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Bird Species in the Agroforestry Areas of Karang Intan District, Banjar Regency, Indonesia

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Abstract: Data on birds in agroforestry areas of South Kalimantan are not yet available. The purpose of the study was to analyze bird species that use agroforestry areas as habitats. The sample locations are the agroforestry areas of Kiram Village, Biih Village, and Pulau Nyiur Village, Karang Intan District, Banjar Regency. Diurnal bird species were observed and individuals were counted at 07.00-10.00 and 15.00-18.00 with five replications and the point count method in October 2021. Only a point count was placed in each village. Observational aids are binoculars and a prosumer camera. Twenty-five bird species were found in all agroforestry areas of Karang Intan District. Species and individual birds spread differently at each sample location. The index of bird species diversity from the highest to the lowest is the agroforestry area of Pulau Nyiur (2.63), Biih (2.47), and Kiram (2.43). Although the community similarity index differs between calculations based on the number of species and based on the number of individuals, the order of similarity from highest to lowest is the same, namely Kiram-Biih, Kiram-Pulau Nyiur, and Biih-Pulau Nyiur. Because it is also a suitable habitat for protected or threatened birds, agroforestry areas can be maintained and even improved as natural conservation areas

Keywords: agroforestry; bird; conservation; diversity; similarity

Abstrak: Data mengenai burung di area agroforestri Kalimantan Selatan belum tersedia. Tujuan penelitian adalah menganalisis spesies burung yang menggunakan area agroforestri sebagai habitat. Lokasi sampel adalah area agroforestri Desa Kiram, Desa Biih, dan Desa Pulau Nyiur, Kecamatan Karang Intan, Kabupaten Banjar. Spesies burung diurnal diamati dan individunya dihitung pada jam 07.00-10.00 dan 15.00-18.00 dengan lima kali ulangan dan metode point count (titik hitung) pada bulan Oktober 2021. Hanya satu titik hitung ditempatkan pada setiap desa. Alat bantu pengamatan adalah teropong dan kamera prosumer. Dua puluh lima spesies burung ditemukan di seluruh area agroforestri Kecamatan Karang Intan. Spesies dan individu burung menyebar berbeda di setiap lokasi sampel. Indeks keragaman spesies burung mulai dari tertinggi hingga terendah adalah area agroforestri Pulau Nyiur (2,63), Biih (2,47), dan Kiram (2,43). Walaupun indeks kemiripan komunitas berbeda antara perhitungan berdasarkan pada jumlah spesies dan berdasarkan pada jumlah individu, urutan kemiripan mulai dari tertinggi hingga terendah sama, yaitu Kiram-Biih, Kiram-Pulau Nyiur, dan Biih-Pulau Nyiur. Karena juga merupakan habitat sesuai bagi burung lindungan atau hampir terancam, area agroforestri dapat dipertahankan bahkan kualitasnya ditingkatkan sebagai kawasan pelestarian alami.

Kata Kunci: agroforestri; burung; kemiripan; keragaman; konservasi

INTRODUCTION

Agroforestry or *wanatani* is a cropping system that combines forestry crops with agricultural crops. The system developed in many countries is doubly beneficial because it preserves natural plants (forests) and cultivated plants and protects physical resources from serious damage. This system is a solution for dealing with critical land due to conflicts of interest between producing food and protecting the environment (Budiadi, Suryanto, and Sabarnuridin, 2012) as well as supporting sustainable agriculture that functions economically, ecologically, as well as socially (Suek and Mella, 2021).

South Kalimantan, the province with the smallest area in Kalimantan has an area, both dry land and wet land that is managed with an agroforestry system. One that is traditionally developed by the community, in this case the Banjarese ethnicity, is the *dukuh* or fruit island (Hafizianor and Iswahyudi, 2016). In the *dukuh* there are various species of fruit plants, such as durian (*Durio zibethinus*), langsung (*Lansium domesticum*), and rambutan (*Nephelium*

lappaceum) as well as empon-empon plants, such as turmeric (*Curcuma longa*), kencur (*Kaempferia galanga*), and galangal (*Alpinia galanga*) planted and can be found.

In addition to plants, other resources found in agroforestry areas are animals. Of the eighteen species of animals found in agroforestry areas (Diniyati, 2015), birds are interesting to study. These animals are easy to find, but until now data on birds in agroforestry areas of South Kalimantan is not yet available. The research aims to record bird species that use agroforestry areas as habitats and analyze the presence of birds in the area.

