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Analysis and Identification of Weeds in 3-Month-Old *Acacia crassicarpa* Stands at PT. Arara Abadi Rasau Kuning District

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Abstract

Acacia crassicarpa is a cultivated species in the Industrial Plantation Forest at PT. Arara Abadi, particularly in the Rasau Kuning District. One of the limiting factors for the growth of Acacia crassicarpa stands is weed infestations. At three months of age, weed infestations increased and became uniform across the Acacia crassicarpa stand area. To ensure that weed control measures yield effective and efficient results, it is essential to base these measures on information regarding the types and composition of weeds in the Acacia crassicarpa area. Therefore, this study aimed to analyze and identify the types of weeds found beneath the Acacia crassicarpa, which is three months old. This research method employs purposive sampling to select locations with dense weed populations for use as study plots. The analysis and identification of the weeds revealed nine species, including Goletrak (Borreria alata), which was the most prevalent, with 50 individuals recorded. Other species identified include Bundung (Cyperus odoratus), Wild Acacia, Ruas-ruas, Ramiding (Stenochlaena palustris), Sword Fern (Nephrolepis biserrata), Alang-alang (Imperata cylindrica), and Meniran (Phyllanthus urinaria). The range of the KR values was between 0.5% and 25.3%, while the FR values ranged from 2.4% to 14.6%. The BKR values varied from 0.3% to 18.8%, and the INV values ranged from 3.5% to 56.0%. The highest SDR value for Borreria alata was 18.7%, indicating significant dominance within the weed community. The Shannon-Wiener diversity index (H') was calculated at 1.96, categorizing it as a moderate level of diversity. Simpson's dominance index (D) was measured at 0.15, suggesting a stable level of weed dominance. Additionally, the Margalef species richness analysis (R1) results yielded a value of 1.51, indicating a low level of species richness among the weeds.

Keywords: *Acacia crassicarpa, Borreria alata*, Biodiversity Value, Industrial Plantation Forest, Weeds

1. Introduction

Acacia crassicarpa is one of the favored species for industrial forest plantations (HTI) and serves as a valuable raw material for pulp and paper production. This species thrives in peatlands, allowing for optimal utilization of these ecosystems. According to Martins et al. (2020), *Acacia crassicarpa* exhibits excellent properties and qualities as a raw material for the pulp industry, characterized by its lignin content, carbohydrate content, and kraft pulp yield, as well as wood characteristics that are easily observable and measurable. Furthermore, this plant is classified as a fast-growing species, making it particularly attractive to HTI entrepreneurs. *Acacia crassicarpa* has also benefited from significant genetic improvement due to its rapid growth and the production of high-quality wood (Nirsatmanto, 2020)

The exceptional properties and benefits of *Acacia crassicarpa* must be promoted in the media and the environments in which it thrives. To achieve optimal growth and maximize the advantages of cultivated plants, it is essential to create favorable conditions. The development of *Acacia crassicarpa* has garnered significant attention from one of the HTI companies in Riau Province, specifically PT. Arara Abadi, particularly in the Rasau Kuning District. An intensive silviculture system has long been implemented to enhance the production potential of *Acacia crassicarpa*, necessitating the minimization of limiting factors that hinder growth and productivity.

Weeds are plants that are considered undesirable in cultivated areas. They can grow spontaneously in vacant

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lots or in regions that are either being planted or have not yet been planted (Kimhong et al., 2025). According to Umiyati and Widayat (2017), weeds are all types of plants that grow autonomously in areas cultivated by humans, which can be detrimental to these crops. Weeds in cultivated fields increase production costs for weed control and labor losses. Furthermore, research by Budi et al. (2020) on oil palm plantations indicates that the cost of weed control can reach IDR 257,998 per hectare. This issue is a significant concern for managers, as it increases production costs and labor expenses and leads to competition for resources between cultivated plants and weeds. This competition affects the availability of nutrients, growing space, water, and sunlight, ultimately hindering the optimal growth of cultivated plants and reducing their yields (Gunawan et al., 2025; Imaniasita et al., 2020)

Weeds are one of the limiting factors of its growth productivity. Another interesting thing about weed attacks on Acacia crassiacarpa is that they increase and grow uniformly at the age of the plant, which is 3 months. In another study at PT. RAPP on the same plant, Acacia crassiacarpa, at the age of 1 month, weed analysis was carried out, and 2 species from the fern group (Kusumaningsih et al., 2023). Another study on the analysis of weed types on different types of Acacia, namely Acacia mangium growing on mineral land, found 15 species belonging to 10 families in the age classes of 2, 3, and 4 months, respectively, namely 11 species, 9 species and 11 species(Sari et al., 2020).

