Effect of Suicide Tree Crude Extract (*Cerbera odollam* Gaerth.) on Common Cutworm (*Spodoptera litura* Fabricius)

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Common cutworm (*Spodoptera litula* Fabricius) is an insect pest which widely spread and damaged the many important crops in Thailand. The purpose of this research was to study the effect of crude extract from Suicide Tree (*Cerbera odollam* Gaerth.) on control of the third instar larva of common cutworm. The insecticidal efficacy against common cutworm larva was tested using Leaf dipping method and Topical application method. The result showed that at 30% (w/v) of Suicide Tree fruit crude extract displayed strong antifeedant activity, whereas the lower concentration and Suicide Tree leaf crude extract had no effect. In addition, the percentage of mortality from the Suicide Tree fruit crude extract at the concentration of 1, 5, 10 and 30% were 13.33, 80.00, 93.33 and 100% respectively, with LC50 value at 24 hour was 2.68+0.37%. From our results, it was interesting to note that the Suicide Tree fruit crude extract has a strong insecticidal efficiency and should be applied further for control of insect pest.

Keywords : Anti-insect property, *Cerbera odollam* Gaertn., Common Cutworm

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Introduction

Cerbera odollam Gaertn. is a mangrove plant belonging to the Apocynaceae family and distributed widely in the coastal areas of South East Asia and Indian Ocean (Laphookhieo *et al*., 2004). The *C.odollam* tree grows to a height of 6-15 m. and has dark green freshy lanceolate leaves. The large white flowers have a delicate perfume, reminiscent of jasmine. The fruit, when still green looks like a small mango with a green fibrous shell. The seeds have a long history as an ordeal poison in Madagascar, due to the highly toxic cardiac glycosides they contain. The first precise descriptions of the poison were recorded in the early 19th century (Gaillard *et al*., 2004). The Burmese use it for lighting as a cosmetic or mixed with other oils as an insecticide or insect repellent (Chopra *et al*., 1956). The Indian team of Guruswami *et al*. (1970) studied the pharmacological of crude ethanolic extract of *C. odollam* seed on 50 frogs' hearts, the main effect being to suppress the impulse-producing and conducing tissues of the heart. The bark and leaves of the plant are traditionally used as emetic and cathartic; kernels are used as emetic; fruit is used as a cure for hydrophobia (Kirtikar and Basu, 1987). In some countries the leaves and bark are eaten for their cathartic properties (Chopra *et al*., 1958). Furthermore, some research works have been performed to evaluate its biological activities such as cytotoxic activity (Laphookhieo *et al*., 2004) and the effect on central nervous system (Hiên *et al*., 1991). The main objective of this study was to evaluate the insecticidal properties of the leaf and fruit ethanolic crude extract of *C. odollam.*

Materials and Methods

Preparation of crude extract

The *C.odollam* leaf and fruit were collected from Chandrakasem Rajabhat University, Bangkok, Thailand. The identification of the plant species was confirmed and deposited in the Forest Herbarium (BKF. No.189459). The leaf and fruit of *C.odollam* were washed with tap water and cut into small pieces. The plant materials were left under the shade and dried in the hot air oven at 50 ℃. The extraction was carried out by maceration with 95% ethanol for 4 days. Then the extracts were evaporated to remove the solvent under reduced pressure using a rotary evaporator. The leaf and fruit crude extracts of *C.odollam* from the extraction were 106.37 g and 93.95 g and were kept at 4^{o}C until used in the bioassay.

Bioassay procedure

Leaf dipping method: The effective insecticidal activities of the *C. odollam* leaf and fruit crude extracts were tested on *Spodoptera littoralis* (3 rd instar larvae) by the leaf disk choice test, in comparison with the commercial insecticide carbaryl and control sample. Leaf disks of a standard size (1.33 cm^{2}) were cut from *Brassica oleracea* L. cv. (Chinese kale), and then were spread on their upper surfaces with 20 μL of crude extract solution at the concentrations of 0.5, 1.0, 5.0, 10.0 and 30.0%. Control leaf disks were spread with the same volume of 95% ethanol. After the solvent was evaporated, two treated and two control leaf disks were placed on moist filter paper in a Petri dish. Two 3rd instar larvae were randomly selected and fed on the leaf disks in the Petri dishes (Brem *et al*., 2002). Each experiment was conducted in triplicate.

Topical application method: Different levels of concentration of the *C.odollam* leaf and fruit crude extracts i.e. 0.5, 1.0, 5.0, 10.0 and 30.0% were topically applied to the dorsal thorax of the instar 3 rd of *Spodoptera littoralis* and compared with the chemical pesticide. All

treatments were replicated 3 times and 10 insects were used for each replication (Busvine, 1980). Mortality was recorded every 3 hrs. After 24 hrs the percentage mortality was calculated by using Abbot's (1925) formula.

$$\textit{Percentage of mortality} = \frac{\textit{Number of dead larvae}}{\textit{Number of larvae introduced}} \times 100$$

Statistical analysis: Effective concentration was calculated by using Probit analysis, SPSS for Windows (Finney, 1971). Data from the topical application method and mortality were subjected to analysis of variance (ANOVA of arcsine square root transformed percentages). Differences between the treatments were determined by Tukey's multiple range test (SAS Institute, 2001).

