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Insect Diversity and Population in Agricultural Ecosystem Region Mountain, Kauditan District Area North Minahasa

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Abstract
This study aims to assess the diversity and insect populations in agricultural ecosystems. Sequens of this study consisted of determining the location of the sample, the sample unit, and agricultural ecosystems. This research was conducted using survey methods, identification and analysis data.The result study showed that abundance, / insect populations and diversity obtained from agricultural ecosystem is a total of 39 individuals consisting of 6 orders and 6 families, with the amount of each individual as follows : Hemiptera 7, 12 Diptera, Hymenoptera 5, 4 Coleoptera, Lepidoptera 6, .and Orthoptera 5 The density populations the highest of the agricultural ecosystem that is on the order Diptera Family Lauxalidae.
Keywords: insect diversity, AGIRCULTURAL, ECOSYSTEM, KAUDITAN, North Sulawesi

INTRODUCTION

North Minahasa District is a district that is located in the north Sulawesi.This area surrounding mountain slopes Klabat an agricultural area, plantation, fruits, woods and stone mining. SubdistrictKauditan is part of the North Minahasa district has 11 villages.Each village is located in the district Kauditan agricultural land and plantations. Agricultural land and plantation many found around the slopes just before harvest fruits season such as mango, olive, mangosteen and others are found some kind of insect diversity. Increased insect population began during the summer and fruit Salak one insect species found in the field during the season of flowers and fruits are of the order Diptera and Hymenoptera.

The emergence of the existence of the diversity of insects when the flowering and fruits harvest season is any directional changes in time called suksesi. Community structure is one of the important properties of these changes (Rondonuwu, 2006).A number of trends have been assosiated with vegetation succesion generalist or strategis generally dominate early successional stage (Brown *et al*, 1986) Level is very high diversity of insects that can adapt to the conditions of both the natural habitats such as primary forests and man-made habitats such as agricultural land and plantations (Siswanto&Wiranto, 2001).Location and agricultural plantations in the surrounding mountainside Klabat the the slope generally high land. Therefore, it is necessary to identify areas kemiringan.The aim of insect identification is to assess whether the diversity of insects that were found in the location with a different slope will be different from the other. In view of the aforesaid it is clear that the spread of insects around the mountain slopes will be different each location, because of the difference in altitude of the land. Some long lived perennials may endure adverse conditions favor out crossing and seeding recruitmen ,such windows of oppoturnity are unpredictable requiring annual investment.(Archer,S *et al*, 1991).

Forest sites around the mountainside Klabat has a population density of forest plant species is higher than the plantations and crops., Therefore in the forest habitat more carnivorous insect numbers and diversity of species of insects are much higher and more complex than the agroecosystem (Janzen, 1987). Many leaf chewing insects are also messy eaters, dropping clipped leaves or fragment of leaves (greenfall) to the forest floor.(Risley,L.S.(1986). If insects were disturbed forest habitats such as the logging, manufacture of mining land and land stones agriculturalthattoinsect community forests will be extinct or migrated to other areas, is likely to be competent with important pests in agricultural cultivation. In Case the immigration to the area of forest insect crop because its habitat is disturbed, then the succession will occur in community structure. Insects are the components of biodiversity are most numerous, have important ecological functions and can be indicators of environmental degradation. (Scowalter, 2000). Although a considerable proportion of forest cannopies can be turned over annually by insect herbivore. (Lowman, 1992).

Insect diversity around the plantation area adjacent to the foothills of the population will decrease as a result of deforestation. Herbivorous insects that diteli by researchers in the UK said that 80% of insect herbivore is monofag and l0% less eat the plants more than three family (Scoonhoven*et al*, 1988). Similary herbivore induced changes in light availability may influence litter quality through efect on leaf chemistry (Van der wale *et al*, 2000). Different land use will also affect the changes in the structure and composition of vegetation on the land and in the end will affect the stability of the new ecosystem. Ecosystem change into a new ecosystem involves not only vegetation, but also involves a good fauna that live on the land and the land surface, meaning fauna will also experience a sequence of parallel changes with the level of plant fibers.The insect fauna of

Kuwait has suffered from such destrution result of experiment from Kuwait at the first period 474 spesies of insect were recorded from Kuwait (356 genera,109 families,19 orders) but the numbers of species increased to 492 (273 genera,116 families, 19 orders) during the second period.(Wasnia Al Houty,2009).

