PLANT SCIENCE TODAY
ISSN 2348-1900 (online)
Vol 12(1): 1-7
https://doi.org/10.14719/pst.3124

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RESEARCH ARTICLE

Assessment and analysis of plant vegetation under oil palm from 2000 and 2017 plantation

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OPEN ACCESS

ARTICLE HISTORY
Received: 25 January 2024
Accepted: 07 November 2024
Available online
Version 1.0 : 04 February 2025
Version 2.0 : 22 February 2025

Check for updates

Additional information
Peer review: Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

Reprints & permissions information is available at https://horizonepublishing.com/journals/index.php/PST/open_access_policy

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Indexing: Plant Science Today, published by Horizon e-Publishing Group, is covered by Scopus, Web of Science, BIOSIS Previews, Clarivate Analytics, NAAS, UGC Care, etc
See https://horizonepublishing.com/journals/index.php/PST/indexing_abstracting

CITE THIS ARTICLE
Asbur Y, Purwaningrum Y, Kusbiantoro D, Nasution K, Hendrawan D, Lubis FA. Assessment and analysis of plant vegetation under oil palm from 2000 and 2017 plantation. Plant Science Today. 2025; 12(1): 1-7. https:/doi.org/10.14719/pst.3124

Abstract

Intensive use of chemicals in agricultural cultivation such as fertilizers and pesticides has caused a decline in plant diversity in agricultural ecosystems in recent decades. This study aims to determine the diversity of weeds and dominant weeds in oil palm plantations in the planting years 2000 and 2017. The research was carried out from January to June 2023 at the oil palm plantation PT Perkebunan Nasional III, Kebun Sei Putih, North Sumatra using the 1 m x 1 m quadratic method. In oil palm stands in the 2000 planting year, the grass weed *Cirtococcum oxyphyllum* was found as the dominant weed with a high importance index and Summed Dominance Ratio (SDR), while in oil palm stands in the 2017 planting year, the broadleaf weed *Ageratum conyzoides* was found as the dominant weed. Species diversity (H') under oil palm stands in the 2000 planting year ranged between 0.67-1.61, which means that species diversity is low to moderate and in 2017 planting year ranged between 1.34-1.64, which means that species diversity is moderate. The community coefficient value for both planting years was low, namely below 75 percent, which means that the weed community in both planting years was very diverse.

Keywords

dominance; oil palm; species diversity; vegetation analysis; weed

Introduction

Agricultural intensification involving increased use of chemicals and heavy agricultural equipment is one of the factors causing land degradation and loss of plant diversity (1). Most studies report that plant diversity is preferred in agricultural cultivation over other management methods, such as tillage or herbicide application because it can cause a decrease in plant diversity (2) and cause significant global biodiversity extinction (3). Therefore, one of the main challenges humans must address in the future is to find a way to balance agricultural production and biodiversity in agricultural lands (4).

Weeds are considered to reduce crop yields significantly (5). Therefore, weed management concentrates on chemical weed control to maximize yields. This causes soil, water and air pollution, which has an impact on biodiversity and ecosystem services (6), so it is important to emphasize that certain weed species are hosts for biological control agents (7), so weeds are also important for providing ecosystem services such as controlling pests (8). Consequently, reducing plant diversity will have a negative impact on the provision of these ecosystem services.

In oil palm plantations (*Elaeis gueenensis* Jacq.) that have canopies already shading each other, various types of weeds will be found, ranging from grasses,

broadleaf, sedges, to ferns (9; 10; 11; 12). This is because, in oil palm plantations that have produced these, the LCC (Legume Cover Crop) Mucuna bracteata is no longer found because it cannot withstand the shade of oil palm fronds (13).

The large number of weeds found in oil palm plantations causes plantation actors to control weeds mechanically and chemically using herbicides. As a result, oil palm plantations become clean of weeds so that plants no longer cover the soil surface. This has a negative impact on biodiversity (2), causing other environmental problems of particular concern in oil palm plantations, namely soil erosion and loss of soil fertility (14).

