

Ministry of Education
Department of Higher Education
Panglong University

Panglong University
Research Journal

Vol. 8, No.1

December, 2017

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Pesticidal Activity of Myanmar Habitat *Capsicum annum* L.

Khin Thant Sin¹

Abstract

The modern world trends in scientific research are focused towards the production of secondary metabolites, their use and application. Capsaicin, the pungent principle of hot peppers is one of the known natural compounds. This research has been focusing the influence of capsaicin on Aphid as a biopesticide. The possibilities of utilization of *Capsicum annum* L. for extracting capsaicin and its use as a biopesticide against the green peach aphid *Myzus persicae* Sulz.. The content of capsaicin was evaluated spectrophotometrically, and the ability of capsaicin for acting as biopesticide was calculated according to Abbott. Results showed that oleoresin from *Capsicum annum* L. and its dilution 1:20 are the most efficient as a biopesticide.

Keywords: Capsaicinoid, Eco-friendly biopesticide.

Introduction

The scientific researchers propose for the production of secondary metabolites for eco-friendly purposes because of the environmental pollution and toxicity impact (Isman, 2006; Saxena, 2014). The secondary metabolites produced by plants are found in nature as organic molecules that habitually composite with distinctive carbon skeleton. The plants are a significant source of secondary metabolite (Raoa and Ravishankar, 2002) and also the resolution of eco-friendly biopesticides. The appreciation of the vital role of the organic constituent has augmented mainly in conditions of resistance to their enemy, pest, and diseases in agronomic sector (Saxena, 2014). Moreover, the exhaustive apply of chemical as the pesticides and their pollution of the abiotic environment and the toxicity of biotic community have created increased worldwide concern to promote substitute bioresources to be utilized in the safe management of plant pests (Wauchope, 1978; Madhumathy *et al.*, 2007).

The chemotherapeutics used of biological resources for plant protection is paid attention in recent years because they are generally showed less in toxicity and readily recyclable by the soil microorganism in

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The environment (Isman, 2006). The development of resistance by pests and vectors against biological resources has not been reported. The species *Capsicum annum* L. belongs to the family Solanaceae is a typical shrub, usually found in almost all parts of the world. The fruits of *Capsicum annum* L. include hot flavor, which is owing to the presence of capsaicinoids. In the group of capsaicinoids, capsaicin and dihydrocapsaicin are accountable for pungency of 90% (Govindarajan and Sathyanarayana, 1991). Capsaicin containing products have principally been used insects repellent since ancient times (Madhumathy *et al.*, 2007). On the other hand, application of capsaicin and analogs on 2.5% humus content of compacted sandy loam with pH value of 7.9 showed stable at the point of implementation over 9 days, even there has vague water. And soil microorganism severs capsaicin losing into vanillylamine, that continuously destroyed into vanillin, vanillyl alcohol, and vanillic acid (Gervais *et al.*, 2008).

This research has been mainly focused the influences of ethanol extract of *Capsicum annum* L. fruits on the pests named Aphids, scientifically *Myzus persicae* Sulz. Crude product was used in the recent investigation because the main purpose is to apply directly without confusable preparation steps by farmers of the remote area.

Materials and Methods

The fruits samples of *Capsicum annum* L. were collected from Ma-U-Bin Township, Ayeyarwaddy region, Myanmar in February 2014 and identified by the author at Department of Botany, University of Yangon. Fruit sample was dried in an electronic dryer at a temperature of 45°C until to get constant weight. The dried material was grinded with a blender to get the fine powder. 500mL of 96% (v/v) ethanol was used for extraction of 100g powdered plant material in an ultrasonic bath using the temperature of 40°C, within a period of 1 h. The filter paper was used to get filtrate from the ethanol extract and then distillation was done to remove excess alcohol. The thick red crude residue that contains capsaicinoid was kept at room temperature ($28 \pm 2^\circ\text{C}$). The acquired crude extract had a concentration of 13.12 mg/mL. Then five variant dilutions were prepared for the treatment and the sterile distilled water was used as a control. The absorbance of crude extract of fruits dried powder was diluted with ethanol and measured by Ultraviolet–visible spectrometry, Shimadzu, Japan (Fig. 1).

The investigation into the effectiveness of ethanol extract of *Capsicum annum* L. fruits as pesticide was made on mustard culture. Mustard plants of 4 weeks cultivar were introduced by *Myzus persicae* Sulz., minute plant-feeding insects that carry the plum pox virus disease (collected from the field, Thin-gun-gyun Township, Yangon Region). The infection, pale yellow with brown blotches on the leaves was formed. In order to allow faster development of the plant louse, and also to restrict the spreading of the infection, the infected samples were covered with trap bags separately. Infected plants were treated in the period of 10 days after the initial infections because adult longevity of Aphids is 14 days in average (Ozgokce and Atlihan 2005; 8). To accurate the efficiency result, the experiments were repeated three times and analysis of data was carried out by using Probit analysis (Finney, 2009). The evaluation of the effectiveness of capsaicinoid was based on the number of infected leaves with Aphids.

