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Impact of Biopesticides on Sugarcane Fungal Disease and Their Management.

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ABSTRACT

The sugar production decreases by various factors the major one is diseases causing pathogenic fungi, in the presence study fungi isolated from the stalk of sugarcane. The highest fungal populations were isolated from variety COC 671 Sugarcane that was used for further investigation. Xylem sap as well as crushed cane sap was use for isolation. Fungal population decreased from the lowest to the upper most internodes. The two major fungal species were identified from stalk of sugarcane were *Aspergillus flavus* gr. and *Fusarium monoliforme* gr. Treatment was given at the time of planting to eyes (single bud) of sugarcane. The *Trichoderma viridae*, *Azotobactor*, Phosphate Solubilizing bacteria and combination of these biopesticides and Biofertilizer was use for study of antifungal activity, germination rate of sugar cane. The result showed that control fungal pathogens and help to germinate sugar cane plant. Combination application 94 %, *Trichoderma* 84% *Azotobacter* 62%, PSB 66%, synthetic 72 % fungicide control 48% germination and healthy plant shows up to 70 days study. The Biocontrol agent and Biofertilizer are combine they are shows maximum germination of sugar cane plant and disease free healthy plant hence it increasing the yield of sugar cane this combination more beneficial than synthetic pesticide and low cost methods

Keywords: *Trichoderma viridae*, biopesticides, sugarcane

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INTRODUCTION

Biopesticide are used primarily as preventative measures, so they may not perform as quickly as some synthetic chemical pesticides. However, biopesticides are generally less toxic to the user and are non-target organisms, making them desirable and sustainable tools for disease management. Biopesticides that can be used by organic growers can be classified as either microbial or biochemical, based on the active ingredient. Microbial pesticides include live organisms (e.g., beneficial bacteria, fungi, nematodes, and viruses) and/or their fermentation products as the active ingredient. Biochemical pesticides include plant extracts, pheromones, plant hormones, natural plant-derived regulators, clay, potassium bicarbonate, and enzymes as the active ingredient. Biopesticides are living organisms, which can destroy agricultural pests. The two most important advantages of biopesticides are a) they are target specific and do not destroy beneficial organisms and b) do not leave harmful residues.

Sugarcane (*Saccharum officinarum* L.) one of the most important cash crops of India, plays enormous role in the economy of India. It grows in the tropical and subtropical regions of world. Due to its wide range of adaptability, it supplies more than 60% of world sugarcane basic raw material for India sugar industry. Sugar industrial wastes such as molasses are used for the synthesis of alcohol, biocompost etc., while bagasse is used as fodder for farm animals during the winter season, which helps alleviating the shortage of green fodder (Subhani et al. 2008). Sugarcane is a perennial crop that is established by planting setts or stem cuttings with two or more buds that germinate and produce primary and then secondary shoots (tillers), which develop into stalks. The crop is normally harvested 12-18 months after planting and the next or first-ratoon crop is produced from the buds remaining on the underground portions of the stalks (Pankhurst et al., 2003). Besides producing a vast agro-industrial base, sugarcane is an important contributor sharing to Gross National Product. Our sizeable population is also engaged in production and making allied by-products. Among various factors responsible for low yield, diseases are the major cause. Over 100 fungi, 10 bacteria and 10 viruses and about 50 species of nematodes are pests of sugarcane in different parts of the world Red rot, caused by *Colletotrichum falcatum* is an important disease of sugarcane (inter-specific hybrids of *Saccharum* L.), which cause severe losses in sucrose yield in many cane growing areas of the world. In India, it has caused extensive damage in recent past and got the status of the most destructive and an important hazard in the cultivation of sugarcane. The role of fungicides in modernizing and changing the condition of agriculture is quite significant. It is difficult to manage red rot through chemotherapy (fungicides/chemicals) because impervious nature of rinds and fibrous nodes at cut ends do not allow sufficient absorption in setts (Agnihotri, 1990). *Trichoderma* is a mycoparasitic (fungal antagonist) present in nearly all agricultural soils and in select other environments. They grow towards hyphae of other (disease-causative) fungi and secrete enzymes that degrade the other fungus's cell walls, after which Trichoderma consumes the host protoplasm as a food source and multiplies its own spores.

