



**UNIVERSITI PUTRA MALAYSIA**

**ALLELOPATHIC POTENTIAL OF *Tinospora tuberculata*  
AS NATURAL HERBICIDE ON MUSTARD (*Brassica juncea*) and  
SWEET CORN (*Zea mays*)**

**NURUL ILYANA KAMARUZAMAN**

**FP 2015 100**

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FACULTY OF AGRICULTURE  
UNIVERSITI PUTRA MALAYSIA  
SERDANG, SELANGOR

2014/2015

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HERBICIDE ON MUSTARD (*Brassica juncea*) and SWEET CORN (*Zea  
mays*)**

By  
**NURUL ILYANA BINTI KAMARUZAMAN**

A project report submitted to Faculty of Agriculture,  
Universiti Putra Malaysia

as fulfillment of the requirement of PRT 4999 (Final Year Project)  
for the award of the degree of Bachelor of Horticultural Science

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## CERTIFICATION

This study report entitled “Allelopathic Potential Of *Tinospora tuberculata* As Natural Herbicide On Mustard (*Brassica juncea*) and Sweet Corn (*Zea mays*)” is prepared by Nurul Ilyana binti Kamaruzaman 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.

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## LIST OF ABBREVIATIONS

ANOVA      Analysis of variance

cm          Centimetre

g            Gram

%          Percentage

°C         Degree celcius



## ABSTRAK

Allelopati adalah perencatan pertumbuhan, perkembangan dan penyebaran oleh tumbuhan dan mikroorganisma berdekatan disebabkan oleh pengeluaran kompaun toksik yang dinamakan allelokimia yang merencat pertumbuhan pelbagai jenis tumbuh-tumbuhan termasuk rumpai. Satu kajian telah dijalankan untuk mengkaji potensi allelopati daripada *Tinospora tuberculata* kepada perencatan rumpai. Potensi allelopati pada bahagian daun dan batang *Tinospora tuberculata* dinilai melalui keupayaan merencat pertumbuhan rumpai yang ada pada dua tumbuhan yang berbeza iaitu, tumbuhan monokotiledon, *Zea mays* dan tumbuhan dikotiledon, *Brassica juncea*. Potensi allelopati pada daun dan batang *Tinospora tuberculata* dengan menggunakan kepekatan 0g, 10g, 15g dan 20g sebagai rawatan. Spesis, kepadatan, tinggi, berat basah dan berat kering kedua-dua tumbuhan tersebut diukur sebagai penanda kepada allelopati oleh *Tinospora tuberculata*. Serbuk kering daripada daun *Tinospora tuberculata* menunjukkan potensi perencatan yang lebih tinggi daripada serbuk kering batang *Tinospora tuberculata*. Peningkatan kepekatan serbuk juga mengurangkan pertumbuhan rumpai. Hasil kajian juga mendapati bahawa pertumbuhan jagung manis (*Zea mays*) dan bayam (*Brassica juncea*) mungkin turut dipengaruhi oleh kepekatan serbuk *Tinospora tuberculata*. Hal ini menunjukkan *Tinospora tuberculata* mempunyai potensi allelopati dan boleh merencat pertumbuhan rumpai yang juga bergantung kepada kepekatan yang digunakan.

## ABSTRACT

Allelopathy is the suppression of growth, development, and distribution of nearby plants and microorganisms caused by the released of toxic compounds called allelochemicals that inhibit the growth of many different plants such as weeds. A study was conducted to determine the allelopathic potential of *Tinospora tuberculata* on suppression of weeds. Allelopathic potential of aerial parts of *Tinospora tuberculata* was evaluated on its ability to suppress weeds in two crops, dicotyledon plant, mustard (*Brassica juncea*) and monocotyledon plant, sweet corn (*Zea mays*) under glasshouse condition. Dry powders of aerial part (stems and leaves) of *T. tuberculata* with concentrations of 0g, 10g, 15g and 20g were used as treatments. Species, density, height, fresh weight and dry weight of weeds and height, fresh and dry weight of two crops were measured as indicators of allelopathy of *T. tuberculata*. Leaves dry powder showed higher inhibitory potential than stem dry powder. Increasing of the dry powder concentration decreased the growth of weeds. The results also suggested that the growth of sweet corn and mustard were may also affected by the concentration of dry powder of *T. tuberculata*. This suggests that *T. tuberculata* may possess allelopathic potential and can suppress the growth of weeds as it showed inhibitory activities depend on dry powder concentration.



