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ABUNDANCE OF *Thrips palmi* Karny AND THE PHENOMENON OF *Thrips* sp. (Thysanoptera: Thripidae) ATTACK AS PEST AND VIRUS VECTORAT VEGETABLES PLANTATION IN JAMBI REGION

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ABSTRACT

Thrips sp. are insect pests that mostly damage a variety of crops such as vegetables. The attack caused thrips starting from mild to severe attacks. The attack will be more severe if the thrips act as vectors. One of the species that has potential as viral vectors is *Thrips palmi* Karny. The abundance of thrips population also influences the level of attack. In Jambi Province have been no reports about the abundance of *Thrips palmi* Karny and Thrips sp. attack phenomena on vegetable crops. The study aimed to analyze the abundance of *Thrips palmi* Karny and thrips sp. attack phenomena on vegetable crops. The study was conducted by a survey on vegetable crops in lowland and highland regions of Jambi. Thrips were collected from a variety of vegetable crops at each location. The obtained Thrips were collected in 70% alcohol, and then made microscopic slides to identify the type of thrips. Further it was an analysis of the abundance of *Thrips palmi* Karny that exist in each of obtained sample. The observations of the phenomenon thrips attack carried out on 50 pepper plants in the infested cage thrips. Observation and analysis carried out on the morphology, chemistry and Elisa test to the affected leaves. *Thrips palmi* Karny had the highest abundance in lowland and highland was happened in the plant of *Solanum melongena*, then *Cucumis sativus*. The observations in captivity found thrips attacks occurred on the upper leaf surface, happened at the base, the middle and the edges of the leaves with silvery attacks. The attacks of chili thrips on the leaves of plants lowered chlorophyll content and damage the leaf cell structures. Levels of nitrogen, fats and carbohydrates of the attacks chili thrips on the leaf were not significantly different from the control leaves at 5% level. Elisa test results showed that the leaves attacked thrips obtained from plantation vegetables did not contain Tospovirus.

Keywords: abundance, *Thrips palmi* Karny, the attacks, phenomenon.

INTRODUCTION

Thrips are important pests that attack the crop commercially. Thrips attacks on vegetable crops and other plants are quite high. Damage caused by thrips attack in Bandung and Bogor district ranges between 10-46% (Prabaningrum, 2002). In the province of Jambi the damage by thrips can reach 60% (DPTP, 2010). Damage caused by thrips attack will be even greater if it is followed by virus attacks taken along accidentally by thrips. It is known that there is 0.2% thrips as virus vectors of Tospovirus group (Ullman and German, 1995; Marullo and Mound, 2002). According to Riley *et al*. (2011) there are 14 species currently reported thrips transmit Tospovirus and *T. palmi* is one species that is reported as vectors of plant diseases.

Heavy damage in vegetables caused by *T. palmi* is widespread in tropical and sub-tropical world. The first appearance of this species occurs in Kyushu, Japan in 1978. From That time it has become the most serious pests on vegetables and fruits in western Japan. Characteristics that cause this important pest are: preference at young tissues of plants, high reproductive rate, has a wide range of host plants, low sensitivity to insecticides. According to Miyazaki and Kudo (1988) *T. palmi* has a very wide range of host plants; there are 34 families and 117 species of host plants recorded in Japan. According to Sastrosiswojo (1991) *Thrips tabaci* Lind, *T. palmi* and *T. parvispinus* become major pest species in vegetable crops in Indonesia.

This study aims to explore, identify and analyze the abundance of *T. palmi* and the phenomenon of *Thrips* sp. attack in plantation vegetables in the lowlands and highlands in the province of Jambi. This information is very useful as information to provide appropriate recommendations in the biological control. The information gained will be very useful in controlling thrips in accordance with the conditions of lowland and highland regions of Jambi, so it is needed to be revealed in a study. Research on the phenomenon of abundance and *T. palmi* attack on vegetable crops is still limited. The results of this study are expected to gain knowledge about the abundance of *T. palmi* on vegetable crops in the highlands and lowlands in the province of Jambi and the phenomenon attacks.