For weed control to provide effective and efficient results, it must be based on information about the types and composition of weeds growing in the Acacia crassiacarpa area. Information on the types and composition of weeds can be obtained by analyzing weed vegetation, and is the first step in weed control. So, this study aims to explore and identify the types of weeds in 3-month-old *Acacia crassicarpa* stands at PT. Arara Abadi Distri Rasau Kuning.

2. Material and Methods

The research was conducted at PT. Arara Abadi, Rasau Kuning District, Minas District, Siak Regency, Riau Province (Coordinates 0°45'13.0"N 101°34'39.8"E, 48 masl) on 3-month Acacia crassiacarpa stands on peatlands. The research period was from October 2023 to January 2024. The planting distance of the stands was 3 mx 2 m. The method used was purposive sampling, which selected locations with dense weeds to be used as plots. The number of plots was 6, each measuring 40 mx 40 m. Each plot was made into 10 subplots systematically on the diagonal line for weed observation. Observations were made before herbicide application was carried out on the plot. The analysis of weed vegetation used in this study was a quadrat with a size of 1 mx 1 m, which was placed systematically between the planting lines.

Weed samples in each plot are used to follow the purpose of the type of measurement, and there are 2 ways to measure the samples to be observed, namely destructive and non-harmful. In this study, weed observations were carried out without damaging the soil to determine the type and quantity of damage and to observe the dry weight of weeds by pulling the weeds out to the roots.

The tools used in this study were GPS, meter, knife, frame/square measuring 1 x 1m, machete, digital scale, camera, weed identification book, label, plastic bag, and stationery to measure and record the research results. The materials used in this study were plots and weeds. Meanwhile, the software used to analyze the data found was Microsoft Excel version 2013. Observation parameters include: the identification of weed species, population size, coverage or cover of a weed species, and total dry weight of each weed species. These parameters are used to analyze weed vegetation with the following formula:

a. Density (K) is the number of each species in each unit area (individual/m2). Relative frequency (KR)

$$K = \frac{\text{Number of individuals of a species}}{\sum \text{sample squares plot}}$$

$$KR = \frac{\text{Density of a species}}{\sum \text{"Density of entire species"}} x100$$

b. Frequency (F) is the ratio of the number of weeds that appear to the probability of occurring in a sample plot. Relative frequency (FR)

$$F = \frac{\text{Number of plots containing that species}}{\sum \text{sample squares plot}}$$

$$FR = \frac{\text{Frequency of a species}}{\sum \text{Frequency of entire species}} \mathbf{x100}$$

c. Dry Weight (DW) is the absolute dry weight of all types of weeds, obtained from the weight of weeds that have been oven-dried and then weighed using an analytical scale.

d. Relative dry weight (RRW) compares a type of weed's absolute dry weight and all kinds' absolute dry weight in percent.

$$BKR = \frac{\text{absolute dry weight of a species}}{\sum \text{absolute dry weight of all types}} x100$$

e. Determining importance value *(* IV)

$$IV = KR + FR + BKR$$

f. Determining *the Summed Dominance Ratio* (SDR)

$$SDR = \frac{IV}{3}$$

g. Shannon-Wiener diversity index (H')

Species diversity is a parameter that aims to compare two communities. Species diversity can also be considered species heterogeneity, a characteristic of community structure. Species diversity is measured by the Shannon-

Wiener Diversity Index formula as follows:

$$H' = -\sum_{i=1}^{n} \left(\frac{n_i}{N}\right) \left(\ln \frac{n_i}{N}\right)$$

Information:
H' = Shannon-Wiener diversity index
This = The number of essential values of a type
N = Total number of critical values of all types
Ln = Natural logarithm (natural number)

The interpretation of the H' value is explained as follows: if the H' value < 1, then the species diversity is classified as low, and the community stability is low. If the value is 1 < H'< 3.32, the species diversity is classified as moderate, and the community stability is mild. If the H' value > 3.32, the species diversity and community stability are classified as high.(Saitama et al., 2016).

