UNIVERSITI PUTRA MALAYSIA

POTENTIAL OF PLANT TONIC ON CONTROLLING FUSARIUM OXYSPORUM F.SP. CUBENSE, THE CAUSAL AGENT OF BANANA WILT

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BY

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ENDORSEMENT/CERTIFICATION

This project entitled "The Potential Of Plant Tonic in Controlling *Fusarium Oxysporum* f.sp. *Cubense,* the causal agent of banana wilt" is prepared by Nur Farzana Binti Roshaidi -174657 and submitted to the Faculty of Agriculture in fulfilment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agricultural Science.

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LIST OF ABBREVIATIONS

%	Percentage
CRD	Completely Randomized Design
PDA	Potato Dextrose Agar
mm	millimetre
ANOVA	Analysis of Variance
Foc	*Fusarium Oxysporum* f.sp *cubense*

ABSTRACT

Fusarium wilt caused by the soil inhabiting fungus, *Fusarium oxysporium* f.sp. *cubense* is a major factor limiting commercial banana production in Malaysia. Control measures involving field sanitation, soil fumigation, organic amendments and crop rotation are generally non-effective. The effective method of controlling fusarium wilt is the planting of new resistant varieties however, it is not only time consuming but is at time not feasible as this pathogen can overcome resistant, and there is no resistant cultivars that has been developed in Malaysia. Biopesticide control is the best alternative method to control the Fusarium wilt as it is not only environmentally friendly but are less expensive. One such biopesticides is the use of plant tonic which has fatty acids as the active ingredient. It has been used to control several diseases on crops by inhibiting the growth of fungi, bacteria and virus. The medium chain fatty acids such as Lauric acid, Capric acid and Palmitic acids has been reported to inhibit fungal, bacterial and viral infection. Related study on the use of plant tonic crop diseases has not been reported, thus the objectives of this study is to determine the potential use of plant tonic to control fusarium wilt of banana caused by Foc. Foc was cultured in PDA containing five different treatments which control, 1 ml, 2 ml, 3 ml and 4 ml. The experiments were focused on mycelial growth of Foc from day 1 until day 7, observed and calculated the spore germination of Foc. After day 7, the plates were left for another 7 days for further incubation and spore count was observed, recorded and calculated. As a result, the activities of plant tonic on mycelial growth was inhibited 40.27% (4 ml concentration of plant tonic) as calculated in PIRG and the mycelial growth was 20.30 mm (4 ml). The spore count of Foc in 4 ml concentration was the least (17.7 x 10^6 spore/ml) and the spore germination of Foc contained 4 ml plant tonic was (5.8 %) which is the least spore germination. Therefore, 4 ml of concentration of plant tonic was the most inhibited the growth of Foc.

ABSTRAK

Layu Kulat merupakan kulat di dalam tanah iaitu daripada *Fusarium oxysporium* f.sp. *cubense* yang merupakan faktor terbesar dalam melimitkan penghasilan pisang secara komersial di Malasysia. Kawalan sukat seperti pembersihan ladang, membersihkan tanah, menggunakan tanah organik dan putaran tanaman secara umunya tidak berkesan. Cara yang paling berkesan untuk mengawal layu kulat adalah menggunakan variti-variti yang resistan, walaubagaimanapun cara itu bukan sahaja hanya mengambil masa yang lama akan tetapi patogen ini boleh menlangkaui resistan itu dan tiada kultivar yang resistan terhadap Layu Kulat ini di Malaysia. Kawalan biopestisid adalah cara alternatif yang terbaik untuk mengawal Kulat Layu kerana cara ini mesra alam dan tidak menggunakan kos yang tinggi. Salah satu contoh biopestisid adalah menggunakan tonik tumbuhan mengandungi asid lemak sebagai bahan aktif. Tonik tumbuhan ini telah digunakan untuk mengawal beberapa penyakit terhadap tanaman yang dijangkiti fungus, bakteria serta virus. Rantaian asid lemak medium seperti asid laurik, asid kaprik, dan asid palmitik telah dilaporkan boleh menghalang jangkitan fungus, bakteria dan virus. Kajian yang berkaitan tonik tumbuhan ini terhadap tanaman yang berpenyakit belum dilaporkan setakat ini jadi, tujuan kajian ini dijalankan adalah untuk menentukan potensi penggunaan tonik tumbuhan dalam mengawal Kulat Layu. Foc telah dikultur dalam PDA yang mengandungi 5 rawatan yang berbeza iaitu kontrol, 1 ml , 2 ml , 3 ml dan 4 ml. Eksperimen ini telah mengfokuskan kepada pertumbuhan miselium dari hari 1 hingga hari ke-7 serta pertumbuhan spora. Selepas hari ketujuh, PDA ditinggalkan untuk 7 hari lagi untuk kiraan spora. Hasil yang didapati rawatan 4 ml konsentrasi tonik tumbuhan merencat pertumbuhan miselium iaitu sebanyak (40.27 %) dalam PIRG, untuk pertumbuhan miselium sebanyak 20.20 mm manakala untukpertumbuhan spora dalam 4 ml tonik tumbuhan pula adalah 17.7 x10^6 spore/ml. Secara kesimpulannya, 4 ml konsentrasi paling berkesan merencat pertumbuhan Foc.

