



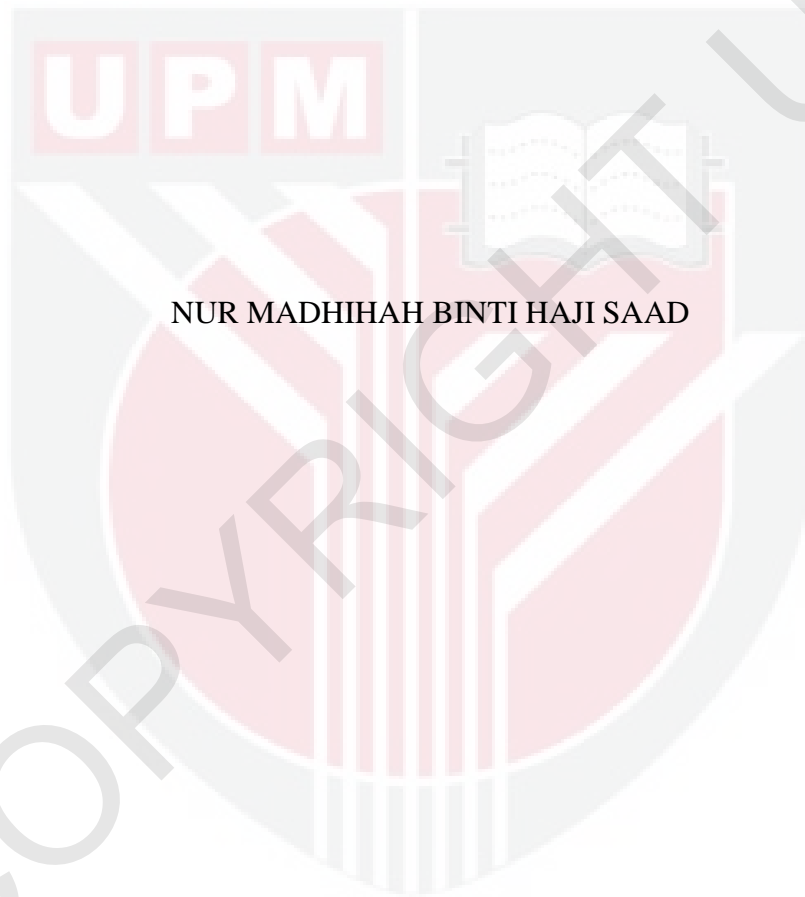
UNIVERSITI PUTRA MALAYSIA

***EFFECT OF CHITOSAN ON CAUSAL AGENT OF RICE SHEATH BLIGHT
DISEASE, *Rhizoctonia solani* Kuhn***

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EFFECT OF CHITOSAN ON CAUSAL AGENT OF RICE SHEATH BLIGHT
DISEASE, *Rhizoctonia solani* Kuhn

BY
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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in partial fulfillment of the requirements of PRT 4999 (Final Year Project) for the award of the Degree of Bachelor of Horticultural Science

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ENDORSEMENT

This project entitled “Effect of Chitosan on *Rhizoctonia solani* Kuhn in Rice Sheath Blight Disease” is prepared by Nur Madhahah Binti Hj. Saad submitted to the Faculty of Agriculture in partial fulfillment of the requirement of PRT 4999 for the award of the degree of Bachelor of Horticultural Science.

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ABSTRACT

EFFECT OF CHITOSAN ON CAUSAL AGENT OF RICE SHEATH BLIGHT DISEASE, *Rhizoctonia solani* Kuhn

Rice sheath blight disease is one of the destructive disease of paddy field that lowering the quality and yield of production. The causal agent is *Rhizoctonia solani* Kuhn. Chitosan has been used in agriculture as an alternative approach to chemical fungicides whereas in modern agriculture practices it is very important in managing the disease with minimum harm to the environment. In this study, chitosan had been used as antifungal to control the fungus *R. solani*. Chitosan at the rate of which were 2 and 4% caused 67.22 and 75.56% inhibition of mycelial growth, 58.45 and 91.96% inhibition of disease incidence and 76.10 and 99.00% inhibition of disease severity respectively. Chitosan acts as protection of rice stem from infection by *R. solani*. This study showed that chitosan has the potential to be introduced by the farmers in controlling the disease of rice sheath blight disease thus improving the plant quality via chitosan application.