Control of the emergence of new pests around the plantation due to deforestation and plantations around the Klabat mountainside is through outreach to the community of farmers who cultivate plants around the mountain area adjacent to the forest. Prohibits the operation of illegal quarrying around the forest and mountain slopes.Replanting in forests damaged by forest and mining overhaul a control that aims to preserve the variety of plants in the forest back endangered and while improving ecosystem disturbance, so the food chain and life cycle of insects re-formed.

Natural phenomena will affect the food chain and life cycle of insects, as well as when changing habitats and landscape changes. Assessing the impact of changes in landscape due to differences in land and geography is through the identification of species and the composition of insects are there to be used as bio-indicators to predict changes in a particular habitat or ecosystem. It is the relationship between biotic and abiotic environmental factors, where the species or populations of plants, animals including insects and microorganisms will be amended presence, vitality and response as the influence of environmental conditions.

Each species will respond to changes in the environment depends on the stimulus (stimulus) that it receives. The response given to identify the changes and the level of pollution in the environment (Speight *et al*, 1999) .The location of research partially in the plantation population that is for agricultural ecosystems planted eggplant, corn and rice with an altitude of 100-200 meters above sea level. Location or uncultivated land land and forest ecosystems is at an altitude of 200-300 meters above sea level and 300-400 meters above sea level.With to determine topography and ecosystems of the above, then the insect diversity can be investigated and assessed.

MATERIALS AND METHOD

The research was conducted on land agricultural ecosystems which corn crop acreage and land location.Altitude eggplant 200.300 and 400 meters above sea level and an average temperature of -30 C at locationabout 25 km from Location DesaKaima, around the slopes of the Klabat mountain. The research was conducted for 6 (six) months consisting of 4 (four) months in field locations for sampling insects and 2 (two) months of the identification of insects in the Laboratory of Plant Pests and Diseases Department of the Faculty of Agriculture, University of Sam Ratulangi in Manado, North Sulawesi. Materials and device used consists of Alcohol 75%, cotton, Microscope, brushes, paper towels, funnel, killing bottle, nets / net, emergency lamp, paper labels, sample bottles, altimeter, thermometer, insect identification book (Borror, DJ1992) and others.

Research Procedure:

1. Sampling method

The sampling method used during the conduct of the study consisted of 1) a method of sampling using nets / net to capture the diurnal insects. Technique is the use of 3 to 6 times sweeping net sampling in the field is the system penyapuhan three (3) to six (6) times the swing.

2. The method of determination of the sample unit

This method uses a device consisting of a roller meter and altimeter or GPS. At locations that will be used to advance research surveyed to see location suitable for sampling. Topographic location or altitude measurement location.using recording devices height is altimeter or a GPS location. Altimeter This is a measure which merely serves as a measure altitude of the location of the surface of the sea, while the GPS as well as a measuring tool that has advantages for measuring the degree of altitude, latitude and longitude. Having in mind the location of ecosystems with distance high measuring instrument, then made experimental plots.

3. Implementation of the study

Several studies in the field of implementation procedures comprising:

1. The land area for each plot experiment with the size of 20 x 20 meters consisting of three replications / plot. Each plot experiment labeled. A1, A2 and A3. Also on the same sample bottles labeled in order to be identified.
2. Catching insects begin at 07:00 am to 10:00 am with nets. .
3. Prior to the implementation of research the first initial and final temperatures measured

