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Grain Substrate Evaluation for Mass Cultivation of *Trichoderma harzianum*

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Now a day, the environmental pollution caused by disproportionate use of chemical pesticides increased the interests in biological based integrated disease management, where chemical pesticides are substituted by bio-pesticides to control plant diseases. *Trichoderma* spp. is a potential fungal biocontrol agent against a range of plant pathogens. The major issue involved in mass production and utilization of bioagents are selection of efficient strains, development cost effective methods, for mass multiplication, effective methods for storage, and its formulation. Present study deals with use of different cereal grains for their suitability as substrates for mass multiplication *Trichoderma harzianum*. Sorghum grain was found as superior substrate as it gave maximum population (c.f.u.) and can be used for the effective mass multiplication of ThCh-1.

Key words: *Trichoderma harzianum*, Sorghum grains, Mass cultivation.

Losses due to plant diseases are 10-20% of the total world food production every year, resulting in economic losses amounting to billions of dollars. Chemical control is offer nonspecific in its effect, killing beneficial organisms and it may have undesirable health and environmental pollution risk. Biological control of pathogens using *Trichoderma harzianum* is very promising method against soil borne plant parasitic fungi. The fungal pathogens play a major role in the development of diseases on many important field and horticultural crops; resulting in sever plant yield losses. Intensified used of fungicides has resulted in accumulation of toxic compound potentially hazardous to human and environment an also in the buildup of resistance of the pathogens. In order to tackle these national and global problems, effective alternatives to chemical control are being employed. Biological control is nature friendly approach that uses specific micro-organisms, which interfere with plant protection. Biological control by an antagonism is a potential, no chemical and ecofriendly approach for managing plant diseases (Andrews, 1992). Among several groups of plant diseases, major amount of work has been done on the biological based integrated control of soil borne fungal plant pathogens by using fungal antagonist like, *Trichoderma* spp. *Trichoderma* is one of the common fungal biocontrol agent, is being used world wide for suitable management of various foliar and soil borne plant pathogens (Bellows and Fisher, 1999). *Trichoderma* spp. are acclaimed as effective, ecofriendly and cheap, nullifying the ill effects of chemicals. Therefore, of late, these are identified to act against on array of important soil

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borne plant pathogens causing serious diseases of crops. Therefore considering the cost of chemicals and hazardous involves, biological control of plant diseases appears to be an effective and ecofriendly approach being practice world over. Further biological control strategy is highly compatible with sustainable agriculture and has a major role to play as a component of biological based integrated disease management (BIDM). Large scale production, along with shelf life and establishment of bioagents in targeted niche, determine the success of biological control. Therefore cost effective large scale production, shelf life of formulation, establishment of bioagent in to targeted niche and consistency in disease control are the primary concern with augmentative biological control (Deacon, 1997). Adaptation of technology in the biocontrol arsenal needs to be investigated. Development of acceptable easily prepared and cost effective formulations for delivery should be major goal (Tewari and Bhanu, 2004). For mass multiplication of bioagent through solid state fermentation technology an enormous quantity of spore biomasses needed. Various substrates like grains, organic matters, agricultural wastes etc. are being used for mass multiplication of *Trichoderma harzianum* with various degree of success (Dennis and Webster, 1971; Elad *et al*., 1982; Deacon, 1997; Butt *et al*., 2001). Therefore looking towards need for cost effective production of ecofriendly biopesticide, present investigation is carried out to evaluate locally available cheaper grains for mass multiplication of *Trichoderma harzianum* for sustainable environment and sustainable agriculture.

MATERIALAND METHODS

Healthy and cleaned grains (Sorghum, Bajra, Rice, Wheat, and Finger millet) were taken and were boiled separately, till before soft. Then they were spreaded on blotter paper on laboratory platform to drain out the excess water. Then, 150 gm of each grains was taken in polypropylene bags (10" x 12", transperent) and plugged by using cotton plug and metal ring. This was covered with alluminium foil and tied with rubber band. The bags were sterilized in vertical autoclave (Centrofix Model No. 3SSST 4571) for 15 min. at 121^{0}C (15 lbs) and allowed to cool. Seven days old culture of *T. harzianum*, grown on potato dextrose agar medium was used for inoculation. Five mycelial discs (5 mm) of above culture was inoculated in each bag and incubated for 15 days at room temperature (27 ± 2^{0}C). Four repetitions were kept for each treatments. After 15 days of incubation, the substrates were mixed thoroughly in polypropylene bags. One gram of sample from each