RESEARCH METHODS

Observations abundance of *T. palmi*

The study was conducted at vegetable crops in lowland and highland areas with an altitude of Jambi province 0-200 m above sea level and 800-1750 m (mdpl). The method used in this research is a sampling method through a survey by direct visual observation of the colonized plants and attacked by thrips. Imago thrips found were collected subsequently taken to the laboratory for identification. Identification of thrips carried out in the laboratory of Biology Department of Mathematics, Faculty

of teacher training and education science, Jambi University and at the Australian National Insect Collection, CSIRO, and Canberra. The data obtained were entered into a Table for analysis.

Thrips exploration

The exploration of thrips carried out by a survey at local vegetables crops plantation in the highlands and lowlands by collecting the imago thrips from 100 plants at each location by tracing a line along the 3-km transect line. If the location is less than the length, the transect was deflected into the original direction with a distance of 1 m from the first transect line (Khan, 2006; Palmer *et al*. 1989). Thrips taken from plants in each 20 m transect lines has been predetermined its terminal point. Imago thrips collected put into a vial volume plastic of 50 ml. Subsequently it was collected in 70% alcohol for identification preparation. Microscope slides were made for the collected imago to identify its species.

Thrips identification

Before doing the identification, thrips that have been collected are grouped based on the similarity of morphology in such of body color, the number of antennas, wings color and wing base by using a stereo binocular microscope Olympus brand. Then identification is done by observing the morphology of insects such as tassel wings, antennae, ocelli, color, and other important parts by binocular microscope with a magnification of 40x. Identification was done by using the key identification made by Palmer *et al*. (1989); Mound and Kibby (1998); Moritz *et al*. (2001); Mound (2006). Identification of thrips carried out in the laboratory of Biology Department of Mathematics, Faculty of teacher training and education science, Jambi University and at the Australian National Insect Collection, CSIRO, and Canberra. The data obtained were put into a Table and then it was analyzed.

Analyzing abundance

Imago that have been identified are recorded and counted the number of *T. palmi* were obtained for each location, plantation vegetables in the lowlands and highlands of Jambi province the data of *T. palmi's abundance* obtained were analyzed statistically.

Analyzing the phenomenon of Thrips attacks on plant

To analyze the phenomenon of thrips attack on the leaves of host plants was also done by observation. Observations carried out to observe phenomena that occur as a result of the thrips attack. The attacks phenomenon observed by planting 50 chili plants in a polybag, then each polybag was placed in mica plastic cages and smooth gauze pads. Into each cage is removed imago thrips. Imago of thrips host plants was obtained from *T. palmi* highest abundance while researching an abundance of thrips. Next attacks phenomena occurred on the leaves of chili were observed. Observation and analysis of: (a) The phenomenon was observed include: parts of attacked plants, color, shape, and location of the attack on the plant.

The data obtained were recorded and documented. The data obtained is shown descriptively and in the form of captured images, (b) Quantitative analysis of attacked leaf chlorophyll content of chilli thrips used chlorophyll meter (SPAD), the analysis of the content of the primary compound leaves infested by thrips. The contents that were analyzed namely nitrogen, fat and carbohydrate content.

RESULTS AND DISCUSSIONS

Observations of abundance of *Thrips palmi* Karny

The study began on April 2014 at vegetable crops in lowland and highland Jambi province. Location of the study had an average temperature of 28ºC and 23ºC in the lowlands at high altitudes, the air relative humidity ranged from 59-96% in the lowlands, and 58-97% in the highlands. The survey was conducted for each location of vegetables plantation at the time of the plants. The results of the identification of the species of *Thrips* sp. found for each type of plant were counted its abundance. *Thrips palmi* abundance of species that are found in plants surveyed are presented in Table-1 and Table-2 below. From Table-1 it appears that *T. palmi* are found not at all kinds of surveyed vegetables. *T. palmi* are found in a row at the plant eggplant, cucumber, cucumber, string beans, squash, spinach, and pare. Species of *T. parvispinus* found in all surveyed vegetable crops.

