

Study of Arthropods on *Ageratum Conyzoides* and *Synedrella Nodiflora* as E-Catalog Media

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ABSTRACT

The agricultural area in Wringinpitu Village is an agriculture with a variety of plants including rice, corn, sugar cane, and others, to reduce pests in the agricultural area, natural enemies can be used in the form of predators and parasitoids so that farmers allow wild plants to live and grow around the rice fields. Some of the dominant wild plants are *Ageratum conyzoides* and *Synedrella nodiflora* plants. This study aims to (1) determine the types of arthropods found in *Ageratum conyzoides* and *Synedrella nodiflora*, (2) Knowing and understand the temporal distribution of daily Arthropod visits on *Ageratum conyzoides* and *Synedrella nodiflora*, and (3) Produce e-catalog media from the study of daily visits of Arthropods on *Ageratum conyzoides* and *Synedrella nodiflora* plants. This research is a type of descriptive quantitative, using visual control method. Arthropods were observed at 06.00-07.00 and 16.00-17.00 with 3 replications presented in graphic form and then interpreted descriptively. The results of research on *Ageratum conyzoides* and *Synedrella nodiflora* plants have found 11 families consisting of Coccinellidae, Carabidae, Formicidae, Papilionidae, Nabidae, Tephritidae, Stryphidae, Oxyophidae, Grillidae, Asilidae, and Acrididae. The results of the highest temporal distribution in *Ageratum conyzoides* were 4 families of Coccinellidae in the morning, while in *Synedrella nodiflora* there were 3 families of Carabidae in the afternoon. In the form of photo, documentation was used as electronic catalog media using wordpress containing refugia plants of *Ageratum conyzoides* and *Synedrella nodiflora* species, distribution of daily visits Arthropoda and photo documentation of Arthropoda.

Keywords: *Ageratum Conyzoides*; Arthropods; E-Catalog; *Synedrella Nodiflora*.

INTRODUCTION

Refugia can provide shelter spatially or temporally for natural enemies of pests such as predators and parasitoids, as well as support components of biotic interactions in ecosystems such as pollinators (Ilhamiyah et al. 2020). Various types of pests belong to the phylum Arthropoda. Arthropoda conservation so that the ecosystem remains balanced, maintained, and as a form of natural pest control without using pesticides on rice plants in the presence of wild plants in agricultural areas. In Indonesia, areas where there are many wild plants or refugia plants, including the agricultural area in Wringinpitu Village, is an agriculture with a diversity of plants including rice, corn, sugar cane, and others, to reduce pests in the agricultural area, natural enemies can be used in the form of predators and parasitoids so that farmers let wild plants live and grow around the rice fields. One of the dominant wild plants is *Ageratum conyzoides* (Figure 1a) and *Synedrella nodiflora* (Figure 1b).

Bandotan plant (*Ageratum conyzoides* Linn.) is known as a wild plant originating from the Asteraceae family and has various biological and pharmacological activities (Yunistia, D.C. & Soraya, R. M. 2018). while *Synedrella nodiflora* (L.) Gaertn (Asteraceae) is a medicinal plant that contains bioactive components such as flavonoids, alkaloids, tannins, and others, and is used to treat various diseases and the leaves are consumed as vegetables and feed for certain livestock (Adjibode, et al. 2015). According to Utami & Murningsih (2018), the plant species *Synedrella nodiflora* was also found with a large number of individuals.



Figure 1. a. *Ageratum conyzoides*, b. *Synedrella nodiflora*

Based on the results of interviews with farmers around the rice fields in Wringinpitu Village, the use of wild plants has been maximized by these farmers, but there are several obstacles, namely the hot weather this month makes some wild plants dry up and even die. Not only that, but farmers also do not know about *Ageratum conyzoides* and *Synedrella nodiflora* plants and how Arthropods can be found, and what are the factors in these areas so that further research and observations need to be carried out.

