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RESEARCH ARTICLE

EFFECT OF DIFFERENT MEDICINAL PLANTS (*CENTELLA ASIATICA*, *HYDROCOTYLE SP.* AND ORTHOSIPHON *STAMINEUS*) ON DEVELOPMENT OF *SPODOPTERA LITURA* (FABRICUS)(LEPIDOPTERA : NOCTUIDAE)

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ABSTRACT

Spodoptera litura a serious pest for many types of plant and the larvae can defoliate many economically important plants especially those have soft leaves texture. *Centella asiatica, Hydrocotyle* sp. and *Orthosiphon stamineus* were used widely as medicinal plant for health cure. These three different medicinal plants were supplied to *Spodoptera litura* larvae to investigate their effects towards *S. litura* development and leaves weight consumed. *Centella asiatica* shown highest mean leaves weight consumed with 1518.5 mg followed by *Hydrocotyle* sp. and *O. stamineus* with 121.5 mg and 1.69 mg for each. Cumulative leaf weight consumed per larva was highest on *C. asiatica* with total 478525.20 mg, followed by *Hydrocotyle* sp. with 3237.22 mg and *O. stamineus* recorded lowest leaves consumed by the larva with 72.25 mg. Development of *S. litura* also shown *C. asiatica* recorded only seven stadia compared to *Hydrocotyle* sp. and *O. stamineus* that recorded eight stadia for each medicinal plants.

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INTRODUCTION

Spodoptera litura is an extremely serious pest and the larvae of this insect can defoliate many economically important plants (Gokulakrishnan *et al*., 2012). The larva of this insect feed in a group when they are young but spread out as they get older to find the best host which can give enough food and shelter to complete their life cycle (Ahmad *et al.,* 2013 and Schreiner, 2000). According to Ellis (2004), many cases of *S. litura* attack were found in Africa and Asia and these species was a general feeder on over 100 hosts plant, including crucifers, legumes, millets, deciduous fruit trees, and various ornamentals and vegetables. Although control with insecticides was possible, these insect shown resistance towards insecticides application (Xue *et al*., 2010 and Mallikarjuna, 2004). Medicinal plant can be considered as any parts of medicinal plant such as foliage, root, flower, fruit and seed which may be used as a food sources, extracts for pharmaceutical usage, cosmetic, supplement food and also for spiritual usage (Pan *et al.,* 2014 and Street and Prinsloo, 2013). Medicinal plants were distributed worldwide and they are most abundant in the tropical rain forest of the tropical countries where tropical forests were known as a richest biome on earth (Farnsworth and Soejarto, 1988). Recently, there has been increasing usage of medicinal plant in the developing countries as health care sources as medicinal plant were free from the side effects of synthetic drugs. *Centella asiatica* contains with primary pharmacologically active constituents which were the triterpenoid and saponin compounds namely, asiatic acid, madecassic acid, asiaticoside and madecossaside (Tiwari *et al.,* 2011 and Gohil *et al*., 2010), The Indian traditionally regard this plant as a potent brain tonic and shows remarkable properties in terms of treating senile decay and loss of memory, whilst it is also alleged to enhance verbal articulation (Tiwari *et al.,* 2011 and Gohil *et al*., 2010). *Hydrocotyle* sp. or also known as "water pennyworts" was a perennial plant with creeping rootstocks which have antioxidant, anticancer and antiproliferative (Huang *et al.,* 2008). *Orthosiphon stamineus*

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which commonly known as Misai Kucing in Malaysia was used for treating diabetes and hypertension (Mat Salleh and Latiff, 2002 and Ohashi *et al*., 2000). *Orthosiphon stamineus* leaves have been introduced to Europe and Japan as a health tea that possess diuretic activity (Beaux *et al*., 1999). Most of this medicinal plant or herbs are growth without any treatment or protection from any pest attacks and these phenomena will induce the pest attacks such as *S. litura*. Objective of this study was to determine the leaves weight that consumed by the *S. litura* and development of *S. litura* on different medicinal plants.

MATERIALS AND METHODS

Centella asiatica, *Hydrocotyle* sp. and *O. stamineus* leaves were obtained from Taman Pertanian Universiti, Universiti Putra Malaysia and *Spodoptera litura* eggs were obtained from Malaysian Agricultural Research and Development Institute (MARDI). One newly hatched larva was placed on a leaf that has been cut at the similar size, 2.5 cm in diameter. These leaves were placed inside a plastic container (6.5 cm diameter) along with a filter paper that has been moistened to avoid the evaporation. After 24 hour, excreta were removed from the remaining leaves and the leaves were dried in the oven with 60-70 $^{\circ}$ C in 24 hours. The weight of that leaves were measured and recorded. The plastic containers were cleaned, and new weighed leaves were supplied along with the new moist filter paper for each larva. These processes were done daily for each larva until feeding ceased in the prepupal stage. Daily food consumption per larva was estimated by subtracting oven-dried weight of remaining leaf tissue from weight of leaf provided that had been corrected for moisture loss. There were 120 larval used for each host plant (treatment) in 4 replicates and each replicates had 30 samples of larval.

Data collections and analysis

The data was analyzed with the SPSS programme (One-Way ANOVA, Tukey) and the data collected were mean and cumulative food consumption per larva on each host plants (oven-dried weight of leaf) and time development for each stadia of *S. litura.*

RESULTS AND DISCUSSION

Leaf weight consumed

Mean leaf weight consumed by the larva as shown by Table 1 was shows highest numbers when they were fed on the *C. asiatica* with 1518.5 mg and lowest on the *O. stamineus* with 1.7 mg.