Table-2 shows that *T. palmi* was found sequently on the eggplant, cucumbers, and beans. The number of *T. palmi* were mostly in the eggplant plants. The number of individuals of *T. palmi* highest lowland is also found in plants eggplant. The abundance of *Thrips palmi* populationin lowland and upland in percent can be seen in Tables 3 and 4. Analysis of abundance of *T. palmi* is based on a comparison of the number of *Thrips* sp. species found in the same plant species.Abundance was analyzed based on the number of thrips species found in the same type of host plants. From Table-3 it appears that at the plant *Solanum melongena* (eggplant), the abundance of *Thrips palmi* (%) obtained higher in the lowlands than other thrips species that infested eggplant plants. Next followed by *Cucumis sativus* (cucumber). At cucumber, the percentage of other thrips is higher than *Thrips palmi*, although the percentage is higher in all vegetable crops. From Table-4 it can be seen at that the *Solanum tuberosum plants* (potato), the abundance of *T. palmi* (%) obtained is higher at upland compared with other thrips species. And then followed by S. *melongena*.

Morphology of *Thrips palmi*

Identification is done by using the key identification made by Palmer *et al*. (1989); Mound and Kibby (1998); Moritz *et al*. (2001); Mound (2006). Morphology, antenna segment, seta oceli, sensila campaniform on metanotum and comb (comb) of *Thrips palmi* is presented in Figure-1.

Symptoms of *Thrips* sp. attack on Chili

To observe the *Thrips* sp. attack, Imago was put in a cage that has contained the growth of pepper plants at flowering phase. *Thrips* sp. obtained from plants of eggplant (*Solanum melongena*). It is based on the results of previous studies that *Thrips palmi* found its highest abundance in eggplant crops. After that, the observed attack began at the first day until days 21. Documentation of the data collected is then performed a descriptive analysis of the attack. The results of the observation of phenomena thrips attack on the leaves of adult thrips chili plants are taken from the host plant abundance was highest *thrips palmi* (eggplant) has the same attack patterns from previous studies (2012). Previous research invested thrips were taken from healthy chili plants, yellow, plant cucumber and squash plants.The results obtained during the observations documented by using micro lens camera. The results are presented in the following description: (1). Location *Thrips* sp. attack greater part occurs in the young leaves, and there are few had attack on the upper leaf, (2). *Thrips* sp. attack occurs on the upper leaf surface, (3). *Thrips* sp. attack sp. starting from a mild attack to heavy attack. *Thrips* sp. attack sp. is silvery-white, then the attack gradually turned into a brownish color (Figure-2), (4). This form of *Thrips* sp. attack varied, there which are round, oval, elongated, and form of eight number (Figure-3), (5). *Thrips* sp. attacks the leaves of chili plants on the surface by way of sharpening and sucking, and the results of the sharpener scattered around the dining thrips, (6). Next, thrips suck networks by immersing the body in the filings of the sharpener results, (7). Observation of the feeding thrips population on the same leaf can individually or in groups (Figure-4), (8). Location thrips attack on the leaves of plants can occur at the tip, middle, and base of the leaf (Figure-5), (9). Observations by using micro lens on thrips cross section affected leaves, the color changes. The color of affected leaves starting from the top surface to the bottom surface becomes lightly browned (Figure-6).

In Figure-2 above it can be seen that the thrips are generally strike the top of the chili plant leaves or young leaves. This is related to the nitrogen content contained in those plants. The food is mainly nitrogen was instrumental in the breeding of insects, especially the effect on the fecundity of female insects (Blum 1985). At this finding thrips more common attacks upper leaf than shoot, because the leaves on the nymph population able to accommodate more than the leaf buds, leaf size over broader than leaf buds.

