POTENCY OF *Trissolcus latisulcus* Crawford (Hymenoptera: Scelionidae), AN EGGS PARASITOID OF *Chrysocoris javanus* Westw (Hemiptera: cutelleridae), PEST ON *Jatropha curcas* L

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ABSTRACT

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ABSTRACT

Results of preliminary field survey showed that *Trissolcus latisulcus* Crawford (Hymenoptera : Scelionidae) mostly found in the *Jatropha curcas* plants. It indicated that these eggs parasitoid may be has a highly potential prospect to control *Chrysocoris javanus* Westw (Hemiptera: Scutelleridae) which is a serious pest of *Jatropha curcas* L., but the information of this parasitoid is paucity. A laboratory experiment was conducted to investigate the potency of *T. latisulcus* as an eggs parasitoid of *C. javanus* for developing a more suitable biological control programe in controlling *C. javanus*. The results showed that *T. latisulcus* has high fecundity 95.70 ± 18.34; daily egg-production per female 15.76 ± 2.63; total egg production per female 29.30 ± 25.96, reproduction time 6.10 ± 0.88 days; sex ratio 1:3.83 and parasitoid capacity was 19.14 ± 3.67 %.

Keywords: *Jatropha curcas* L, *Chrysocoris javanus* Westw, *Trissolcus latisulcus* Crawford, parasitoid eggs.

INTRODUCTION

Recently, efforts to develop and utilize alternative energy sources have been increasing due to the need to meet energy demand and to reduce the dependence on fossil energy sources. Utilizing plants as altenative sources as a priority because is being renewable energy resources. Physic nut, *Jatropha curcas* L, is one of the prospective plants (Hambali et.al, 2007).

J. curcas is known as a toxic plant and can be used as an insecticide , but it was found that many insect pest may attack this plant eq , *Selenothrips rubrocinctus, C.javanus, Ferrsia virgata, Planococcus minor,* and *Tetranychus* sp.

C. javanus, is one of the important pest of of *J. curcas* that feed mainly on the growing fruit and caused its deteriotion and defoliation. Synthetic chemical insecticides have been used satisfactorily to control this pest. However, it has been known that not all chemical substances have always been used correctly and some of them are highly toxic. It has caused of resistance phenomena, very wide spread pollution and environment unfriendly. Biological control of *C. javanus,* by using parasitoid such as *Anastatus* sp. (Hymenoptera : Eupelmidae), *Epiterobia* sp. (Hymenoptera: Pteromalidae) and *Trissolcus latisulcus* Crawford (Hymenoptera:

Scelionidae) have been suggested by many authors to overcome these problems (Rumini dan Karmawati 2007; Qodir 2010). *T. latisulcus* mostly found in the *J. curcas* plants, so that these parasitoid has a highly potential prospect to control *C. javanus* but the information of this parasitoid is paucity . The objective of this study was to assess potency of *T. latisulcus* to control *C. javanus*.

MATERIAL AND METHODS

Chrysocoris javanus Westw

Stocks of *C. javanus* for laboratory cutures were initially collected from *J. curcas* crops in Leuwikopo, Darmaga and Lulut, Citeureup, both are located in Bogor, West Java, Indonesia. Individual leaves and branches *J. curcas* infested by nymfa and imago of *C. javanus* were replaced into sealable plastic bags and taken to the laboratory. *C. javanus* were rearing in 45 cm x 45 cm x 60 cm wooden cages cages walled with gauze. The legs of each cage were deeped in oil to avoid ants or others inside the cage. Four weeks aged of *J.curcas* planted in 18 cm x 25 cm polybag were placed in the cages as food of *C. javanus*.Every day the plants were watered to keep them growing. The eggs of *C.javanus* were collecting every day and used for this experiment.