h. Simpson's dominance index (D)

The dominance index aims to determine the abundance of species and the balance of the number of individuals of each species in a dominant ecosystem. If the dominance index value is high (increasing), dominance is more concentrated on one type, and vice versa; if the dominance index value is low, several types dominate together. The dominance index value can be calculated using the following formula:

$$D = \sum_{i=1}^{n} \left(\frac{n_i}{N}\right)^2$$

Information:
D = Dominance index
Ni = Important value of each nth species
N = Total importance value of all species

Suppose the value is 0 < D < 0.5. In that case, it means that there are no dominant species or the community structure is in a stable state, and a value of 0.5 < D < 1 means that there are dominant species or the community structure is in an unstable state due to ecological pressure.(Dharmawan & Wicaksono, 2019).

i. Margallef Species Richness Index (R1)

The species richness index (R1) determines the magnitude of species richness. The species richness index can be calculated using the following formula:

$$R1 = \frac{S - 1}{\ln (N)}$$

Information:
R1 = Species richness index (Margallef)
S = Number of species found
N = Total number of individuals

If the R1 value < 3.5 indicates low species richness, if the value 3.5 < R1 < 5.0 indicates medium species richness, and if R1 > 5.0 indicates high species richness (Kasim *et al.*, 2022).

J. Weed identification aims to determine the type, morphology, method of invasion, distribution, and method of controlling weeds that grow in industrial forest plantations.

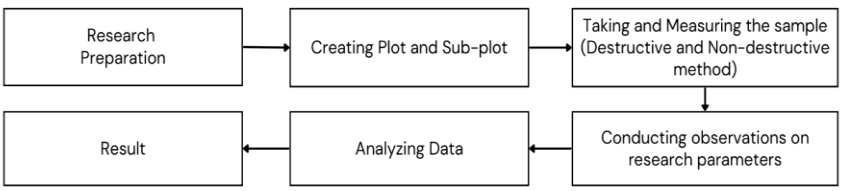

Figure 1. Research flow diagram

3. Results and Discussion

3.1. Composition and Description of Weed Types

Based on the results of weed analysis on 3-month-old *Acacia crassicarpa* stands in Rasau Kuning district of PT. Arara Abadi, weed type identification, density (K), relative density (KR%), frequency (F), relative frequency (FR%), dry weight (g), relative dry weight (BKR%), and essential value index (IV%) were obtained which can be seen in Table 1 and Table 2 below.

Table 1. Types of weeds found in 3-month-old *Acacia crassicarpa* stands

No	Weed Name	Latin Name	Family
1	Acacia	*Acacia crassicarpa*	Fabaceae
2	Sections	*Asystasia gangetica*	Acanthaceae
3	Goletrak	*Borreria alata*	Rubiaceae
4	Bundung	*Cyperus odoratus*	Cyperaceae
5	Low Elephant Grass	*Isolepis cernua*	Cyperaceae
6	Reeds	*Imperata cylindrica*	Poaceae
7	Sword Nail	*Nephrolepis biserrata*	Nephrolepidaceae
8	Meniran	*Phyllanthus urinaria*	Phyllanthaceae
9	Ramiding	*Stenochlaena palutris*	Aspleniaceae

*Note: Identification of Weeds based onNgatimin et al. (2020)

Table 2. Identification of weed composition in 3-month-old *Acacia crassicarpa* stands

No	Latin Name	∑	K	KR (%)	F	FR (%)	BK (g)	BKR (%)	IV (%)
1	*Acacia crassicarpa*	36	6.0	18.2	1.0	14.6	46.4	11.5	44.3
2	*Asystasia gangetica*	32	5.3	16.2	1.0	14.6	70.2	17.4	48.2
3	*Borreria alata*	50	8.3	25.3	1.0	14.6	64.9	16.1	56.0
4	*Cyperus odoratus*	40	6.7	20.2	1.0	14.6	79.4	19.7	54.5
5	*Isolepis cernua*	14	2.3	7.1	1.0	14.6	75.7	18.8	40.5
6	*Imperata cylindrica*	1	0.2	0.5	0.2	2.4	2.1	0.5	3.5
7	*Nephrolepis biserrata*	1	0.2	0.5	0.2	2.4	6.8	1.7	4.6
8	*Phyllanthus urinaria*	3	0.5	1.5	0.5	7.3	1.2	0.3	9.1
9	*Stenochlaena palutris*	21	3.5	10.6	1.0	14.6	56.8	14.1	39.3
	Total	**198**	**33**	**100**	**7**	**100**	**404**	**100**	**300**

