

Types of Ferns (Pteridophyta) in the Oil Palm Plantation Area, Rambahan Village, Pasaman Regency as a Contribution of Teaching Materials to Biodiversity Material Phase E SMA/MA

Eti Nurhayati¹, Nursyahra², Aulia Afza³

^{1,2,3}Program Studi Pendidikan Biologi, Fakultas Sains dan Teknologi, Universitas PGRI Sumatera Barat, Jl. Gn. Pangilun, Kec. Padang Utara, Kota Padang, Sumatera Barat, Indonesia

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ABSTRACT

Ferns are a division of plants that are distinctly characterized by three primary parts: roots, stems, and leaves. However, ferns do not produce seeds. In Rambahan Village, located in Pasaman Regency, there are privately managed oil palm plantations that are often overrun with ferns, some of which have become weeds to the oil palm crops. The specific species of these ferns remain unidentified by the local community. This study aimed to identify the species of ferns in the oil palm plantations of Rambahan Village and to produce a book as a contribution to biodiversity education materials. The research, conducted from August to September 2024, was descriptive in nature and employed an exploratory survey method. Results revealed the presence of 19 fern species (Pteridophyta) in the plantation area, including *Helminthostachys zeylanica*, *Selaginella plana*, *Vittaria costata*, *Adiantum latifolium*, *Vittaria lineata*, *Davallia denticulata*, *Phymatosorus scolopendria*, *Crypsinus taeniatus*, *Thelypteris Abrupta*, *Asplenium dimidiatum*, *Asplenium serratum*, *Thelypteris palustris*, *Nephrolepis biserrata*, *Nephrolepis cordifolia*, *Stenochlaena palustris*, *Dryopteris filix*, *Dryopteris carthusiana*, *Diplazium esculentum*, and *Lygodium palmatum*. The resulting book serves as an educational contribution to biodiversity studies.

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Corresponding Author:

Eti Nurhayati

Jurusan Pendidikan Biologi, Fakultas Sains dan Teknologi, Universitas PGRI Sumatera Barat, Indonesia

Email: enurhayati974@gmail.com

1. INTRODUCTION

Indonesia is one of the countries that has the highest plant biodiversity in the world. One of the plants that live in Indonesia is ferns (Pteridophyta). Ferns are a division whose members clearly have cormus, meaning that their bodies can clearly be differentiated into three main parts, namely roots, stems and leaves. However, ferns do not yet produce seeds. In terms of habitat and way of life, apart from growing in the soil, ferns (Pteridophyta) also live by attaching themselves to other organisms to obtain nutrition and nutrients from these organisms. One of the hosts where ferns attach is to oil palm trunks. Therefore, ferns can be divided into several groups, namely epiphytic ferns, terrestrial ferns and aquatic ferns. [1].

One of the habitats for ferns can be found in the oil palm plantation area in Rambahan Village, Pasaman Regency. Rambahan Village is one of the villages in Pasaman Regency which is administratively located in Rao Selatan Nagari Tanjung Betung District. The area of this nagari is 29.30% of the area of South Rao sub-district, namely 99.31 km^2 . The livelihood of the population is generally farming and gardening. One of the plantations owned by the community is oil palm plantations. This oil palm plantation is owned by individuals. Based on ministerial regulation number 98 of 2013 concerning guidelines for plantation business licensing, it is stated that what is meant by community oil palm plantations is oil palm plantations managed by the community with an area of less than 25 hectares.

Based on the results of surveys and observations carried out in December 2023 in the Rambahan village oil palm plantation, various types of ferns (Pteridophyta) were found in this plantation area. It is not uncommon for people not to know the types of ferns that exist, so people do not know about the types of ferns that have economic and ecological benefits. So the researchers wanted to see what types of ferns usually grow in the oil palm plantation area of Rambahan village. The species diversity of this fern is unknown and similar research has never been carried out in this area. The results of this research will be contributed in book form. According to Minister of Education, Culture, Research and Technology Regulation Number 22 of 2022, general books are intended for a wide audience and provide information and education to the public so that these books have a wide and varied readership.

