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SPECIES DIVERSITY OF THRIPS (THYSANOPTERA) PREDATOR ON CHILI PLANTATION (*CAPSICUM ANNUUM* L.) IN THE HIGHLANDS JAMBI PROVINCE, INDONESIA

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ABSTRACT

Species of thrips predators are very important in controlling the pest population in the field. In the highlands of Jambi Province are the unreported species of natural enemy thrips. Information species of predator thrips are very important in biological control precisely. This research was conducted to explore, analyze the diversity species of thrips predator in the chili plantation highland province of Jambi. The survey found that 18 species of thrips predator in highlands province of Jambi was grouped into eight families. These species are *Ammoplanus* sp, *Cheilomene ssexmaculata, Chilocorus melanophthalmus, Chilocorus ruber, Chrysopoda* sp, *Coccinella repanda, Coelophora 9 maculata, Coelophora inaequalis, Coelophora reninplagiata, Metepeira* sp, *Misumena* sp, *Neoscona* sp, *Oxyopes sp 1, Oxyopes* sp *2, Oxyopes* sp *3, Termatophylidea* sp, *Theridion* sp 1, *and Theridion* sp *2. Sphecidae and Coccinellidae is mostly found in the survey area. Species diversity of thrips predator in the high lands was relatively low category.* The highest populations that founded in highlands were the members of specidae and coccinellidae family. *Ammoplanus* sp. is a family member of Sphecidae are and *Cheilomenes sexmaculata* in a group members of Coccinellidae & both were found most abundantly in summer (February to June) and winter (July to November) season.

Key words: Species diversity, *thrips predator, Capsicum annuum* L.

INTRODUCTION

Thrips are important pests that attack the chili plant. Thrips damage the crop by whittling and sucking. As a result, the plant will be stunted. Thrips attacks in chili and other plants are quite high. Damage increases when thrips carry virus diseases in plants, the damage can reach 100%. Thrips attacks on crops such as chili starting from mild to severe attack. Mild attack starts from the symptoms on the leaves are marked with colors such as silvery white attacks. Furthermore, the silvery white color changed to brown. Generally to control the pests (either against pest thrips and other pests), synthetic insecticides are most commonly used by the farmers with spray in the crops in the field. Spraying is done periodically started planting chili in the land, without going through the first stages of monitoring. Thus, it will cause various effects either to the pest itself or the impact on the animals, and the environment. The use of synthetic insecticides in controlling thrips can pollute the environment, insect pests become resistant, it is possible the explosion killing pests and natural enemies (predators) so that reviews their abundance are reduced [1-2].

According to some researchers [1], the high and the low number of predator population was affected by the use of insecticides. The use of insecticides to control thrips predator which is only decreased the populations, so it is not enough to suppress the thrips population. Therefore, the presence of insect predators must be maintained to control thrips. Natural enemy of thrips in nature generally consist of a group of predators. Family predator on the field thrips among others is from the group Specidae, Chrysopidae, Cecidomyiidae, Coccinellidae [2]. In the province of Jambi been no reports of thrips predator species.

This study was aimed to explore and analyze the diversity of thrips predator species in the highland province of Jambi. This study will provide useful information to choose the right natural enemies as biological control thrips and to develop in the field of science to study the biology and ecophysiology of insects.

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MATERIALS AND METHODS

The study was conducted in the chili plantation and surrounding highlands of Jambi province with the height 800-1750 m above sea level (masl) (Table 1). The location of the study had an average temperature of 22°C, air relative humidity ranged between 58-95%.

The research was conducted during the winter and summer season. The method used in this research is the method of sampling surveys to 50 locations with direct visual observation on the chili plantation and surroundings (Tables 2 and 3). Thrips predatory insects were collected for identification purpose.

Table 1: The survey location and altitude in the highlands province of Jambi in summer (February-June)

District / City	Local names	Altitude (masl)
	Sanggaran agung	837
	Siulak gedang	847
	Siulak tenang	984
	Sungai betung hilir	1.054
	Sungai betung mudik	1.068
	Sungai renah	1.079
	Suko pangkat	1.104
	Sungai batu hitam	1.253
	Telun berasap	1.391
	Pesisir bukit	1.416
	Tangkil	1.471
Kerinci	Pauh tinggi	1.476
	Harapan Jaya	1.445
	Sungai sikai	1.480
	Kersik tuo	1.535
	Lindung jaya	1.510
	Mekar jaya	1.639
	Sungai dalam	1.507
	Sungai kemumu	1.517
	Danau tinggi	1.507
	Sungai lintang	1.615
	Sako dua	1.623
	Kebun baru	1.711
	Jalan buntu	1.713
Sungai penuh	Renah kayu embu	1.558

