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The diversity of insects found in polycultural land of green spinach (*Amaranthus* sp) in Sinar Harapan Farming Group, Tarakan

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ABSTRACT

The diversity of insect species has an important role in the ecosystem stability. The farming system in kampung enam village used a polyculture farming system. Polyculture farming can increase the ecosystem stability since providing a better environment for the predatory insects and parasitoids in controlling the natural pest population in a commodity. One horticultural commodity found in polyculture land in Sinar Harapan Farmer Group of Tarakan is spinach. The declining quality and production of spinach is caused by several plant-disturbing organisms, such as insects. This research aimed to figure out the diversity and dominance of insects in the polyculture land of green spinach (*Amaranthus* sp) in the Sinar Harapan Farmer Group of Tarakan. The data were collected using traps, such as yellow traps and pitfall traps. Furthermore, identification was conducted at the Plant Protection Laboratory, Faculty of Agriculture, Universitas Borneo Tarakan. The obtained data were analysed using th Shannon Wiener diversity index and Simpson dominance. The research results show that the obtained insects were included into 9 orders, 36 families, 58 species with a total number of 912 individuals. Based on the analysis results using the Shannon Wiener diversity index and Simpson dominance, the diversity of insects in polyculture land of green spinach (Amaranthus sp) was 3.12 (H') in which the diversity was categorised into high. Meanwhile, the value of insect dominance index was 0,02 with the dominant insect type of dragonfly (Pantala flavescens) with a total number of 115 individuals.

Keywords:

Diversity,
Polyculture Land,
Insect Dominance

INTRODUCTION

Indonesia has a high level of biodiversity and is one of the centres of biodiversity in the world. Insect diversity is one form of biological wealth which is estimated to reach hundreds of thousands of insect species, but not all types of insects are known, including new types of insects [1]. Insects are the dominant animal group with almost 80% of the number of species on the earth's surface. Of the 751,000 species of insect groups, about 250,000 species are found in Indonesia. Insects in agriculture are widely known as pests, predators, and parasitoids [2].

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The level of diversity of insect species has an important role for stability in the ecosystem. Species diversity is a community trait that shows the level of diversity of the types of organisms in it [3]. The level of individual predatory insects shows a close relationship between the availability of food sources and the plant growth phase, where plants play a role in providing food sources for the growth and development of natural enemy insects, so that pests that have the potential as food sources are reduced [4].

Tarakan City has four sub-districts. East Tarakan District is one of the sub-districts that has a livelihood as horticultural farmers with a land area of 50 HA. The farming system in East Tarakan sub-district, village of six in the Sinar Harapan farmer group is a polyculture farming system. Polyculture planting will increase the stability of the agricultural ecosystem because it provides a better environment for predatory insects and parasites so that they can control natural pest populations in a commodity [5]

One of the horticultural commodities found in the polyculture land of the Sinar Harapan farmer group is green spinach. The decline in the quality and production of spinach plants is caused by several factors, one of which is plant-disturbing organisms such as insects. In an effort to find out the types of insects that are on spinach plants, it is necessary to identify the diversity of insect species on spinach polyculture fields in the Kampung Enam.

METHOD

This research was carried out on polyculture land of green spinach (Amaranthus sp) in the Sinar Harapan Farmers Group, Tarakan City, Kampung Enam Village, East Tarakan District, Tarakan City and at the Plant Protection Laboratory, Faculty of Agriculture, Borneo Tarakan University. The tools and materials used are flakon bottles, insect identification books, swing nets, specimen boxes, insect needles, styrofoam, brushes, microscopes, pitfall traps and yellow traps. The materials used are 70% alcohol, label paper, papilot paper.

This research uses active and passive collection methods, active collection uses direct collection while passive collection uses traps such as pitfall traps and yellow traps. The insects obtained were then identified and analysed descriptively. Analysis of the data used in this study is the Shanon-Wiener diversity index, and the Simpson dominance index.