Based on the background described above, the researcher has carried out research entitled "Types of Ferns (Pteridophyta) in the Palm Oil Plantation area of Rambahan Village, Pasaman Regency as a Contribution of Teaching Material to Biodiversity Material in Phase E SMA/MA". The results of this research will be contributed in book form.

2. METHOD



Figure 1. Map of the research location

This research uses an exploratory survey method. The exploration method is carried out by exploring the oil palm plantation by taking the road in the middle of the plantation then walking to the right and left in a zigzag manner for 20m each. This is done repeatedly until no more different species are found. During sampling activities in the field, several tools and materials are needed to load the dry herbarium of fern specimens, including scissors, cutter knife, newsprint, cellphone, duct tape, sacks, plywood, large plastic, raffia rope, label paper, and other stationery. Meanwhile, the ingredients needed for preservation are 70% alcohol or spirit liquid.

After sampling and making the herbarium were completed, the fern herbarium specimens were identified at the Botany Laboratory, Faculty of Science and Technology, PGRI University, West Sumatra using the Flora identification book for schools in Indonesia (2008) by C.G.G.J Van Steenis, Plant Taxonomy by Gembong Tjitrosoepomo (2005) and Reserva Biologica do Uatuma Amazonia Central Pteridophyta do Uatuma zuquim, Gabriela, dan Jefferson (2008). Then a book was designed on Types of Ferns found in the Rambahan Village Oil Palm Plantation Area which was used as a contribution.

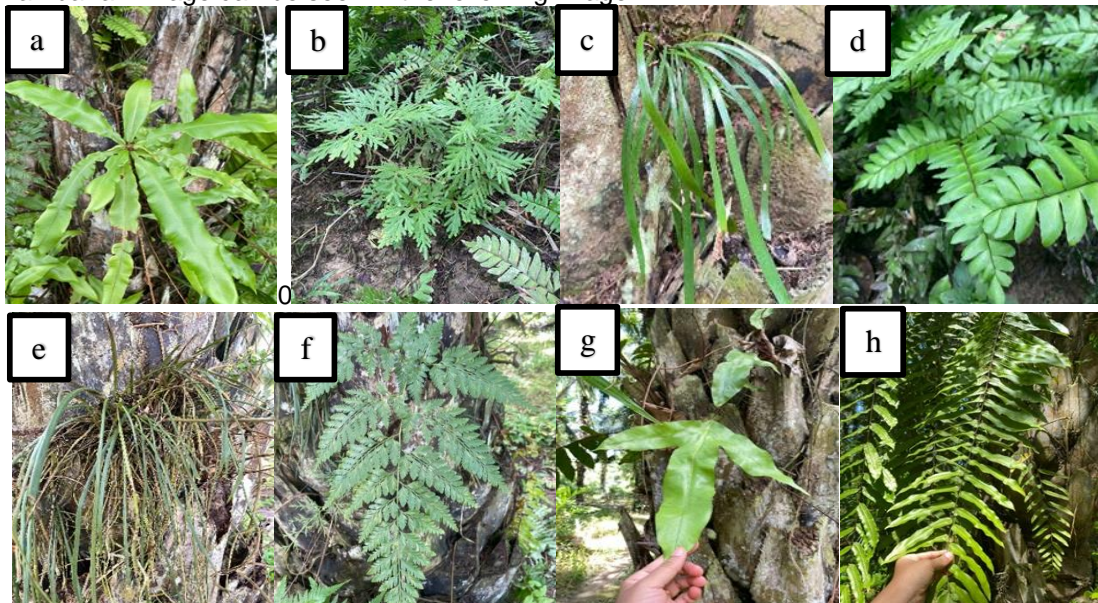
3. RESULTS AND DISCUSSION

Based on the research that has been carried out on the types of fern plants in the oil palm plantation area of Rambahan Village, 19 species of fern plants were obtained which are included in 3 classes, namely the Psilophytinae, the Lycopodinae and the Filicinae, as shown in table 1.