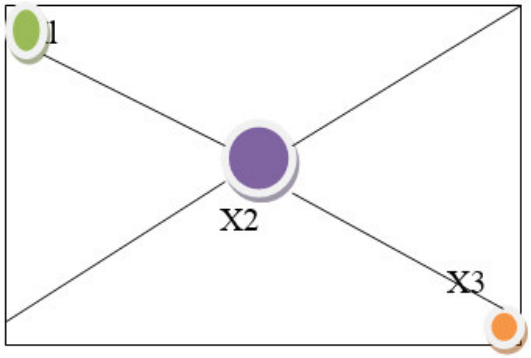


Figure 1. Plot experiment with three location points Xl, X2 and X3

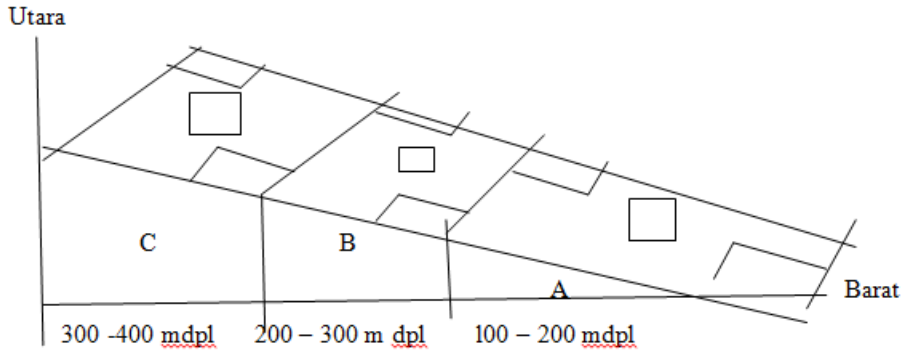


Figure 2. Example of a site plan experiments based on geography / high-field sites

Note: Image sketch: A plot for agricultural ecosystems (land corn) l00 -200 maslB plots for agricultural ecosystems (land eggplant) 200 -300 maslPlots C for agricultural ecosystems (eggplant field) 300-400 masl

4. Data Analysis

Analysis of insect diversity in the ecosystem and the location of different altitude used Shannon index (and Reynolds, 1998:, Krebs, 1989 :

$$H' = -\sum(n.i/N)\ln(n.i/N)$$

H = Index of Shannon diversity
Ni = number of insects of a kind,
N = number of insects all types
In = natural logarithm

RESULTS AND DISCUSSION

The total number of insect species obtained in the study area for agricultural ecosystem whichis ecosystem corn and eggplant with different geografl layout is numbered 195 species insects consisting of 8 orders, 15 families.Insects were obtained from agricultural ecosystems (Table 1) for the corn crop was 2.5 months with 100 -200 masl geographical location (below sea level) consists of 8 orders are Homoptera, Hemiptera, Diptera, Odonata, Coleoptera, Hymenoptera, Orthoptera and Lepidoptera and 15 Families are Tyhcocybinae, Berytidae, Reduvidae, Lygalidae, Otitidae, Hellomycidae, Stratomycidae, Tethinidae, Caloppterygidae, Zygoptera, carolidaeTenebrionidae, Agromycidae, acrididae and Tetigonidae. Family Tyhcocybinae has the highest population of individual insects that 66 individuals (Table l) comparison of different groups of individuals on its ecosystem. corn cropping patterns that do not conform to the pattern of the actual plant, causing an explosion of the pest (Evans.JW., L963).

Insects found in agricultural ecosystems (Table 2) for eggplant age of 2 months at an altitude topography of 200-300 meters above sea level consists of 4 orders namely Hymenoptera, Diptera, Hemiptera and Orthoptera and 8 families that Halectidae, Colltidae, Crane fly, cauxaplidae, Bertidae , Miridae, Braconidae, and Tetygonidae. Insects found in agricultural ecosystems (Table 3) for eggplant age of 2 months at 300 -400 masl The topography consists of 5 orders are Orthoptera, Hemiptera, Blattaria, Coleoptera and Hymenoptera and 9 family is Agrididae, Grylidae, Nabididae, Miridae, Coreidae, Blattidae, Endomycidae, Chrysmeidae and Multidae.