Trissolcus latisulcus Crawford

In all experiment, *T. latisulcus* came from a rearing facility at the Department of Plant Protection, Bogor Agrucultural University.The parasitized eggs of *C.javanus* were collected from *J.curcas* crops and trasnferred into 0.5 cm x 10 cm glass tubes which is covered with cotton ball. A pair of *T.latisulcus* which were emerged from the eggs of *C.javanus* and have copulated were rearing in glass tubes fed with 20 eggs of *C. javanus* which were sticked on a paper stub 0.5 cm x 2 cm using Arabic gum.The parasitized eggs of *C. javanus* were selected and transferred into test tubes and kept under room condition of 28.18 $\pm$ 0.59 C and 56.33 $\pm$ 4.27 % RH. Imago of *T.latisulcus* that emerged were transferred into test tubes and fed with 10% concentrate honey and used for this experiment.Fifty sterilized eggs of *C.javanus* were sticked on 0.5 cm x 2 cm paper stub using Arabic gum and placed in the test tube 1 cm in diameter and 10 cm in length. An adult female of *T.latisulcus* which has copulated was released in the test tube and fed with 10% concentrate of honey. Adult male of *T.latisulcus* was separated in different tube to investigate its longevity. The study was conducted in the laboratory under room condition as previous experiment. Every day the paper stub was replace with a new one until the adult female of *T.latisulcus* did not produce any more eggs. The dead female of *T.latisulcus* was dissecting to know the number of eggs in the ovary. Observation was done on the fecundity, fertility, daily eggs production, longevity, survival time, sex ratio, reproduction time and the number of adult *T.latisulcus*. Ten replicate adult female and male of *T.latisulcus* were used in this study.

RESULTS AND DISCUSSION

Longevity

T. latisulcus longevity was counted based on the development time from egg until adult emerged. Parasitized host was dissected to evaluate the longevity of egg,

larvae, prepupae, pupae. The result showed that the longevity of adult male was 11,91 ± 0,73 days and female was 12,66±1,22 days (Table 3). According to Awan *et al.* the development time of *T. basalis* at three different geografies area of *Nezara viridula* was 9-12 days. The longevity of *T. latisulcus* may be related to temperature. Torres *et al.* (2002) studies have shown that at 23,83 °C the development time of *T.brochymenae* on *Podisus nigrispinus* was 13,3±0,2 days for adult female and 12,3±0,2 days for adult male.

Table 3. The total number and development time of adult male and female *T. latisulcus*

Day on	Number of Adult male	Number of Adult female
10	3,00	0,00
11	39,00	74,00
12	106,00	272,00
13	20,00	201,00
14	3,00	62,00
15	1,00	29,00
16	0,00	10,00
17	0,00	6,00
18	0,00	5,00
Total number	172,00	659,00
Longevity (day)	11,91 ± 0,73	12,66 ± 1,22

The development time of *T. latisulcus* was depend on the number of generation. Effective parasitoid has short immature development time and high fecundity (Doutt and DeBach 1973). The shorter development time of *T. latisulcus* will give the higher number of population. This information was important to investigate the population development, mass rearing and released of *T. latisulcus* in the field.The data showed that *T. latisulcus* may be released in the field on the nineth days after the eggs were parasitzed. The development time of adult male and female was related to the number of offsprings and also increased the opportunity for copulation.

The survival rate of *T. latisulcus*

Data in table 4 showed that the mean percentage of survival rate of *T. latisulcus* on *C. javanus* was 86,71±3,77 %. The highest percentage of survival rate *T. latisulcus* indicated that *C. javanus* possibly a suitable host for *T. latisulcus*.

Table 4. The survival rate of *T. latisulcus*.

Replication	Parasitized Eggs	Number of *T. latisulcus*	Percentage of survival rate (%)
1	102,00	91,00	89,22
2	105,00	90,00	85,71
3	106,00	93,00	87,74
4	104,00	91,00	87,50
5	95,00	82,00	86,32
6	123,00	107,00	86,99
7	57,00	49,00	85,96
8	98,00	79,00	80,61
9	93,00	88,00	94,62
10	74,00	61,00	82,43
Mean ± SD	95,70 ± 8,34	83,10 ± 16,78	86,71 ± 3,77

Factors influenced mortality of pre-adult *T. latisulcus* was unknown but the observation showed that some of developed adults could not chewing the egg-skin. The host species and temperature could affect the survival rate of parasitoid (Kivan and Kilic 2002; Chabi-Olaye *et al.* (2001).

The longevity of *T. latisulcus*

The results showed that the longevity of adult female of *T. latisulcus* was 17,40 ±7,38 days and adult male was 23,70±9,49 (Table 5). According to Arkawa *et al.* (2004) *T.mitsukurii* female could life for 11,0±0,5 days on *N.viridula*. Awan *et al.* (1990) studies have showed that *T.basalis* female could life up to 34,4 days on *N.viridula* as a host and adult male could life longer. Longevity of parasitoid could be related to the availability of alternative food such as honey or nectar (Rahat *et al.*2005)

Table 5. Life-parameter of adult female *T. latisulcus*.

