Homoptera Diversity with Organic and Inorganic Treatment of Soybean (*Glycine max*) in Jetis and Siman District Ponorogo Indonesia

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***Abstract*—Diversity of insect affected quality and quantity of agricultural products. Therefore diversity of soybean insect within organic and inorganic treatment is very important. This research aim to know how the diversity of homoptera in organic and anorganic treatmen of soybean. The experiment was conducted in district of Siman (7 ° 54' 20 .1 'S 111 ° 28' 51. 0" E) and Jetis (7° 54' 20 .1 "S 111° 28' 26. 2" E) Ponorogo, Indonesia during August - September 2016. Collections were applied on four methods there were pitfall traps, sticky traps, sweep net and light trap. The insect diversity showed that order Homoptera on organic fields is higher than on inorganic land. The population of homoptera from organic treatment are 26 Nabidae, 9 Cicadellidae, 7 Jassidae, two Cicadellidae, one Cicadellidae 1, one cicadellidae 2, and one nabidae. While, inorganic treatment are consisting two individual cicadellidae and seven individual jassidae. The number of insect population in inorganic treatment is higher than organic may caused insect in inorganic are resistant from usage of pesticide and variety of food web.**

***Index Terms*—Homoptera, diversity, organic, inorganic, soybeans, ponorogo**

I. Introduction

Homoptera are mostly phytophagus in whole life cycle and many of them are vector of diseases (Borror *et al.*, 1992 [1]; Castner, 2004 [2]; Eyles and Linnavuori, 1974 [3]; Hodkinson and Lan, 1979 [4]). According to Higgins, 1997, Insect pests can cause problems in soybean cultivations by plants defoliating in which the most common type of insect feeding, or by feeding on the pods or seeds.

Organic vegetables are vegetables produced on the farm which environmental friendly or closed to the concept of nature. Organic plants are nature friendly produced on the farm as much as nature treatment. (Walewangko, 2015 [5]). International Federation of Organic Agriculture Movements (IFOAM) describes organic agriculture is a holistic farming systems that support and accelerate biodiversity, biological cycles and soil biological activity (Nurhidayati *et al.*, 2008 [6]).

Soybean is one of biotechnology product which has importan values comercially. The economic viability of soybean production is depend on related sub-products, such us meal and oil (Thoenes, 2008 [7]).

Soybean (*Glycine max*) organically produced after frequently land planted with conventional cultivation treatments. In order to become organic product, soybean must be planted at least three times intensively under criteria of organic farmland and product (Deri, 2010 [8]). According to Sarawa *et al.*, 2014 [9] treatment of manure 20 ton/ha generally give better growth and different treatment without manure, but the effect is similarly with treatment of manure 10 ton/ha. This means that organic fertilizer to soybean plants have optimum limit provision, if excess provision given effect becomes ineffective. In Indonesia soybean intensively planted approximately three months during the season (Radiyanto *et al.*, 2010 [10]). According to Ghulamahdi and Nuraeni, 2009 [11], dose of using manur organic fertilizer is affect the real number for soybean pood in every plant.

Global soybean production is projected to expand around 23 % over the next decade, growing on average, about 2.5 % per year, compared to 5 % during the past decade. Behind the slowdown are a marked decrease in the yearly expansion of area planted to soybeans in Argentina and Brazil and a stagnation of planted area in the USA. Yield improvements are expected to be modest in developed countries and more pronounced among developing country producers, as the latter will have increased access to advanced genetic engineering techniques. Global soybean production is anticipated to continue to be dominated by producers in the Americas. The share of the USA share is anticipated to decrease to the benefit of South American producers, which are expected to drive overall growth in world oilseed production. In China and India, soybean production should continue to grow by less than one percent per year. With regard to exports, close to 95% of the anticipated growth in global oilseed shipments are expected to consist of soybean exports from South America, notably Brazil, Argentina and Paraguay, where export volumes are expected to rise 6-8% yearly on average. The three countries together should account for 70% of all soybeans shipped in 2015 (compared to about 55% today). By contrast, shipments of soybeans from the USA are anticipated to stagnate around current levels. Global soybean imports are anticipated to expand by 3%

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annually during the next decade (half the rate recorded in the past), with much of the expansion continuing to occur in developing countries in Asia, in particular China. China's soybean imports are estimated to rise by 5% annually, or 75% in total. At this rate, in 2015, the country's share in global soybean purchases should exceed 50% and the degree of China's reliance on foreign suppliers will have increased further Theones, 2008 [7].