Based on Table 1 in the field, 9 types of weeds were obtained under the 3-month-old *Acacia crassicarpa* stand. Goletrak (*Borreria alata*) is one of the most commonly found weeds of 50 individuals, then Bundung (*Cyperus odoratus* 40 individuals, Wild Acacia 36 individuals, Ruas-ruas 32 individuals and Ramiding (*Stenochlaena palutris*) 21 individuals. However, some weeds were found very rarely in the measurement plot, such as Sword Paku (*Nephrolepis biserrate* 1 individual, Alang-alang (*Imperata cylindrica*) 1 individual, and Meniran (*Phyllanthus urinaria*) 3 individuals. with a range of relative density values 0.5% - 25.3%, relative frequency values 2.4% - 14.6%, relative dry weight values 0.3% - 18.8% and important index values ranging from 3.5% - 56.0%.

Table 2 found three of the highest weed species and three lowest weed types. *Borreria alata* weed is a broadleaf weed with the highest relative density value of 25.3%, a critical index value of 56.0%. *Cyperus odoratus* weed, the relative density value obtained was 20.2% with a significant index value of 54.5%. *Asystasia gangetica* weed, with a relative density of 16.2% and an important value index of 48.2%. While the three lowest weed types, namely *Imperata cylindrica*, *Nephrolepis biserrate*, *Phyllanthus urinaria* were found with the lowest relative density value of around 0.5-1.5% and an important value index of 3.5-9.1%.

The density and type of dominant weed vegetation in an *Acacia crassicarpa* stand are very important, especially when controlling weeds. Weed density and dominance determine the amount and type of herbicide used right on target. Manual weed control also requires information on the types of weeds in the stand to save work and use the right tools.

Of the 9 types of weeds, the broadleaf weeds are *Acacia crassicarpa*, *Borreria alata*, *Asystasia gangetica*, *Stenochlaena palutris*, *Phyllanthus urinaria* and *Nephrolepis biserrate*. While the rest are narrow-leaf weeds such as *Cyperus odoratus*, *Isolepis cernu*a, and *Imperata cylindrica*. Broadleaf weeds are weeds with net-like leaves. What needs to be known about broadleaf weeds is that these weeds compete with cultivated plants in terms of getting sunlight. Meanwhile, narrow-leaf weeds or groups of grasses with ribbon-like leaves and stems have segments. This type of weed has creeping roots, and some have rhizomes.

Based on the impacts caused, broadleaf weeds have good growth ability and dominate peatlands. This is due to several supporting factors, such as wide leaf morphology. This aligns with the research conducted in which Mawandha et al. (2021) obtained results that broadleaf weeds dominate significantly compared to grass and tekian weeds on peatlands, with a dominance value reaching 84.83%.

a. Acacia crassicarpa

Acacia crassicarpa, in this case, is a type of wild acacia. Acacia is an invasive type that can grow quickly and dominate. Although the type is the same as cultivated plants, this wild acacia grows haphazardly and is very disturbing to cultivated plants.

Figure 2. *Acacia mangium*

This weed type is an erected tree with a single trunk a maximum height 15-30 meters. The bark is gray, and the phyllodes are light green to gray-green, lanceolate-falcate, 8-27 cm long, 1-4.5 cm wide. The inflorescences are pale yellow, bell-shaped, 2-7 cm long, appearing in clusters of 2-6 at the ends of branches. The pods are gummy, dull brown, straight, 3-12 cm long, 1-4.5 cm wide(CABI, 2025) The presence of wild Acacia also causes various problems for cultivated plants, including competition for sunlight, water, and competition in utilizing nutrients and growing

space (planting distance) (Kosasih & Mindawati, 2011).

b. Asystasia gangetica

Asystasia gangetica can grow in various regions with diverse conditions. In shaded areas such as plantation areas with relatively tall plants, this plant can produce leaves and vegetative organs so that it has fast and competitive growth and is often used as ruminant livestock feed (Kumalasari et al., 2020). This weed grows by spreading, dominating, and densely covering the soil. This weed interferes while providing fertilizer and nutrients that are feared to compete with the main plants.