Replication	Oviposition period (day)	Post oviposition period (day)	Longevity (day)	
			Female	Male
1	6,00	8,00	14,00	26,00
2	6,00	9,00	15,00	28,00
3	7,00	9,00	16,00	33,00
4	6,00	31,00	37,00	36,00
5	6,00	11,00	17,00	27,00
6	8,00	13,00	21,00	27,00
7	6,00	5,00	11,00	3,00
8	5,00	11,00	16,00	19,00
9	6,00	8,00	14,00	15,00
10	5,00	8,00	13,00	23,00
Mean ±SD	6,10 ± 0,88	11,30 ± 7,26	17,40 ± 7,38	23,70 ± 9,49

The longevity of adult female was shorter than adult male may be due to the oviposition activity of the female. Godfray (1994) said that the female parasitoid need more energy and power to prepair nutrient for their offsprings so that the longevity was shorter.

The data showed that adult female *T. latisulcus* laid their eggs at the first day after emerged and the average number of eggs could mencapai 35,50. This condition gave benefit to the parasitoid because immediately after the adults female emerged they parasitized their host., so that external factors such as temperature and RH would be eliminated

Oviposition perid of *T. latisulcus* was only 6,10±0,88 days (Table 5). The data showed that *T. latisulcus* could be used for mass rearing only six days after they emerged .Iranipour *et al.* 2010 studies showed that oviposition period of *Trissolcus grandis* on *Eurygaster integriceps* Puton (Hemiptera: Scutelleridae) was 4,7-22,4 days and it be related to the temperature.

Data in table 5 showed that pre-oviposition period of *T. latisulcus* was 11,30±7,26 days. Awan *et al.* (1990) proved that pre-oviposition period of *T.basalis* was 21,1 days on *N.viridula*. The results of Iranipour *et al.* (2010) showed that post-oviposition period of *T. grandis* on *E.integriceps* was 30 days, however *T.semistriatus* on *E.integriceps* was only 5,7 days (Kivan and Kilic 2006). These results showed that *T. latisulcus* was a *pro-ovigenic* insects which has reservoir-eggs in whole life and may laid eggs on different host (Driesche *et al.* 2008). Information on the life cycle of parasitoid is needed as a basic knowledge/science to made strategies for controlling insect pest. Life cycle of *T. latisulcus* was 11,91-12,66 days less than *C.javanus* as host 60-80 days.

Emergence of adult *T. latisulcus*

Adult male of *T. latisulcus* emerged from *C. javanus* eggs on the 10^{th} -12^{th} days and adult female on the 11^{th}-12^{th} days after the eggs laid by chewing the host eggs-skin. The highest number of *T. latisulcus* both male and female emerged at the same day but adult male emerged earlier than adult female, these have given more opportunity for *T. latisulcus* to copulate.Copulation process was very important for parasitoid because unfertilized eggs developed as adult male and fertilized eggs as adult male and adult female.