Plants that function as micro-habitats from natural enemy insects and attractor plant pests are called Refugia (Kurniawati, 2011). The existence of refugia plants also supports the life of natural enemy insects, there are at least six types of plants that can increase the resilience of predatory insects (Laubertie et al. 2012). According to Wardana, R. et al. (2017) refugia plants that are commonly planted tend to have striking colors and have a distinctive aroma, this is the reason why insects prefer the color of the flower because color affects the insect's vision spectrum. The existence of Arthropods can benefit farmers in balancing the ecosystem, so it is important to maintain it by reducing the use of pesticides on crops, one of which can be done by maintaining or protecting the arthropod population in agricultural areas (Wulandari & Kamilah, 2021).

Research conducted by Intan, et al. (2016) showed that the temporal distribution of arthropods in *Portulaca oleracea* L. showed that the average daily visit at 12.00-13.00 WIB was higher than the daily visit at 07.00-08.00 WIB and 16.00-17.00 WIB. These results can be used as a basis for consideration to determine the most appropriate time for Integrated Pest Management (IPM) on tomato farms. An agricultural system that develops environmentally-based pest control techniques, one of which is by utilizing refugia plants which are expected to maintain the sustainability of agroecosystems in the field, by adhering to the principle of Integrated Pest Management (IPM) (Wulandari & Tamam, 2021). Wild plants can attract Arthropods as their habitat utilization. Arthropods have different temporal distributions. The rhythm in insects is called the biological clock (Purwanti, 2011), insects have daily activities that follow the biological clock which shows the activity of organisms at certain times and zones (Wulandari, 2016).

The temporal distribution of arthropods can be used as a basis for implementing integrated pest control (IPM). Through the biological clock, it is possible to determine the activities carried out by Arthropods, it is necessary to research "study of arthropods on *Ageratum conyzoides* and *Synedrella nodiflora* as e-catalog media" to know how and when Arthropods visit plants. refugia. The results of the research will be used as media in the form of an e-catalog.

METHOD

The research was conducted in Wringinpitu Village, Mojowarno District, Jombang Regency, carried out in July 2021. This research is a type of descriptive research through a quantitative approach. Before making observations, field surveys and interviews with farmers in the Wringinpitu Village area, then determined the refugia plants and carried out observation exercises using visual control methods and capture simulations and identified types of arthropods. Determination of observed plants using the roaming method by determining 1 plot of *Ageratum conyzoides* and *Synedrella nodiflora* plants.

The tools used for this research are cellphone cameras, stationery and notebooks. Supporting this research are scientific journals on arthropods, refugia plants and catalogs. The method used in the observation is a modification of the "visual control" method developed by Frei and Manhart (1992) in (Wulandari, 2016). The visual control method is a method of remote observation between the observed plant and the observer as far as 2 meters and is carried out within a certain time by observing directly the insects that visit the refugia plant.

The study population was all Arthropod populations found in *Ageratum conyzoides* and *Synedrella*

nodiflora plants. While the sample in this study were Arthropods who visited during the observation time on *Ageratum conyzoides* and *Synedrella nodiflora* plants. The data collection technique was carried out by the visual control method at a distance of two meters by performing at one point of the sample that had been used as a sampling site for *Ageratum conyzoides* and *Synedrella nodiflora* plants, the time of data collection was carried out at 06.00-07.00 and 16.00-17.00 for three replications in each plant. The data is then entered into the table that has been created. Data related to the composition and daily visits of Arthropods on wild plants *Ageratum conyzoides* and *Synedrella nodiflora* was carried out by making temporal distribution data of daily visits of Arthropods on wild plants *Ageratum conyzoides* and *Synedrella nodiflora* presented in graphic form and then interpreted descriptively.