METHODS

The research locations are agroforestry areas in Karang Intan District, Banjar Regency, South Kalimantan. The sample locations are areas in Kiram Village, Bih Village, and Pulau Nyiur Village. The area was chosen because based on the map it looks close and in the field it is included in the definition of agroforestry. The distribution of the locations is presented in Figure 1.

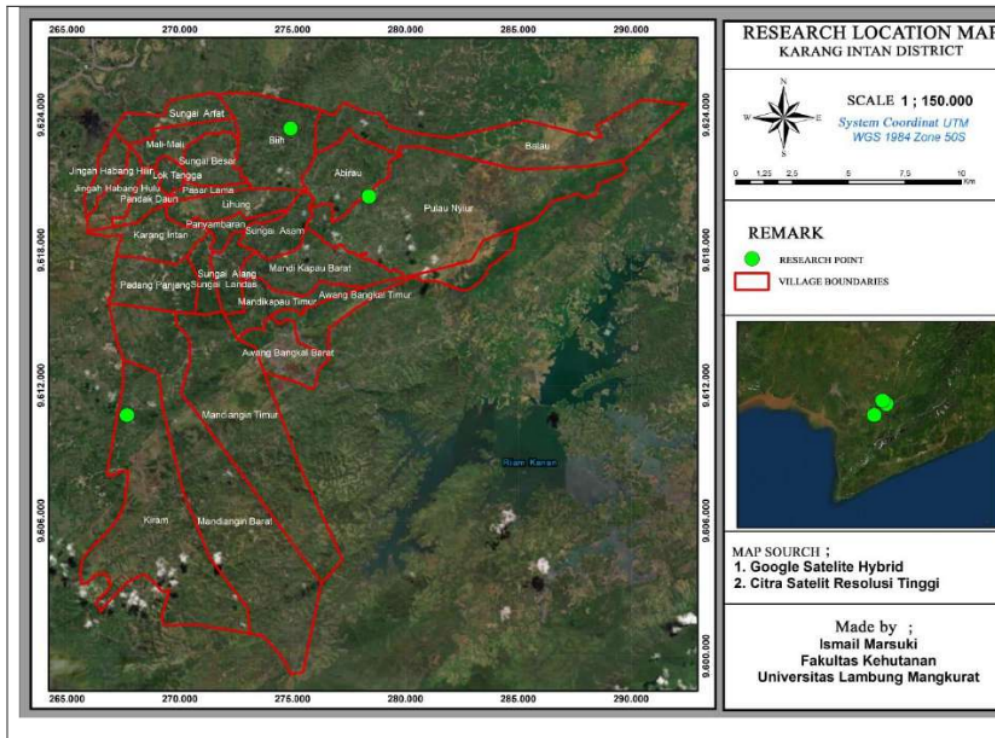


Figure 1. Distribution of observation locations in Karang Intan Sub-district, Banjar Regency

Diurnal bird species were observed and individuals were counted at 07.00-10.00 and 15.00-18.00 in five replicates and by the point count method in October 2022. Only a point count was placed in each village. The assumption is that the structure and composition of plants in the agroforestry area is relatively the same. Observational aids are binoculars and a prosumer camera. Bird species were identified based on (MacKinnon, Phillipps, and van Balen, 2010; Soendjoto et al., 2015a, 2019).

Data analysis begins by adding up the number of individuals in five replications. The number of species and the number of individuals were used to obtain the Shannon-Wiener diversity index and the community similarity index. The status of bird protection is determined based on Permen LHK No. P.106/2018, while its conservation status is based on IUCN (2022).

1. The formula for the Shannon-Wiener diversity index is

$$H' = - \sum \left(\frac{n}{N} \right) \ln \left(\frac{n}{N} \right)$$

In this case, H' = index of species diversity, n = number of individuals per species, N = number of individuals of all species, and \ln = natural logarithm.

2. The formula for the community similarity index is

$$IS = \frac{2a}{2a + b + c}$$

In this case, IS = similarity index, a = number of species found, both in community A and B at the same time, b = number of species found only in community A, c = number of species found only in community B. If the calculation is based on the number of species, IS calculated according to the above formula. However, if the calculation is based on the number of individuals, IS is calculated without including the constant 2.