Table 1. Insect Diversity in Agricultural Ecosystems Corp. Corn (maize)

No	ORDO	FAMILI	Farmland corn crop egg plants at 100 -200 masl	
			∑ ORDO	∑ FAMILIES
1	Homoptera	Thyhcocybinae	66	66
2	Hemiptera	Bertidae		11
		Reduvidae	16	2
		Lygalidae		3
3	Diptera	Otitidae		5
		Hellomyzidae	18	3
		Stratomycidae		6
		Tettimidae		4
4	Odonata	Calopyteygidae	9	6
		Zygoptera		3
5	Coleoptera	Carabidae	6	4
		Terebrionidae		2
6	Hymenoptera	Agromyzidae	19	19
7	Orthoptera	Acrididae	4	2
		Tetygonidae		2
8	Lepidoptera	Chareutidae	2	2
	Jumlah total		140	140
	Index Shannon			

Table 2. Insect Diversity in Agricultural Ecosystems Eggplant

No	ORDO	FAMILI	Farmland tanamanterongpadaketinggian 200 - 300 mdpl	
			∑ ORDO	∑ FAMILI
1	Hymenoptera	Halectldae	7	7
2	Hemiptera	Bertidae		7
		Mirldae	12	5
3	Diptera	Tlpulldae		4
		Cauxaplldae	6	2
4	Orthoptera	Tetygonldae	3	3
	Jumlah total		28	28
	Index Shannon			

Tabel3 . Insect Diversity in Agricultural Ecosystems eggplant

No	ORDO	FAMILI	Farmland tanamanterongpadaketinggian 300 - 400 mdpl	
			∑ ORDO	∑ FAMILI
1	Hymenoptera	Multldae	3	3
2	Hemiptera	Coreidae		7
		Mirldae	12	5
3	Orthoptera	Acrdldae		2
		Grylldae	4	2
4	Coleoptera	Endomycldaechrysmedale	6	2
				4
	Blattodea	Blattldae	2	2
8			27	27
	Jumlah total			
	Index Shannon		1,436	2,042

Discussion

The result processing the data in Table 1 that the percentage population of agricultural ecosystem insects in corn crop land in geografiposition 100 -200 masl shown in Figure 2 looks the order Homopterahave population majority of 47% different with another order. While the lowest percentage of insects in order Lepidopterato found is 1%

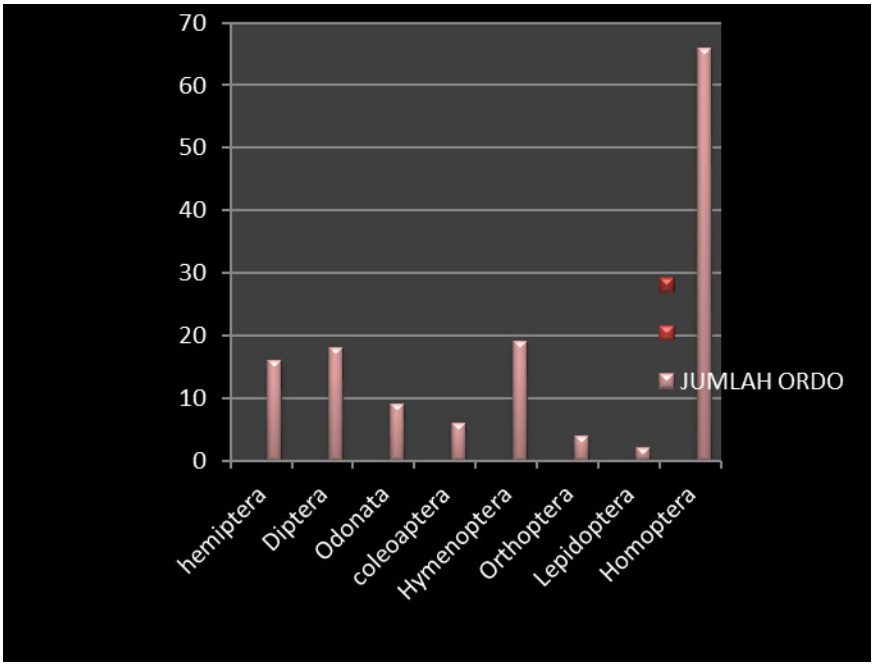


Figure 3. Bar graphs population / abundance of insects in agricultural ecosystems corn in geography position 100-200 masl