In line with RSPO and ISPO policies, the management of oil palm plantations must be carried out sustainably. The use of cover crops using dominant weeds in several private oil palm plantations has been carried out, including using the weeds *Nephrolepis biserrata* and *Asystasia gangetica* (L.) T. Anderson which hasbeen proven to be able to provide various ecosystem services such as increasing erosion control and water retention (14; 15; 16), increasing soil organic carbon (17), contributing to pest control and increasing biodiversity (2; 18), as well as increasing the diversity of soil microorganisms (19).

Based on this, it is necessary to analyse the vegetation in oil palm stands in the 2000 and 2017 planting years to determine the dominant weeds and weed diversity. The purpose of this study was to determine the diversity of weeds and dominant weeds in oil palm plantations in the planting years 2000 and 2017. The research hypothesises that there are differences in the diversity of weeds and dominant weeds in oil palm plantations in the planting years of 2000 and 2017.

Materials and Methods

Study Site

The research was carried out from January to June 2023, at the oil palm plantation PT Perkebunan Nasional III, Kebun Sei Putih, Galang District, Deli Serdang Regency, North Sumatra (03° 24'34"N 98°52'58"E).

Research materials and tools

The materials used in this research were plants under oil palm stands in the 2000 and 2017 planting years.

Research method

The research was carried out by identifying plant types under oil palm stands in the 2000 and 2017 planting years through direct observation in the field using the quadrat transect method measuring 1 m x 1 m. Determining the research location was purposive sampling, a method of deliberately determining research locations considered representative. Data collection in the research area was carried out by dividing the location into four observation points (stations) determined based on the cardinal directions, namely West, East, North and South. At each station, a vegetation analysis was carried out by recording the population, weighing biomass and determining the dominance of plant species under oil palm stands in the 2000 and 2017 planting years

Vegetation analysis was carried out by recording each type of weed found in the sample plot at each observation station. The dominance of each weed species was calculated by weighing its biomass, by pulling out all the weeds in the sample plot, separating them by type, identifying the weed type and calculating the population of each type of weed. Each type of weed was then counted and recorded as density data. Next, each type of weed was put into a brown envelope to be dried in an oven and weighed for dry weight to measure dominance.

Data Analysis

The above data is then used to calculate density (D), relative density (RD), frequency (F), relative frequency (RF) (20), dominance (D) (21), value index importance (IVI) (22), Summed Dominance Ratio (SDR) (23), Species Diversity Index (H') (24) and community coefficient (C) (9). The formulas for calculating it are:

$$\text{Density of species A} = \frac{\text{Total number of individuals of A}}{\text{Total plot area}}$$

$$\text{Relative density of species A} = \frac{\text{Density of A}}{\text{Density of all species}} \times 100\%$$

$$\text{Frequency of species A} = \frac{\text{Number of plots where species A is found}}{\text{Number of total plots}} \times 100\%$$

$$\text{Relative frequency of species A} = \frac{\text{Frequency species A}}{\text{Frequency of all species}} \times 100\%$$

Dominance of species A (D) = Total number of individuals of A x Biomass of species A

Importance Value Index (IVI) = Relative Frequency + Relative Density

$$\text{Summed Dominance Ratio (SDR)} = \frac{\text{IVI}}{2}$$

$$H' = \sum_{1=1}^{s} pi \ln pi$$

Where: H'= species diversity index; Pi = importance chance of each species = ni/N; ni = number of individuals of each species; N = the total number of individuals

According to Magurran (24), the classification of diversity value is as H'<1: Lower diversity; 1 <H'<3: Moderate diversity; and H'> 3: High diversity.

$$\text{Community coefficient (C)} = \frac{2\,W}{a + b} \times 100$$

Where: w: the number of the two lowest populations for the type of each community; a: total population in the first community; b: total population in the second community.