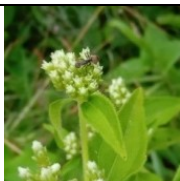




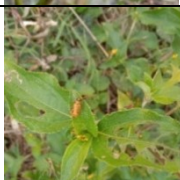
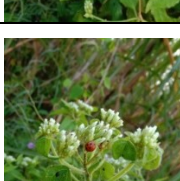
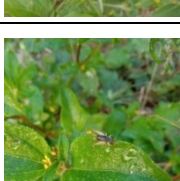
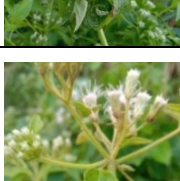

RESULT AND DISCUSSION





Study of arthropods on *Ageratum conyzoides* and *Synedrella nodiflora* as e-catalog media in the agricultural area of Wringinpitu Village includes research on visits of Arthropoda species, determining the temporal distribution of Arthropoda daily visits, then the research will be developed as an e-catalog media

Result

Based on the results of research conducted on *Ageratum conyzoides* and *Synedrella nodiflora* plants, various types of arthropods have been found in the agricultural area of Wringinpitu Village, Mojowarno District including 8 families found in *Ageratum conyzoides* plants, namely Formicidae, Oxyopidae, Carabidae, Coccinellidae, Tephritidae, Papilionidae, Nabidae, and Syrphidae. The 6 families found in *Synedrella nodiflora* include Formicidae, Oxyopidae, Carabidae, Gryllidae, Asilidae, and Acrididae, can be seen in Table 1.

Table 1. Types of Arthropods that Visit the Wild Plants *Ageratum conyzoides* and *Synedrella nodiflora*

Refugia Plant	Family	Photo	Refugia Plant	Family	Photo
<i>Ageratum conyzoides</i>	Formicidae		<i>Synedrella nodiflora</i>	Formicidae	
	Oxyopidae			Oxyopidae	
	Carabidae			Carabidae	
	Coccinellidae			Gryllidae	
	Tephritidae			Asilidae	

Refugia Plant	Family	Photo	Refugia Plant	Family	Photo
	Papilionidae			Acrididae	
	Nabidae			-	-
	Syrphidae			-	-

The temporal distribution of Arthropods has different results so that their daily visits to *Ageratum conyzoides* and *Synedrella nodiflora* plants fluctuate every time. The following is data from observations of the temporal distribution of daily visits of Arthropods on *Ageratum conyzoides* and *Synedrella nodiflora* plants, presented in Table 2.

Table 2. Temporal Distribution in *Ageratum conyzoides* and *Synedrella nodiflora* Plants

Famili	Waktu	Rata-rata	
		<i>Ageratum conyzoides</i>	<i>Synedrella nodiflora</i>
Coccinellidae	06.00-07.00	3	0
	16.00-17.00	1,5	0
Carabidae	06.00-07.00	0,5	0,5
	16.00-17.00	0	1,5
Tephritidae	06.00-07.00	0	0
	16.00-17.00	0,5	0
Oxyopidae	06.00-07.00	0	0,5
	16.00-17.00	0,5	0,5
Papilionidae	06.00-07.00	0,5	0
	16.00-17.00	0	0
Nabidae	06.00-07.00	0,5	0
	16.00-17.00	0,5	0
Formicidae	06.00-07.00	0,5	0
	16.00-17.00	0,5	0,5
Syrhipidae	06.00-07.00	0	0
	16.00-17.00	0,5	0
Grillydae	06.00-07.00	0	0,5
	16.00-17.00	0	0
Acrididae	06.00-07.00	0	0,5
	16.00-17.00	0	0
Asilidae	06.00-07.00	0	0,5
	16.00-17.00	0	0

Based on table 2 the average Arthropoda visits are 06.00-07.00 and 16.00-17.00 on *Ageratum conyzoides* plants including Coccinellidae 3 in the morning and 1.5 in the afternoon, Carabidae 0.5 in the morning, Formicidae 0.5 in the morning and 0.5 in the afternoon, Papilionidae 0.5 in the morning, Nabidae 0.5 in the morning and 0.5 in the afternoon, Tephritidae 0.5 in the afternoon, Sryphidae 0.5 in the afternoon and Oxyophidae 0.5 in the afternoon. The family that has the highest distribution average is

Coccinellidae 3 in the morning and 1.5 in the afternoon. Meanwhile, Arthropod visits at 06.00-07.00 and 16.00-17.00 on *Synedrella nodiflora* plants include Formicidae 0.5 in the afternoon Grillidae 0.5 in the morning, Asilidae 0.5 in the morning, Acrididae 0.5 in the morning, Carabidae 0.5 in the morning and 1.5 in the afternoon, Oxyopidae 0.5 in the morning and 0.5 in the afternoon. The family that has the highest distribution average is Carabidae 1.5 in the afternoon and 0.5 in the morning.

