

## Pesticidal Activity of Chilli (*Capsicum annum* L.)

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### Abstract

In the modern world trends in scientific research are focused on 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 on 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 *Alyzus persicae* Sulz.. The content of capsaicin was evaluated spectrophotometrically, and the ability of capsaicin to act as a biopesticide was calculated according to Abbott. Results showed that oleoresin from *Capsicum annum* L. and its dilution at 1:20 are the most efficient as a biopesticide.

**Keywords:** Capsaicinoid, Eco-friendly biopesticide

### Introduction

Scientific researchers propose 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 are habitually composite with a distinctive carbon skeleton. The plants are a significant source of secondary metabolites (Raoa and Ravishankar, 2002) and also the resolution of eco-friendly biopesticides. The appreciation of the vital role of organic constituents has increased mainly in conditions of resistance to their enemies, pests, and diseases in the agronomic sector (Saxena, 2014). Moreover, the exhaustive application of chemicals as pesticides and their pollution of the abiotic environment and the toxicity of the biotic community has created and 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 for plant protection is paid attention in recent years because they generally show less toxicity and are readily recyclable by the soil microorganism in 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 a 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 as insects repellent since ancient times (Madhumathy *et al.*, 2007). On the other hand, application of capsaicin and analogs to 2.5% humus content of compacted sandy loam with a pH value of 7.9 showed stable at the point of implementation over 9 days, even though there was 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. The crude products were used in the recent investigation because the main purpose was to apply them directly without confusable preparation steps by the farmers of the remote area.

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## Materials and Methods

The fruits samples of *Capsicum annum* L. were collected and identified from MaU-Bin Township, Ayeyarwaddy region, Myanmar in February 2014. A fruit sample was dried in an electronic dryer at a temperature of 45°C until it reached a constant weight. The dried material was grinded with a blender to get the fine powder. 500mL of 96% (v/v) ethanol was used for the extraction of 100g of powdered plant material in an ultrasonic bath using a 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).

An investigation into the effectiveness of ethanol extract of *Capsicum annum* L. fruits as a pesticide was conducted on mustard culture. Mustard plants of the 4 week 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 a pesticide was measured at 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.

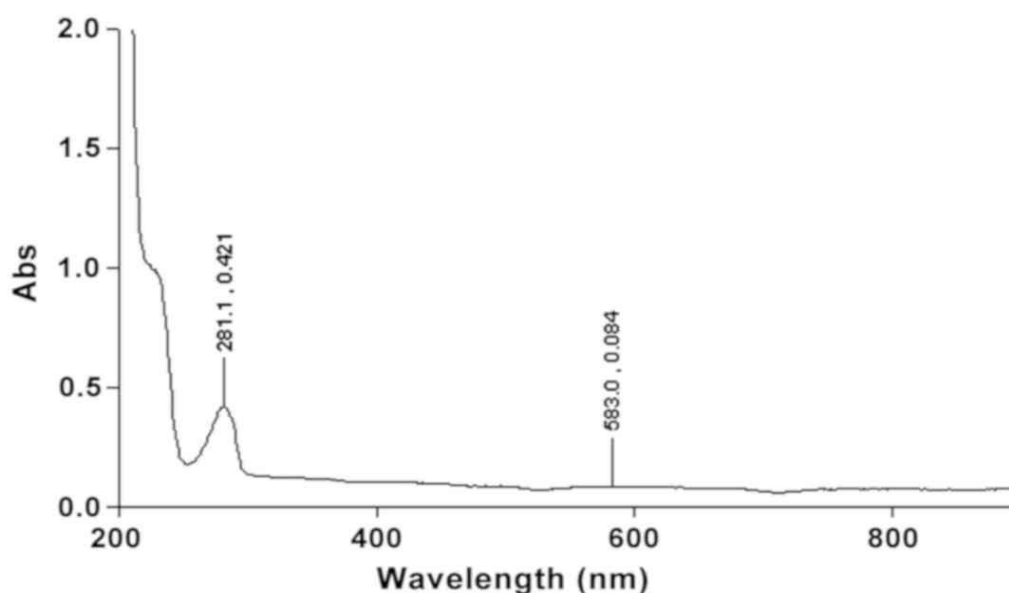


Figure 1: UV spectrum of ethanol extracts of *Capsicum annum* L.