If the C value is ≥ 75 percent, it means that there is not much difference in the condition of the vegetation (9).

Results

Plant structure under oil palm stands in the 2000 and 2017 planting years

Various plant species naturally grow under mature oil palm stands. The dominant species under oil palm stands is determined by vegetation analysis

The composition of plant species under oil palm stands in the 2000 and 2017 planting years consisted of grasses, ferns, broadleaved and tukulan (oil palm seedlings growing under oil palm stands). The composition of weed species consisted of 18 weed species from 9 families, namely Poaceae, Euphorbiaceae, Asteraceae, Melastomataceae, Fabaceae, Thelypteridaceae, Pteridaceae, Campanulaceae and Piperaceae. The total number of plant populations under oil palm stands in the 2000 and 2017 planting years were respectively 557 and 223 at the East station, 256 and 186 at the West station, 428 and 35 at the North station, 244 and 197 at the South station (Table 1).

Cyrtococcum oxyphyllum (Hochst. ex Steud.) Stapf is a grass weed from the Poaceae family that dominates under oil palm stands in the 2000 planting year for the East station with 547 populations, the West station with 238 populations and the North station with 334 populations, while at the South, *C. oxyphyllum* wsa not found, it is dominated by the grass weed, namely *Ehrharta erecta* Lam. with as many as 183 populations. In oil palm stands in the 2017 planting year, the most dominant weed was a broad-leaved weed from the Asteraceae family, *Ageratum conyzoides* L. At the East station, *A. conyzoides* was found in 150 populations, at the West station with 110 populations and at the North station with 18 populations.While the South Station had the most dominant weed *C. oxyphyllum* with 167 populations, followed by *A. conyzoides* with 25 populations (Table 1).

Plant diversity and dominance under oil palm stands in the 2000 and 2017 planting years

In oil palm stands in the 2000 planting year, dominant grass weed type namely *C oxyphyllum* was calculated for the East, West and North stations with relative densities of 98.20%, 92.97% and 78.04% respectively with SDR values of 60.45, 51.11 and 40.55 respectively. While in oil palm stands in the 2017 planting year broad-leaved type namely *A. conyzoides* was more dominant in the East, West and North stations with relative densities of 67.26%,

Table 1. Composition and number of plant populations under oil palm stands in the 2000 and 2017 planting years as observed based on cardinal directions, East, West, North and South

Family	Species	Planting year of 2000	Planting year of 2017
		East Station	
Poaceae	*Cyrtococcum oxyphyllum*	547	-
	Ehrharta erecta	-	59
Euphorbiaceae	*Euphorbia hirta*	10	2
Asteraceae	*Ageratum conyzoides*	-	150
Melastomataceae	*Clidermia hirta*	-	8
Fabaceae	*Calopogonium mucunoides*	-	4
Total		**557**	**223**
		West Station	
Poaceae	*Cyrtococcum oxyphyllum*	238	-
	Oplismenus compositus	9	-
	Axonopus compressus	9	-
	Imperata cylindrica	-	3
Asteraceae	*Ageratum conyzoides*	-	110
	Asystasia gangetica	-	1
Thelypteridaceae	*Thelypteris kunthii*	-	46
Pteridaceae	*Adiantum peruvianum*	-	22
Melastomataceae	*Clidemia hirta*	-	4
Total		**256**	**186**
		North Station	
Poaceae	*Cyrtococcum oxyphyllum*	334	-
	Axonopus compressus	31	-
	Ehrharta erecta	13	6
Pteridaceae	*Adiantum peruvianum*	42	-
Euphorbiaceae	*Euphorbia hirta*	5	-
Campanulaceae	*Isotoma longiflora*	3	-
Asteraceae	*Ageratum conyzoides*	-	18
Fabaceae	*Calpogonium mucunoides*	-	4
Melastomataceae	*Melastoma affine*	-	2
Piperaceae	*Peperomia pellucida*	-	1
	Tukulan	-	4
Total		**428**	**35**
		South Station	
Poaceae	*Ehrharta erecta*	183	-
	Axnopus compressus	31	-
	Cyrtococcum oxyphyllum	-	167
Euphorbiaceae	*Euphorbia hirta*	19	4
	Euphorbia heterophylla	3	-
Asteraceae	*Ageratum conyzoides*	8	25
	Tukulan	-	1
Total		**244**	**197**