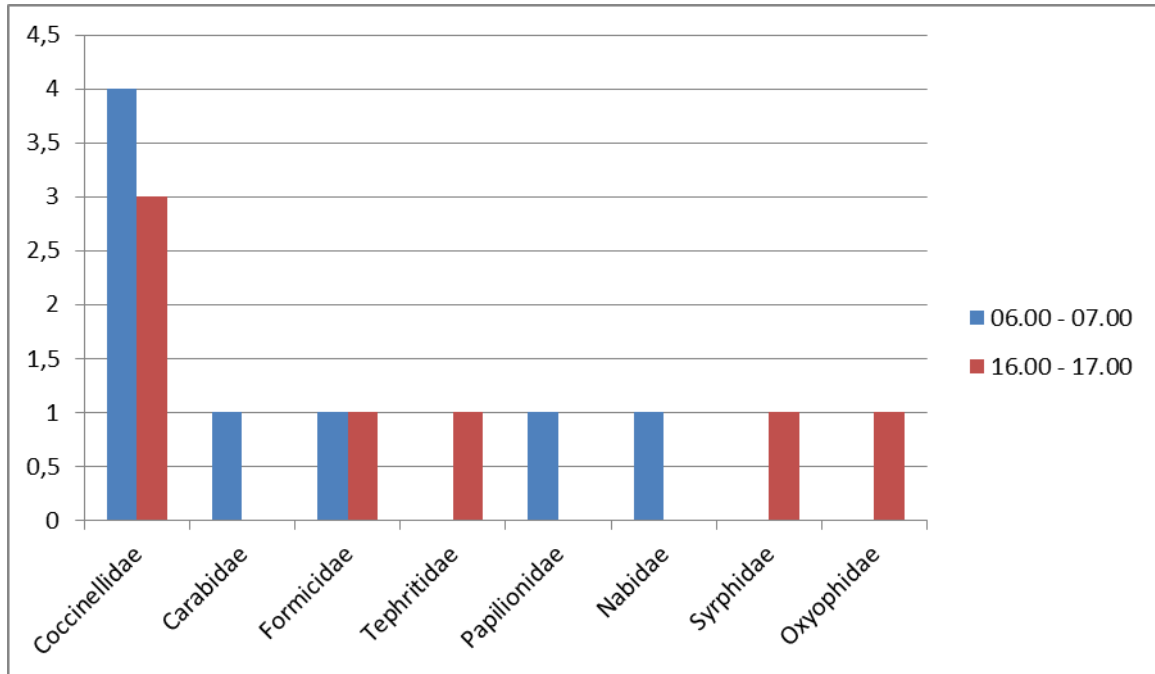


Figure 2 Temporal Distribution of *Ageratum conyzoides* plants based on period and family

Based on Figure 2 the number of results obtained from data collection on *Ageratum conyzoides* plants in the morning were 4 Coccinellidae, 1 Carabidae, 1 Formicidae, 1 Papilionidae, and 1 Nabidae. While in the afternoon there were 3 Coccinellidae, 1 Formicidae, 1 Tephritidae, 1 Stryphidae, 1 Oxyphidae. The family that has the highest number of distributions is Coccinellidae, both in the morning there are 4 birds and in the afternoon there are 3 Arthropods.