The attacks on chilli thrips on the leaves of plants characterized by silvery white color, then gradually change to brown. To meet the nutritional, thrips suck the cell fluid causing the cell to become damaged and destroyed (Kirk 1997). Lewis (1997) reported the thrips attack causes the surface of the leaf became silvery-white leaves, then the leaves dry and turns to be brown and eventually fall out.

In Figure-3 it can be seen that this form of *Thrips* sp. attack on the leaves of chili plants varies. The attack is round, oval, elongated, and there is a form the number 8. The shape of the holes is varying depending on the thickness of the leaves observed. Mandibular stylet help by piercing the first hole, maxillary stylet widen the holes on the surface, left a hole in the form of a Figure-8 (Kirk 1997).

Table-1. Abundance of *Thrips palmi* and other thrips on vegetable crops in the lowland area of Jambi.

Species	Abundance					
	T. palmi	***T. parvispinus***	**Tubulifera**	***Thrips* sp.**	**Male**	**Nymph**
chickpea	-	++	-	+++	+	++
pare	+	+++	++	++	++	+
eggplant	+++	+++	-	+++	+++	+++
cucumber	++	+++	+	+	++	++
ubu wood	-	+	+	+	+	+
rimbang	-	+	-	+	+	+
beans	+	+++	+	+++	+++	+++
peanuts	-	+	-	+++	-	+++
mustard	-	+	-	+	+	+
kale	-	+	-	+	+	+
papaya	+	+	+	+	+	+
squash	+	++	-	+	+	+
pumpkin	-	+	-	-	+	+
cucumber	++	+	-	+	+	++
spinach	+	+	+++	-	+	+
chili	-	+	-	-	+	+
velvetleaf	-	+	-	+	+	+
bengkoang	-	+	-	+	-	+

Note: - = not found (0 individu), + = amount found little (<50 individuals), ++ = number found middle (50-100 individuals), +++ = number found many (> 100 individuals).

Table-2. Abundance of *Thrips palmi* and other thrips on vegetable crops in the highlands region of Jambi.

Species	Abundance					
	T. palmi	***T. parvispinus***	**Tubulifera**	***Thrips* sp.**	**Male**	**Nymph**
chickpea	+	+++	++	++	++	+++
pare	-	++	-	-	+	+
eggplant	+++	++	++	+++	+++	+++
cucumber	+	+++	-	-	++	++
ubu wood	-	+	-	-	-	-
Rimbang	-	+++	+	-	+++	++
beans	-	++	-	+++	+	++
potatoes	++	++	+	-	++	+++
corn	-	+	+	+	-	+
chili	-	++	++	+	+	++
mustard	-	+	-	+	-	+
carrots	-	+	+	-	+	+
tea	-	+	+++	+	+	++
chayote	+	+	+	+	+	++
pumpkin	+	+	-	-	-	-
kale	+	+	-	-	+	+
papaya	+	+	-	++	++	-
Nuts starfruit	-	+	-	++	+	+
cowpea	++	++	-	+	++	+

Note: - = not found (0 individu), + = amount found little (<50 individuals), ++ = moderate number found (50-100 individuals), +++ = number found many (> 100 individuals).

Table-3. Abundance (%) of *Thrips palmi* in lowland.

Tanaman	**Abundance** (%) **in lowland**			
	T. palmi	***T. parvispinus***	***Thrips* sp.**	**Tubulifera**
Momordica charanta	1,30	72,7	24,0	1,90
Solanum melongena	23,8	22,0	20,2	0,00
Cucumis sativus	13,8	76,1	9,60	0,50
Vigna sinensis	0,30	16,2	83,4	0,10
Carica papaya	5,30	68,4	21,1	5,30
Luffa acutangula	4,50	72,7	22,7	0,00
Cucumis sativus *	29,6	20,4	50,0	0,00
Amaranthus hybridus	33,3	11,1	0,00	55,5

**cucamber*

Table-4. Abundance (%) of *Thrips palmi* in the highland.