Species diversity is a characteristic of the biological level of community based organizations, diversity can be used to express the community structure. Diversity of species is also frequently used as a measure of the stability of the community and the environment. The diversity of species that could be used to mark the number of species in a particular area, where the relationship is expressed numerically as the diversity index (Devan, *et al.* 2013 [12])

Many insect asociate with soybean, Sharma *et al.*, (2014 [13]); Sayuthi, (2011 [14]), Yakub *et al.*, (2013 [15]), Koswanudin, (2013 [16]), Radiyanto *et al.*, (2014 [10]), Hendrival *et al.*, (2013 [17]) are been associated including *Riptortus linearis* Fabricius. (Heteroptera: Alydidae) Stem fly (*Melanagromyza sojae* Zehntner) Tobacco caterpillar (*Spodoptera litura* Fabricius) Green semiloopers (*Chrysodeixis acuta* Walker, *Gesonia gemma* and Diachrysia orichalcea (Fabriciussensu Hübner) Girdle beetle (*Obereopsis brevis* Gahan) Pod borer (*Helicoverpa armigera* Hubner), *Nezara viridula*, and White fly (*Bemisia tabaci* Gennadius).

The main obstacle in the cultivation of soybean crops are destructive pests of soybean plants since the start phase until the crop seed production. Pests that damage crops and many kinds of soy is enough. According to the research results Research and Development Center for Food Crops, destructive pests of soybean plants from seeding to the soybean crop production as much as 15 types, consisting of a variety of species from different families and different orders, among other family agromyzidae (Diptera), Aphididae (Homoptera), Aleyrodidae (Homoptera), Tetranycidae (Acarina), Chrysomelidae (Coleoptera), Noctuidae (Lepidoptera), Piralydae (Lepidoptera), Alydidae (Hemiptera) and Pentatomidae (Hemiptera) (Center for Food Crops Research and Development, 2006 [18]). Cultivation technology with ecologically sustainable approach is believed to be able to answer the certainty of production and the sustainability of environmental sustainability in the production system.

According to Radiyanto *et al.*, 2014 [10], the composition of distribution pest populations are found in soybean fields were treated with insecticide and without insecticide from highest is *Aphis* sp. then *Phaedonia inclusa, Riptortus linearis, Nezara viridula* and *Ophiomyia phaseoli*. Pests and natural enemies in soybean plants on land without insecticide treatment the population is lower than the soil treated with insecticide.

II. Material and Method

The study was conducted over two months during August - September 2016 in the village of Wonokerto, district Jetis (7^{o}54'20.1 "S 111^{o}28'26.2"E) for treatment of organic field of soybean and inorganic treatment of soybean field in the village of Demangan, District Siman (7 °54'20.1 'S 111 °28'51.0" E), Ponorogo, East Java, Indonesia.

Insect collection method used was pitfall trap, with 600 ml mineral botle, yellow sticky trap with stamp Gajah (PT.Megasari Makmur), general sweep net with a diameter of 45 cm and with a white light trap (32 watts). Pitfall trap placed in every sub block in hole with 20 cm depth, sticky trap hanging on 150 cm in every sub block, sweep net taken randomly in every sub block, and light trap are doing for six hour since sunset. This research was conducted with four treatment and every of each block is divided into the four different sub block A, B, C, and D (Fig. 1), from each sub block taken three pitfall traps, 1 yellow stickytrap, and 1 random sweep net, then sample light trap is taken from one block for five hours after sunset. Here is an overview of block design in the research location.

A	B
C	D

Figure 1. Layout of sub block in every research location.

This figure is layout of soybean field in organic treatmen and inorganic. Organic and inorganic treatment of soybean has some layout such us first figure. Then, the sample is taken from this block area.