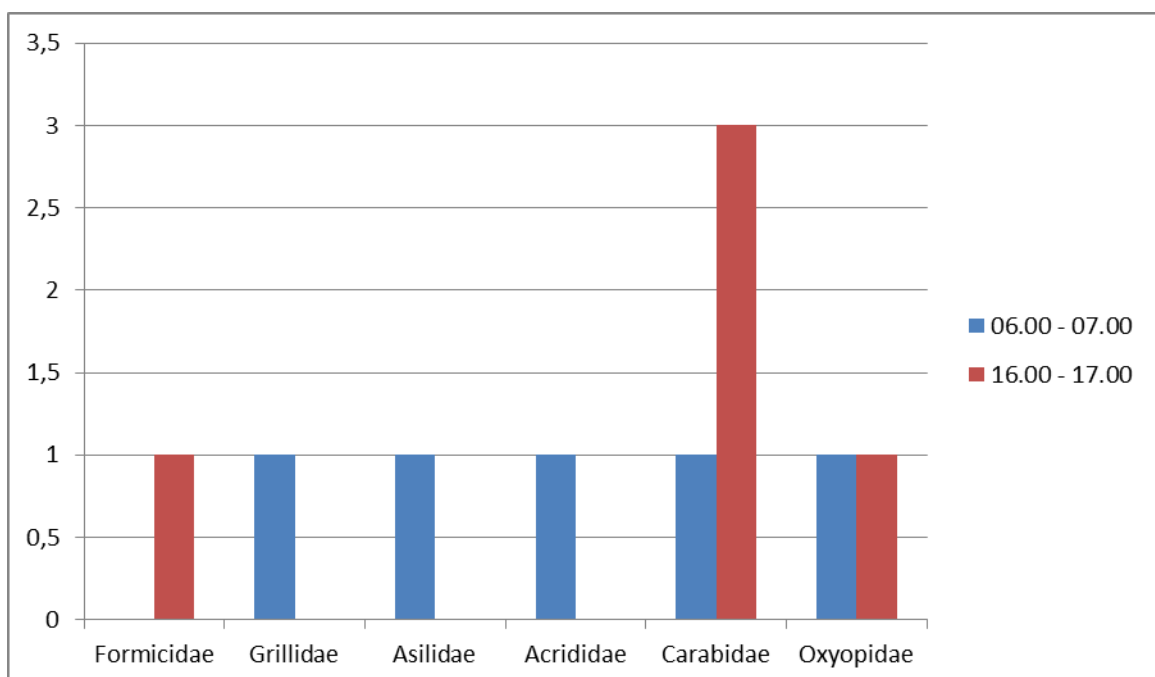


Figure 3 Temporal Distribution of *Synedrella nodiflora* plants based on period and family

Based on Figure 3 the number of results obtained from data collection on *Synedrella nodiflora* plants in the morning was 1 Grillidae, 1 Asilidae, 1 Acrididae, 1 Carabidae, 1 Oxyopidae. While in the afternoon there was 1 Formicidae, 3 Carabidae, 1 Oxyopidae. The family with the highest distribution was Carabidae with 3 individuals in the afternoon, while in the morning 1 Arthropod was found.

The results of the study of Arthropod daily visits to *Ageratum conyzoides* and *Synedrella nodiflora* in the agricultural area of Wringinpitu Village, Mojowarno District, the documentation will be used as an e-catalog media using WordPress in the form of a catalog display that provides information about daily visits of Arthropod to *Ageratum conyzoides* and *Synedrella nodiflora* plants. The following is an application link and an Arthropod e-catalog display <https://ekatalogarthropoda.wordpress.com/2021/12/09/studi-kunjungan-harian-arthropoda-pada-tanaman-ageratum-conyzoides-dan-synedrella-nodiflora-di-area-pertanian-desa-wringinpitu-kecamatan-mojowarno/>