59.14% and 51.43% respectively and SDR values of 39.25, 45.12 and 31.26 respectively. The South Station for oil palm in the 2000 planting year was dominated by the grass type *E. erecta* with a relative density of 75.00% and SDR 34.66, while in the 2017 planting year it was dominated by the grass type *C. oxyphyllum* with a relative density of 84.77% and SDR 35.27 (Table 2).

The preponderance of the *A. conyzoides* species in oil palm stands in the 2017 planting year (Table 2) is due to the fact, that *A. conyzoides* leaves contain allelopathic substances which can inhibit the growth of other weeds. In accordance with the opinion of Priyatmoko et al. (30) who stated that the allelopathic ability of the leaves of the *A. conyzoides* species was identified as containing 3 phenolic acids, namely gallic acid, caumalic acid and protocatechuic acid which can inhibit the growth of other weeds by inhibiting the absorption of Nitrogen (N. This is also an advantage of the *A. conyzoides* species because it can add N to the soil which plants need.

Table 2 also presents the species diversity index (H') at each research location. The species diversity index (H') in the 2000 planting year at the West, East, North and South stations was 0.67, 1.03, 1.61 and 1.52 respectively, while in the 2017 planting year it was 1.49, 1.55, 1.64 and 1.34 respectively. This value shows that the diversity of weed types in oil palm stands in the 2000 and 2017 planting years is low and moderate.

The highest importance value index (IVI) in oil palm stands in the 2000 planting year at the East, West and North stations was found in the *C. oxyphyllum* species, as 181.36, 153.33 and 121.65 respectively. While for 2017 planting year the highest IVI at East, West and North stations was found in the species as 117.76, 135.36 and 93.77 respectively. At the South stations it was found in the *E. erecta* species in oil palms in the 2000 planting year and the *C. oxyphyllum* species in the 2017 planting year with IVIs of 103.98 and 105.81, respectively (Table 2).

Table 2. Dominant vegetation types under oil palm stands in the 2000 and 2017 planting years along with the community coefficient (C) value for each species