The sample taken with four methode to arrect insect and sample counted for analysis population. The big insect pinned directly to insect body and the tiny insect placed patch on triangle paper with pin, every insect box put with camphor in, for avoiding insect stay safe and not eaten by other organism or other insect. After the sample is sorted, the next step is identification insects one by one and then grouped according by family level. The pickling process according to the guidelines conducted by Borror *et al.*, (1992) [1], Radiyanto *et al.*, 2014 [10], Suprapto and Yuli, 2012 [19], and Hodkinson & Lan, (1979) [4]. Data processing is using Microsoft Excel 2007.

III. Result and Discussion

TABLE I. Data Species Homoptera from Each Family

NO	Family Name	Number Of Species	
		Organic	Inorganic
1	Cicadellidae 1	1	0
2	Cicadellidae 2	1	0
3	Ciccadelidae	9	0
4	Nabidae I	1	0
5	Nabidae	26	0
6	Cicadellidae	0	2
7	Jassidae	0	7
	Total	38	9

In the above (Table I) are described that order of homoptera is observed there are several families were founded. In the field of organic founded five families are cicadellidae with 9 population, cicadellidae 1 with the number of population is 1, cicadellidae 2 with the population is 1, nabidae with the population is 26, and nabidae 1 is 1 population, in the field of inorganic only founded two families from order of homoptera, represented with two population of cicadellidae and seven population of jassidae.

Population of jassidae and cicadellidae members can be seen in the graph. The following graph is the difference between the level of homoptera insect diversity in soybean fields of organic and inorganic fields;

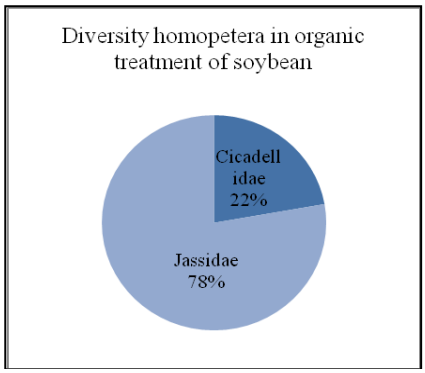

Figure 2. Diversity order homoptera family cicadellidae and jassidae in the inorganic fields.

The diversity of homoptera in inorganic field of soybean just two family both cicadellidae and jassidae (Fig. 2). This amount illustrate that the inorganic field is low diversity but amount of every family is higher than organic field. This problem may be consist because the insect are reistant to aplication of pesticide.

According to Sayuthi, (2011 [14]), the use of synthetic insecticides can cause pest resistance and resurgence, the destruction of natural enemies (predators, parasitoids, and other beneficial microorganisms), and toxicity to the user. It is therefore necessary to find control in other ways that are environmentally friendly, one of them by using vegetable insecticides or biopesticides of neem seed extract (A. Indica), which has been shown to control various types of insect pests. extracts of neem seed

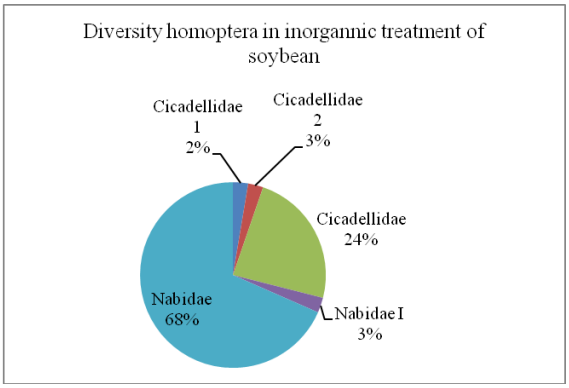

Figure 3. The diversity of insects homoptera Cicadellidae, Cicadellidae 1, Cicadellidae 2, Nabidae and Nabidae 1 in the organic fields.

Diversity homoptera in organic treatment of soybean is higher than inorganic treatment although their amount little than inorganic but are average each other. This indicate that organic treatment has good ecosystem field.

Organic farms less contaminated by chemical substances that low chemical residues. This greatly affects the insect organism component contained in both the organic fields and inorganic (Fig. 3). In the inorganic land farmers use pesticides to address pest problems this causes the insects were killed and of some species are resistant (Edelson, 2012 [20]). Inorganic land of dominate only with family cicadellidae and jassidae which may resist to any treatment of insect controlling by farmer.

