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BY

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A project report submitted to Faculty of Agriculture,

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CERTIFICATION

This study report entitled "Allelopathic Effect of Aqueous Extract of *Ageratum conyzoides* on Seed Germination and Seedling Growth of Brassicaceae Vegetables" is prepared by Nur Fatin Qairawani Binti Mustapha 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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ANOVA	Analysis of Variance
cm	Centimeter
g	Gram
ml	Milliliter
%	Percentage
^{o}C	Degree Celsius

ABSTRACT

Allelopathy is the suppression of growth, development, and distribution of nearby plants and microorganisms caused by the release of toxic compounds called allelochemicals by plants which grow dominantly in an area such as *Ageratum conyzoides*. Thus, a study was conducted to determine the allelopathic potential of *Ageratum conyzoides* on seed germination and seedling growth of three Brassicaceae vegetables, *Brassica juncea* (mustard green), *Brassica alboglabra* (kailan), and *Lactuca sativa* (lettuce). Ten percent of aqueous extracts of roots, stems, leaves and flowers of *Ageratum conyzoides* were used to treat the seeds of the three vegetables on filter paper in Petri-dishes. Seed germination was counted after 10 days and seedling radicle and plumule length was measured at every three days interval starting from the first day of germination until 15th day as an indicator of allelopathy of *Ageratum conyzoides*. The experiment was conducted in Completely Randomized Design (CRD) with five replications. Aqueous extract of *Ageratum conyzoides* did not affect seed germination of the three Brassicaceae vegetables. However, the extracts affected the seedling growth of these vegetables on their shoot and root development. Extracts from leaf and stem produced the highest inhibitory effects on the seedling growth of the vegetables by 25-50%, followed by the effect from flower and root extract with 0-30%.

Ageratum conyzoides plants produce allelopathic chemicals. Different parts of plant produce significant difference of allelopathic phenomenon on seedling development of the three Brassicaceae vegetables. Extract from leaf and stem cause

higher inhibitory effect on shoot and root development of Brassicaceae vegetables seedling, more than those from flower and root.

ABSTRAK

Allelopati adalah suatu tindak balas kimia yang boleh merencatkan pertumbuhan dan perkembangan tumbuhan disekeliling kerana pengeluaran sejenis kompaun yang dipanggil alelokimia oleh tumbuhan yang mempunyai populasi yang banyak di dalam suatu kawasan seperti *Ageratum conyzoides*. Oleh itu, satu kajian telah dijalankan untuk menentukan potensi alelopati dari *Ageratum conyzoides* terhadap percambahan biji benih dan pertumbuhan anak benih tiga jenis tumbuhan sayuran Brassicaceae, iaitu *Brassica juncea* (sawi hijau), *Brassica alboglabra* (kailan), and *Lactuca sativa* (salad). Sepuluh peratus cecair ekstrak dari akar, batang, daun dan bunga *Ageratum conyzoides* digunakan untuk merawat biji benih dan anak benih dari ketiga-tiga jenis sayuran Brassicaceae ini di atas kertas turas di dalam bekas Petri. Jumlah percambahan biji benih dikira selepas hari ke-10 rawatan, dan panjang pucuk dan akar diukur pada setiap tiga hari bermula hari pertama percambahan sehingga hari ke-15 sebagai penanda alelopati daripada *Ageratum conyzoides*. Kajian ini dijalankan dalam Reka Bentuk Rawak Lengkap dengan lima replikasi. Ekstrak *Ageratum conyzoides* tidak mempengaruhi percambahan biji benih ketiga-tiga jenis sayuran, tetapi memberi kesan terhadap pertumbuhan pucuk dan radikel biji benih. Ekstrak daripada bahagian daun dan batang *Ageratum conyzoides* menunjukkan rencatan yang paling tinggi terhadap pertumbuhan anak benih iaitu sebanyak 25-50%, manakala cecair ekstrak dari bahagian bunga dan akar memberi kesan sebanyak 0-30%.

Ageratum conyzoides menghasilkan kimia alelopati. Setiap bahagian daripada tumbuhan ini menunjukkan fenomena alelopati yang berbeza terhadap pertumbuhan

anak benih daripada ketiga-tiga jenis sayuran Brassicaceae. Ekstrak daripada bahagian daun dan batang *Ageratum conyzoides* menyebabkan perencatan yang tinggi terhadap pertumbuhan pucuk dan akar anak benih daripada ketiga-tiga jenis sayuran, seterusnya adalah daripada bahagian bunga dan akar.

CHAPTER 1

INTRODUCTION

Allelopathy has been known as an important natural mechanism which influences plant distribution, dominance, formation, vegetation and also crop production. It has been related to problems associated with plants like weed which grow abundantly in an area. Allelopathy is a natural process which plays important roles in agricultural production system. According to Bhowmik and Inderjit (2003), allelopathy can affect the growth of a plant either direct or indirect through the allelochemicals released from another plant to the environment. Recently, crop growers have been introduced to sustainable agricultural practices which are more environmental friendly, whereby natural processes play pivotal roles. Allelopathy plays a wide role in biodiversity. They may regulate the population and production of plant community in an area (Reigosa *et al*., 2006). Sustainable agriculture is the cultivation of crops and livestocks to produce food, fiber, or other plant or animal products using farming techniques that protect the surrounding, people's health and communities, and also animal welfare.

Researches have been conducted (Akram and Husin, 1987; Anjum *et al.*, 2005; Mutlu and Atici, 2008; Meksawat and Pornprom, 2010; Idu and Oghale, 2013; Badha and Jehangir, 2014) to explore the possibilities of chemical compounds from plants having potential to be used as natural herbicides. The toxic compounds released by plant to suppress the growth of nearby plants and microorganisms are called allelochemicals. Plants with allelochemicals are known as allelopathic plants,

which mean that they have the potential of allelopathy. It consists of secondary metabolites which are terpenoids, steroids and alkaloids (Holt and Radosevich, 2007; Zundorf, 2007). According to Rizvi *et al*., (1990), the term allelochemicals are included the plant biochemicals that apply their physiological and toxicological action on plants and microorganisms, and microbial biochemicals that apply their physiological and toxicological action on plants.

One example of such plant is *Ageratum conyzoides*. *Ageratum conyzoides* is an annual herbaceous plant which grows widely in Malaysia. It can be easily found at the roadside, wastelands, field crops and plantation areas. This plant also possesses traditional medicinal potential such against epilepsy and wounds. It has been reported to have a wide range of secondary metabolites including benzofurans, chromenes, terpenoids, and flavonoids, where some of them are allelochemicals which can slow down the growth of other plants (Okunade, 2002).

This study was conducted with the objectives of:

i. Evaluating the allelopathic effects of each extracts of *Ageratum conyzoides* on seed germination of Brassicaceae vegetables.
ii. Determining the allelopathic effect of the extracts on seedling development of the three Brassicaceae vegetables.

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