Trichoderma is particularly effective, as it does not have to be infested by pests but acts through physical contact. The shelf life and effectiveness of *Trichoderma* depends largely on appropriate formulation. In fact, product formulation is one of the most complex R & D

problems and is considered to be one of the most secret assets of the production technology. The main objective is that to find out comparative efficacy and specificity of the Bio fungicides against the fungal disease for economical control of this disease.

MATERIALS AND METHODS

The sugar cane collected from various field, geographical location with latidudes and longtitudes and fungi isolated from the sugarcane internodes. The fungi grown on Potato Dextrose Agar Media, this fungi was separate into petridish. The isolated fungi identified characteristic and microscopic identification. The two major fungi present on each sample, which were identify from Agarkar Research Institute, Pune. The biocontrol agent *Trichoderma viridae* apply on isolated fungi for anti-fungal activity under laboratory conditions. The pot test study garden soil, sugar cane, chopper,1 kg size poly propylene bag, and other materials was collected, sugar cane 5 cm size bud was separated and wash under clean water, the 50 bags 50% fill up with soil after that 50 bud planted. As a control, 50 bud set 20 min treatment of *Trichoderma viridae*, 50 bud set 20 min treatment of Azotobacter, 50 Bud set 20 min treatment of Phosphate Solubilizing bacteria, and combinative set all the set fill up in the bag and placed under shade condition. The germination of sugar cane observe 30 day to 70 days.

RESULTS AND DISCUSSION

Colletotrichum falcatum is wide spread sugarcane diseases, which causes heavy yield losses of sugarcane crop. Biotechnological applications are yielding encouraging results in the areas of genome characterization, mapping for specific traits, molecular variability of pathogens, marker aided selection for insect/disease resistance, transformation, precise detection of plant pathogens etc. The pathogen affects crop, for period from germination to harvest stage. Biopesticides treatment develops red rot resistant variety in sugarcane. By applying culture of *T.viridae*, the effect of growth observed least germination after seventy days. By using only Azotobacter the growth observed 62%. PSB Culture show 66% germination of sugarcane. The combination of *T. viridae, Azotobacter* and PSB Culture recorded 94% growth of sugarcane. Biocontrol agent and Biofertilizer are combine they are shows maximum germination of sugar cane plant and disease free healthy plant hence it increases the yield of sugar cane. This combination more beneficial than synthetic pesticides and low cost methods. Bacteria provide Nitrogen and Phosphate those are major compounds related to growth. Regulatory controls over metabolisms need to be identified and characterized to improve yield and quality of sugarcane.

The most common fungi species isolated from sugarcane stalks Fusarium spp. Causing stalk rot. This study showed that the combination of *Tri. Viridae, azotobacter* and PSB Culture recorded growth of sugarcane 94%. The Biocontrol agent and Biofertilizer combined shows maximum germination of sugar cane plant and disease free healthy plant hence it increases the yield of sugar cane. This combination more beneficial than synthetic pesticide and low cost methods. This result showed that brown rust, caused by Fusarium spp., can cause severe epidemics in susceptible sugarcane productors. The effect of the disease on yield was evaluate