Figure 3. *Asystasia gangetica*

The morphology of this weed is that of a taproot, an opposite leaf arrangement, oval and tapered leaf tips, and rounded leaf bases. It has bisexual, zygomorphic flowers, green petals, linear-lanceolate, 5 mm long, and hairy on the back. The capsule fruit is cylindrical, about 2.5 cm long, consists of 2-4 flat seeds, and is blackish-white to brownish (Socfindo Conservation, 2025).

c . *Borreria alata*

Borreria alata is one type of weed that is often found in plantations. This weed is competitive and can cause malnutrition to the growth of the central plant, so it is necessary to control it both physically and chemically (Nainggolan et al., 2022).

Figure 4. *Borreria alata*

This type of Borreria weed is very detrimental because it also likes to suck plant nutrients; as a result, plant productivity decreases and causes economic losses for farmers.(Tanasale et al., 2023). *Borreria alata* is a branched herbal weed with a stem height of about 75 cm, fleshy and 4-flapped. The leaves are opposite, elliptical, broad at the top and middle, and the tips are wide, short, and sharp, with a size of about 2.5 - 5 cm. The yellowish inflorescence appears in the leaf axils, measuring 0.6 - 1.2 cm. The flowers have hairy calyx and 4 sepals, with 4 androecium and a branched stigma. The characteristics of the seeds are hypocotyls measuring 15 - 23 mm.

d. *Cyperus odoratus*

Cyperus odoratus is a type of weed nutgrass that grows seasonally or perennially. Cyperus species produce much around rice fields because this habitat supports its life (Dari et al., 2023). This group of weeds is difficult to control because they have stem tubers in the soil that can grow over a long period. So, it is necessary to do optimal planning to control this weed.

Figure 5. *Cyperus odoratus*

This weed is a herb with the characteristics of a single leaf in the form of a ribbon with a length of 12 - 24 cm and a width of 0.1 - 0.4 cm. It has a long hollow stem and stands upright. The arrangement of the leaves is rosette on the stem. Flowers are compound flowers in the form of panicles at the end of the stem. The basic inflorescence is brownish-yellow, linear in shape with 3 pistils and 3 stamens(Dari et al., 2023)

e. *Isolepis cernu*

Isolespis cernua is a grass weed that can grow well and thrive in humid conditions, resulting in very dense and fertile growth on peatlands.

This weed also grows in water and on land. This weed is also a variable annual species, with fibrous stems 3-20 cm high, with 1-3 leaves shorter than the stem. The inflorescence is pseudolateral with 1-3 stemless spikelets and a bract that follows the stem (Dopchiz & Poggio, 2012). *Isolepis cernu*a is also easy to grow via seed and is quicker and easier to propagate vegetatively (Mahr, 2009).

Figure 6. Isolespis cernu

f . *Imperata cylindrica*

Imperata cylindrica or called cogongrass is a weed that is often found in open land and cultivated land and is one of 10 important weeds and is problematic worldwide. This weed is an invasive type, and its distribution is extensive. Itas adaptability, reproduces very quickly, and produces allelopathic substances that can inhibit the growth and development of plants around it (Ratna et al., 2022).

Figure 6. *Imperata cylindrica*

Imperata cylindrica has a height varying from 30-150 cm. The above-ground stem is short, erect and grows from rhizomes. The leaves are stiff, linear-lanceolate, reaching 120 cm long and 4-18 mm wide, with a conspicuous white vein in the middle, rough edges, and a pointed tip. The inflorescence is a white, spike-like, terminal, hairy crown flower, 5-20 cm long and up to 2.5 cm in diameter. The seeds are oblong, pointed, brown, and 1 - 1.5 mm long (CABI, 2025). The roots of cogongrass are pointed and have a hard, scaly texture. Cogongrass has rhizomes, which grow underground whitish and produce many stems. Through seeds and rhizomes cogongrass can grow and spread widely in almost all land conditions.

g. *Nephrolepis biserrate*

Nephrolepis biserrata is one of the weeds that grows and develops in various areas with humid and closed conditions, one of which is in oil palm plantations and HTI. Weeds can be categorized as shade plants because, in field conditions, these weeds grow well in oil palm plantation areas, which can be ground cover plants.