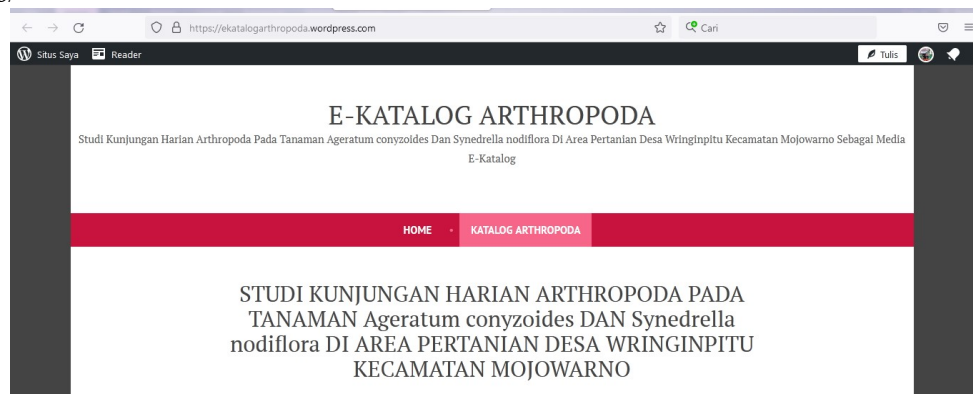


Figure 4 Arthropod main page display via WordPress

The E-catalog designed using WordPress contains the types of refugia on *Ageratum conyzoides* and *Synedrella nodiflora* plants, distribution of daily Arthropoda visits, and documentation of Arthropoda visits on *Ageratum conyzoides* and *Synedrella nodiflora* plants.

Discussion

The results of research on Arthropod visits on *Ageratum conyzoides* and *Synedrella nodiflora* in the agricultural area of Wringinpitu Village, Mojowarno District, including 8 families found on *Ageratum conyzoides* plants, namely Formicidae, Oxyopidae, Carabidae, Coccinellidae, Tephritidae, Papilionidae, Nabidae, and Syrphidae. The 6 families found in *Synedrella nodiflora* include Formicidae, Oxyopidae, Carabidae, Grillidae, Asilidae, and Acrididae. Arthropods that are often encountered come from the class insects. Insects are the most abundant group of organisms on earth, which is about 66% of all animal species (Zhang, 2011). According to Jankielsohn (2018) Insects have the widest habitat distribution in the world, therefore insects play an important role in ecosystems and food chain trophics. In agriculture, the role of insects is very much needed in the process of pollination, decomposition, and biological control, the number of insect pests is only less than 0.5% of the total number of known insect species, but can cause damage to up to 18% of world agricultural production. According to Hamid (in Nelly & Yaherwandi, 2015) that the diversity and abundance of insects in general in a habitat is not only determined by their ability to reproduce but also by the available resources, one of which is prey or host. In addition, it is influenced by the temperature in the agricultural area, according to Rahmawati (2004) the range of air temperature in the soil mesofauna, including insects, is between 29.6°C to 32.1°C. The weather in this area is very hot during the day so that farmers are not maximal in their efforts to utilize refugia plants around their agricultural areas from pests and the like. This affects the temporal distribution of Arthropods and the number of Arthropoda species that visit the refugia plants in the area.

The temporal distribution of arthropods on *Ageratum conyzoides* and *Synedrella nodiflora* plants had different visiting times, the number of *Ageratum conyzoides* plants in the morning was 4 Coccinellidae, 1 Carabidae, 1 Formicidae, 1 Papilionidae, and 1 Nabidae. While in the afternoon there were 3 Coccinellidae, 1 Formicidae, 1 Tephritidae, 1 Syrphidae, 1 Oxyphidae. The highest temporal distribution of visits based on number was Coccinellidae, with an average of 4 in the morning 3 and 3 in the afternoon with an average of 1.5. According to (Yaherwandi, 2005) the cause of the high level of

diversity of Coccinellidae predators in a habitat is determined by various factors such as bioecology, environmental conditions, and ecosystem management. Febriani, et al. (2021) research shows the temporal distribution of the Coccinellidae family which acts as a natural enemy in *Heliotropium indicum* plants in Ploso and Plandaan district found in the morning, afternoon and evening. Based on research conducted by Kahono (2010), the javelin beetle species from *Henosepilachna vigintioctopunctata* were found on five types of hosts, namely Takokak, Leunca, Tomato, Eggplant, and Amethyst. The *Henosepilachna pusillanima* beetle was found to eat the leaves of the Belustru vegetable plant and Cucumber fruit. The javelin beetle *Henosepilachna pusillanima* eats leaves on this plant as in general, the javelin beetle feeds on the leaves of the family of Cucurbitaceae, which damages the leaves with a typical type of damage, making circular cut lines. which cut the leaf veins in curved lines to keep the leaf defense fluids from entering the leaf areas where the beetles are feeding.