Table 1. Types of fern plants found in the oil palm plantation area of Rambahan Village

Classis/Ordo	Familia	Spesies	Habitat
Psilophytinae			
Ophioglossales	Ophioglossaceae	1. <i>Helminthostachys zeylanica</i>	Epifit
Lycopodinae			
Selaginellales	Selaginellaceae	2. <i>Selaginella plana</i>	Terrestrial
Filicinae			
Polypodiales	Pteridaceae	3. <i>Vittaria costata</i>	Epifit
		4. <i>Adiantum latifolium</i>	Terrestrial
		5. <i>Vittaria lineata</i>	Epifit
	Polypodiaceae	6. <i>Davallia denticulata</i>	Epifit
		7. <i>Phymatosorus scolopendria</i>	Epifit
		8. <i>Crypsinus taeniatus</i>	Epifit
		9. <i>Thelypteris Abrupta</i>	Terrestrial
	Aspleniaceae	10. <i>Asplenium dimidiatum</i>	Epifit
		11. <i>Asplenium serratum</i>	Epifit
		12. <i>Thelypteris palustris</i>	Terrestrial
		13. <i>Nephrolepis biserrata</i>	Terrestrial
	Nephrolepidaceae	14. <i>Nephrolepis cordifolia</i>	Epifit
		15. <i>Stenochlaena palustris</i>	Terrestrial
	Blechnaceae	16. <i>Dryopteris filix</i>	Terrestrial
	Dryopteridaceae	17. <i>Dryopteris carthusiana</i>	Terrestrial
		18. <i>Diplazium esculentum</i>	Terrestrial
	Athyriaceae	19. <i>Lygodium palmatum</i>	Terrestrial
Schizaeales	Lygodiaceae		

Documentation of research results on the types of ferns found in the oil palm plantation area of Rambahan village can be seen in the following image.