Plant	**Abundance** (%) **di Highland**			
	T. palmi	***T. parvispinus***	***Thrips* sp.**	**Tubulifera**
Phaseolus vulgaris	1,90	81,6	14,2	2,40
Solanum melongena	32,8	21,2	22,3	3,70
Cucumis sativus	5,60	94,4	0,00	00,0
Solanum tuberosum	52,9	44,1	00,0	2,90
Sechium edule	23,3	20,0	53,3	3,30
Cucurbita moschata	50,0	50,0	0,00	0,00
Ipomoea aquatica	20,0	80,0	0,00	0,00
Carica papaya	2,90	2,90	94,3	0,00
Vigna unguiculata	37,1	51,4	11,4	0,00

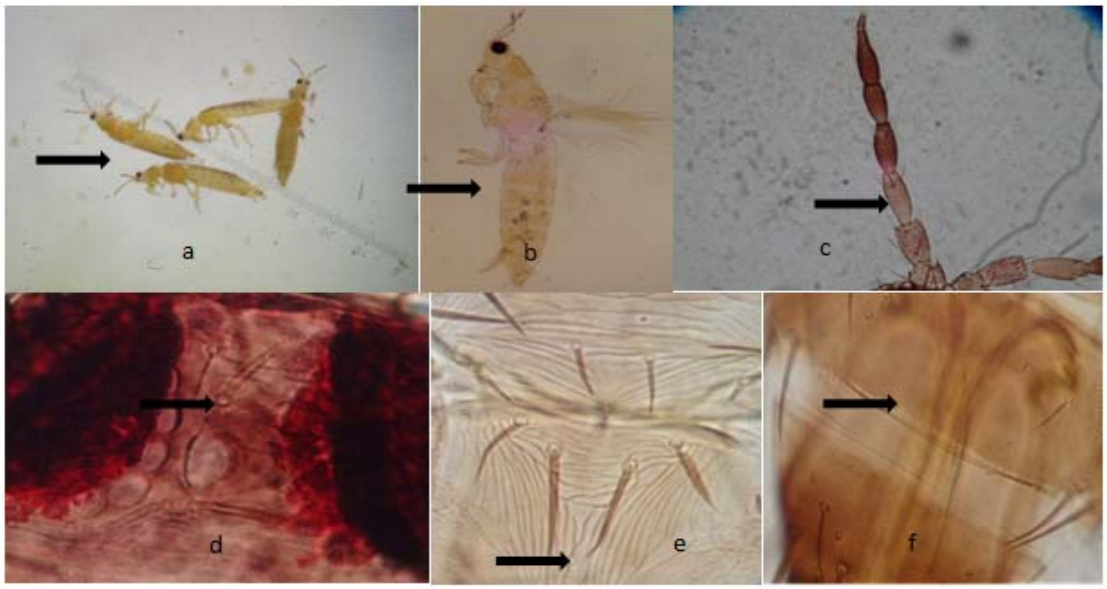

Figure-1. Imago of *Thrips palmi*. a) under a stereo microscope, b) under a compound microscope, c) antenna, d) setae ocelli e) sensilla campaniform, and f) comb.

Figure-2. *Thrips* sp. Attack (a) the shoots and young leaves, (b) on the upper leaf surface of a silver-colored, and (c) attack becomes brownish color.

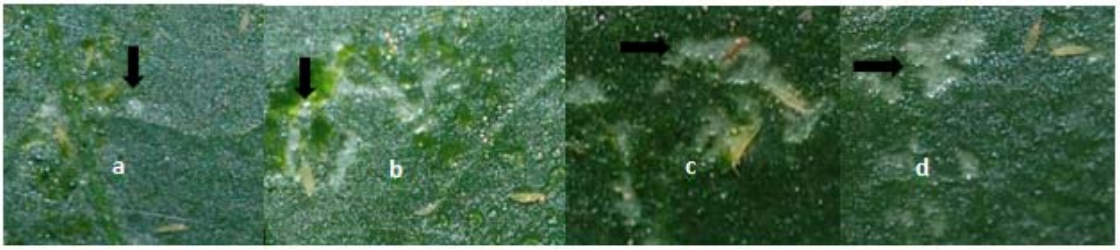

Figure-3. Variation of *Thrips* sp attack. on leaves of pepper plants. a) round b) oval, c) elongated d) form of eight number