Species	Planting year of 2000				Planting year of 2017			
	RD	RF	SDR	IVI	RD	RF	SDR	IVI
East Station								
Cyrtococcum oxyphyllum	98.20	50.00	60.45	181,36				
Euphorbia hirta	1.80	50.00	39.55	118,64	0.90	16,67	18,02	117.76
Ageratum conyzoides					67.26	33.33	39.25	57.72
Ehrharta erecta					26.46	16.67	19.24	27.75
Clidermia hirta					3.59	16.67	9.25	42.72
Calpogonium mucunoides					1.79	16.67	14.24	54.05
Species Diversity index (H')		0.67				1.49		
Dominance Index (DI)		0.52				0.25		
Community Coefficient (C)		0,51%						
West Station								
Cyrtococcum oxyphyllum	92.97	42.86	51.11	153.33				
Oplismenus compositus	3.52	42.86	24.35	73.04				
Axonopus compressus	3.52	14.29	24.54	73.63				
Ageratum conyzoides					59.14	40.00	45.12	135.36
Thelypteris kunthii					24.73	10.00	13.68	41.03
Adiantum peruvianum					11.83	10.00	14.42	43.25
Imperata cylindrica					1.61	10.00	7.13	21.38
Clidemia hirta					2.15	20.00	9.01	27.03
Asystasia gangetica					0.54	10.00	10.65	31.95
Species Diversity index (H')		1.03				1.55		
Dominance Index (DI)		0.38				0.27		
Community Coefficient (C)		0.45%						
North Station								
Cyrtococcum oxyphyllum	78.04	25.00	40.55	121.65				
Adiantum peruvianum	9.81	8.33	6.97	20.90				
Axnopus compressus	7.24	16.67	13.90	41.71				
Ehrharta erecta	3.04	16.67	10.61	31.84	17.14	16.67	13.37	40.12
Euphorbia hirta	1.17	25.00	17.30	51.90				
Isotoma longiflora	0.70	8.33	10.67	32.01				
Ageratum conyzoides					51.43	33.33	31.26	93.77
Calpogonium mucunoides					11.43	16.67	24.21	72.63
Tukulan (Oil palm sprouts)					11.43	16.67	17.64	52.93
Melastoma affine					5.71	8.33	8.29	24.86
Peperomia pellucida					2.86	8.33	5.23	15.69
Species Diversity index (H')	1.61					1.64		
Dominance Index (DI)	0.24					0.21		
Community Coefficient (C)	0.43%							
South Station								
Ehrharta erecta	75.00	25.00	34.66	103.98				
Axnopus compressus	12.70	25.00	20.24	60.71				
Euphorbia hirta	7.79	25.00	21.84	65.53	2.03	22.22	14.66	43.97
Ageratum conyzoides	3.28	12.50	10.64	31.93	12.69	44.44	21.25	63.75
Euphorbia heterophylla	1.23	12.50	12.61	37.84				
Cyrtococcum oxyphyllum					84.77	11.11	35.27	105.81
Tukulan (Oil palm sprouts)					0.51	22.22	28.82	86.47
Species Diversity index (H')		1.52				1.34		
Dominance Index (DI)		0.24				0.27		
Community Coefficient (C)	0.45%							

Note: RD: relative density; RF: relative frequency; SDR: summed dominance ratio; C: community coefficient; IVI: importance value index

The community coefficient (C) of plants under oil palm stands in the 2000 and 2017 planting years at the East, West, North and South stations were 0.51%, 0.45%, 0.43% and 0.45%, respectively. This value is smaller than 75%, indicating that there is a significant difference between weeds under oil palm stands in the 2000 and 2017 planting years.

Discussion

Plant structure under oil palm stands in the 2000 and 2017 planting years

The total number of plant populations under oil palm stands in the 2000 and 2017 planting years were 557 and 223 at the East station, 256 and 186 at the West station, 428 and 35 at the North station, 244 and 197 at the South station, respectively. This is different from the results found in the research of Stariawan and Fuady (10); Asbur et al. (11) who found a very large population under oil palm stands with various species and families, i.e. 2910 -3731 weed populations with 36 species and 11 families.

The results of this study found that generally under oil palm stands there is a mixture of grasses and broadleaf. The dominant species at the West, East and North stations were grass species in the 2000 planting year oil palm stands and broadleaf species in the 2017 planting year oil palm stands. The dominant grass weeds identified came from the Poaceae family, while the broadleaf weeds came from the Asteraceae family. Simangunsong et al. (9); Satriawan and Fuady (10); Asbur et al. (11); Asbur and Purwaningrum (12) reported that other oil palm stands in various regions in Indonesia also found a mixture of weed vegetation families although the dominant species were different.

In this study, we found that *C. oxyphyllum* and *E. erecta* species were the most dominant grass groups under oil palm stands in the 2000 planting year and *Ageratum conyzoides* species from the broadleaf group was the most dominant weed under the 2017 oil palm stands. Differences in weed species under oil palm stands in the 2000 and 2017 planting years were due to differences in the intensity of sunlight reaching the ground surface. In oil palm plantations in the 2000 planting year, oil palm fronds had shaded each other so that the intensity of sunlight reaching the ground surface was lower, while in oil palm plantations in the 2017 planting year, oil palm fronds had not shaded each other so that the intensity of sunlight reaching the ground surface was greater. *C. oxyphyllum* and *E. erecta* are perennial weeds with habitats under humid and shaded rainforest stands (25; 26), while *A. conyzoides* grows in dry, degraded and unshaded land (27).