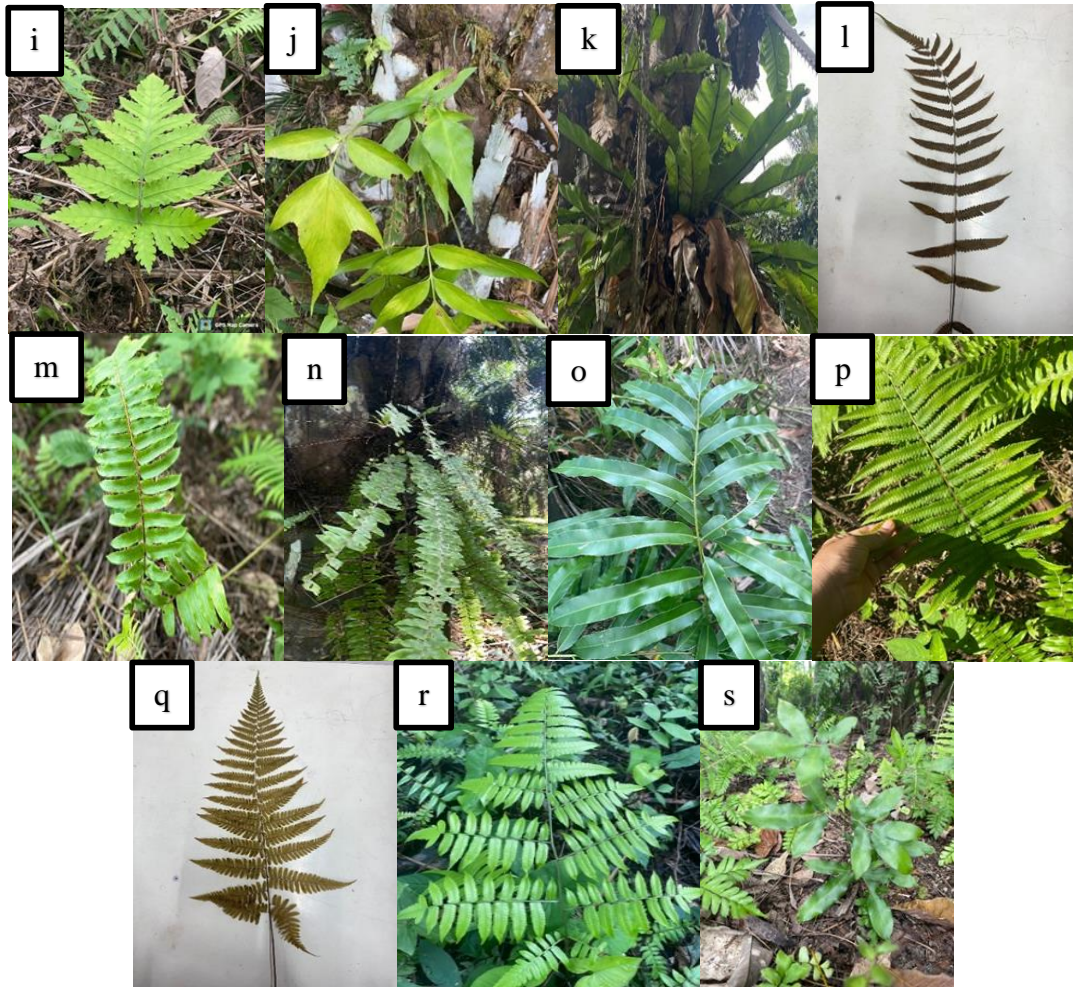


Figure 2. Ferns in the oil palm plantation of Rambahan village a. *Helminthostachys zeylanica* Vittaria costata, b. *Adiantum latifolium*, c. *Vittaria lineata*, d. *Davallia denticulata*, e. *Oleandra neriiformis*, f. *Phymatosorus scolopendria*, g. *Goniophlebium percussum*, h. *Tectaria fuscipes*, i. *Asplenium dimidiatum*, j. *Asplenium nidus*, k. *Thelypteris palustris*, l. *Nephrolepis biserrata*, m. *Nephrolepis cordifolia*, n. *Stenochlaena palustris*, o. *Dryopteris filix*, p. *Dryopteris carthusiana*, q. *Diplazium esculentum*, r. *Selaginella plana*, dan s. *Lygodium palmatum*

a. *Helminthostachys zeylanica*

Grows scattered, terrestrial habitat, rhizome spreading, fleshy. Green erect stipes covered with hairs. Leaves consist of two main parts, namely sterile leaves and fertile leaves, green with pinnate bones. The sporangium is arranged in small clusters at the end of the sporophyll stalk. The environment where this species grows is a humid place and protected from sunlight. According to Sastrapraja (1980), this fern can be recognized by its herbaceous appearance, dimorphism, elongated sterile leaves. The sterile leaves are elongated, arranged in a finger with a pointed tip, pointed base and wavy edges, the fertile leaves form spikelets.

b. *Selaginella plana*

It has branching stems and roots. The leaves are small (microphyll) and arranged like "tongues" (ligula). The leaves are arranged tightly in a spiral line. Only a few sporophyll leaves were found collected in a series at the tip of the stem. The leaves are small and arranged around the stem in a tighter arrangement. The stems are located at ground level and sometimes take root to form new plants. According to Tjitrosoepomo (2011), *Selaginella plana* has branches that form anisotomes and on the stem there are small leaves arranged in a spiral forming 4 rows. At the bottom of the upper side of the leaf there is a scale called a ligula. This part is a water sucking device which is often connected to transport vessels via tracheids.

c. *Vittaria costata*

These ferns are found as epiphytes on moist oil palm trunks and some are attached to mossy trees. It has a fibrous root shape, an inconspicuous stem, a single elongated leaf, a flat leaf base, a pointed leaf tip and a green color with flat leaf edges and not incised, and has a herbaceous appearance. Sorus is located under the surface of the leaf. In accordance with the opinion of Tjitrosoepomo (2009), this fern is a terrestrial fern that is an epiphyte on trees. The leaves are dark green with a thick, lanceolate structure with flat edges and a rounded base. Dark brown spores are located on the lower edge of the leaf tip surface.

d. *Adiantum latifolium*

Adiantum latifolium lives terrestrially, the stems are round brown, the rhizomes are hairy and grow in groups. The leaves are dark green, the base of the leaf is tapered, the tip of the leaf is rounded. The brown submarginal sorus is located on the lower edge of the leaf, the shape of the sorus is long, rounded. According to Steenis (2013), this fern has erect rhizome roots, dense and short leaves. The leaf stalks are glabrous, the leaves are compound, the leaflets are alternate and the leaf stalks are thick at the ends. Sori on the underside of the leaf under the edge of the curled leaf spur, the edge of the leaf also functions as a covering membrane.