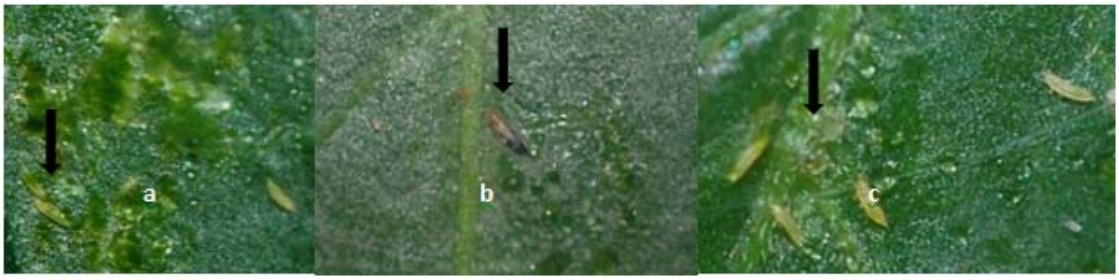

Figure-4. Imago and nymph thrips are being sharpened chili leaf surface. (a) Imago bowed heads in sharpener powder, (b), individually, (c) in groups.

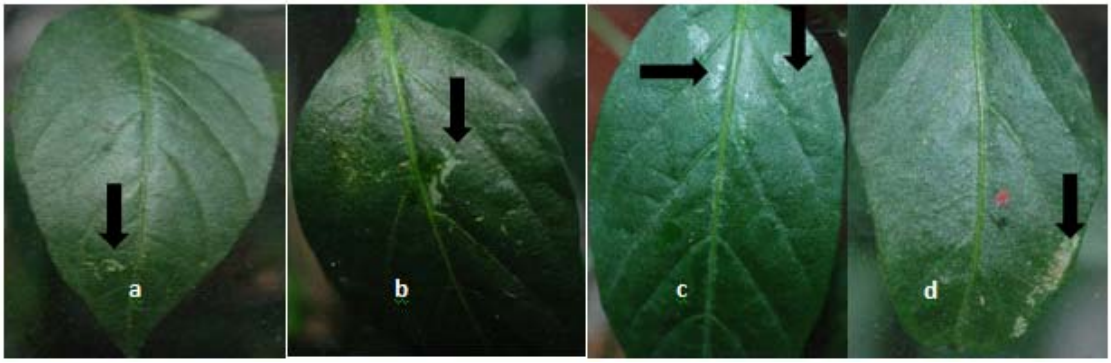

Figure-5. Location of attack *Thrips* sp. on leaves of chili plants. (a) end, (b) middle, (c) base, (e) edge.

Figure-6. A cross section of leaves affected chilli thrips attack. (a) Not attacked by (b) an attack from the top surface to the bottom surface.

CONCLUSIONS

T. palmi species are not found in all vegetable crops. *T. palmi* found in plants: *Momordica charanta, Solanum melongena, Cucumis sativus, Solanum tuberosum, Vigna sinensis, Phaseolus vulgaris, Carica papaya, luffa acutangula, Amaranthus hybridus, Sechium edule, Cucurbita moschata, Ipomoea aquatica, Vigna unguiculata.*The highest abundance of *T. palmi* was found in the lowlands and highlands of the plant *Solanum melongena* (eggplant) and *Solanum Tuberosum.* The thrips attacks on the chilli leaves of plants occur on the upper leaf surface at the base, middle, or at the edge of the leaf. Thrips are investing leaves of chili plants occur individually, or in groups. The thrips attacks on chilli plant leaves are round, oval, elongated and form a Figure of

eight with the silvery color of the attack, then change color to brown.

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