



**UNIVERSITI PUTRA MALAYSIA**

**EFFECT OF *Piper betle* L. EXTRACT ON GROWTH OF  
*Colletotrichum capsici*, CAUSAL AGENT OF ANTHRACNOSE OF CHILI**

**NUR ASIFA ZAHARI**

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**NUR ASIFA BINTI ZAHARI**

**FACULTY OF AGRICULTURE**

**UNIVERSITI PUTRA MALAYSIA**

**SERDANG, SELANGOR DARUL EHSAN**

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**BY**

**NUR ASIFA BINTI ZAHARI**

**A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in  
fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of  
the degree of Bachelor of Horticultural Science**

**Faculty of Agriculture**

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**CERTIFICATION**

**This project report entitled *Effect of Piper betle L. Extract on Growth of Colletotrichum capsici*, Causal Agent of Anthracnose of Chili is prepared by Nur Asifa Binti Zahari and submitted to the Faculty of Agriculture in fulfillment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Horticultural Science.**

**Student's name :**

**Nur Asifa Binti Zahari**

**Student's signature :**

.....

**Certified by :**

.....

**(Assoc. Prof. Dr. Jugah Bin Kadir)**

**Project Supervisor,**

**Department of Plant Protection,**

**Faculty of Agriculture**

**Universiti Putra Malaysia.**

**Date : .....**

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## LIST OF ABBREVIATIONS

°C	Degree Celsius
g	Gram
mL	Milliliter
rpm	Rotation per minute
mm	Millimeter
μL	Microliter
LCB	Lactophenol cotton blue
ANOVA	Analysis of variance

## ABSTRAK

Cili merupakan salah satu tanaman yang paling penting ditanam di seluruh dunia. Ia berada di kedudukan yang paling popular dan sering ditanam sebagai sayur-sayuran berbuah di antara tanaman sayur-sayuran di Malaysia. Walau bagaimanapun, seperti tanaman-tanaman lain, ekonomi pengeluaran cili adalah terhad disebabkan oleh serangan pelbagai penyakit dan perosak. Penyakit bintik berpusar adalah salah satu kekangan ekonomi utama terhadap pengeluaran cili di seluruh dunia, terutama di kawasan tropika dan subtropika. Racun kulat sintetik telah digunakan secara tradisional untuk mengawal penyakit lepas tuai, tetapi penggunaan racun yang berlebihan serta kos yang tinggi telah meninggalkan kesan negatif terhadap tumbuh-tumbuhan, kesihatan manusia dan juga alam sekitar. Permintaan yang semakin meningkat daripada pengguna terhadap produk yang bebas kimia serta kebimbangan mereka tentang permasalahan kesihatan dan pencemaran alam sekitar telah mewujudkan satu langkah lain bagi mengawalnya. Dikatakan bahawa penggunaan tumbuh-tumbuhan secara amnya dianggap lebih selamat dan kurang berbahaya dari penggunaan racun sintetik. Sehubungan itu, kajian ini dijalankan untuk menentukan kemungkinan menggunakan ekstrak daun sireh untuk mengawal atau menghalang patogen yang menyebabkan penyakit lepas tuai pada cili (*Capsicum annuum* L.). Ekstrak air dan etanol menunjukkan kesan yang berbeza kepada pertumbuhan *C. capsici*, di mana ekstrak etanol lebih berkesan. Pertumbuhan miselium *C. capsici* ketara ( $P < 0.05$ ) dikurangkan sebanyak 50% ekstrak etanol. Pengeluaran spora juga ketara ( $P < 0.05$ ) dikurangkan sebanyak 50% ekstrak etanol ( $0.000 \times 10^4$  spora/ml). Percambahan spora dikurangkan sebanyak 50% ekstrak etanol (0.00%). Kajian ini menunjukkan bahawa kepekatan

ekstrak etanol yang paling tinggi lebih berkesan dalam merencatkan pertumbuhan *C. capsici* dan pengeluaran spora.



## ABSTRACT

Chili is one of the most important crops grown worldwide. It ranks as the most popular fruit vegetable and occupies the highest hectareage among the fruit vegetables in Malaysia. However, like any other crops of economic importance, chili production is restricted by various pests and diseases. Anthracnose disease is one of the major economic constraints to chili production worldwide, especially in tropical and subtropical regions. Synthetic fungicides has been used traditionally to control the postharvest diseases, but their excessive use complemented with high costs, residues in plants, and development of resistance, has left a negative effect on human health and the environment. The increasing demand of consumers towards chemical free produce and their concern for health and environmental pollution have develop the interest toward other alternatives. Naturally occuring biologically active compounds from plants are generally assumed to be safer and less hazardous then the synthetic compounds. In view of this, this research is conducted to determine the possibility of using extract from betel leaves to control or inhibit the pathogen causing postharvest disease on chili (*Capsicum annum* L.). The water and ethanol extracts showed varying degree of inhibitory on *Colletotrichum capsici* growth, with the ethanol extracts being more effective. Mycelial growth of *C. capsici* was significantly ( $P < 0.05$ ) reduced by 50% ethanol extracts of *P. betle*. Spore production was also significantly ( $P < 0.05$ ) reduced by 50% ethanol extract of *P. betle* ( $0.00 \times 10^4$  spore/ml). Spore germination reduced by 50% ethanol extract of *P. betle* (0.00%). These results show that higher concentration of the ethanol extract are more effective for the suppression of *C. capsici* growth and spore production.

## CHAPTER 1

### INTRODUCTION

Chili (*Capsicum annuum*) is a herbaceous perennial dicotyledonous plant of the family Solanaceae. It is also known as capsicum, paprika, pimiento, cayenne or chili pepper depending on place and type of fruits. Many chili constituents are important for nutritional value, flavour, aroma, texture and colour. Chilies are low in sodium and cholesterol free, rich in vitamins A and C, and are a good source of potassium, folic acid and vitamin E (Bosland and Votava, 2003). Capsaicin and dihydrocapsaicin are substances found in chilies and responsible for pungency, thus exhibit antimicrobial properties, physiological and pharmacological effects (Dorantes et al., 2000). Chili is considered to be one of the most important crops in the tropics. In Malaysia, it is cultivated over an area of 14,735 ha with the production of 25,672 ton giving yield of 4.6 ton per hectare (FAO, 2010). Anthracnose is one of the fungal diseases which affect chili production in Malaysia. The disease mainly affects the yield as well as the quality of the crop. Anthracnose mainly appeared on mature pod, however, die-back of shoots, leaf spots and mature green pod damage have also been reported. Use of fungicides is a common practice to control anthracnose in Malaysia. Although fungicides provide an effective disease control, it cause harmful effect to the consumers as they can accumulate in the harvest. In addition, spraying of chemicals can develop an adverse effects such as microbial resistance and it may be harmful to the beneficial organism and towards the environment too. Biologically plant extract represent a rich potential source of an alternative and perhaps environmentally more acceptable disease management compounds. In general, antifungal activity of plant extracts have been well

documented and in more recent times, studies on the effects of plant extracts and essential oils on plant pathogens have also received attention (Tripathi et al., 2008). In the agricultural sector, plant extracts, essential oils and their components are gaining increasing interest due to their volatility, reasonably safe status, their eco-friendly and biodegradable properties and also wide consumer acceptance (Tzortzakis and Economakis, 2007). However, research on the use of these products to control the postharvest pathogen in Malaysia is still lacking. Therefore, the objective of this research is to determine the potential of using extracts from *Piper betle* to manage post-harvest anthracnose of chili



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