## CHAPTER 1

### INTRODUCTION

Weeds are considered as one of the main problems in agriculture as they aggressively compete with the crops for water, sun light and many other nutrients causing yield and the quality of the crops to decrease (Berchielli *et al.*, 1990; Norcini and Stamps, 1992). Weeds can also affect the crops by spreading the diseases as they can be the host to insects and pests. Damages in crop yields caused by weeds are greater than either insects or plant diseases (Kamal, 2010). There are a lot of ways to control and eradicate unwanted weeds. One of the easy and common ways that used in agriculture to kill these unwanted weeds is by using synthetic or chemical herbicides which either pre-emergent or post emergent herbicide. In the recent years, it is reported that the reliance on synthetic herbicides has increased. For example in rice production, the total expenditure spent on herbicides is about US\$4.10 million Malaysia (Karim *et al.*, 2004). It is predicted by 2025 that the cost of herbicides in rice production globally could be increasing to US\$3 billion per year (Zhang *et al.*, 2004).

However, there are a lot of concerns of using synthetic herbicides. Uses of synthetic herbicides to control weeds can be very harmful to environment and for human consumption and also can negatively affect the plant in various ways (Vyvyan, 2002). Using synthetic or chemical herbicides also can cause weed to develop new altered

genes of weed generations that have high defense mechanism towards herbicides and making them harder to control. These concerns had led to new approaches to control weeds and can be a replacement for synthetic herbicides which are by using plant products as natural herbicides (Rizvi and Rizvi, 1984). The idea of using natural herbicides is by manipulating the allelopathic potential of plants to control the weeds. Despite of the fact that there were a lot of interests in allelopathic studies during the past two decades, it was only in the late seventies that a thought of controlling weed by using allelopathy was considered (Putnam and Duke, 1974).

Very few allelopathic researches on crops had been done in the tropical and subtropical countries such as Malaysia compared to the developed countries. Most of the research on allelopathy has been done by them since they are practicing monocropping because of extreme winter for letting the raising of the second crop within a calendar year. Tropical and subtropical countries are more advantageous as the climate is suitable for round year cropping. Therefore, it is believed that seemingly, allelopathy can play a greater role in these climates and environment where group of crops and weeds live together (Avchar and Deokule. 2011).

Allelopathic plants can inhibit the growth, root growth and germination of other plant. This is because of the present of allelochemicals in many parts of plant (Piyatida and Kato-Noguchi, 2012). These allelochemicals can be released to the soil by four different ways which are through root exudation, leaching, volatilization and decomposition of plant residues. All part and tissues such as stems, roots, leaves, fruit, flower and seeds of allelopathic plant contain allelochemicals (Kohli *et al.*, 1997).

However, each parts of allelopathic plant do not possess the same concentrations (Qasem and Foy, 2001).

Malaysia's tropical rainforest consists of diverse and numerous species of plants. A lot of medicinal plants can be found in Malaysia's forest. A varied range of secondary metabolites produced by these medicinal plants can be used for human benefits. One of the traditional medicinal plants used by Malaysian is *Tinospora tuberculata* which also locally known as Batawali. It is from family Menispermaceae and can be easily found from the south-western part of China and all over south-east Asia including Malaysia. It contains a lot of active substances such as berberine, picrotene, bergennin, giloin and many more. *Tinospora tuberculata* is used to cure a lot of illnesses such as rheumatic arthritis, rheumatic hip joints, fever, jaundice, diabetes, malaria, and also outside injuries and infections such as bruises, scabies and wounds.

The objective of this research is to determine the allelopathic potential of aerial parts (stem and leaves) of *Tinospora tuberculata* on the suppression of weeds by using two test plants, mustard (*Brassica juncea*) and sweet corn (*Zea mays*).

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