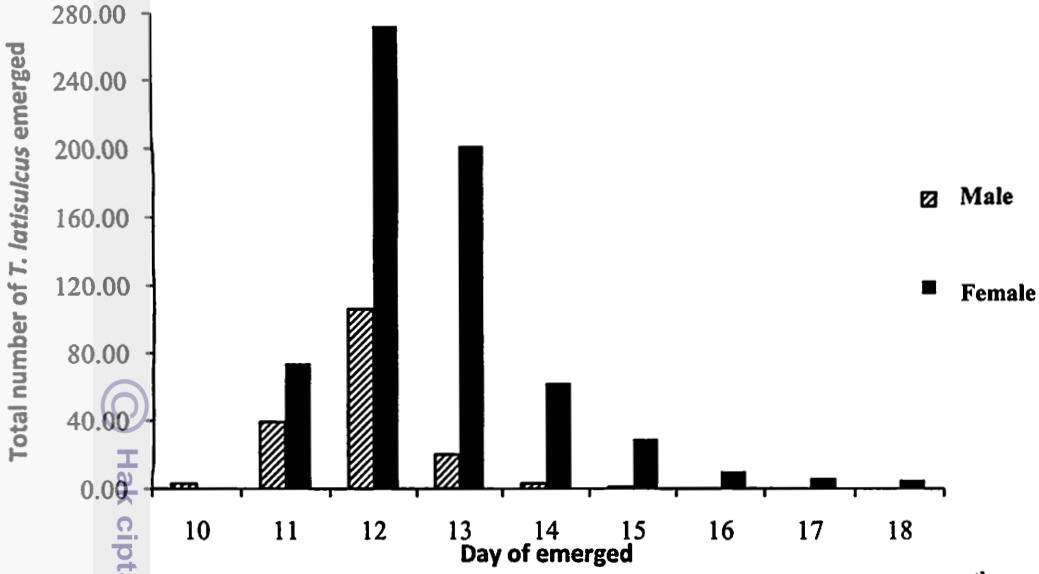

Figure 10. Total number of adult male and female *T. latisulcus* on day 10th until day 18th .

In this studies the sex ratio of *T. latisulcus* was 1 : 3,83 it meant the number of adult female is about four times than male and it would increase the population growth or development of *T. latisulcus*.Kivan and Kilic (2002) found that sex ratio of *Trissolcus semitriatus* was related to the host.

Table 6. Sex ratio of *T. latisulcus* (F1)

Replication	Number of Offsprings F1	Adult male	Adult female	Sex ratio
1	91,00	17,00	74,00	1 : 4,35
2	90,00	11,00	79,00	1 : 7,18
3	93,00	27,00	66,00	1 : 2,44
4	91,00	4,00	87,00	1 : 21,75
5	82,00	8,00	74,00	1 : 9,25
6	107,00	17,00	90,00	1 : 5,29
7	49,00	6,00	43,00	1 : 7,17
8	79,00	15,00	64,00	1 : 4,27
9	88,00	28,00	60,00	1 : 2,14
10	61,00	39,00	22,00	1 : 0,56
Mean ± SD	83,10 ± 16,78	17,20 ± 11,13	65,90 ± 20,60	1 : 3,83

Reproduction capacity

Data in table 7 showed that the reproduction capacity of *T. latisulcus* 95,7±18,34 per adult female; daillly eggs production was 15,76±2,63 . Doutt and DeBach (1973), found that factors affecting the ability of *T. latisulcus* to control *C.javanus* in the field were searching host capacity, host sekection, host specification and survival rate in their habitat.

Table 7. Reproduction capacity of adult female *T. latisulcus*

Replication	Fecundity	Eggs production/day	Number of eggs inside ovary	Potency eggs production
1	102,00	17,00	32,00	134,00
2	105,00	17,50	42,00	147,00
3	106,00	15,14	36,00	142,00
4	104,00	17,33	55,00	159,00
5	95,00	15,83	27,00	122,00
6	123,00	15,38	36,00	159,00
7	57,00	9,50	26,00	83,00
8	98,00	19,60	25,00	123,00
9	93,00	15,50	41,00	134,00
10	74,00	14,80	16,00	90,00
Mean ± SD	95,70 ± 18,34	15,76 ± 2,63	33,60 ± 10,97	129,30 ± 25,96