RESULT AND DISCUSSION

Based on the results of research that has been carried out on polyculture fields of green spinach plants in the Sinar Harapan Farmer's group, Tarakan City, the insects obtained were 9 orders 36 families 58 species with a total number of 912 individuals:

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Table 1. Insect diversity and dominance index

No	Nama Genus/Spesies	Jumlah	Pi (ni/N)	Ln Pi	Pi.Ln Pi	H'	Indeks Dominansi
1	*Neurothemis terminata*	8	0,01	-4,69	-0,04		0,00
2	*Orthetrum sabina*	17	0,02	-3,94	-0,08		0,00
3	*Pantala flavescens*	115	0,13	-2,06	-0,26		0,02
4	*Rhodothemis rufa*	16	0,02	-4,00	-0,07		0,00
5	*Orthetrum glaucum*	8	0,01	-4,69	-0,04		0,00
6	*Rhyothemis phyllis*	3	0,00	-5,68	-0,02		0,00
7	*Agriocnemis pygmea*	10	0,01	-4,47	-0,05		0,00
8	*Ischnura senegalensis*	22	0,03	-3,68	-0,09		0,00
9	*Hipolimnas bolina*	1	0,00	-6,77	-0,01		0,00
10	*Lethe confusa*	1	0,00	-6,77	-0,01		0,00
11	*Potanthus confucius*	1	0,00	-6,77	-0,01		0,00
12	*Papilio demoleus*	2	0,00	-6,08	-0,01		0,00
13	*Eurema tominia*	2	0,00	-6,08	-0,01		0,00
14	*Appias lybthea*	5	0,01	-5,16	-0,03		0,00
15	*Pieris rapae*	1	0,00	-6,77	-0,01		0,00
16	*Junonia atlites*	4	0,00	-5,39	-0,02		0,00
17	*Theretra oldenlandiae*	2	0,00	-6,08	-0,01		0,00
18	*Spodoptera litura*	1	0,00	-6,77	-0,01		0,00
19	*Plutella xylostella*	75	0,09	-2,46	-0,21		0,01
20	*Musca domestica*	76	0,09	-2,44	-0,21		0,01
21	*Lucilia sericata*	5	0,01	-5,16	-0,03		0,00
22	*Sarcophaga Pernix*	1	0,00	-6,77	-0,01		0,00
23	*Tabanus megalops*	1	0,00	-6,77	-0,01		0,00
24	*Bactrocera carambolae*	1	0,00	-6,77	-0,01		0,00
25	*Hermatia illucens*	4	0,00	-5,39	-0,02		0,00
26	*Tolmerus atricapillus*	3	0,00	-5,68	-0,02		0,00
27	Condylostylus	97	0,11	-2,24	-0,24		0,01
28	*Atractomorpha crenulata*	21	0,02	-3,73	-0,09		0,00
29	*Oxya hyla*	8	0,01	-4,69	-0,04		0,00
30	*Valanga nigricornis*	24	0,03	-3,60	-0,10		0,00
31	*Phaneroptera falcata*	1	0,00	-6,77	-0,01		0,00
32	*Melahoplus femurrubrum*	11	0,01	-4,38	-0,06		0,00
33	*Gryllotalpa orientalis*	29	0,03	-3,41	-0,11		0,00
34	*Gryllus bimaculatus*	2	0,00	-6,08	-0,01		0,00
35	Mantis	5	0,01	-5,16	-0,03		0,00
36	*Forficula auricularia*	84	0,10	-2,34	-0,22		0,01
37	*Calais parreysii*	1	0,00	-6,77	-0,01		0,00
38	*Lilioceris lilii*	1	0,00	-6,77	-0,01		0,00
39	*Polistes humilis*	14	0,02	-4,14	-0,07		0,00
40	*Xylocopa sulcatipes*	4	0,00	-5,39	-0,02		0,00
41	Nomia	1	0,00	-6,77	-0,01		0,00