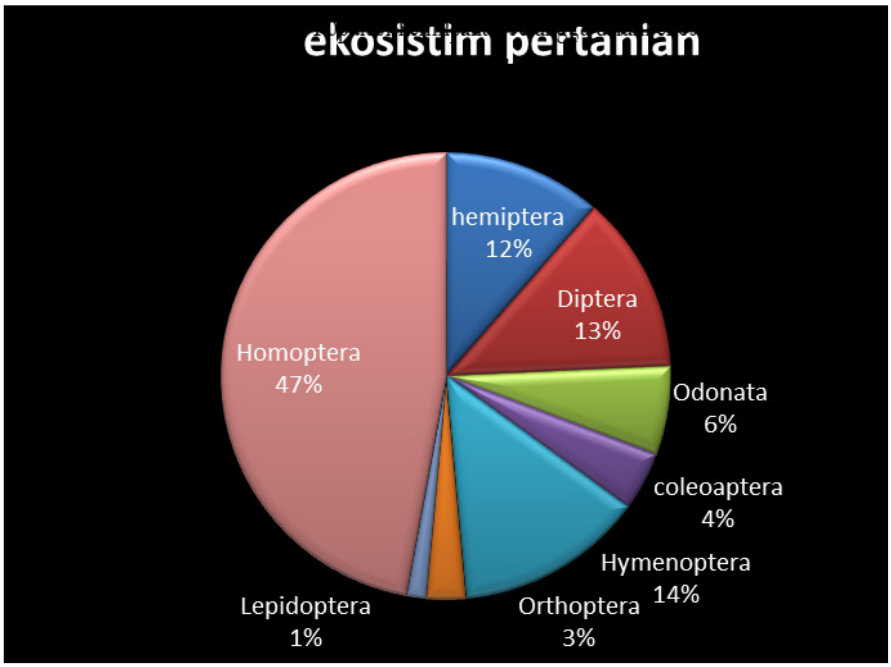


Figure 4. Pie Population Diagram insects on maize atpositiongeografl 100-200 masl

Population / abundance of insects for agricultural ecosystems on geographic position 200 -300 masl for eggplant (Figure 2) consists of 4 orders namely Hymenoptera, Diptera, Hemiptera, Orthoptera and 8 families is Halectidae, Cauxaplidae, Coltidae, Crane fly, Bertidae, Miridae, Bronidae, and Tetygonidae. Type insect order Hemiptera dominated by Hymenoptera Families 12 11 Families while the order is the order Orthoptera least 3 Family.