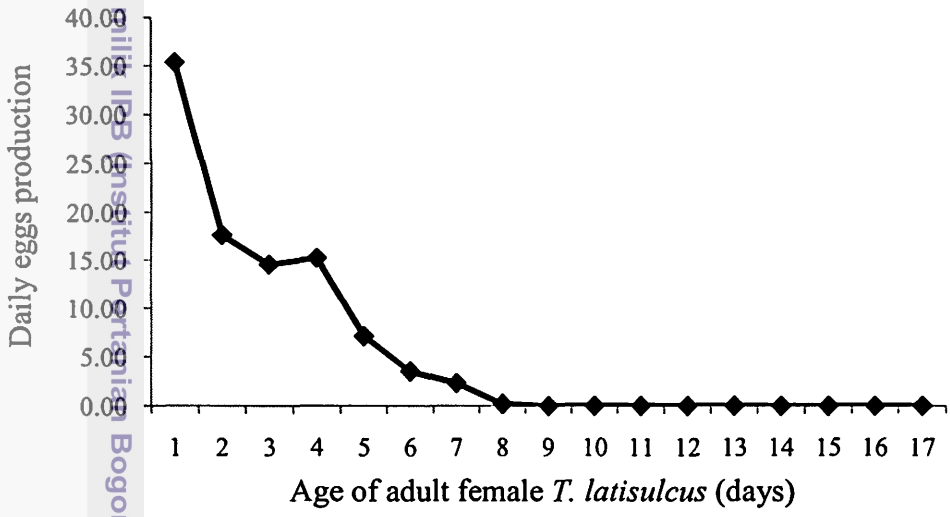

Figure 11. Daily eggs production of adult female *T. latisulcus*

Maximum number of eggs production laid by *T. latisulcus* 35,30±7,13 was on the first day after emerged and gradually decreased on the second day until sixth day and reached minimum number on the seventh day. This result indicated that *T. latisulcus* may be rearing on *C. javcanus* for 7 days in the laboratory.

Percentage of *T. latisulcus* parasitism

Data in table 8 showed that mean percentage of *T. latisulcus* parasitsm was 19,14±3,67 %, it was lower than *T. basalis* on *N. viridula* 41,8±72% (Awan et al. 1990). Kivan and Kilic (2002) studies demonstrated percentage parasitism of *Trissolcus semistriatus* reached 24% on *Euryclema ornatus* (Hemiptera:Pentatomidae) and 94,8 % on *Graphosoma lineatum* (Hemiptera: Pentatomidae) as its host.

Table 8. Percentage of *T. latisulcus* parasitism

Replicate	Number of Parasitized eggs	Number of Unparasitized eggs	Percentage of parasistism (%)
1	102,00	398	20,40
2	105,00	395	21,00
3	106,00	394	21,20
4	104,00	396	20,80
5	95,00	405	19,00
6	123,00	377	24,60
7	57,00	443	11,40
8	98,00	402	19,60
9	93,00	407	18,60
10	74,00	426	14,80
Mean ± SD	95,70 ± 8,34	404,30 ± 18,34	19,14 ± 3,67

Daily percentage parasitism of *T. latisulcus* reached maximum 70,60% on the first day after adult female emerged.This results were important for assessing the inoculative releases of parasitoid to suppress the population of *C.javanus* in *J. curcas* crops.

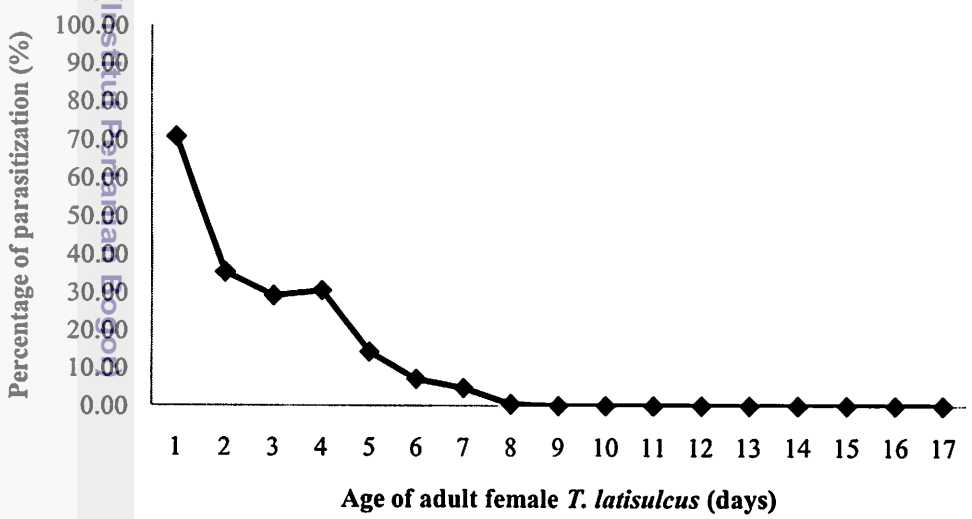

Figure 12. Percentage of parasitization of *T. latisulcus* on different age

CONCLUSION

T. latisulcus has a highly potential prospect to control *C. javanus* as *T. latisulcus* mostly found in the *J. curcas* plants and *T. latisulcus* has high fecundity 95.70 ± 18.34; daily egg-production per female 15.76 ± 2.63; total egg production per female 29.30 ± 25.96, reproduction time 6.10 ± 0.88 days; sex ratio 1:3.83 and parasitoid capacity was 19.14 ± 3.67 %.

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