Weeds have a shape like a bunch of 3-5 strands. The stem is 1-2.5 mm in diameter with spreading branches. The scales on the stem can be very rare, dense, spreading, or hanging. This plant does not have tubers (CABI, 2025). The shape of the leaves is elongated, the edges are serrated, the tips and bases are tapered, the surface is hairy, and the width and length of the largest leaf are about 0.6 cm x 2.2 cm. The surface of the leaves is rough, with spores evenly located on the edge of the leaf. It has a round, slender, and elongated brown stem shape, fibrous roots, and rhizomes with a hairy stem surface (Listiyanti et al., 2022). Meanwhile, the leaf stalks have a soft, brown, scaly texture.

Figure 7. Nephrolepis biserrata

This plant is considered a weed when its number is large and dense, and it interferes with cultivated plants, especially when absorbing nutrients in the soil, where there will be competition. On the other hand, it benefits other plants, such as oil palm plantations. According to research by Ariyanti et al. (2016, this plant is used as a ground cover plant, which can affect the growth rate and production of oil palms because of the availability of sufficient water.

h. *Phyllanthus urinaria*

Phyllanthus urinaria, or Meniran, is a plant known to the public as a traditional medicine ingredient. This plant likes humid and shaded places. Meniran can be found in rocky areas, riverbanks, bushes, former rice fields, or growing around the yard. This plant will be called a weed because it has disturbed the main plant. However, so far, this plant is not invasive. However, it is known that this plant can be a home for several plant pests, so it can indirectly interfere with the growth and development of the central plant.

Phyllanthus urinaria has an erect, unbranched, or sparsely branched main stem that is rarely more than a foot tall. The lateral branches with two rows of alternate leaves resemble compound leaves. The leaves are finely hairy, nearly stalkless, oblong to narrowly obovate, blunt at the

tip, and about ½ - ¾ inch long. The unisexual flowers are white, small, and inconspicuous, occurring singly or in small clusters in the leaf axils. The female flowers develop rapidly after pollination to produce stalkless, round, somewhat flattened, rough-textured capsules. These capsules are about 1/8 inch in diameter when mature and are found beneath the leaves.

Figure 8. *Phyllanthus urinaria*

i. *Stenochlaena palutris*

Stenochlaena palustris is a type of fern growing in shaded areas with fairly moist soil conditions. (Aini et al., 2022)This type of weed grows or dominates in peat areas.

Figure 9. Stenochlaena palustris

This weed usually reproduces with spores, has an upright or creeping stem, and grows quickly. The shape of the roots is fibrous, and the rhizome stem grows or spreads on other plants. The surface of the stem is smooth green, and the leaves are compound, flat, and pinnate. The leaves stand upright, are long, have serrated edges, have brownish thorns, and have a smooth surface. The tip of the leaf is pointed, and the base is rounded (Halimatun et al., 2024).

Based on research by Kusumaningsih et al. (2023)on the same cultivated plant *Acacia crassicarpa* 1 month the type of weeds in the peat area that dominate there are 2, namely lemidi fern (Stenochlaena palustris) and harupat fern (*Nephrolepis biserrate*), the most dominant is Stenochlaena palustris with a density of 3,986 individuals/ha. These ferns can multiply because they produce fast and efficient seeds inhibiting cultivated plants, so they dominate and are invasive.

3.2. Summed Dominance Ratio Value of Weeds (%)

Based on the results of weed analysis on 3-month-old *Acacia crassicarpa* stands in Rasau Kuning district of PT Arara Abadi, the Summed Dominance Ratio (SDR) value was obtained, which can be seen in Table 3. SDR measures the relative dominance of various weeds in an area or ecosystem. Based on the SDR data in Table 3, the value obtained was between 1.2% -18.7%.

The highest SDR value in *Borreria alata* weeds is 18.7%, which indicates significant dominance in the weed community. Other types of weeds, such as *Cyperus odoratus*, *Asystasia gangetica*, and *Acacia crassicarpa*, also contribute highly to weed dominance with a 14.8-18.2% value.

