Laboratory Study of Some Plant Crude Extracts against Soybean Leafroller *Lamprosema indicata* Fab. (Lepidoptera: Pyralidae)

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Abstract: Thepotential of some plant crude extract against *Lamprosemaindicata*was evaluated. The experiment was done by applying crude extract solution uniformly on Petridish and the larvae of *L. indicata* were released. The crude extract used in this study was obtained fromSoxhlet extractor (acetone as solvent). The concentrations (treatments) of crude extract used were 0.25 and 0.5% (volume of extract/volume of water, v/v). The results showed that crude extracts affected insect mortality. Crude extract of *Jatrophacurcas* (seed), *Tageteserecta* (leaf) and *Piper betle* (leaf) at 0.5% concentration caused insect mortality up to 50%, whilst *Annona muricata*(seed), *C. aurantifolia*(peel), *A. conyzoides*(leaf,stem), *C. nardus*(leaf) and*M. koenigii* (leaf) caused insect mortality from 32.5 to 47.5%. The 0.25% crude extract concentration caused lower insect mortality.

1 INTRODUCTION

Soybean Leafroller *Lamprosemaindicata* Fab.commonly causes damage to some cultivated plants and wild Leguminosae. The insect attacks the soybean plant since 11 days after planting to 70 days of old plant. The larva fold and spin the leaves together and then feed on from the inside of the surface. The larvae are mobile and bright green. Older larvae defoliate the leaves leaving only the veins. The pupa are found at the feeding sites. The insects attack the soybean crops and this has been reported solely during the first 4-6 weeks, mostly during dry season (Kalshoven, 1981). The damaged leaves caused by the insects are about 50% and this result in the decreasing of seed production.

Synthetic insecticide has been used extensively to overcome the pest problems and indiscriminately, resulting in a number of problems viz., the development of insect resistance to insecticides, resurgence of pests and adversed effect on non-target organisms such as natural enemies of insect pests. According to (Marwoto, 2007), monitoring in soybean production centre in Indonesia show that the controlling of insect pest still relies on synthetic insecticide. Insecticideis used intensively in some plantingareas in controlling insect pest on soybean with high dose and frequency of application. this causes negative effect on insects; insect resistance, and resurgence of insect pest. Hence, there is a need to replace synthetic chemicals withnatural compounds in plants.

A number of plants or part of plants growing around Kabupaten Deli Serdang, North Sumatra are known to have insecticidal properties, inclined to the study of the mortality effect against *L. Indicate,* a insect pest of soybean *Glycine max*.

2 MATERIALS AND METHODS

2.1 Collection of Plant Materials and Extractions

Thirteen species of plants that have been reported to possess insecticidal property (Prakash&Rao 1997; Prijono 2003; Dodia et al., 2008;) were collected from Kabupaten Deli Serdang Indonesia during April 2018 (Table 1).

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Table 1: Plant and parts of plant used.

No.	Plant Species	Family	Part of Plant Used
1	*Alpiniagalanga*	Zingiberaceae	Rhizome
2	*Annonamuricata*	Annonaceae	Seed
3	*Jatrophacurcas*	Euphorbiaceae	Seed
4	*Citrus aurantifolia*	Rutaceae	peel
5	*Carica papaya*	Caricaceae	Leaf
6	*Isotomalongiflora*	Campanulaceae	Leaf
7	*Tageteserecta*	Compositae	Leaf
8	*Lantana camara*	Verbanaceae	Leaf
9	*Cymbopogonnardus*	Poaceae	Clump (stem)
10	*Cymbopogonnardus*	Poaceae	Leaf
11	*Ocimumcitriodorum*	Lamiaceae	Leaf
12	*Ageratum conyzoides*	Asteraceae	Plant
13	*Piper betle*	Piperaceae	Leaf
14	*Murrayakoenigii*	Rutaceae	Leaf

The plants were washed thoroughly and air dried under shade. The seeds of *A. indica*, *A. muricata* and *J. curcas* were hulled to get the kernel. The rhizome of *A. galanga* was slashed about 5 mm to make dry totally, then ground using electric grinding machineand finally passed through a 10 mesh sieve to obtain the powder. Extraction was done using ‘Soxhlet Extractor’. A 50 g of the powdered material was placed in a filter paper and then placed in the extractor. Then 200 ml acetone was poured in to the receiving flask. The process of extraction took about 10 h. A 50 ml Crude extract was obtained after removal of the solvents with vacuum evaporation at temperature of <40ºC . There were 14 crude extracts because some plant used were from different parts.