Results and Discussion

The leaf and fruit samples of *C. odollam* were extracted with 95% ethanol and the extracts were then evaporated and dried. The ethanolic crude extract of *C. odollam* from leaf and fruit represented about 7.82 and 10.63 % of the dry weight. (Table 1).

Leaf disk assays were carried out in the laboratory with third instar larvae of *Spodoptera littoralis* Boisduval. The insecticidal activities of the *C.odollam* crude extracts from leaf and fruit were determined. The results are presented in Table 2.

The ethanolic fruit crude extract of *C .odollam* displayed strong antifeedant activity at the concentration of 30.0% (w/v), whereas the lower concentration and leaf crude extract of *C .odollam* had no effect, comparison with the commercial insecticide carbaryl which showed repellent activity against larvae of *S. littoralis* at the concentration of 0.5 %.

The toxicity of leaf and fruit crude extract of *C. odollam* was studied by using topical application method. The results demonstrated that the percentage of mortality from the leaf crude extract of *C. odollam* at the concentration of 0.5, 1.0 and 5.0 % (w/v), 24 hrs were 6.66, besides the concentration at 10.0 and 30.0% (w/v) were 10.00 and 16.66 respectively. Moreover, the with LC_{50} value at 24 hrs was more than 30.00 $\pm$ 0.22%. Whereas, the percentage of mortality from the fruit crude extract of *C. odollam* at the concentration of 1.0% (w/v), 24 hrs resulted in 13.33. It was significantly different when compared with The LC_{50} value at 24 hrs was 2.68 $\pm$ 0.37%. The mortality rate increased from lower concentration to higher concentration (Table 4). Smaller doses of extracts may not be adequate for killing the insect, however it may sometimes induce malformation (Ahmad, 2007). The results revealed that the fruit crude extract of *C. odollam* was more effective than the leaf crude extract of *C. odollam*. Similarly to Gaillard *et al*. (2004) reported the leaf of *C. odollam* appeared to be quite devoid of the marked toxicity found in the seeds. In contrast, only seeds extract of *C. odollam* potentiated the pentobarbital induced sleeping time in mice while barks extract of *C. odollam* were not toxic to albino mice (LD_{50} 750 mg/kg). Previous report showed that *C. odollam* seeds were more toxic compared to its barks and etc. (Ahmed *et al*., 2006). Moreover, the seeds extract of *C.odollam* exhibited high level cytotoxicity against brine shrimp with LC_{50} value of 0.3 µg/ml (Ahmed *et al*., 2008). However, the crude extracts are usually complex mixtures of various biochemical components. Preliminary phytochemical analysis should be taken for the major chemical group.

Table 1 The percentage of yield of the *C. odollam* crude extracts

Plant part	Crude extract content (g)	Yield (%)
Leaf	106.37	7.82
Fruit	93.95	10.63

Table 2 Antifeeding activities of leaf and fruit ethanolic crude extracts of *C.odollam*

Samples	Concentration of the crude extract (% w/v)				
	0.5	1.0	5.0	10.0	30.0
Leaf	-	-	-	-	-
Fruit	-	-	-	-	A
Carbaryl	R	R	R	R	R
Control	-	-	-	-	-

R = repellent activity, feeding inhibition without testing treated leaf disk.

A = strong antifeedant activity, less than 5% of total area of treated leaf disks in each Petri dish was consumed.

a = antifeedant activity, 5-20% of total area of treated leaf disks in each Petri dish was consumed.

- = inactive.

Table 3 Toxicity of the leaf ethanolic crude extract of *C.odollam* against *S. littoralis*

Concentration (%) (w/v)	Accumulated mortality rate (%)				
	3 hrs	6 hrs	9 hrs	12 hrs	24 hrs
0.0	0.00[a]	0.00[a]	0.00[a]	0.00[a]	0.00[a]
0.5	3.33[a]	3.33[a]	3.33[a]	3.33[a]	6.66[a]
1.0	3.33[a]	3.33[a]	3.33[a]	6.66[a]	6.66[a]
5.0	3.33[a]	3.33[a]	3.33[a]	6.66[a]	6.66[a]
10.0	3.33[a]	3.33[a]	6.66[a]	6.66[a]	10.00[a]
30.0	0.00[a]	6.66[a]	10.00[a]	10.00[a]	16.66[a]

Mean followed by the same letter within column indicate no significant difference (P = 0.05)

Table 4 Toxicity of the fruit ethanolic crude extract of *C.odollam* against *S. littoralis*

Concentration (%) (w/v)	Accumulated mortality rate (%)				
	3 hrs	6 hrs	9 hrs	12 hrs	24 hrs
0.0	0.00[a]	0.00[a]	0.00[a]	0.00[a]	0.00[a]
0.5	0.00[a]	0.00[a]	0.00[a]	0.00[a]	0.00[a]
1.0	0.00[a]	3.33[a]	6.66[a]	10.00[a]	13.33[a]
5.0	3.33[b]	46.66[b]	60.00[b]	66.66[b]	80.00[b]
10.0	53.33[bc]	70.00[bc]	76.66[b]	80.00[b]	93.33[b]
30.0	83.33[c]	86.66[c]	86.66[b]	93.33[b]	100.00[b]

Mean followed by the same letter within column indicate no significant difference (P = 0.05)

Conclusion

The results obtained from this study suggested that the fruit crude extract of *C. odollam* could be used as alternative sources for insecticidal purposes and might be effectively used in pest management, *S. litura*.

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