RESULTS AND DISCUSSION

Species Richness

Twenty-five bird species were found in all agroforestry areas of Karang Intan District, but with different distributions in each sample location (Table 1). In Pulau Nyiur Village, the number of bird species found was higher than that found in Biih Village. The next one in Biih Village is higher than the number of bird species in Kiram Village.

Table 1. Species names and number of individuals observed in five replicates in agroforestry areas

No	Family/Scientific nama	Indonesian name	Common name	Kiram	Biih	Pulau Nyiur	Status	
							P.106	IUCN
A Acanthizidae								
1	<i>Gerygone sulphurea</i>	Remetek laut	Golden-bellied Gerygone	40	54	38	TL	LC
B Alcedinidae								
2	<i>Todiramphus chloris</i>	Cekakak sungai	Collared Kingfisher	2	-	6	TL	LC
C Chloropseidae								
3	<i>Aegithina viridissima</i>	Cipoh jantung	Green Iora	-	5	5	TL	NT
D Cisticolidae								
4	<i>Orthotomus ruficeps</i>	Cinenen kelabu	Ashy Tailorbird	22	27	15	TL	LC
5	<i>Orthotomus sericeus</i>	Cinenen merah	Rufous-tailed Tailorbird	45	58	48	TL	LC
6	<i>Prinia flaviventris</i>	Prenjak rawa	Yellow-bellied Prinia	1	-	-	TL	LC
E Cuculidae								
7	<i>Cacomantis merulines</i>	Wiwik kelabu	Plaintive Cuckoo	8	26	14	TL	LC
8	<i>Centropus bengalensis</i>	Bubut alang-alang	Lesser Coucal	29	37	26	TL	LC
F Dicaeidae								
9	<i>Dicaeum trochileum</i>	Cabai jawa	Scarlet-headed Flowerpecker	-	-	2	TL	LC
G Estrildidae								
10	<i>Lonchura fuscans</i>	Bondol kalimantan	Dusky Munia	-	1	-	TL	LC
H Hemiprocnidae								
11	<i>Hemiprocne longipennis</i>	Tepekong jambul	Grey-rumped Treeswift	-	-	1	TL	LC
I Megalaimidae								
12	<i>Psilopogon mystacophanos</i>	Takur warna-warni	Red-throated Barbet	6	11	8	DL	NT
J Nectariniidae								
13	<i>Aethopyga siparaja</i>	Burung-madu sepah raja	Crimson Sunbird	-	-	2	DL	LC
14	<i>Anthreptes malacensis</i>	Burung-madu kelapa	Brown-throated Sunbird	19	26	26	TL	LC
15	<i>Cinnyris jugularis</i>	Burung-madu sriganti	Olive-backed Sunbird	-	-	2	TL	LC
K Passeridae								
16	<i>Passer montanus</i>	Burung gereja	Eurasian Tree Sparrow	7	12	7	TL	LC
L Picidae								
17	<i>Picoides moluccensis</i>	Caladi tilik	Sunda Pygmy Woodpecker	-	-	22	TL	LC

18	<i>Sasia abnormis</i>	Tukik tikus	Rufous Piculet	-	1	-	TL	LC
M Pittidae								
19	<i>Pitta sordida</i>	Paok hijau	Western Hooded Pitta	27	40	-	DL	LC
N Pycnonotidae								
20	<i>Pycnonotus aurigastes</i>	Cucak kutilang	Sooty-headed Bulbul	8	22	48	TL	LC
O Rallidae								
21	<i>Amaurornis phoenicurus</i>	Kareo padi	White-brested Waterhen	24	-	15	TL	LC
P Rhipiduridae								
22	<i>Rhipidura javanica</i>	Kipasan belang	Sunda Pied Fantail	44	55	40	DL	LC
Q Timaliidae								
23	<i>Macronous gularis</i>	Ciung air coreng	Pin-striped Tit-babbler	19	32	12	TL	LC
24	<i>Malacocincla sepiaria</i>	Pelanduk semak	Horsfield's Barbbler	-	1	-	TL	LC
R Vangidae								
25	<i>Hemipus hirundinaceus</i>	Jingjing batu	Black-winged Flycatcher-shrike	-	2	12	TL	LC
				Number of species (S)	15	17	20	-
				Number of individuals (N)	301	410	349	-
				Diversity Indeks (H')	2.43	2.47	2.63	-

Note:

- Status of protection (based on Permen LHK P.106/2018); TL: Unprotected, DL: Protected
- Conservation status (IUCN, 2022); LC: Least Concern (low risk), NT: Near Threatened