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 <sub>50</sub> and LC <sub>90</sub> (ppm)
Control	Distil water	0	5.0000	
1	1:100	0.1312	8.0645	
2	1:50	0.2624	41.8803	LC <sub>50</sub> =0.3132
3	1:25	0.5248	89.1666	LC <sub>90</sub> =0.5297
4	1:12.5	1.0496	96.9387	
5	1:6.25	2.0992	99.0825	

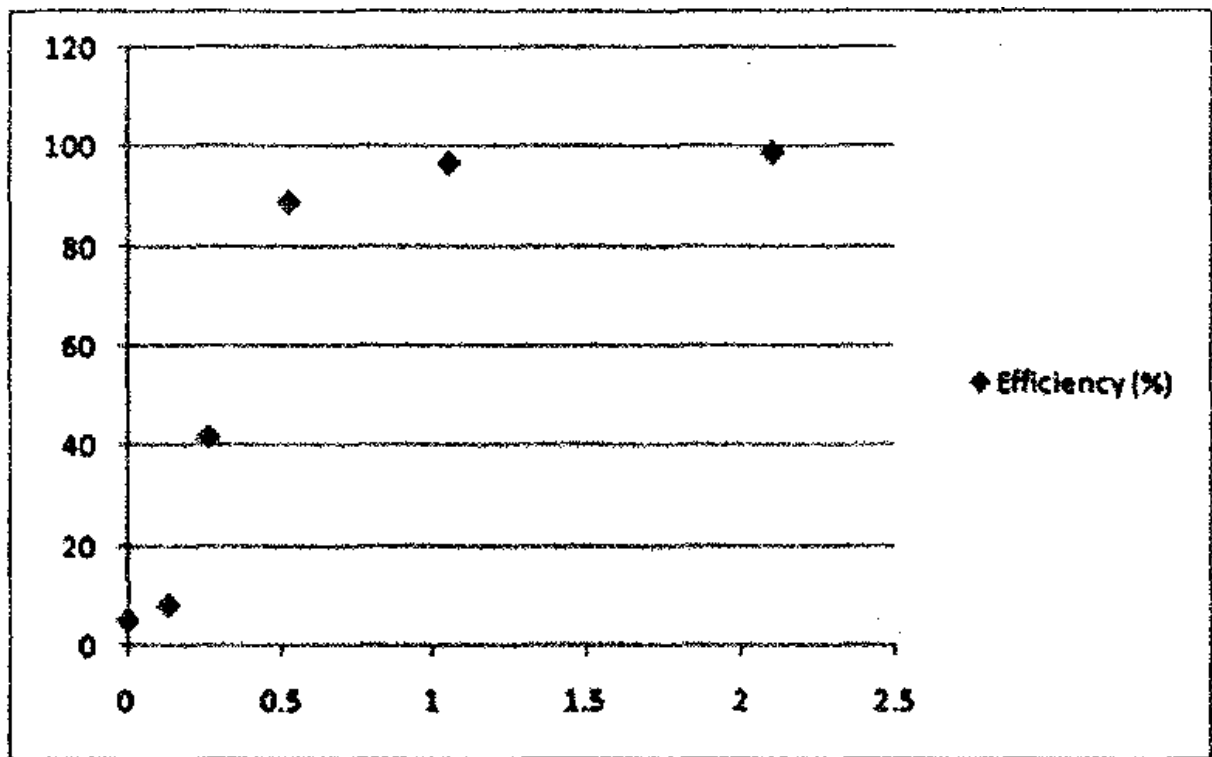


Figure 2 : Relationship between concentration of capsaicinoid and its efficiency % on Aphids.



Figure 3: Habit of chilli fruit (*Capsicum annum* L.)



Figure 4: Immature of chilli fruit (*Capsicum annum* L.)



Figure 5: Mature of chilli fruit (*Capsicum annum* L.)

### Discussion and Conclusion

Ecological reliability is the primary state, indeed the motivation of organic cultivation. Organic farming is a structured attitude pursued for 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 chemicals and on management applications that renovate, maintain and improve environmental consensus. In this research, natural product of fruits of *Capsicum annum* L. were used as eco-friendly pesticides to decipher the environmental pollution and toxicity impact.

The ethanol extract of fruits proved to be sufficiently active on the species *Myzus persicae* Sulz.,  $LC_{50}$ , and  $LC_{90}$  values were 0.3132 ppm and 0.5297 ppm respectively that providing its toxic nature. According to the result, control also showed lethal of Aphids. It might be that some natural enemy has already done their duty in life. The wealth of the recent study is that it illustrated the possibility of using the fruits of *Capsicum annum* L. for Aphids control. Because mammals have less toxicity 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 vanishes within a relatively short time in the intestinal lumen. Hence, carefully selected pesticides can minimize human toxicity impacts and freshwater ecotoxic effects. Future research concerning the effect of capsaicin on the 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  $LC_{50}$  and  $LC_{90}$  values as a biologically degradable, reduced preparation steps, useful and harmless pesticide.

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