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No	Nama Genus/Spesies	Jumlah	Pi (ni/N)	Ln Pi	Pi.Ln Pi	H'	Indeks Dominansi
42	*Lasius niger*	73	0,08	-2,48	-0,21		0,01
43	*Polybia occidentalis*	1	0,00	-6,77	-0,01		0,00
44	Evaniella	2	0,00	-6,08	-0,01		0,00
45	*Pompilus cinerus*	12	0,01	-4,29	-0,06		0,00
46	*Trigona sp*	7	0,01	-4,83	-0,04		0,00
47	*Anoplolepis gracilipes*	51	0,06	-2,84	-0,17		0,00
48	*Sceliphron destillatorium*	1	0,00	-6,77	-0,01		0,00
49	*Vespa tropica*	1	0,00	-6,77	-0,01		0,00
50	*Ancistrocerus nigricornis*	1	0,00	-6,77	-0,01		0,00
51	*Apis cerana*	1	0,00	-6,77	-0,01		0,00
52	*Xylocopa latipes*	2	0,00	-6,08	-0,01		0,00
53	*Dolichoderus thoracicus*	4	0,00	-5,39	-0,02		0,00
54	*Agenioideus cinctellus*	3	0,00	-5,68	-0,02		0,00
55	*Cosmolestes picticeps*	36	0,04	-3,19	-0,13		0,00
56	*Acanthocephala femorata*	8	0,01	-4,69	-0,04		0,00
57	*Gonocerus acuteangulatus*	3	0,00	-5,68	-0,02		0,00
58	*Sehirus cinctus*	18	0,02	-3,88	-0,08		0,00
	N	912				3,12	

From the analysis of the insect diversity index, it was found that the diversity of insects was 3.12 (H'), including the category of high diversity according to the Shannon-Wiener diversity index where insect diversity >3 is a high diversity of insects. The high diversity obtained because the research area is a polyculture area is known that the availability of feed, environment, and ecosystem stability in polyculture fields is very good for breeding predatory insects and other insect pests. In the study, it was found that the population of predatory insects was very diverse so that the pest population could be controlled naturally. The diversity of insect species is important in maintaining the stability of an ecosystem. Where when in a place or land there are various kinds of diversity of insects, the food chain of an insect ecosystem will always be connected to one another. High species diversity in a place can show that the place is very complex because the interactions that occur in the ecosystem are very high [6].

The results of the analysis of the insect dominance index found that the more dominant insect was the Ordo Odonata Family Libellulidae or better known as the *Pantala flavescens* dragonfly with a population of 115 with a dominance index of 0.02 (C), with a total insect population of 912, including the low dominance category according to Simpson dominance index 0<C<0.5, including the distribution of low dominance insects. This insect is an insect that acts as an important natural enemy for agriculture, in addition to being a bioindicator of a clean

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environment. In addition, dragonflies play an important role in the food chain in agriculture. Dragonfly nymphs can eat protozoa, mosquito larvae, small crustaceans, tadpoles, small fish, water beetles, and nymphs of different species or of the same species can eat each other (cannibalism). Imago dragonflies are capable of preying on many types of insects, such as aphids, leafhoppers, stink bugs, mosquitoes, flies, butterflies so that they can benefit the world of agriculture, especially organic farming. This dragonfly is obtained by using the net method. This is because net traps are light and easy to use [7].

The most predatory insects after the dragonfly *Pantala flavescens* obtained on polyculture land of green spinach plants are insects from the Order Diptera, family Dolichopodidae or commonly referred to as long-legged green flies (Condylostylus) with the number obtained as many as 97 individuals with a dominance index of 0.01 (C) from the research that has been done. According [8], Condylostylus is known as a predator or predator at both the adult and larval stages. Adult flies prey on aphids, leafhoppers, thrips, mealybugs, and mites that are pests on spinach plants. Based on the results of research that has been done, this Condylostylus insect was obtained using a yellow trap.