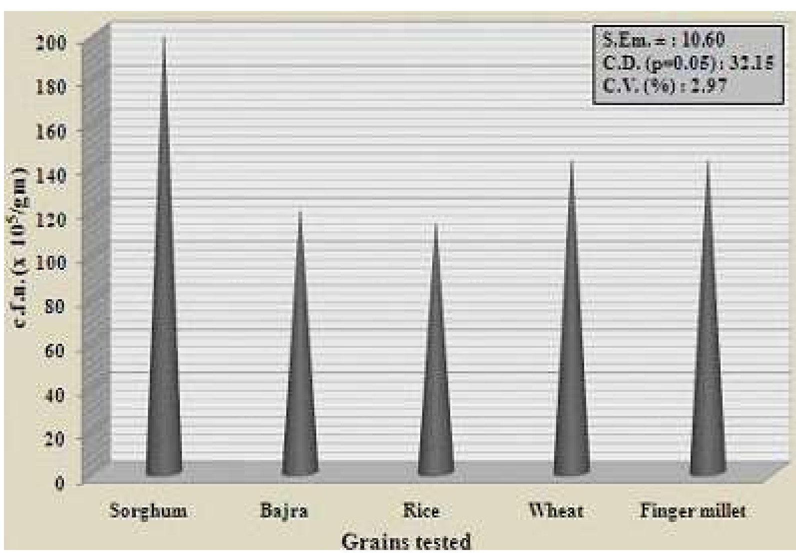

Fig. 1. Population (c.f.u.) of *T.harzianum in* different grains.

substrate was drawn aseptically for colony counts. The number of colony forming unit (cfu/g) at 10^{-5} dilution were recorded by using serial dilution plate technique.

RESULTS AND DISCUSSION

Different grains were used as substrates for the mass multiplication of *T. harzianum* and population in terms of c.f.u. per gram were recorded and depicted in Fig 1 and presented in Fig 2. Among the different grains tested, significantly higher population was found in sorghum grains (198.25 x 10^5 c.f.u/g) and it covered the entire surface of the substrate with profuse green sporulation as compared to the rest. Next best in order of merit was grains of wheat (141.75 x 10^5 c.f.u/g) and finger millet [141.75 x 10^5 c.f.u/g) which were found statistically at par with grains of bajra [119.00 x 10^5 c.f.u/g] and rice [112.75 x 10^5 c.f.u/g]. The results are in agreement with the findings of Upadhyay and Mukhopadhyay (1986); Rini and Sulochana (2007); Bhagat *et al.* (2010); Parab *et al.* (2008); Pramodkumar and Palakshappa (2009). The present study clearly suggest that sorghum grains are very useful and commonly available cheaper source for mass multiplication at laboratory, farmer and even at commercial level.

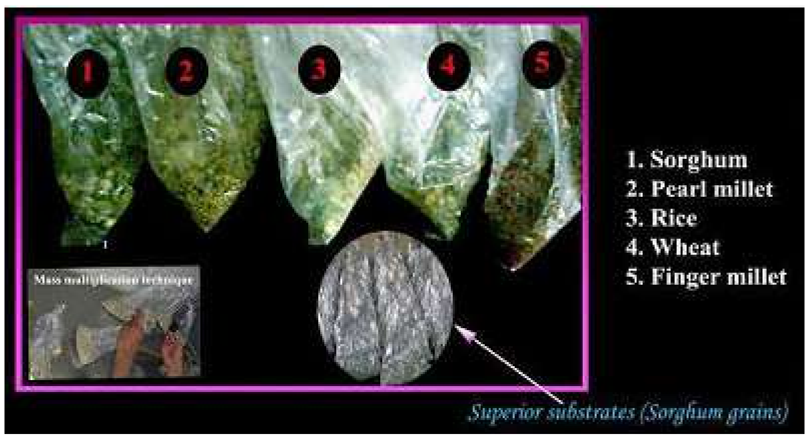

Fig. 2. Mass multiplication of *T.harzianum* (Th Ch-1) on different grains.

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