Table 3. SDR Values of Weed Types under *Acacia crassicarpa* stands aged 3 months

No	Local Name	Scientific Name	SDR (%) *
1	Wild Acacia	*Acacia crassicarpa*	14.8
2	Sections	*Asystasia gangetica*	16.1
3	Goletrak	*Borreria alata*	18.7
4	Bundung	*Cyperus odoratus*	18.2
5	Reeds	*Imperata cylindrica*	1.2
6	Low Elephant Grass	*Isolepis cernua*	13.5
7	Sword Nail	*Nephrolepis biserrata*	1.5
8	Meniran	*Phyllanthus urinaria*	3.0
9	Ramiding	*Stenochlaena palutris*	13.1
Total			**100**

* Note: SDR stands for Summed Dominance Ratio

The higher the SDR value of a species, the greater its control over biotic and abiotic factors in the environment (Lubis et al., 2022). Mawandha et al. (2021) stated the strong dominance results of broadleaf weeds, with a Summed Dominance Ratio (SDR) value exceeding 50%, indicating the ability of this type of weed to continue growing in non-optimal conditions such as in peatlands. Therefore, in this study, there were no weeds with an SDR value exceeding 50%, so the weeds found were suspected of having difficulty growing in non-optimal conditions.

The lowest SDR value was for the weed species *Imperata cylindrica* 1.2%, indicating a rare weed type rarely found and its relatively small contribution to total dominance.

3.3. Analysis of H', D, and Margalef species richness index values

Based on the results of weed analysis on 3-month-old *Acacia crassicarpa* stands in the Rasau Kuning district of PT Arara Abadi, the values of the Shannon-Wiener diversity index (H'), Simpson dominance (D) and Margallef species richness (R1) were obtained, which can be seen in Table 4.

Based on the data presented in Table 3, the Shannon-Wiener diversity value (H') is 1.96, categorized as moderate. This indicates that the *Acacia crassicarpa* stands at 3 months and has a relatively even level of weed

diversity. Meanwhile, the Simpson dominance value (D) of 0.15 indicates a stable level of weed dominance, indicating that no weeds significantly dominate the stand. The Margallef species richness analysis (R1) results of 1.51 illustrate a low level of weed species richness. This can be interpreted as the *Acacia crassicarpa* standing at the 3-month growth stage having a limited weed abundance in terms of species variation. These findings provide important insights into weed management in the early growth stage of the *Acacia crassicarpa* stand, which can be the basis for planning appropriate weed control measures, such as using one or two types of active ingredients to control weeds in the stand because it is only dominated by certain weeds with low or even species richness.

The moderate diversity of weeds, even dominance, and low weed species richness in 3-month-old *Acacia crassicarpa* stands are likely due to peatlands having the characteristics of marginal land that is poor in nutrients so that only certain weeds can grow.

Table 4. Analysis of weed index values in 3-month-old *Acacia crassicarpa* stands

Index Analysis	Mark	Criteria
Shannon-Wiener diversity (H')	1.96	Currently
Simpson's Dominance (D)	0.15	Stable
Species Richness (R1) Margallef	1.51	Low

4. Conclusion

Weeds growing in 3-month-old *Acacia crassicarpa* stands at PT Arara Abadi in the Rasau Kuning District revealed 198 individual plants. Nine species were identified, including Goletrak (*Borreria alata*), one of the most commonly found weeds, with 50 individuals. Other species included Bundung (*Cyperus odoratus*) with 40 individuals, Wild Acacia with 36 individuals, Ruas-ruas with 32 individuals, and Ramiding (*Stenochlaena palutris*) with 21 individuals. Additionally, some weeds were found very rarely in the measurement plot, such as Sword Nail (Nephrolepis biserrata) with 1 individual, Alang-alang (*Imperata cylindrica*) with 1 individual, and Meniran (*Phyllanthus urinaria*) with 3 individuals. The relative density values ranged from 0.5% to 25.3%, relative frequency values from 2.4% to 14.6%, relative dry weight values from 0.3% to 18.8%, and essential index values from 3.5% to 56.0%.

The highest species dominance ratio (SDR) value in *Borreria alata* is 18.7%, indicating significant dominance within the weed community. Other weed species, such as *Cyperus odoratus*, *Asystasia gangetica*, and *Acacia crassicarpa*, contribute substantially to weed dominance, with SDR values ranging from 14.8% to 18.2%.

The Shannon-Wiener diversity index (H') is 1.96, which is categorized as moderate. The Simpson dominance index (D) of 0.15 indicates a stable level of weed dominance. The Margalef species richness analysis (R1) results of 1.51 illustrate a low level of weed species richness.

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