2.2 Insect Rearing

The larvae and/or pupae of *L. indicata* in the folded leaves were collected from Soybean in field and put in the wire cage (50x50x60 cm) consistingof soybean plant (± 3 weeks old). The number of larvae or pupae was 10 per cage. The emerged adults copulated and put egg on the soybean plant. After about 2 weeks the new larva (a length of about 15 mm) was used for study.

2.3 Testing Method

Method used was adopted from Tillman’s (2006) as residual toxicity. Each crude extracts with the 0.5 and 0.25% concentration was smeared with 2 ml crude extract on the top and bottom of petri dish (100 by 15 mm). Water was used as the control. After the solution wasdried (about 1 hour), ten *Lamprosemaindicata* larvae were placed in the petri dish. The experiment was arranged as CRD by having 14 crude plant extracts as treatment and replicated four times.Data of *L. indicata*mortality were transformed using Arc Sine Transformation (Gomez & Gomez 1984) for normalization before analysis. To determine the difference of mortality of *L. Indicate,* each crude extract, one-way analysis of variance (ANOVA) was performed. Means were separated with Fisher’s Protected Least Significant Difference (LSD, $P < 0.05$) where ANOVA result was significant. All statistical analyses were done using Minitab Program.

3 RESULTS AND DISCUSSIONS

There was a significant difference in percentage of mortality of *L. indicata* among plant extracts (F = 10.21df = 28&87, $P < 0.05$). The average larva mortality was showed in Table 2.

Table 2: Mortality of *L. indicata* after contact with crude extract as residual toxicity.

No	Crude Extracts	Conc. (%)	Mean (%)
1	*Annonamuricata*	0.50	32.50 abcde
		0.25	22.50 defg
2	*Alpiniagalanga*	0.50	30.00 bcde
		0.25	27.50 cdef
3	*Jatrophacurcas*	0.50	52.50 a
		0.25	37.50 abcd
4	*Citrus aurantifolia*	0.50	35.00 abcde
		0.25	5.00 ij
5	*Carica papaya*	0.50	30.00 bcde
		0.25	7.50 hij
6	*Isotomalongifora*	0.50	5.00 ij
		0.25	0.00 j
7	*Lamtanacamara*	0.50	35.00 bcde
		0.25	30.00 bcde
8	*Tageteserecta*	0.50	52.50 a
		0.25	22.50 defg
9	*Ageratum conyzoides*	0.50	40.00 abcd
		0.25	22.50 defg
10	*Cymbopogonnardus* (leaf)	0.50	35.00 abcde
		0.25	17.50 efgh
11	*Cymbopogonnardus* (clump)	0.50	12.50 fghi
		0.25	5.00 ij
12	*Ocimumcitriodorum*	0.50	2.50 ij
		0.25	0.00 j
13	*Piper betle*	0.50	50.00 ab
		0.25	12.50 ghi
14	*Murrayakoenigii*	0.50	47.50 abc
		0.25	22.50 defg
15	Kontrol	0	0.00 j

Means in a column followed by different letters are significantly different (P=0.05) by LSD Test.