Results

The lethal efficiency of the capsaicinoid as pesticide was measured in 24 hours after the application, and calculated (Table 1). Figure 1 showed the quality of capsaicinoid with the UV spectrum of ethanol extracts of *Capsicum annum* L. fruits, and Figure 2 showed the relationship between concentration and lethal percentage.

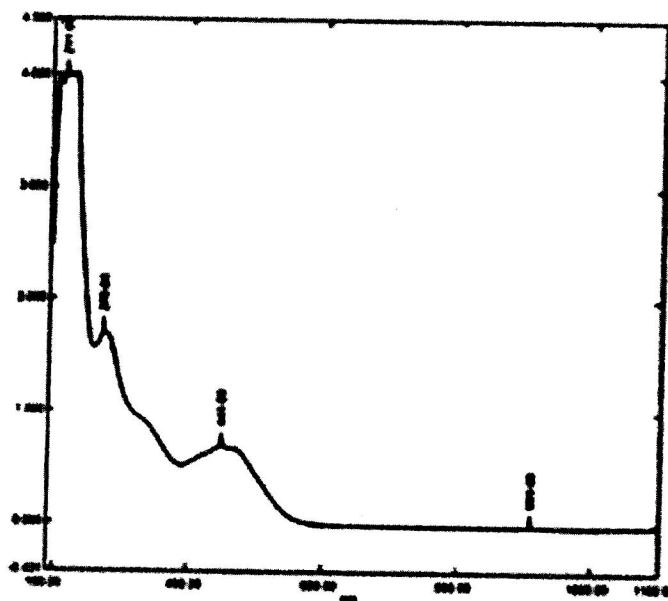


Fig. 1. UV spectrum of ethanol extracts of *Capsicum annum* L.

Table 1. Efficiency of the capsaicinoid in five different dilutions after 24 hours of the treatment on the mustard plants

Variant	Dilution Ratio	concentration of capsaicinoid (mg/mL)	Efficiency (%)	Value of LC ₅₀ and LC ₉₀ (ppm)
Control	Distil water	0	5.0000	
1	1:100	0.1312	8.0645	
2	1:50	0.2624	41.8803	LC ₅₀ =0.3132
3	1:25	0.5248	89.1666	LC ₉₀ =0.5297
4	1:12.5	1.0496	96.9387	
5	1:6.25	2.0992	99.0825	

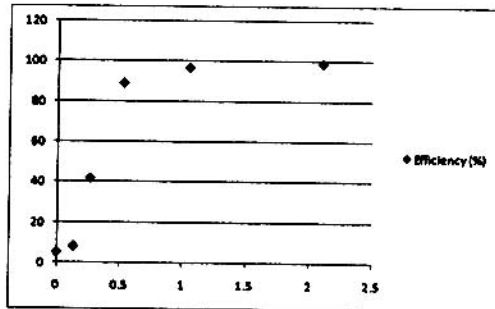


Fig. 2. Relationship between concentration of capsaicinoid and its efficiency % on Aphids.

Discussion and Conclusion

Ecological reliability is the primary state, indeed the motivation of organic cultivation. Organic farming is a structure attitude pursue at an ecosystem sustainability, food safety, high-quality nourishment, biotic community welfare and community righteousness (Thippeswamy, 2014). Furthermore, ecological reliability is established on the smallest use of synthetic chemical and on management application that renovates, maintains and improves environmental consensus. In this research, natural product of fruits of *Capsicum annum* L. was used as eco-friendly pesticide for decipher the environmental pollution and toxicity impact.

The ethanol extract of fruits proved to be sufficiently active on the species *Myzus persicae* Sulz., LC₅₀ and LC₉₀ values were 0.3132ppm and

0.5297ppm respectively that providing its toxic nature. According to the result, control also showed lethal of Aphids, it might be some natural enemy has already worked their duty in life. The wealth of the recent study is that illustrated the possibility of using fruits of *Capsicum annum* L. for Aphids control. Because mammals have less toxic, and it can rapidly be metabolized in the liver and urination within a few hours (Govindarajan and Sathyanarayana, 1991). Moreover, Kawada *et al.*, 1984 said capsaicin vanish within relatively duration in the intestinal lumen. Hence, carefully selected pesticide can minimize human toxicity impacts and freshwater ecotoxic effects. Future research concerning the effect of capsaicinoid on nervous system of Aphids is needed to understand the mechanism of action of crude extract of *Capsicum annum* L. fruits. In this research, extract of *Capsicum annum* L. fruits, naturally occurring capsaicinoid, possible application of pesticides confirms with its LC₅₀ and LC₉₀ values as a biologically degradable, reduced preparation steps, useful and harmless pesticide.

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