room must be maintained at 60˚C for at least 2h and a 'cook-out' of the mushroom house at 70˚C for 5–6h or 80˚C for 30–60 min is necessary. Casing soil used for the cultivation of *A. bisporus* and other mushrooms in traditionally pasteurized either chemically or with steam. The need for alternative control measures to manage nematodes in mushrooms was realized in India because of the non-availability of exclusive and non-persistent nematicide in the market and the growing demand among consumers for pesticide-free consumables. Biological control, if exploited, has a great potential in this crop. Several plant species are known to possess nematicidal properties against mushroom nematodes and their use probably would be the safest if recommended as a compost ingredient. Studies have shown that use of fresh leaves of karanj (5%) and neem leaf powder (2–5% w/w), when mixed in compost, resulted in nematode reduction, and enhanced mushroom yields. Incorporation of oil cakes like neem (*Azadirachta indica*), karanj (*Pongamia pinnata*), coconut (*Cocos nucifera*), castor (*Ricinus communis*) and groundnut (*Arachis hypogaea*) in compost before spawning has been found to enhance sporophore yield more as compared with nematicide applications. Both leaf and seed extracts of *A. indica* were toxic to most of the fungus whereas leaf extracts of *Chrysanthemum indicum* and *Tagetes erecta* were comparatively less toxic. Total count of colony forming units of various fungi was less in the compost with leaves of *A. indica* incorporated as compared to *C. indicum* and *T. erecta*. Various plant extracts also showed stimulation in the growth of *P. sajorcaju*. There was a considerable increase in the mycelial growth of *A. bisporus* with the addition of plant extracts in the medium. Tolerance in mushrooms to nematode parasites is characterized by a lower rate of nematode multiplication and mycelial damageand was generally attributed to hyphal diameter. Resistance in *P.sajorcaju* against *A. sacchari*, *A. agarici* and *A. composticola*has been reported by several workers (Kaisa, 2002; Nagesh and Parvatha Reddy, 2000; Parvatha Reddy, 2008a,b).

CONCLUSION

With ever increasing domestic and export market needs for mushroom, the need to upgrade and modernize mushroom production technologies is vivid under Indian conditions. It is essential to practice prophylactic measures, besides popularizing the use of physical methods, botanicals, disinfectants etc., to prevent losses due to nematodes. Research attention for evolving nematode resistant/tolerant strains, nematode effective culture filtrates from microorganisms and safe synthetic chemicals also need to be addressed to at micro and macro levels of mushroom production in India.

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