e. *Vittaria lineata*

This fern is epiphytic, grows in clumps, short brown rhizomes, pinnate leaf spines, flat leaf edges, tapered leaf tips and bases. It has brown sorus, arranged on the lower leaf surface in the form of lines parallel to the edge of the leaf. This type of fern grows epiphytically, has single leaves like grass leaves. The creeping rhizome is rather long and dark brown in color. The upper surface of the leaf is dark green, the edge of the leaf is slightly curved towards the lower surface to cover the collection of spores found along the edge of the leaf [5].

f. *Davallia denticulate*

Grows epiphytically or terrestrially. Has long, fleshy rhizome roots. Old rhizomes are covered with dark brown scales, while young rhizome scales are light brown. Ental frayed. The shape of the ental is more or less triangular, consisting of single or triple pinnate leaves. The texture is stiff and strong, with a shiny upper surface according to the opinion of [6]. This nail has a strong, fleshy and slightly spreading rhizome, the stem is dark brown and slightly shiny. The shape of the enthal is triangular, triple or quadruple pinnate. The leaves are triangular in shape with serrated edges. The leaves are stiff and strong, the leaves are green, and have fibrous roots.

g. *Phymatosorus scolopendria*

Forms a network of fibrous roots. The rhizome stems are spreading, with small scales. The leaves are green, finger-shaped, the leaves are in pairs, the surface is smooth, the tips of the leaves are tapered. Sorus are found under the surface of the leaves, in parallel clusters which are yellowish brown and round in shape. This type of pteridophyta is found epiphyte on tree trunks. Fibrous roots, rhizome stem, hairy surface. Round petioles are covered with hairs. The leaves are green, single, finger-shaped, the edges are pointed, the tip and base are tapered. The surface of the leaves is smooth, on the lower surface of the leaves you can find oval-shaped brown sorus arranged in a spread. The round sorus is elongated and spreads across the lower surface of the leaf from the middle side of the leaf vein [7].

h. *Crypsinus taeniatus*

Epiphytic fern habitat, short dark brown rhizome. Stipes are brown and hairy. Simple pinnatus leaves are light green, the edges of the leaves are flat and the tips of the leaves are tapered. The leaves are pinnate. The round sorus is brown and does not have an indisium located on the underside of the leaf. According to Holtum (1966), these nails are widespread in damp areas. Superficial sorus under the surface of the leaf which is arranged on the left and right of the leaf, round in shape, brown in color, has no indisium and appears on both leaf surfaces.

i. *Thelypteris abrupta*

Live terrestrially in open places, grow in groups. Having round rhizomes, pinnatus leaves with pointed tips and serrated leaf edges. The green leaves have a rough texture. Sorus spreads over the lower surface of the leaves, is round and brown in color. This description is supported by the opinion of Zaquim (2008) who states that this fern lives terrestrially, pinnate leaves, macrophyll, tapered leaf tips, curved edges, rough texture and round sorus with indisium spreading under the leaf surface. The environment where these ferns grow is in areas that are moist and rich in humus. The introduction to this fern is that the rhizome is spreading, round, grows in clusters, long stipes.

j. *Asplenium dimidiatum*

Lives epiphytically on oil palm tree trunks. The green leaves are oval to lanceolate and narrow at the tip. The surface of the leaves is shiny, the edges are wavy or slightly curved. The brownish spores are located inside the sori which are arranged linearly along the leaf veins on the lower surface of the leaf. According to Sylvestre et al., (2023), this fern is an epiphytic or terrestrial fern. Has erect, short stems, dark brown to blackish scales. Leaves erect, lamina pinnate, lanceolate, rachis very scaly, especially on the abaxial surface of the axis of the pinna. Linear spores cover the entire abaxial surface of the pinna usually terminating near the margin. Spores with cristate perispores.

k. *Asplenium serratum*

Asplenium serratum L. is an epiphytic fern that is similar to *Asplenium nidus*. This fern has a short, creeping rhizome with single leaves that resemble a rosette. The spore characters form a line and are located on either side of the leaf spine. This is in accordance with what was stated by Sofiyanti et al. (2013) that this fern has a short and creeping rhizome with a single leaf type resembling a rosette. The leaves on this fern are smaller and less stiff. On the right and left of the leaf veins, the sori are arranged tightly to form a straight line.

