Evaluation of the effect of irradiated Chitosan on growth of important rice pathogens to minimize the disease incidence in rice (*Oryza sativa* L.)

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Abstract

Rice (*Oryza sativa*) is the one of the world's most important staple crops and a major part in the diet of more than half the world's population.

Among the diseases of rice, Rice blast, Sheath blight and the Brown spot or Grain discoloration is considered as the most economically important fungal diseases. Rice Blast caused by *Pyricularia grisea* is considered as a major disease of rice because of its wide distribution and extent of destruction under favorable conditions. Sheath blight caused by *Rhizoctonia solani* a common in rice fields in the wet zone of Sri Lanka causing considerable damage. In addition rice leaves as well as grains may be infected by various organisms such as *Helminthosporium* sp., *Alternaria* sp., *Curvularia* sp. and *Fusarium* sp. before or after harvest, causing brown spot and grain discoloration.

Usually resistant varieties are used to manage the rice blast disease. However, fungicide application is required when disease outbreaks occur under weather conditions favorable to the pathogen. Since no disease resistant rice varieties have been identified for sheath blight disease, fungicide application is the only solution for management of this disease.

Chitosan is a biological compound with antifungal activities and obtained commercially from shrimp, crab shells chitin (a N- acetyl glucosamine polymer) by alkaline deacetylation. It is a polycationic polymer contains more than 50000 glucosamine units and a linear polysaccharide composed of randomly distributed β-(1-4)-linked D-glucosamine (deacetylated unit) and N-acetyl-D-glucosamine (acetylated unit). However oligochitosan has a wide range of biological applications, including health, food, plant growth stimulator, feed additive, antimicrobial agent *etc.* In addition to that, oligochitosan is effective at eliciting plant innate immunity inducing phytoalexin against plant diseases in many plants. Therefore Cobalt 60 source was used to separate oligochitosan from polymer chitosan in in Atomic Energy Authority in Sri Lanka.

According to radiation dose emitted from Co 60 number of oligomers were taken and acetic acid series and lactic acid series were prepared. The growth of *Rhizoctonia* sp., *Pyricularia* sp., *Cuvularia* sp., and *Fusarium* sp. were studied *in vitro* on Potato Dextrose Agar (PDA) medium mixed with irradiated Chitosan solutions separately in acetic acid series and lactic acid series.

Concentrations of 100, 200, 300, 400 and 500 ppm of the irradiated chitosan solutions were tested against all pathogens. The results of *invitro* confirmed that irradiated Chitosan solutions in acetic acid series could suppress the growth of above fungal pathogens in rice with increasing of concentrations under the laboratory conditions. Therefore 400 ppm concentration of chitosan solutions was selected for pot experiment and field experiment.

Bg 94-1 rice variety was selected for pot experiment and field experiment. Experiment done for Blast disease (*Pyricularia* sp.) in upland nursery showed better suppression of blast pathogen as chemical fungicide. Disease incidence in most of the treatment was low. Field experiment was done for Brown spot & Grain discoloration disease. Grain discoloration percentage in that experiment was almost 100% in all treatment. Therefore there was no significant suppression on Brown spot & Grain discoloration pathogens (Curvularia sp. & *Fusarium* sp.). For Sheath blight disease pot experiment was done under green house condition. In this experiment percentage of relative lesion height was calculated after measuring maximum lesion height. Percentage of relative lesion height of each treatment was higher in all treatment than in fungicide treatment. Therefore any treatment could not suppress Sheath blight disease in better way.