

Diversity of Pollinator Insects in The Vegetable Plantation in Kecamatan Dolat Rayat

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Abstract. The presence of insect pollinators plays an important role in the pollination process. The purpose of this study is to analyse the diversity of insect pollinators in vegetable plantations in 3 villages at Kecamatan Dolat Rayat, Kabupaten Karo. Sampling was carried out on five types of plantation: bean plant, chayote, peas, eggplant, and chilli. At each sampling point, five plots of 1,2m x 10m were established with a spacing of 2m between the plots. Insect pollinator observation technology using sampling scan method combined with insect net. The results of the study identified 7 families of 10 species and 880 individuals. Diversity index that used is The Shannon-Weiner with $H' = \pm 1,24$ in the villages. The most prevalent order was Apidae, and the most abundant species was *Apis cerana*. The greatest variety of pollen hybrids was found on chayote plantations.

Keywords : Pollination; Fertilization; Shannon-Weiner index.

1. Introduction

A pollinator is an insect that goes about for the purpose of joining dust to the pistil [1]. Fertilization is the method involved with moving dust from the anther to the pistil (disgrace) [2]. The insects engaged with fertilization predominantly comprise of Hymenoptera (subterranean insects and honey bees), Coleoptera (beets), Lepidoptera (butterflies and moths) and Diptera (flies) [3]. These insects assist with pollinating both wild and rural blooming plants. The job of insect fertilization for people incorporates expanding agrarian creation and keeping up with normal plants [4]. Tropical plants are overwhelmingly over 90% pollinated by pollinators and 75% by insects [5]. Insect pollinators are fundamental since some plant species can't self-fertilize (self-fertilization). Fertilization happens on the grounds that pollinating insects are drawn to the plant's blossoms. The fertilization cycle starts with the pollinating insect roosting on a blossom, then, at that point, contacting the dust, and the dust sticks to the insect's feet, and as the insect moves to search out the honey quintessence of another bloom, it sticks to the insect's feet. Dust tumbles to disgrace [6].

Flowering plants contain sugar (nectar), which serves as food for pollinating insects. The presence of pollinating insects in blooming plants relies upon various factors, for example, blossom tone, bloom aroma, dust, nectar, bloom shape, blossom size, number of blossoms, and

similarity of pollinating insects with bloom attributes. impacted by natural elements [7]. Over 80% of plant species depend on insects for fertilization and transport of dust from one blossom to another [8]. Besides, this can likewise happen on the grounds that it is impacted by natural factors, for example, neighborhood temperature, stickiness, light power and wind speed [9]. The presence of pollinating insects is additionally emphatically impacted by the accessibility of blossoming plants in the biological system. Loss of blossoming plants can prompt a diminished presence of pollinating insects. The woodland harm that happens can upset communications among plants and insects. Around 95% of wiped out creatures are spineless creatures, generally insects (Myers et al. 2000). Another element that lessens pollinator insects is the abuse of pesticides to control bothers on agrarian land [10].

Kecamatan Dolat Rayat, situated in Kabupaten Karo, North Sumatra is a region that has rural land which is generally planted with vegetables. The presence of pollinating insects on rural land in Kecamatan Dolat Rayat is vital in assisting the fertilization with handling, bringing about an expansion in vegetable yield creation. The utilization of pesticides by ranchers in killing irritations on vegetable yields will actually want to lessen the number of inhabitants in pollinating insects. The consequences of the study on the utilization of pesticides on vegetable yields showed that most ranchers in Dolat Rayat Region utilized insect poisons with various medicines that surpassed the necessities. This will lessen the variety of pollinating insects on the agrarian land. In farming, fertilization of plants by insects is one of the keys to the progress of rural creation [11]. The variety of pollinating insects on rural land in Kecamatan Dolat Rayat has not been generally considered and distributed. In view of the depiction above, concentrating on the variety of pollinator insects in vegetable manors in Kecamatan Dolat Rayat is fundamental.

2. Research Methods

The examination on pollinating insects was done in three towns, Kubucolia Village, Bukit Village and Melas Village in Dolat Rayat District. The review range is resolved utilizing GPS to decide how far the perception site is from local locations. Each plot is 1.2m x 10m, the dispersing between plots is $\pm 0.5m$, and each site comprises of 5 plots. Insect perceptions were separated into his three time allotments: morning (07.00-09.00), early afternoon (10.00-12.00) and evening (13.00-15.00). Visiting insects are seen on one plant each time, so the plant utilized for perception differs relying upon the season. Perception time per plot is an hour. Until the observation is complete, and so on. Visiting insects were observed only in fine weather, and the total observation time was 15 days. Scan sampling is the method of observing insects [12]. That is, count the number of species and individual visiting insects. Insects not yet known at the time of observation were caught and identified with sweep nets. The insect identification process was performed in the Biology Laboratory of the Faculty of Mathematical Sciences at UNIMED. Identification by book "Identifikasi Serangga" [13], "Entomologi Pertanian" [14], "Kunci Determinasi Serangga" [15], serta "Taksonomi dan Bioekologi Lalat Buah Penting di Indonesia (Diptera: Tephritidae)" [16].