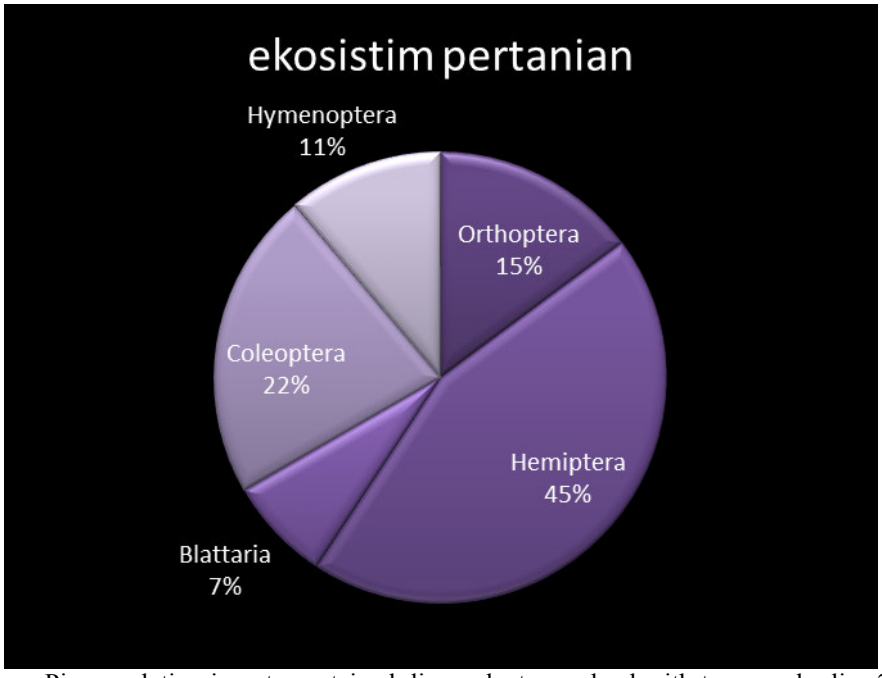
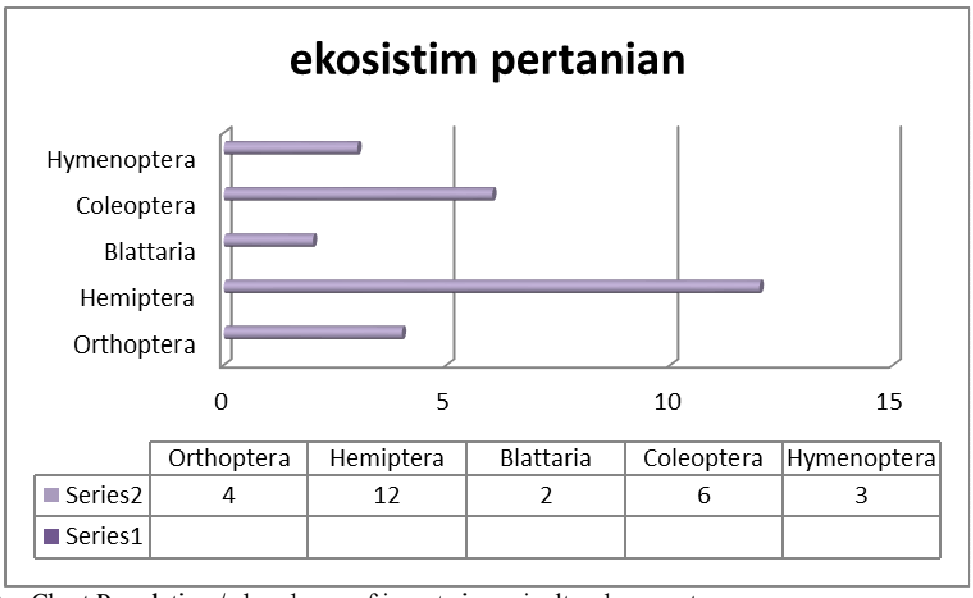


Figure 5. Diagram Pie population insects contained di eggplant crop land with topography lies 200-300 meters above sea level.

Toresult processing data in table 2 shows that the percentage of insects populationhighest geographical position 200 -300 masl to ecocystemagricultural corn field , which show 3 image obtained is of the order Hemiptera while the lowest 45% of the order Blattaria 7%.



	Orthoptera	Hemiptera	Blattaria	Coleoptera	Hymenoptera
Series2	4	12	2	6	3
Series1					

Figure 6. Bar Chart Population / abundance of insects in agricultural ecosystems
Eggplant crop land in the topography position 200-300 masl

The results of data processing in Table 3, show that the population / abundance of insects in agricultural ecosystems eggplant crop land in the geographic position of 300-400 meters above sea level (Figure 5). consists of 5 orders are Orthoptera, Hemiptera, Blattaria, Coleoptera, Hymenoptera and 9 families that Agrididae, Grylidae, Nabididae, Miridae, Coreidae, Blattidae, Endomycidae, Chrymeidae, and Multilidae. Type insect order Hemiptera dominated Hymenoptera 9 12 Family and Family, whereas the lowest order is the order Blattaria 2 Family 3 Family and Hymenoptera.