l. *Thelypteris palustris*

Thelypteris palustris has fibrous roots. Stems erect, rhizome and rather small. Compound leaves, opposite leaflets which are located slightly alternately, curved tips, serrated edges, tight petioles on the surface there is a dark brown indumentum. The sorus is located under the surface of the leaf with a round shape lined up on the edge of the leaflets and is blackish brown in color. This type of pteridophyta is found terrestrially on moist soil surfaces and is shaded by trees. In line with the opinion of Nugraheni and Prabowo (2022), *Thelypteris palustris* is a species of fern (Pteridophyta) which has the characteristics of a creeping rhizome and curved leaves. This fern prefers full sun to shade. Grows in sandy soil that is moist but not too wet. But this plant can adapt to other types of soil easily. Can be found along ponds or water parks.

m. *Nephrolepis biserrata*

Nephrolepis biserrata grows terrestrially. Rhizome roots are upright, densely leafy. The leaf stalks are covered with light brown scales and fall off easily. The leaflets are sitting or almost sitting, at a distance from one another, lanceolate or striped, the base is wedge-shaped or pointed and the upper edge often has weak ears, the tip is narrow, pointed, the young leaves have fine hairs. The sterile leaves have flat edges or have weakly serrated edges, the fertile ones are as wide as the sterile ones, have ears, have shallow serrated edges or have flat edges at the ends. The leaf veins are parallel, close together, and end in sori. According to Tjitrosoepomo (2009), long fibrous roots, rhizome stems with a surface covered by hair. Flat, rectangular leaf stalks with hairy surfaces. Young leaves are light green with curled tips. Compound leaves, pinnately bony, elongated leaf shape, serrated edges, tapered tip and base. The surface of the leaves is hairy. Round or striped sorus can be found on the lower surface of the leaves arranged parallel to the edge.

n. *Nephrolepis cordifolia*

Grows terrestrially or epiphytically. It has erect rhizome roots, propagates below the soil surface like hair and is scaly. Leaves are pinnate, long and curved. Arrangement of leaflets in

pairs along the main stem. The leaf edges are finely serrated and the leaf stalks are hairy. Sorus are found on the edges and middle of the leaves, which are round in shape. According to Romaidi et al., (2012) The appearance is herbaceous, the leaves are compound, there are entals (young leaves that roll up), the color is green, the veins are pinnate, the surface is smooth, leaf-shaped, the leaf edges are finely serrated, the leaf stalks are hairy. Apart from that, the leaves are also reduced, meaning the lower leaflets are very small when compared to the other leaflets. The stem is long, in the form of a rhizome, has a rough surface and contains ramenta. The stems are brown and unbranched. Has fibrous roots. The roots are brown and have scales. Sorus are found on the edges and middle of the leaves, and are round in shape. Each sporangium contains spores which are yellow and rarely greenish.

o. *Stenochlaena palustris* (Burm. f.) Bedd

This fern has a long spreading rhizome. Ental pinatus, serrated leaf edges are shiny green. uncommon as an epiphyte. According to Sofiyanti (2013), *Stenochlaena palustris* has fibrous roots, climbing rhizome stems. Leaf stalks are round with a smooth surface. Young leaves are red with curled buds. Compound leaves, pinnate spines, elongated in shape, toothed edges, pointed tip, tapered base and smooth leaf surface. The sorus are small round in shape, arranged parallel to the bottom of the leaf and do not have an indisium.

p. *Dryopteris filix*

Fiber root form. The rhizome stems are long upright, have a brown hairy surface and are not branched. The compound leaves are green, the surface of the leaf is smooth, the edge of the leaf is serrated and the tip of the leaf is tapered. This fern has a sorus located on the bottom surface of the golden yellow leaves. This type of pteridophyta is found terrestrially on moist soil surfaces. According to Batta and Triyoso (2022) *Dryopteris filix-mas* has a fibrous root shape. The rhizome stems are long upright, have a brown hairy surface and are not branched. The compound leaves are green, the position of the leaflets is alternate, the leaves are wavy with a smooth hairy surface, the edges of the leaves are serrated and the tips of the leaves are tapered. The sorus is located on the bottom surface of the golden yellow leaves. This type of pteridophyta is found terrestrially under trees on moist soil surfaces.