3. Results and Discussion

The total pollinator insects collected on pineapple plants were 734 individuals consisting of 5 families from 2 orders, namely Diptera and Hymenoptera. Order Diptera consists of 4 families namely Syrphidae, Tephritidae, Calliphoridae and Muscidae. The order Hymenoptera is Apidae.

Table 1. Total of Insect Pollinators of The Vegetable Crops

	Famili	Spesies	Time Period			Total
			07.00-09.00	10.00-12.00	13.00-15.00	
1	Syrphidae	<i>Episyrphus sp</i>	42	16	26	84
2	Calliphoridae	<i>Chrysomia megacephala</i>	4	0	0	4
		<i>Stomohina discolor</i>	6	2	2	10
3	Tephritidae	<i>Bactrocera cucurbitae</i>	5	5	8	18
		<i>Bactrocera dorsalis</i>	18	1	3	22
4	Muscidae	<i>Musca domestica</i>	51	5	4	60
5	Apidae	<i>Xylocopa irridipennis</i>	13	0	2	15
		<i>Xylocopa confuse</i>	24	2	11	37
		<i>Apis cerana</i>	400	34	50	484
Amount			563	65	106	734

The data in Table 1 show that the maximum number of pollinating insects occurred between 07.00 and 10.00 WIB with a total of 563 individuals and a total of 400 individuals dominated by bees. However, the lowest number of pollinating insects occurred between 10:00 and 12:00 WIB with a total of 65 individuals, again dominated by bees. Insects have a specific temperature range past which they kick the bucket [14]. By and large, the powerful temperature range is 15°C least, 25°C ideal, and 45°C greatest. Besides, Since insects are poikilothermic organic entities, the internal heat level of insects is emphatically impacted by the surrounding temperature, since temperature affects the physiological cycles of insects [17]. Temperature influences insects movement, dispersal, development and generation. And then, how much nectar in blossoms likewise assumes a significant part in impacting the variety of pollinating insects in nature [18]. How much nectar in blossoms is high in the first part of the day and keeps on diminishing until the night. This influences insects visits to plants. The most reduced number of pollinating insects happened somewhere in the range of 10:00 and 12:00 WIB. This might happen in light of the fact that pollinating insects action happens essentially toward the beginning of the day (07.00-09.00 WIB) and evening (13.00-15.00 WIB). Then, at that point, there is the affecting element, in particular the surrounding temperature. Somewhere in the range of 10:00 and 12:00 WIB there was a temperature climb over 33 °C, the ideal temperature limit for insects. This is reliable that articulation that pollinating insects generally visit toward the beginning of the day when the blossoms are open or the temperature is around 26°C [19]. Moreover, made sense of that the quantity of plant pollinating insects diminishes during the day contrasted with the morning [20]. The information in Table 1 likewise show an expansion in the quantity of pollinating insects between 13.00 WIB and 15.00 WIB. This might happen in light

of the fact that the air temperature around 13.00-15.00 WIB is inside the adequate temperature range for pollinating insects action, for example 28oC. This is upheld by the clarification that the satisfactory temperature conditions for insects to support life are around 15-45 °C [14]. Figure 1 shows the organization of every group of pollinator insects got in this review.