Overall, the 0.5% concentration of crude extracts caused higher insect mortality compared with that of 0.25% concentration for each plant species crude extracts. The seed crude extracts of *J. curcas*, leaf crude extracts of *T. erecta* and *P. betle*were found to be toxic against *L. indicata.* The application of crude extracts against Soybean Leafroller*L. indicata* caused mortality up to 50%. According to Adebowale and Adedire (2006) the insecticidal activity of *J. curcas* seed could be due to the presence of several sterols and terpen alcohols which have been known to exhibit insecticidal properties.Adolf et al. (1984) reportsthat the seed oil of *J. curcas* contains a diterpenoid (12-deoxy-16-hydroxyphorbol). *Tageteserecta* showed good effect against *L. indicata*, (up to 50% of mortality). The active principles which affect the insects are mycene, tagetone and allopatuletin(Dodia et al., 2008).*Piper betle* leaf aqueous extract was reported to show insecticidal activity tested against the bean leaf beetle (Prakash and Rao, 1997). This leaf contains kavikol, citronellal, geraniol, andterpineol. DwiWahyuni (2012) reports that citronella oil *P. betle* leaf possesses ovipositor deterrent and ovicidal activities against *H. armigera*.

The crude extracts of *A. muricata*(seed), *C. aurantifolia*(peel), *A. conyzoides*(plant), *C. nardus* (leaf) and *M. koenigii* crude extracts at 0.5% concentration caused lower insects mortality (32.5-47.5%) but it was not a significant difference with *J. curcas* seed crude extracts, *T. erecta* and *P. betle* leaf crude extracts. The effect of *A. muricata* seed crude extracts may be due to the presence of a toxic alkaloid annonaine. It is an active component isolated from this plant showing insecticidal properties (Prakash and Rao, 1997). Whilst, *C. aurantifolia*(peel) crude extracts contains essential oil (7%), with the main components ofcitral, limonene, β-pinene and aroma compounds which are of terpineol, bisabolene and other terpenoids(Simon

&Akeju, 2017).*Ageratum conyzoides* has been knownto possess bioactive components affecting the insect pest. The major components, namelythe precocenes, have been reported to have antijuvenilehormonal activity.Precocene I and precocene II are highly toxic to the rice weevil *Sitophilusoryzae* (Prakash&Rao, 1997). *Cymbopogonnardus* contains cymbopogone and cymbopogonol, α and β-citrals, myrcene, linalool, lynalyl acetate, citronellal and nerol. Topical application of the ethanolic saturated extract of *C. nardus* has toxicity effects on *S. zeamais, R. dominica* and *Cryptolestes* sp(Doumbia et al., 2014).*Murrayakoenigii* was known as kuryneemhaving bioactive component affecting the insect. Mahanimbin, koenimbin, and koenigicine were isolated from fruits and leaves. Field evaluation of *M. koenigii* leaf extracts revealed reduction of bud fly infestation (Dodia et al., 2008).

Whilst, *J. curcas* crude extract at 0.25% concentration still showed good effect with the mortality of *L. Indicate* and there was no significant difference with 0.5% concentration (37.5% of mortality). The crude extracts of *C. aurantifolia, C. papaya, C. nardus* (clump) extracts showed lowest effects at 0.25% concentration with the range mortality 0-7,5%.*Isotomalongiflora* and *O. citriodorum* at 0.5 and 0.25% concentration treated showed the least effect (0-5% mortality). The effect of *I. longiflora* and *O. citriodorum* was very low and can be considered non-active. Some chemical substances on *I. longiflora* are alkaloid (lobelin, lobelamin, isotomin), whilst, *Occimum sp.*contains bioactive constituents that are generally oviposition deterrent, ovicidal, antifeedant repellent, insect growth regulatory, attractant and insecticidal.The toxic effects compounds ofeugenol, mono and sesquiterpenoids which could be found in the plant extract (Pandey et al., 2014). The lowest effect of this crude extracts against *L. indicata*by the presence of bioactive chemical was very low.

The highest *L. indicata* mortality was about 50%. It may be due to the behavior of larva, which folds and spins the leaves together and feeds from inside. Therefore, contacting the insect with the crude extract was limited.

4 CONCLUSIONS

Almost all crude extracts tested showed mortality effect on *L. indicata*. *Jatrophacurcas*,*T. erecta* and *P. betle* showed good effect at 0.5% concentrations (up to 50%). *Annonamuricata*, *C. aurantifolia*(peel), *A. conyzoides*(plant),*Cymbopogonnardus* (leaf) and *M. koenigii* crude extracts at 0.5% concentration caused lower insects mortality (32.5-47.5%). There is a need of future study to evaluate the insecticidal potency as stomach poison.

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