Several research results reported that the dominant weeds for each oil palm plantation located in different locations also produced different dominant weeds, including the results of research by Simangunsong et al. (9) in the Dolok Ilir oil palm plantation, North Sumatra reported that the dominant weeds came from the grass group (*Andropogon aciculatus*, *Digitaria ciliaris*, *Eleusine indica*, *Cynodon dactylon*); Satriawan and Fuady (10) in the Bireun oil palm plantation, Aceh found *E. indica* from the grass group as the dominant weed; and Asbur et al. (11) in the Natar oil palm plantation, South Lampung found *Nephrolepis biserrata* from the fern group and *Asystasia gangetica* from the broadleaf group as the dominant weeds; and Asbur et al. (12) in the Deli Serdang smallholder oil palm plantation, North Sumatra found *Adiantum trapeziformis* from the fern group and *A. gangetica* from the broadleaf group as dominant weeds.

C. oxyphyllum was the most common grassy weed found under oil palm stands in the 2000 planting year, while *A. conyzoides* was the most common broadleaf weed found under oil palm stands in the 2017 planting year (Table 2). *C. oxyphyllum* is an annual grassy weed native to tropical and subtropical Asia to the Pacific that grows mainly in seasonally dry tropical biomes. It can grow from near sea level to 740 m asl. It grows in rainforests, sclerophyll forests, grape forests and swamp forests. It is native to China, Australia, Bhutan, India, Indonesia, Malaysia, Myanmar, the Philippines, Sri Lanka, Vietnam and New Guinea (25; 26). Riza et al. (28) reported that the *C. oxyphyllum* species can spread quickly because it has light seeds that are easily carried by the wind, a root system in the form of rhizomes (in the soil) and stolons (above the soil) which results in a high expansion capacity and can reach distant areas.

The second most dominant weed found from each observation station was *A. conyzoides*, which is a broadleaf annual weed and is widely found in tropical countries including Indonesia. *A. conyzoides* belongs to the Asteraceae family and the Eupatorieace tribe (29). *A. conyzoides* is a tropical plant that is very common in West Africa and some parts of Asia and South America. It is an annual branching herbaceous plant that grows to a height of approximately 1 m and generally grows near settlements and thrives in any garden soil and is very common in garbage places and in rubble sites (30).

The dominant weed species found in this study were different from those reported by Satriawan and Fuady (10); Asbur et al. (11). In their research results, it was reported that the dominant weeds found were *Asystasia gangetica* and *Nephrolepis biserrata*. This is thought to be due to the oil palm plantations used as research locations routinely carrying out weed control using herbicides containing the active ingredient glyphosate, resulting in a decrease in soil fertility as indicated by the hardness of the soil at the research location and the large number of species of *C. oxyphyllum* and *A. conyzoides* found. In accordance with the opinion of Hall et al. (2) which states that the diversity and richness of species, as well as the composition of communities in agricultural areas are mainly influenced by vegetation management, such as soil cultivation and the use of herbicides.

Plant diversity and dominance under oil palm stands in the 2000 and 2017 planting years

In oil palm stands in the 2000 planting year, *C. oxyphyllum* was the dominant weed for the East, West and North stations, while at the South station the dominant vegetation was the *E. erecta* species. This indicates that the grass group is better able to adapt to less fertile soil conditions. *C. oxyphyllum* is a species of annual or perennial grass group and grows mainly on dry soils (26). *E. erecta* is also a species of perennial grass commonly known as panic veldt grass. This species is native to South Africa and Yemen. It is an invasive species in many parts of the world because it flowers and seeds throughout the year, its seeds germinate quickly, form new plants in just a few weeks and is commonly found growing in degraded lands (31).