Insect pests can cause problems in soybean fields by defoliating the plants, which is the most common type of insect feeding, or by feeding on the pods or seeds within the pods. Pod and seed feeding can be devastating to yields, simply because they destroy the marketable product. Feeding on the pods by bean leaf beetles, most commonly, can expose the seeds to desiccation and pathogens. Corn earthworms (soybean pod worms) reduce yield by feeding directly on the seeds within the pods, as do stink bugs, by sucking the sap from developing seeds.

According to research of Siburian *et al.*, 2013 [21], botanical insecticide from seed soursop is more effective in suppressing pests R. *linearis* from the order Homoptera when compared than chemical insecticides chlorpyrifos. This incident because most farmers use chemical insecticides in handling, so pest R. *linearis* become resistant. Botanical insecticide have a way of working that is become a contact toxic and abdomen toxic (stomach) as well as the workings of chemical insecticides chlorpyrifos. This is consistent with the results of research Komansilanet *et al.*, (2012 [22]) which states that the family of Annonaceae contains acetogenin that is larvicides. Acetogenin on soursop seed solution also acts as an insecticide, acaricide, antiparasitic, bactericide, insect repellent and anti-feedant with the work as a contact toxic and toxic abdomen (gastric).

Capable of controlling pests of the order Hemiptera, Lepidoptera that damage the leaves and pods. Neem plant parts are known to contain active compounds as insecticide plant are the leaves and neem seeds, but the seeds contain more of the active compound. Four main compounds as insecticides included in the group triterpen or specific limonoids (*azadirachtin*, *salanin*, *meliantriol*, *nimbin*), this compound is able to inhibit the development of eggs, larvae or pupae, blocking the process of molting during the larval stage, interfere with the process of sexual communication can hamper the process of mating insects, inhibits the female lays the eggs, create sterile insects, poisoned larvae and imago, and inhibited the formation of the hard outer shell (chitin).

The diversity of homoptera in organic higher than inorganic. In organic fields Homoptera represented by five families, are cicadellidae, cicadellidae 1, cicadellidae 2, nabidae, and nabidae 1 (Fig. 3). Order Homoptera damage soybean plants through the bite on the leaves,

sucking pods vector of diseases. Soil organic soybean emphasizes the application of environmentally friendly insect control is using biopesticides, bioherbicides or insect traps. Insect control with organic methods that are environmentally friendly effects. Organic soy land more than the land inorganic weeds, insects affecting components contained there in.

According to Radiyanto *et al.*, 2010 [10], pests and natural enemies on soybean without insecticide treatment population is lower than that of land treated with insecticide. The presence of pests and natural enemies of soybean plants on plots without insecticide was lower than on the plots that was treated with insecticide. This means that organic fields have a high diversity but its population is lower than inorganic soybean fields.

According to Suprapto and Yulia, 2012 [19], Insect pests are found in soybean varieties Burangrang and Anjasmoro in experimental garden is quite varied, in Anjasmoro varieties found 15 species, comprising nine families of 6 orders and on Burangrang varieties found there are 11 types comprising seven families of five orders. Damage to the soybean crop due to pests in the range 1-18% Anjasmoro varieties and varieties Burangrang is lighter range 1-16%.

In addition to soybeans, insect pests Homoptera also be important for the planting of red pepper, According to Nugroho *et al.*, (2013 [23]), integrated pest management treatment significantly affect the intensity of insect pests Homoptera: Aphididae, while non integrated pest management had no significant effect to the Homoptera insect population in the crop of red pepper.

Soybean (*Glycine max*) is a legume that has a life cycle of 75-110 days. Soybean plants included into the annual plant that produces flowers and soybean pod once in its life cycle (Radiyanto *et al.*, 2010 [10]). According to Ghulamahdi and Nuraeni, 2009, genotipe of NS and G 10428 from soybean both have an average age of 65 and 80 days.

IV. Conclusion

Insect population of inorganic treatment are higher comparing organic treatment in single spesief of homoptera. Since insect diversity of organic treatment are higher rather than inorganic treatment consisting at least five subfamilies.

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