Table 1. Mean leaf weight consumed by *S. litura* larva on three different host plants

Host plant	Leaf weight consumed (mg)
Centella asiatica	15118.50 ± 2777.81a
Hydrocotyle sp.	121.50 ± 116.16b
Orthosiphun stamineus	1.69 ± 5.33b

Means (± SD) within a column followed by the same letter are not significantly different (Tukey HSD, $P < 0.05$).

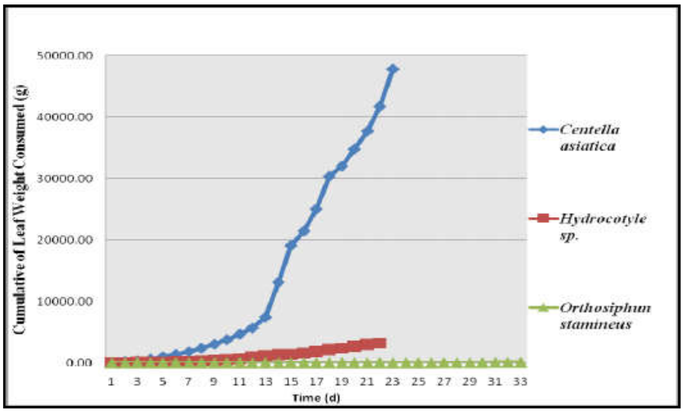

Figure 1. Leaf weight consumed by *S. litura* on different host plants

Table 2. Effects of different host plants on *S. litura* stadium

Stadia	Host plant		
	Centella asiatica	*Hydrocotyle* sp.	*Orthosiphun stamineus*
Stadia 1	3.08 ±0.79b	2.99 ± 0.69b	4.20 ± 0.82a
Stadia 2	4.94 ± 0.99b	4.73 ± 0.82b	7.15 ± 1.97a
Stadia 3	6.81 ± 2.15b	6.65 ± 1.05b	9.77 ±1.48a
Stadia 4	8.85 ± 2.84b	8.39 ± 1.54b	13.21 ± 1.90a
Stadia 5	11.14 ± 3.28b	10.56 ±2.23b	17.21 ± 2.37a
Stadia 6	14.92 ± 2.68b	15.68 ±2.05b	20.06 ± 2.78a
Stadia 7	20.17 ± 3.16b	20.56 ±2.31b	23.63 ± 3.77a
Stadia 8	-*	24.00 ± 0.00*	29.77 ± 2.71*

-Means (± SD) within a row followed by the same letter are not significantly different
(Tukey HSD, $P < 0.05$).
* - The letter cannot be performed for molting 8 because has fewer than two groups (Tukey HSD, $P < 0.05$).

Leaf weight consumed by larva on *C. asiatica* increased drastically and it was different to those feeding on *Hydrocotyle* sp. and *O. stamineus*. The cumulative leaf weight of *C. asiatica* that consumed by the *S. litura* larval was 47825.20 mg per larva and 3237.22 mg for *Hydrocotyle* sp. and 72.25 mg on *O. stamineus* (Fig.1) ($P < 0.05$). Cumulative consumption was relatively constant on *Hydrocotyle* sp. and *O. stamineus* from the first day of study until the pre-pupal stage but it was increase on *C. asiatica* drastically. Larva that fed on *Hydrocotyle* sp. started to feed from the first day and ceased feeding on 22 days compared to those that fed on *C. asiatica* and *O. stamineus*. Larva that fed on *C. asiatica* ceased to feed on the 23 days and 33 days on *O. stamineus* which were the longest time compared to the two others plant host. Duration of larval feeding on *C. asiatica* and *Hydrocotyle* sp. was quite similar and this affected by the structure of the leaf. The leaves were soft and fleshy and these factors stimulated the development of larva to pre-pupal stage. The longest time of development for larva that fed on *O. stamineus* was affected by the less amount of leaf being consumed. *Orthosiphon stamineus* stunted the larva development until the pre-pupal stage. Consumption rates of the larvae fed on different medicinal plants were significantly different. The result shows that the suitable plant for *S. litura* development was *C. asiatica* leaves and the leaves of *O. stamineus* were not suitable for *S. litura* larval development. From these studied the larva development faster on those larvae that fed on *C. asiatica* than those larvae that fed on two other host plants

(Table 2). The number of stadia for these host plants was 7 stadia. This differed to those larvae that fed *Hydrocotyle* sp. and *O. stamineus* which had 8 of larva stadia. The larvae fed on *O. stamineus* took longer time and more number of stadia compared to those larvae that fed on two other plants. These phenomena could be related to the amount of leaf consumed by these larvae. *Spodoptera litura* that fed on *C. asitica* and *Hydrocotyle* sp. had a similar duration of the larval stadium until pupation. Although, those larvae that fed on *Hydrocotyle* sp. had similar duration with *C. asiatica* in their larva stadia but the number of stadia was similar to larvae were fed on *O. stamineus*. There were significant different between *O. stamineus* with *C. asiatica* and *Hydrocotyle* sp. in their molting frequency.

Conclusion

From this study, *C. asiatica* can be classified as the most suitable medicinal plant for *S. litura* development followed by *Hydrocotyle* sp. because both plants have soft leaves structure which attracts the larval. *Orthisiphon stamineus* have shown that these plant affect the larval by stunted and delayed the development and the growth of *S. litura.*

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