The more dominant species of *A. conyzoides* in oil palm stands in the 2017 planting year (Table 2) is due to the leaves of *A. conyzoides* containing allelopathic substances that can inhibit the growth of other weeds. In accordance with the opinion of Priyatmoko et al. (32) who stated that the ability of the leaves of the *A. conyzoides* species as an allelopathy was identified as containing 3 phenolic acids, namely gallic acid, caumalic acid and protocatechuic acid, which can inhibit the growth of other weeds through inhibition of Nitrogen (N) absorption. This allelopathic substance is also an advantage of the *A. conyzoides* species because it can add N to the soil needed by plants.

The species diversity index (H') in the 2000 and 2017 planting years was low and moderate (Table 2). Magurran (24) stated that the Shannon diversity index value can be explained as H> 3.0 which indicates very high diversity, H = 1.5-3.0 indicates high diversity, H = 1.0-15 indicates moderate diversity and H<1 indicates low diversity. A low biodiversity index indicates that the weed species found are limited with same species found in each oil palm planting year. Li et al. (33) and Pan et al. (34) stated that low species diversity is caused by a location that is only dominated by certain types. In contrast, high species diversity indicates that a community has high complexity. Thus, it is clear that this research location has low to moderate biodiversity.

Importance value index (IVI) tells us about the importance of a species in a community or ecosystem (36). Dominant species in a plant community will also have a high IVI (36). Furthermore, Yuliantoro and Frianto (37) stated that high IVI is classified as the main component of the vegetation community in a location and shows the ability to adapt to habitat and high tolerance to environmental conditions. Plants that grow under tree stands depend on the type of plantation crop, soil type, climate and plantation pattern (38). In general, the level of competition between weeds and plants depends on the density of weed species, plant varieties and fertilization rates. This means that the presence of weed species will differ from one area to another, even under the same plant stand (39).

The community coefficient (C) of plants under oil palm stands in the 2000 and 2017 planting years was less than 75%, which means that the types of weeds under oil palm stands in the 2000 planting year were different from those in the 2017 planting year. Palijama et.al (40) stated that many factors influence the diversity of weed communities, including soil pH, soil moisture, light intensity and soil pH are some of the main factors influencing the diversity of weed communities.

Conclusion

The composition of plant species under oil palm stands in the 2000 and 2017 planting years shows 17 types of weeds from 11 families consisting of herbaceous weeds, ferns, broadleaf and tukulan (oil palm seeds that grow under oil palm stands). The total number of plant populations under oil palm stands in the 2000 and 2017 planting years, respectively, was 557 and 223 in the East station, 256 and 186 in the West station, 428 and 35 in the North station, 244 and 197 in the South station. In oil palm stands in the 2000 planting year, *C. oxyphyllum* was found as the dominant weed found in almost every observation station except at the South station where the dominant weed found was *E. erecta*. In oil palm stands in the 2017 planting year, the dominant weed was *A. conyzoides* except in the South station where *C. oxyphyllum* dominated. The highest weed importance values for the two oil palm's planting year groups are also in line with their relative density. The highest important index values were *C. oxyphyllum* in the 2000 planting year and *A. conyzoides* in the 2017 planting year. The highest species diversity value of 1.64 was found in the 2017 planting year group which showed moderate biodiversity and the lowest was in the 2000 planting year group with an H' value of 0.52 which indicates low biodiversity.

Acknowledgements

This research was funded by the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia through a Basic Research Grant. Thanks also to the Oil Palm Plantation PT Perkebunan Nusantara in Sungei Putih, Deli Serdang Regency, North Sumatra for providing land for research.

Authors' contributions

YA conducted the research design, participated in data collection and drafted the manuscript. YP and DH perform statistical analysis of data. DK and KN participated in the preparation and alignment of the manuscript, as well as general coordination. FAL participated in data collection. All authors read and approved the final manuscript. All authors read and approved the final manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interests to declare.

Ethical issues: None

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