The percentage of the role of insects obtained in the research area of green spinach plants is as follows:

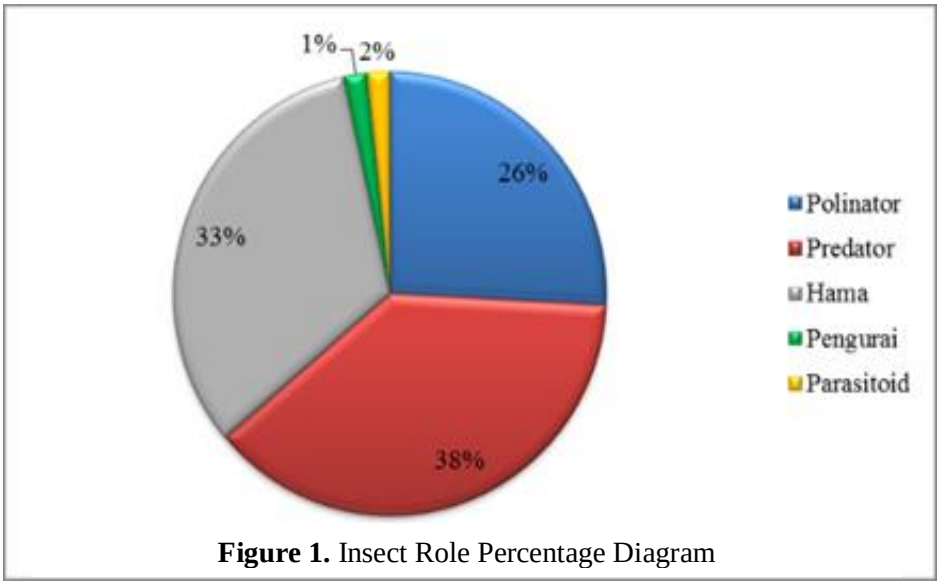

Figure 1. Insect Role Percentage Diagram

The composition of insects based on their ecological role can be seen from the percentage (%). From (Figure 1), it can be seen that the percentage value (%) of insects that act as predators is higher (38%), while insects with the lowest percentage are decomposer insects (1%) and parasitoid insects (2%).

Based on the diagram above, the high number of insects that act as predators on the green spinach polyculture area will greatly assist farmers in natural pest control actions that damage the cultivated green spinach (*Amaranthus* sp) plants. Predatory insects will prey on insect pests that will damage plants.

Predators are the most important group of living things to control the life of organisms in an

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ecosystem such as green spinach polyculture. Predators can prey on all levels of development of their prey from eggs, larvae, nymphs, pupae and imago. Predators kill their prey for their own survival. Most predators are carnivorous and some insects are omnivores or eaters. For example, if the main food available runs out, it will eat some of the plant tissue [9].

CONCLUSION

Based on the results of research on the diversity of insect species on polyculture fields of green spinach (*Amaranthu*s sp) in the Sinar Harapan Farmers Group, Tarakan City, the Diversity Index from the research that has been carried out is 3.12 (H'), the diversity of insects is included in the high diversity category according to with the Shannon-Wiener diversity index where the diversity of insects > 3 is a high diversity of insects. Based on the results of the study, insects from the Order Odonata Family Libellulidae or the dragonfly *Pantala flavescens* were dominant insects with a dominance value of 0.02 and the number of individuals obtained was 115 individuals. where this dragonfly acts as a predator. In addition, there are several other types of insects that are commonly found, such as the *Plutella xylostella* caterpillar with a total of 75, the house fly Musca domestica with a total of 76, the long-legged fly or condylostylus with a number of 97, the cocopet or *Forficula auricularia* with a total of 84 tails and garden ants or *Lasius niger* with a total of 73 tails of which these five types of insects have the same dominance value of 0.01.

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