Table 2: The survey location and altitude in highlands Jambi Province in winter (July-November)

District / City	Local names	Altitude* (masl)
	Sungai minyak	883
	Siulak deras mudik	1.028
	Sungai betung mudik	1.068
	Ujung lading	1.184
	Renah pemetik	1.239
	Lubuk tabun	1.245
	Pasir jaya	1.255
	Renah pesugin	1.255
	Gunung talang	1.256
	Sungai duren	1.258
	Sungai kuning	1.262
Kerinci	Sungai tendai	1.400
	Pesisir bukit	1.416
	Harapan jaya	1.445
	Koto panjang	1.446
	Koto periang	1.446
	Tangkil	1.471
	Pauh tinggi	1.476
	Sungai dalam	1.507
	Lindung jaya	1.510
	Kersik tuo	1.535
	Giri mulyo	1.584
	Sungai kering	1.584
	Kebun baru	1.711

Information: *Altitude is measured using the GPSMAP 60CSx

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Exploration of Thrips predator Species

Exploration of thrips predator species with a survey conducted in the area around the chili plantation in the highlands province of Jambi. The survey was conducted by collecting thrips predator species at each location. At the time of the survey temperature, humidity was recorded and the information of synthetic insecticides by farmers was used as the secondary data. Collection of thrips predators species were collected by insect nets or by hand. Species collected put in a bottle of 50 ml volume that already contains 70% alcohol for the preparation of identification. Each location of cultivated plants that are grown, the insecticide used and the frequency of spraying were noted.

Identification of Thrips predator Species

Specimens of thrips predator species that have been collected were identified. Identification was done by observation of morphological characteristics of the antenna, wings, thorax and other important characteristics. Furthermore, based on morphological characteristics it was identified using these identification keys.

The survey data was incorporated and tabulated into the table form. Data of each species of thrips predator were acquired and used to analyze the diversity. Species diversity index of Shannon (H') was considered for the Diversity Index. To analyze the use of species dominance and evenness of species dominance index Berger-Perker (d) and evenness index Pielou (E) [3] were measured.

RESULTS AND DISCUSSION

Results of a study of the diversity of thrips predator species carried out in the month of summer (February to June) and winter (July to November) and it was found total 18 species of thrips predator in the highlands of the province of Jambi. Thrips predator species consisted with eight families and all the data were tabulated in Tables 3 and 4.

Table 3: Thrips predator species in chili plantation in the highlands of summer (February-June)

Family	Species	Highlands	Altitude(masl)
Coccinellidae	*Chilocorus melanophthalmus*	+	1.535, 1.615
	Coelophora inaequalis	++	837, 984, 1.068, 1.253, 1.471, 1.476, 1.535, 1.517, 1.615, 1.713
	Cheilomenes sexmaculata	++	837, 847, 984, 1.054, 1.068, 1.416, 1.445, 1.471, 1.476, 1.480, 1.507, 1.510, 1.517, 1.535, 1.615, 1.623, 1.711, 1.713, 1.558, 1.560
	Coccinella repanda	+	1.535
	Chilocorus ruber	+	1.560
	Coelophora 9 maculata	+	1.615
	Coelophora reninplagiata	+	1.253
Oxyopidae	*Oxyopes* sp 1	+	984, 1.471, 1.535, 1..615, 1.623, 1.711,
	Oxyopes sp 2	+	1.476,
	Oxyopes sp 3	+	1.517, 1.558
Reduviidae	*Termatophylidea* sp	+	1.711
Sphecidae	*Ammoplanus* sp	+++	837, 847, 984, 1.054, 1.071, 1.079, 1.104, 1.391,1.416, 1.416, 1.445, 1.471, 1.473, 1.480, 1.498, 1.507, 1.508, 1.510, 1.517,1.558, 1.560, 1.607, 1.623, 1.639, 1.710, 1.713
Thomisidae	*Misumena* sp	+	1.558
Theridiidae	*Theridion* sp1	+	837
	Theridion sp2	+	1.471
Araneidae	*Metepeira* sp	+	1.535, 1.507, 1.615
	Neoscona sp	+	1.713, 1.558
Chrysopidae	*Chrysopoda* sp*	+	1.713

Instruction: +++ means many found, ++ represents moderate, + symbolize a little, -stand for no found, * represents larval stage

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Table 4: Thrips predator species on the chili plantation in the highlands in month of winter (July-November)