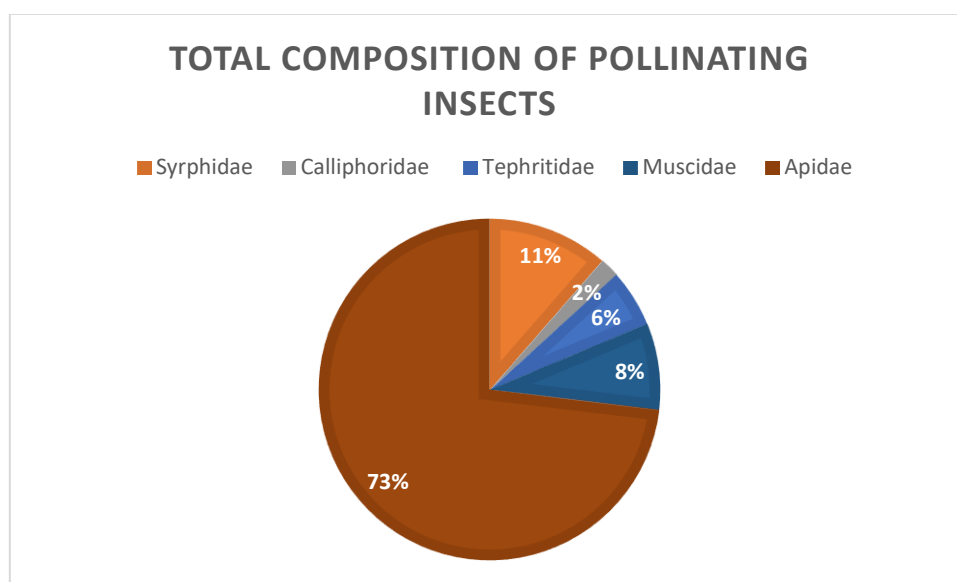


Fig. 1. Families composition of pollinating insects

It can also be seen from Table 1 and Figure 1, that there are several families of pollinator insects with little or no numbers. According to Amalia (2013), some families rest during the day in areas or areas protected from the sun's rays, i.e. shade trees and plants. This family activity time is spent in the afternoon and evening to rest and seek shelter in the treetops or shade. Abundance of pollinating insects in flowering plants such as vegetables indicates insects' interest in vegetables. Bloom thickness and blossom variety are the main factors and decide the variety of pollinating bugs in blooming plants and result in the security of the populace thickness of pollinating bugs [21]; [9]. Blooming plants will create and build the variety of pollinating bugs. Simultaneously, pollinating bugs fundamentally need two primary parts, in particular a spot to settle and the accessibility of food hotspots for these bugs. In this manner, the variety of pollinator not entirely set in stone by the accessibility of food sources in a plant, to be specific nectar and plant dust [22]. Variety or variety is a mix of the quantity of species and the quantity of people of every species locally. Issues with respect to variety for the most part lead to species variety [23]. In this way, estimation of variety should be possible by checking out at the quantity of specific species and the overall overflow of these species locally. Diversity or diversity is determined by two components, namely the number of species of organisms in a community and the number of individuals between species is the same or balanced [24]; [9]. Diversity analysis results The Shanon-Wiener index in this study is presented in Table 2.

Table 2. Diversity Index of Insect Pollination

No.	Species	Total	Pi	ln.Pi	Pi. ln Pi	H'
1	<i>Episyrphus sp</i>	84	0,114441	-2,16769	-0,24807	1,240466
2	<i>Chrysomia megacephala</i>	4	0,00545	-5,21221	-0,0284	
3	<i>Stomorhina discolor</i>	10	0,013624	-4,29592	-0,05853	
4	<i>Bactrocera cucurbitae</i>	18	0,024523	-3,70814	-0,09094	
5	<i>Bactrocera dorsalis</i>	22	0,029973	-3,50747	-0,10513	
6	<i>Musca domestica</i>	60	0,081744	-2,50416	-0,2047	
7	<i>Xylocopa irridipennis</i>	15	0,020436	-3,89046	-0,07951	
8	<i>Xylocopa confuse</i>	37	0,050409	-2,98759	-0,1506	
9	<i>Apis cerana</i>	484	0,659401	-0,41642	-0,27459	
	Total	734				

Based on Shannon-Wiener Diversity Index calculations (Table 2), exhibition of pollinating insects at a vegetable crops in Kecamatan Dolat Rayat Moderate diversity, i.e. $H' = 1.240$. The degree of biodiversity is classified as moderate $1 < H' < 3$ [25]. Various pollinating insects are conserved. Probably because it is affected by several factors such as number and color of flowers to vegetable crops. The number and color of flowers is plant species are determinants of the presence of pollinating insects [18]. Diversity of pollinating insects is related to resource abundance Pollen and nectar contained in plants, especially the plants themselves. [26] Biodiversity can be used to assess status Communities and diversity when the number of species of organisms is large Even one area is big.

4 Conclusion

As a result, it was found that there are 734 vegetable pollinating insects consisting of 2 orders and 5 families of Diptera and Hymenoptera. The highest number of pollinators was between 07:00 and 10:00 WIB and the lowest between 11:00 and 14:00 WIB. Kecamatan Dolat Rayat, Kabupaten Karo the highest diversity category of pollinator insects in vegetable crops is moderate ($H' = 1.24$).

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