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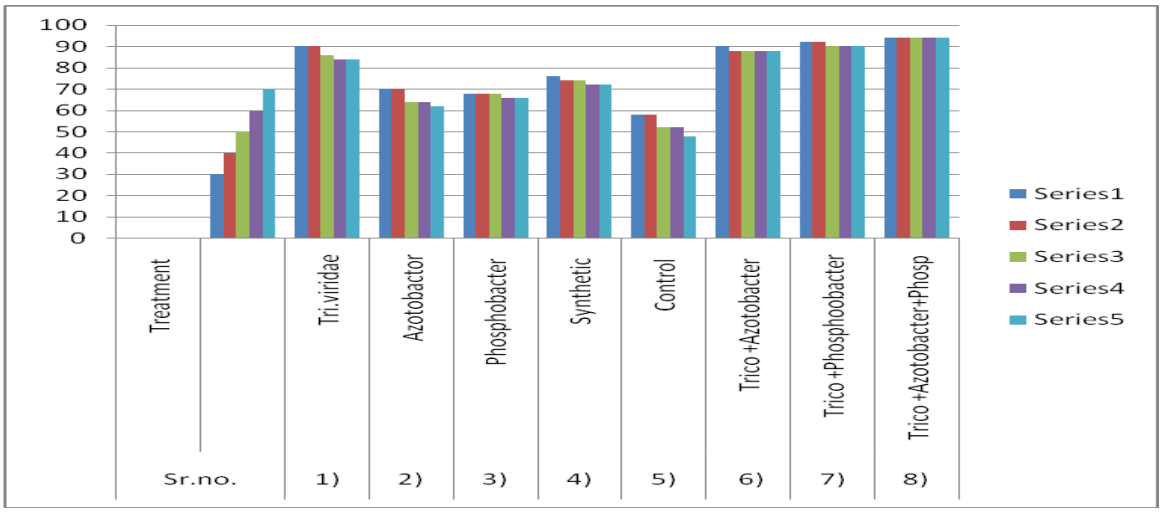
in pot experiments conducted during two months and ten days. A mixture of three Tri.viridae, Azotobacter and PSB applied for sugarcane bud and plants protected by biopesticides. Comparisons of the yields obtained from pot experiment in which brown rust was controlled and the impact of biopesticides is greatest from the first to seventy days period when number of tillers grown.

Graph represents the germination of plants in 70 days by using biopesticides.



To date, at least 12 species or subspecies (varieties) of fungi have been employed as the active ingredients in these products. This number will likely increase into the near future as molecular studies reveal cryptic species within large genera. Most notably, insect pathogenic fungi previously classified as *Verticillium* spp. have been placed in a new genus, *Lecanicillium* (Gams and Zare, 2001), and many insect pathogenic *Paecilomyces* species (including *P. fumosoroseus*) have been transferred to the genus *Isaria* (Hodge et al., 2005).

The germination patterns for the biopesticides have been depicted below Figures, 1, 2, 3 and 4. The growth was higher and compared to the individual separate biopesticides.

Figure 1 Trichoderma viridae treated set

Figure 2 Azotobacter treated set

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Figure 3 Phosphate Solubilizing Bacteria

Figure 4 Trichoderma viridae + Azotobacter + PSB treated set

The germination percentage depicts the increased growth rate (Table.1). *Tri. Viridae*, *Azotobacter*, *Phosphobacter* individually showed decreased rate of growth compared to the applied combination of the biopesticides.

Sr.no.	Treatment	Germination (growth) percentage days				
		30	40	50	60	70
1	Tri.viridae	90	90	86	84	84
2	Azotobactor	70	70	64	64	62
3	Phosphobacter	68	68	68	66	66
4	Synthetic	76	74	74	72	72
5	Control	58	58	52	52	48
6	Tricho +Azotobacter	90	88	88	88	88
7	Tricho +Phosphobacter	92	92	90	90	90
8	Tricho +Azotobacter+Phosp	94	94	94	94	94

CONCLUSION

From this study, Tri.viridae 84 %, Azotobactor 62 %, Phosphobacter 66 %, Tricho + Azotobacter 88 %, Trico + Phosphobacter 90, Trico+ Azotobacter +Phosphobacter 94%, Synthetic 72%, Control 48% of 70 days germination and growth of healthy plant was observed. The two type fungi measurably observe and identified. The Bio-control agent and Bio-fertilizer are combine they are shows maximum germination of sugar cane plant and disease free healthy plant hence it increasing the yield of sugar cane this combination more beneficial than synthetic pesticide and low cost methods also Bacteria provides Nitrogen and Phosphate those are major compound related to growth.

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