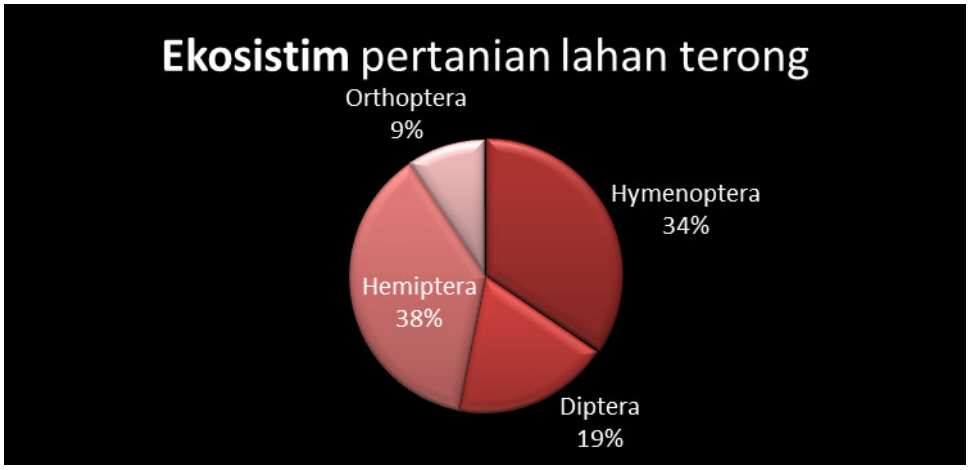


Figure 7.Pie Chart Percentage abundance / insect populations in agricultural ecosystemsEggplant on topographic position 300-400 masl.

The highest percentage of population / abundance of insects on agricultural ecosystems for eggplant on geographic position 300-400 meters above sea level in the figure 5.The highest abundance of the order Hemiptera lowest 38% and 9%.

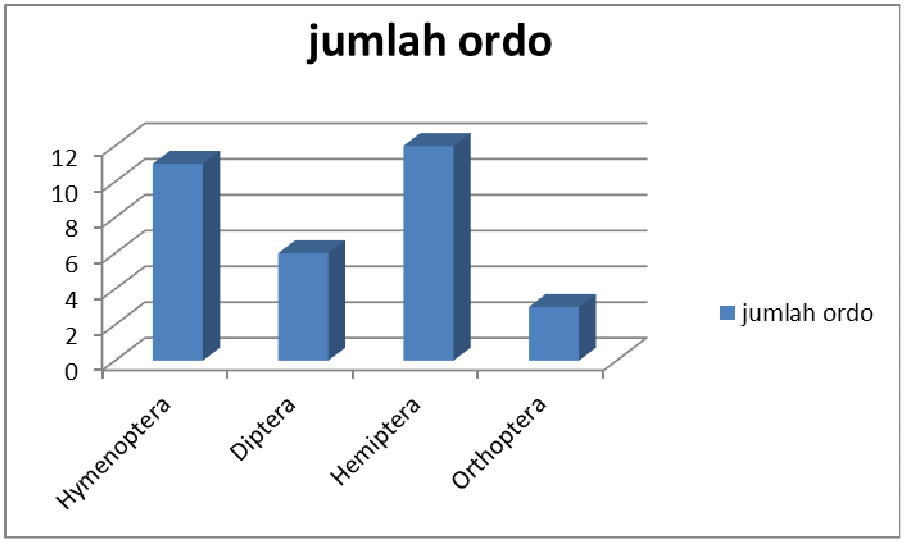


Figure 8. Diagram of the population of stem / abundance of insects in agricultural ecosystems Eggplant crop land located in the topography position 300-400 masl

CONCLUSIONS AND SUGGESTIONS

A. Conclusions

1. The total number of observation sites for insects to agricultural agricultural based on the location of the different topography is 247 individuals consisting of 9 Order and 56 Family. .
2. Solid Insect populations are most in from location agricultural ecosystems, namely on the corn crop 66 individuals and order Homoptera most populations. Geography on corn land 100-200 meters above sea level with an average temperature ranges from 28 -. In the agricultural ecosystem, family Tycocybinae is the rapid insect breeding in maize because these insects easily adapt to the environment and the ecosystems that support the surrounding temperature.

B. Suggestions

Sampling and observation extended to other areas which have different topography ecosystem need to be in order to be able to distinguish species of insects and population.

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