This number is the same as the number of bird species in the agroforestry area within the buffer zone of the Minas Grand Forest Park, Riau Province (Hutapea, Suwarno, and Hadinoto, 2019). However, when compared to the numbers in the agroforestry areas of Ilengi, Gorontalo (8 species) (Hiola and Bachtiar, 2018) and Rowo Bayu, Banyuwangi, East Java (11 species) (El-Arif et al., 2016), the number of bird species in Karang Intan District is higher. On the other hand, this number of species is actually lower than the number of species in the following locations. In the agroforestry area around the Paliyan Wildlife Sanctuary, Gunung Kidul Regency, Yogyakarta, 26 species were found (Pudyatmoko, 2008), in Putussibau District, Kapuas Hulu Regency, West Kalimantan 27 species (Normagiat, 2021), and even 60 species in the coffee agroforestry area of Pengalengan District. (Withaningsih, Parikesit, and Alham, 2020).

Regardless of the comparison results, when referring to the reports of Ayat (2011) and O'Connor, Cahayu, and Noordwijk (2005), the number of species in the agroforestry area of Karang Intan District or generally South Kalimantan is confirmed to be higher than 25 species. This number can be obtained, if 1) the number of counting points in the agroforestry area of each village is more than one or the repetition is more than five, 2) not only diurnal birds but also nocturnal birds are taken into account, 3) observations are carried out regularly every month or not only on the rainy season, but also in the dry season, and 4) experienced bird-identifiers were involved. Soendjoto et al. (2018) reported

that during a 6-8 day monitoring conducted twice a year in 2013-2017 in 4-5 ex-coal mine revegetation reclamation areas, the number of bird species increased from 30 to 70.

Species Diversity

Table 1 shows the bird species diversity index in the Pulau Nyiur agroforestry area (2.63) is higher than in Biih (2.47) and the bird species diversity index in the Biih agroforestry area is higher than in Kiram (2.43). An index with such conditions raises questions. What factors underlie certain bird species with a certain number of individuals present in agroforestry areas?

If it is associated with Table 2, the bird species diversity index increases with the increase in the number of plant species in the agroforestry areas where the birds live; vice versa. However, upon closer inspection, the increase was not linear. When the species diversity index in Kiram was 2.43, Biih 2.47, and Pulau Nyiur 2.63, the agroforestry areas in the three locations were covered by 13, 15, and 16 plant species, respectively. Thus, there are other factors that come into play.

Table 2. Some of the plant species identified in the agroforestry areas of each sample location

No	Indonesian name	Scientific name	Kiram	Biih	Pulau Nyiur
1	Aren	<i>Arenga pinnata</i>	√	-	-
2	Cabai	<i>Capsicum annum</i>	-	-	√
3	Cempedak	<i>Artocarpus integer</i>	-	√	√
4	Durian	<i>Durio zibethinus</i>	√	√	√
5	Gamal	<i>Gliricidia sepium</i>	-	√	-
6	Jambu air	<i>Syzygium aqueum</i>	-	-	√
7	Jeruk purut	<i>Citrus hystrix</i>	-	√	-

8	Jengkol	<i>Pithecellobium lobatum</i>	-	√	√
9	Juwaling	<i>Clausena excavata</i>	√	-	√
10	Kapul	<i>Baccaurea macrocarpa</i>	√	√	√
11	Karet	<i>Hevea brasiliensis</i>	√	√	√
12	Kenanga	<i>Cananga odorata</i>	-	√	-
13	Ketapang	<i>Terminalia catappa</i>	-	-	√
14	Kopi	<i>Coffea sp.</i>	-	√	√
15	Langsat	<i>Lansium domesticum</i>	√	√	√
16	Loa	<i>Ficus variegata</i>	√	-	-
17	Mahang	<i>Macaranga hypoleuca</i>	√	-	√
18	Manggis	<i>Garcinia mangostana</i>	√	-	-
19	Margatahan	<i>Plaquium dasyphyllum</i>	√	-	-
20	Marsihung	<i>Brucea javanica</i>	√	-	-
21	Mata udang	<i>Antidesma montanum</i>	-	-	√
22	Merica	<i>Piper nigrum</i>	-	√	-
23	Petai	<i>Parkia speciosa</i>	-	√	√
24	Pisang	<i>Musa paradisiaca</i>	-	-	√
25	Porang	<i>Amorphophallus muelleri</i>	-	√	-
26	Randu	<i>Ceiba pentandra</i>	-	√	-
27	Sirih	<i>Piper betle</i>	-	-	√
28	Sungkai	<i>Peronema canescens</i>	-	√	-
29	Tampang	<i>Artocarpus nitidus</i>	√	-	-
30	Tarap	<i>Artocarpus elasticus</i>	√	-	-
Jumlah spesies			13	15	16