While the number of *Synedrella nodiflora* plants in the morning was 1 Grillidae, 1 Asilidae, 1 Acrididae, 1 Carabidae, 1 Oxyopidae. While in the afternoon there was 1 Formicidae, 3 Carabidae, 1 Cxypidae. The highest temporal distribution of visits based on the number was Carabidae, with 1 in the morning an average of 0.5 and 3 in the afternoon with an average of 1.5. Beetles are insects of the order Coleoptera that have high and abundant diversity, besides that they play an important role in ecosystem function (Schowalter, 2011). In addition, beetles also play many roles as scavengers and decomposers in the process of breaking down organic matter both on the soil surface and in the soil (Price et al, 2011).

Based on the results of research on daily visits to Arthropods on *Ageratum conyzoides* and *Synedrella nodiflora* in the agricultural area of Wringinpitu Village, the photo documentation of the arthropods will be used as an electronic catalog media using WordPress. According to Kurnia, et al (2018) WordPress is an open-source application that is very popularly used as a blog engine. WordPress is built with the PHP programming language and MySQL database. PHP and MySQL, both are open-source software. Meanwhile, according to Lidar (2021), what is interesting about WordPress is that it is open-source software. This means that WordPress can be used for free and is free to be modified by anyone. In addition, WordPress provides plugins that make it easy for users to add features to the website with just one click. WordPress Is The Most Popular CMS. Easy to use, complete features, and of course free, make WordPress a favorite website maker in the world. WordPress CMS is the platform behind the creation of 30 percent of websites worldwide and makes it the most popular of all CMS.

CONCLUSION

The following are some conclusions drawn from the research that has been done, including: (1) Study of daily visits of Arthropods on *Ageratum conyzoides* and *Synedrella nodiflora* in the agricultural area of Wringinpitu Village has found 11 families consisting of Coccinellidae, Carabidae, Formicidae, Papilionidae, Nabidae, Tephritidae, Stryphidae, Oxyophidae, Grillidae, Asilidae, and Acrididae, (2) Based on the count and the average temporal distribution of Arthropoda visits the *Ageratum conyzoides* plants including Coccinellidae 4 tails 3 in the morning and 3 tails 1.5 in the afternoon, Carabidae 1 tail 0.5 in the morning, Tephritidae 1 tail 0.5 in the afternoon, 1 Oxyophidae 0.5 in the afternoon, 1 Papilionidae 0.5 in the morning, 1 Nabidae 0.5 in the morning and evening, 1 Formicidae 0.5 in the morning and evening and 1 Stryphidae 0.5 in the afternoon. Meanwhile, based on the calculation of the number and average temporal distribution of Arthropoda visits on *Synedrella nodiflora* plants, including 3 Carabidae 1.5 in the afternoon, Oxyophidae 1 tail 0.5 in the morning and evening, Formicidae 1 tail 0.5 in the afternoon, Grillidae 1 tail 0,5 in the morning, Asilidae 1 tail 0,5 in the morning, and 1 Acrididae 0.5 in the morning. The overall temporal distribution is mostly from the Coccinellidae family, (3) The results of research on daily visits of Arthropod to *Ageratum conyzoides* and *Synedrella nodiflora* in the form of photo documentation will be used as an e-catalog media using WordPress containing refugia plants of *Ageratum conyzoides* and *Synedrella nodiflora* species, distribution of daily visits Arthropod and photo documentation of Arthropod.

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