CHAPTER 1

INTRODUCTION

1.1 General

Banana (Musa sp.) is one of the most important cultivars in Malaysia. It is grown primarily for its fruits which is generally has a soft, sweet, dessert bananas, particularly those of the Cavendish group which are the main exports from banana growing countries.

Banana is cultivated about 27000 ha in Malaysia. The major producing banana are Johor (7161 ha), Pahang (3927 ha), and Sarawak (3729 ha) as they are mostly small holder owned and grown. However, the production of banana become decreased as the Foc raided the banana plant and it becomes more serious damage to banana plant as there is no method for the long term for controlling Fusarium wilt of banana (Hussain and William, 2011).

Fusarium wilt of banana or Panama disease has become number one in ranking of occurrence of pest and disease and ranked second in term of cultivated area in Malaysia. It caused by *Fusarium oxysporium* f.sp *cubense* (Foc), the most destructive fungal disease. Foc thrives on moist soil conditions and can survive in soil for many years. It spreads through water, soil, farm tools and machinery. It is also expands its entry into plants via roots of banana (Hussain and William, 2011).

Thus, there are several method to control the infection of Foc. One of the control method Foc in banana plant is chemical control that has been used widely. For example, fungicide has been used to control the Foc in banana plant. However it is not effective for the long term because the used of fungicide, it will make the pathogen developed fungicide resistant. The cost of buying fungicide also will be increased as we need to used the other fungicide to control the Foc. Besides that, it will affect the human health and also the environment.

So, the best alternative for controlling Foc in banana plant is by using biofungicide which is called plant tonic. It is environmental friendly and will not affect as well as human health. There is no research and experiment recorded for the used of plant tonic to control Foc in banana plant .

Plant tonic has a potential as an anti-fungal, anti-bacteria and anti- viral. The main ingredients of plant tonic are vegetable oils and other natural ingredients. It derives from the fatty ester such as lauric acid, caprylic acid, capric acid and myristic acid as anti-effective properties. The fatty esters are able to stimulate phytoalexin as plant immune bodies (Sovereign Innovations, 2009). So, the objective of this study is to determine the potential of plant tonic on controlling Fusarium wilt of banana in Malaysia.

1.2 Objective of Study

The main objective of this study was focused on the biological control of Foc pathogen on banana plant. It was illustrated by the used of plant tonic which was extracted from the plant to inhibit the growth of Foc. This was accomplished by following specific objectives :

1. Measure the PIRG (percentage of inhibition growth) by using the different concentrations of plant tonic on plate PDA containing Foc
2. Measure the mycelial growth of Foc
3. Measure the spore count after 7 days of Foc growth
4. Measure and calculate the spore germination after 14 days of Foc growth

1.3 Hypothesis

Hypothesis of this study are :

Foc the causal agent of Fusarium wilt of banana can be controlled by plant tonic.

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