We identified two factors, but this remains to be further proven. First, there are other plant species that have not been identified and accounted for quantitatively. These plant species and the plant species referred to in Table 2 together form

- 1) strata with variations ranging from forest floor plants, herbs, lianas, to woody plants consisting of seedlings, saplings, poles, and trees or starting from a plant height of 0 m to about 20 m from the ground.
- 2) the composition of plants varies according to species and number of individuals. Each plant species has characters (such as stems, branches, leaves, flowers, fruit, foliage) that are different from other species.

[Dewi and Kurnianto \(2021\)](#) reported that in the buffer zone of Meru Betiri National Park, the area managed with an agroforestry system was the most frequented by birds, most of which were specialist birds in the agricultural environment; the birds use all the strata in the vegetation.

Second, because it tends to be frequented by humans, agroforestry areas have relatively large disturbances or threats. The disturbances include human activities (passing by) and the sound of machines (motorcycles, transport cars, chainsaws). Threats include burning litter or plant

cuttings before planting food crops or substitute plants, land/forest fires, and conversion of areas for agricultural purposes (such as mixed gardens, monoculture gardens) or for non-agricultural purposes (such as settlements, roads, other public facilities). According to [Soendjoto, Riefani, and Zen \(2014\)](#), the presence of bird species in a habitat is determined by the species and their unique behavior, habitat quality and safety, and the quality of observers. According to [Soendjoto et al. \(2015b\)](#), the quality of the habitat includes, among other things, the diversity of plant species, the availability of food sources, the variety of vegetation strata, as well as the proximity or continuity of their location with various types of habitats in a stretch.

Community Similarity

The similarity index value based on the number of species is still wide from the value 1 or not yet similar, but the value based on the number of individuals is close to the value 1 or almost similar (Table 3). Although the calculation basis is different, the order of community similarity from high (or similar) to low (not similar) values remains the same, namely Kiram-Biih, Kiram-Pulau Nyiur, and Biih-Pulau Nyiur.

Table 3. Bird community similarity index between sample locations

Agroforestry area	Kiram	Biih	Pulau Nyiur
Kiram	1	0,95	0,93
Biih	0,75	1	0,88
Pulau Nyiur	0,74	0,70	1

Note:

The number below the diagonal line (line from top left to bottom right) is a similarity index based on the number of species, while above the diagonal it is based on the number of individuals.

Similarity indicates that birds of the same species or relatively the same number of individuals visit different locations. Why do they visit these locations? The birds visited because in different locations the materials they needed and even liked were readily available. According to [Desantoro et al. \(2020\)](#), birds are distributed in different locations because they adapt to the environment and there is competition, vegetation strata, feed preparations, natural selection, and other natural factors. Is that right?

Table 2 shows that in terms of number and species alone, the plants in Kiram are much different from those in Biih. Kiram has 4 species of plants and Biih 15. All the plants in Kiram can

be found in Biih. On the other hand, Biih has a higher number of plant species than Pulau Nyiur. All plant species on Pulau Nyiur are available in Biih.

Thus, there are factors that play a more important role in attracting birds to visit the location than just the number and species of plants. In other words, the causative factor is not as simple as that. Therefore, research needs to be continued to find the factors that play a role in these locations. Kurnianto et al. (2022) stated that in the agroforestry area of the buffer zone of Meru Betiri National Park, jackfruit (*Artocarpus heterophyllus*) is the plant most frequently visited by birds and the canopy is where most birds are active. According to Bari et al. (2021), Javanese bondol (*Lonchura leucogastroides*) is abundant in rice fields when the weather is shady and farmer activity is less; they come to get the mature milky grains because the feed of their choice is easier to crush and the liquid to be sucked in easily.