q. *Dryopteris carthusiana*

Terrestrial habitat. It has a scale-like structure on the underside of the leaf blade, light green in color, relatively narrow, ovate-lanceolate in outline. The edges of the leaves are toothed and prickly. Spores are located in the center. The stem is a long, slender upright rhizome. The surface of the stem is green, unbranched and decorated with light brown scales. The round sorus is located on the underside of the leaf. According to Nuraini and Wisanti (2022) *Dryopteris carthusiana* has a herbaceous appearance with light green lanceolate leaves, finely serrated leaf edges and relatively narrow leaf size. It has a small green stalk and is scaly at the base. Its habitat is in humid areas. There are round, yellowish sorus arranged scattered on the lower surface of the leaves.

r. *Diplazium esculentum*

It has short creeping rhizomes, green upright stipes, frond bipinnatus - tripinnatus, pinnate shape with serrated leaf edges and pointed tips. The base is obtuse and has a herbaceous appearance. Spores are located on the lower surface of the leaves, round and brown in shape. Terrestrial habitat in damp places or under shade. According to Tjitrosoepomo (2009), the rhizome of this fern is black, the stipes are dark and fleshy with lots of flesh, reaching a length of 1.2 m. The fronds are compound, pinnate, lanceolate, with a serrated edge, a pointed tip, a blunt base, and composed of 15 pairs of leaflets. Spores grow along the veins of the leaflets in the axils of the leaflets which grow shoots to reproduce themselves.

s. *Lygodium palmatum*

Lygodium palmatum is a fern that creeps and lives in open areas. The stem is thin with dichotomous branches which are brown in color. Each side of the branch consists of 2 leaves. Leaves with finger veins, flat edges, pointed leaf tips, and green in color. According to

Tjitrosoepomo (2009) *Lygodium palmatum* or known as American climbing fern is a group of ferns that creep and live in open places. The leaves are fingered green, with pointed tips and flat edges. Thin brown stems with dichotomous branching. Each side of the branch has 2 leaves.

Based on the results of research on the types of ferns (Pteridophyta) found in the oil palm plantation area of Rambahan Village, it was found that there were 19 species of ferns which can be grouped into 3 classes, namely the Psilophytinae class (ancient ferns), the Filicinae class (true ferns) and the Lycopodinae class (wire nails/vine ferns). Of these three classes, the most dominant ferns come from the Filicinae class, especially the Polypodiales order which consists of seven families and 16 species. The Filicinae class is dominant because many species of this class are able to survive in moist soil conditions and varying light levels. Meanwhile, ferns in the classes Psilophytinae and Lycopodinae are found in limited numbers, namely only one species of each. This shows that although these two classes of ferns can survive in oil palm plantations, their populations are much smaller than the Filicinae class. The reason why there are few fern species found in this class is due to the lack of supporting environmental conditions for growth such as soil conditions, temperature and ecosystems in oil palm plantation areas. From the research results, it was found that the ferns found in oil palm plantation areas were divided into two main groups based on their habitat, namely epiphytic ferns and terrestrial ferns. Data was obtained for 10 species of terrestrial ferns and 9 species of epiphytic ferns. Terrestrial ferns are more dominantly found in this area.

4. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that there are 19 species of ferns (Pteridophyta) found in the oil palm plantation area of Rambahan village, namely *Helminthostachys zeylanica*, *Selaginella plana*, *Vittaria costata*, *Adiantum latifolium*, *Vittaria lineata*, *Davallia denticulata*, *Phymatosorus scolopendria*, *Crypsinus taeniatus*, *Thelypteris Abrupta*, *Asplenium dimidiatum*, *Asplenium serratum*, *Thelypteris palustris*, *Nephrolepis biserrata*, *Nephrolepis cordifolia*, *Stenochlaena palustris*, *Dryopteris filix*, *Dryopteris carthusiana*, *Diplazium esculentum*, and *Lygodium palmatum*.

The teaching materials for the book on types of ferns produced are valid and can be used as a contribution.

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