Family	Species	Highlands	Altitude (masl)
Coccinellidae	*Chilocorus melanophthalmus*	+	1.446
	Coelophora inaequalis	+	1.068, 1.245, 1.255, 1.400, 1.476, 1.535
	Cheilomenes sexmaculata	++	1.028, 1.184, 1.245, 1.256, 1.400, 1.416, 1.445, 1.446, 1.476, 1.510, 1.535, 1.711
	Coccinella repanda	+	1.507
	Chilocorus ruber	+	1.068
	Coelophora 9 maculata	+	1.476
	Coelophora reninplagiata	+	1.255
Oxyopidae	*Oxyopes* sp 1	+	883, 1.416, 1.535
	Oxyopes sp 2	+	1.476, 1.400
	Oxyopes sp 3	+	1.711
Reduviidae	*Termatophylidea* sp	+	1.256
Sphecidae	*Ammoplanus* sp	+++	883, 1.028, 1.068, 1.184, 1.239, 1.245, 1.255, 1.256, 1.258, 1.262, 1.400, 1.416, 1.445, 1.446, 1.471, 1.476, 1.507, 1.510, 1.535, 1.584, 1.711
Thomisidae	*Misumena* sp	+	1.558
Theridiidae	*Theridion* sp 1	+	1.445
	Theridion sp 2	+	1.445
Araneidae	*Metepeira* sp	+	1.258
	Neoscona sp	+	1.245, 1.255
Chrysopidae	*Chrysopoda* sp*	+	1.262

Instruction: +++ means many found, ++ represents moderate, + symbolize a little, -stand for no found,
* represents larval stage

From Tables 3 and 4, it can be found that group of Sphecidae and Coccinellidae are the highest amount of the predators. The species most commonly found *Ammoplanus* sp. These results are also supported by the earlier reported data by some researchers [4] and they also specified that *Ammoplanus* sp. is attacking thrips in the field. Besides this species, there are some other species that also attacked *T. palmi* in the field. It was also reported [4-5] that *Coccinella* sp, *Oxyopes* sp. and *Neoscona* sp. attack to the *Thrips palmi, C. repanda predator T. tabaci, Coleophora 9 maculata predator Thrips tabaci and Thrips simplex.*

From the results, it was clearly concluded that thrips predator species diversity in the highlands are relatively very low. Thrips predator species diversity in the highlands in summer (February to June) and winter (July to November) can be seen in Table 5.

Table 5: Diversity species of Thrips predator in the highlands province of Jambi

characteristics/ Observation	Summer (February-June)	Winter (July-November)
Number of individuals	787	690
number of species	18	17
Shannon Index ('H)	0.948	0.995*n
dominance index (d)	0.705	0.738*n
evenness Index (E)	0.328	0.351*tn

Instruction: *n represents the significantly different at the level of 5%, *tn stand for no significant difference in the level of 5%

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From the Table 5 it is clearly confirmed that the Shannon Index ('H) diversity of thrips predator species in the summer and the winter are 0.948 and 0.995 respectively and theses were coming under the low category. This is thought to be caused on the site of the highlands is more common monocultures.

Several predators were found in the plantationarea's multicultural or better known as intercropping. There were also found very less amount of other flowering plants. Natural enemies often prefer different habitats of principal cultivated plants [6].

Intercropping on the land near the plantation area is favorable for natural enemies. Second crops provide food and shelter for natural enemies. Crop intercropping provides a variety of alternative habitat, natural enemies more diverse habitats compared with monoculture plantation intercropped [6].

Table 5 also shows that the abundance of prey species of thrips was varied in summer (February to June) and rainy season (July to November). Species diversity and dominance indices thrips predator was seen in summer (February to June) than the rainy and winter season (July to November), and the t test results were significantly different at the 5% level. Thrips predator species evenness in February-June and July-November were not significantly different. Diversity insects may vary in each region. It was influenced by differences in temperature, climate, geographical conditions, and vegetation, that's why each region affects the distinctiveness of species [7].

Precipitation, temperature, air relative humidity and wind are factors that affect the insect population. The number of insects in plants can be increased rapidly in dry weather and decreased rapidly after rain [8].

Besides, the resource also affects the diversity of insects. Insect diversity influenced by the abundant resources that are needed for life [9].

Predators survive because it is located in suitable vegetation. In addition, the high and the low number of thrips predator population affected by the use of insecticides. The use of insecticides causes the decrease in predator population [1].

CONCLUSION

From the results of this research it can be concluded that in the highlands province of Jambi were founded 18 species of insect thrips predator, which grouped into eight families. The highest populations that founded in highlands were the members of specidae and coccinellidae family. *Ammoplanus* sp. is a family member of Sphecidae are and *Cheilomenes sexmaculata* in a group members of Coccinellidae & both were found most abundantly in summer (February to June) and winter (July to November) season.

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