ABSTRAK

KESAN KITOSAN KE ATAS PEMBAWA AGEN PENYAKIT HAWAR

SELUDANG, *Rhizoctonia solani* Kuhn

Penyakit hawar seludang merupakan salah satu penyakit pada pokok padi yang mampu mengurangkan kualiti dan hasil padi. Penyebab penyakit padi ini adalah disebabkan oleh kulat *Rhizoctonia solani* Kuhn. Kitosan telah digunakan dalam bidang pertanian sebagai satu alternatif baru dalam mengawal penggunaan racun kimia dimana pertanian moden kini amat mementingkan pengurusan dalam pengawalan penyakit tanpa memberikan kesan sampingan terhadap alam sekitar. Dalam projek ini, kitosan digunakan sebagai antikulat dalam mengawal kulat *Rhizoctonia solani*. Dua tahap kepekatan chitosan yang berbeza iaitu 2 dan 4% memberikan kesan 67.22 sehingga 75.56% dalam merencatkan pertumbuhan mycelia, 58.45 sehingga 91.96% dalam kawalan kehadiran penyakit dan 76.10 sehingga 99.00% dalam mengawal keterukan penyakit. Kitosan bertindak sebagai perlindungan kepada batang padi daripada dijangkiti oleh *R. solani*. Kajian ini menunjukkan bahawa kitosan berpotensi untuk diperkenalkan kepada petani dalam mengawal penyakit hawar seludang sekali gus meningkatkan kualiti tumbuhan melalui aplikasi kitosan.

CHAPTER 1

EFFECT OF CHITOSAN ON CAUSAL AGENT OF RICE SHEATH BLIGHT

DISEASE, *Rhizoctonia solani* Kuhn

1.1 Introduction

According to Matthews (1995) and Banik (1999) rice (*Oriza sativa* L.) is the main crop in the world after wheat. Due to its importance, rice industry has received special attention from government. Recently, rice was placed as the most important food crop to ensure the nation's food security. Gumma *et al.*, (2011) said that Asia is the bulk producer and consumer of rice, thus it is essential food commodity in Malaysia. Hence, due to increasing population in Asia an estimated 70% of rice need to be increase for the future (Rajamoorthy *et al.*, 2015; Papademetriou, 2000). Hence, to achieve better yield in crop production, plants need to protect themselves from new infection of any disease (Narayanasamy, 2002; Agrios, 2005). New method should be developed rather than by using the chemical fungicide.

Rice production is being interfere with infection by different diseases. One of them is sheath blight disease caused by *Rhizoctonia solani* Kuhn which is a major constraint to rice production, especially in intensified cropping systems (Jayaprakashvel and Mathivanan, 2012). Sheath blight disease affects 50% of global rice production areas (Latif *et al.*, 2011) while in Malaysia, under a favourable condition it may affect up to 50% in decreases of yield production (Zheng *et al.*, 2013).

Unfortunately, nowadays, there are no known complete resistance rice varieties to control sheath blight disease (Adhipathi *et al.*, 2013). Control of the disease has relied mainly on the use of chemical fungicides (Savary and Mew, 1996). However, it is not a sustainable due to pesticide residue accumulation in the soil. There were several cultural practices have been applied to minimize the disease of sheath blight including resistant cultivars, crop rotation, solarization, reduced spacing of hills in transplanted rice, biological control with *Trichoderma* spp. and fluorescent *Pseudomonas*, and induced resistant with avirulent strain of *R.solani* or different chemicals and nutrients (Belmar *et al.*, 1987; Roy 1996; Kumar *et al.*, 2009).

Chitosan is a natural biopolymer modified from chitin that was extracted from shellfish such as shrimps, lobsters or crabs and cell wall from some fungi (Boonlertnirum *et al* 2008). In agriculture field, chitosan is used for antifungal metabolism against pathogens (Hadrami *et al.*, 2010).

Chitosan has been used to explore their potential in biochemical and plant responses toward it. Besides, chitosan has been proven that it can increase the yield and quality of the crop, for examples in orchid (Nge *et al.*, 2006), faba bean (El-sawy *et al.*, 2010), cucumber (Shehata *et al.*, 2012) and corn (Boonlertnirun *et al.*, 2011).

This study, therefore, investigated whether this concept of cultural control can provide a sound and verifiable method for controlling sheath bight disease in rice

production. It will also consider environmentally friendly element in relation to soils, fertilizers and plant nutrition.

1.2 Problem statement

Nowadays, too much chemical used in controlling plant diseases which are unsafe and non- environmental friendly. Hence, chitosan will be undertaken on rice sheath blight disease, particularly on MR219 rice variety.

1.3 Objectives

- i. To determine the suitable concentration of chitosan to inhibit mycelial growth *in vitro*
- ii. To determine the effectiveness of chitosan in controlling sheath blight disease in glasshouse trial

1.4 Hypothesis

The chitosan may be can control the rice sheath blight disease caused by *Rhizoctonia solani* Kuhn

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