Conservation Status

The presence of protected birds (although the ratio is 16% of all bird species found) as well as near threatened birds (the ratio is even only 8%) indicates that the agroforestry area is a habitat suitable for the needs of these birds and of course unprotected birds and near threatened ones. Thus, agroforestry area can be recommended as a conservation area, at least for birds. This opinion reinforces (Imron et al., 2022) that how important polycultural agroforestry systems are as an alternative to support wildlife conservation in future land use changes.

Of course, not all bird species can use the area as part of their habitat. Water birds, such as those found in Lake Tiro, PT Indocement Tunggal Prakarsa, Tarjun (Riefani, Soendjoto, and Munir, 2019) and migratory birds, such as those visiting the west coast of South Kalimantan (Riefani and Soendjoto, 2021) are certain do not use agroforestry areas, such as those scattered in Karang Intan District. The birds do not find basic needs, either in the form of food, muddy conditions, or safe conditions in the agroforestry area.

Another example is a bird species belonging to the family Bucerotidae. Agroforestry areas that are frequented by people and rarely have trees more than 20 m high can indeed be a place for birds to look for food and rest, but are not suitable places for birds to nest. The helmeted hornbill

(*Rhinoplax vigil*) nests in tree holes located at a height of 20 m from the ground and the tree trunk diameter is 65-195 cm (Ministry of Environment and Forestry, 2018). Wreathed Hornbill (*Rhyticeros undulatus*) nests in holes located at a height of 11-27 m belonging a tree 24-35 m high and 83-175 cm in diameter (Rahayuningsih, Kartijono, and Retnoningsih, 2017).

CONCLUSION

From a point count per location and five replicates, 25 bird species were found in the agroforestry area of Karang Intan District. A small number of them are protected and endangered birds.

The recommended further research is to record and analyze bird species in the dry season and to record and analyze the structure and composition of plants in agroforestry areas.

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DAFTAR ISI

Judul	Halaman
Analisis Faktor Jenis Kelamin, Usia dan Lama Bekerja Terhadap Kemampuan TPACK Guru IPA SMP di Kota Cirebon <i>Nindya Hapsari, Zaenal Abidin, Asep Ginanjar Arip</i>	113-123
Identifikasi Genera Bakteri Coliform Pada Air Sungai Desa Datar Kabupaten Jepara <i>Al Manunal Akhnah, Dyah Ayu Widyastuti, Rivanna Citraning Rachmawati</i>	124-131
Pengembangan Panduan Praktikum Perkembangan Hewan Berbasis Inkuiri pada Materi Siklus Estrus <i>Adinda Mutiara Ulfa, Jodion Siburian, Winda Dwi Kartika</i>	132-140
Keanekaragaman Jenis Capung (Ordo Odonata) Pada Berbagai Tipe Habitat di Kecamatan Leuwiliang Kabupaten Bogor <i>Raja Rhamdany Harahap, Insan Kurnia, Gatot Widodo</i>	141-150
Bird Species in the Agroforestry Areas of Karang Intan District, Banjar Regency, Indonesia <i>Ismail Marsuki, Mochamad Arief Soendjoto, Eko Rini Indrayatie</i>	151-158
Pengaruh Ketinggian Terhadap Karakteristik Buah Kacang Panjang <i>Feri Bakhtiar Rinaldi, Jeti Rachmawati, Euis Erlin</i>	159-163
Pengembangan “MeLea Bionik” (Media Leaflet Bioentrepreneurship Hidroponik) untuk Memotivasi Generasi Milenial dalam menghadapi Keterbatasan Lahan di Kota Semarang <i>Ahmad Zubaid, Anif Rizqianti Hariz, Erna Wijayanti</i>	164-168
Aplikasi Sari Akar Eceng Gondok Pada Media Murashige And Skoog (MS) Sebagai Media Multiplikasi Tanaman Krisan (Chrysanthemum morifolium Ramat, Varietas Puspita Nusantara) Secara In Vitro <i>Indira Pipit Miranti, Vivin Andriani</i>	169-174
Penerapan Metode Pembelajaran Index Card Match Untuk Meningkatkan Hasil Belajar di SMAN 1 Kahaungueti <i>Geofani Tarapanjang, Vidriana Oktoviana Bano, Anita Tamu Ina</i>	175-182
Pengaruh Laboratorium Virtual Terhadap Hasil Belajar Siswa Kelas XI Pada Materi Sistem Pencernaan Makanan <i>Simon Petrus Peka Rihi, Vidriana Oktoviana Bano, Riwa Rambu Hada Enda</i>	183-188

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