

Composition and similarity of vegetation types in the Mount Seulawah Agam geothermal area, Aceh Besar District

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Abstract. The Mount Seulawah Agam area is an active volcanic area that has an impact on the emergence of symptoms of volcanism. Such environmental conditions will cause the vegetation that grows in the area to be unique and not commonly found in other areas. Apart from that, the area is still relatively natural and has not experienced much disturbance by human activities. This study aims to determine the composition and similarity of vegetation types in the geothermal area of Mount Seulawah Agam, Aceh Besar District. Data collection in the field was carried out using the multiple square method with stratified sampling based on the specified soil temperature zone. Each zone was laid out in four square plots in a systematic random manner. Each plant found in the observation plot was recorded as its species name (identified by using a flora identification book) as well as the number of individuals of each species. Data analysis was carried out using the Important Value Index (IVI) analysis, and the Sorenson Similarity Index. The results showed that there were 611 individual plants from 65 species identified in various growth rates (seedlings, sapling, poles, and trees). The similarity index of plant species at each growth stage in the Seulawah Agam geothermal area, Aceh Besar District generally has different species similarity in each observation zone, that is, the average is below 50%. This condition indicates that there are significant differences in plant structure at various growth rates in each zone.

Keywords: Species composition, species similarity, vegetation, soil temperature, zones, geothermal

INTRODUCTION

Indonesia is located on a world tectonic framework which is closely related to geothermal energy potential. Geothermal potential in Indonesia is spread over various islands, namely Java, Sumatra, Nusa Tenggara and Sulawesi [1]. Aceh Province is located in the westernmost of Sumatra island and has four active volcanoes, namely Mount Burni Telong, Mount Peut Sagoe, Mount Jaboi, and Mount Seulawah Agam [2]. A geothermal system is a system in which energy stored in the form of hot water or hot steam under certain geological

conditions at a depth of up to several kilometers in the crust of the earth and it includes transferred heat and fluids toward the surface. The presence of concentrations of heat energy in geothermal systems is generally characterized by the presence of heat anomalies that can be recorded on the surface and stated as high-temperature gradients [3].

The Ie Jue hot spring area is located in Lamteuba, Mount Seulawah Agam, Aceh Besar District, Aceh Province. Mount Seulawah Agam is the most active compared to other volcanoes in Aceh. The manifestation of this volcano is the presence of van Heuzt crater and Simpago crater, fumaroles, steam, and hot water (or hot spring) [2]. Hot springs are one indicator of the presence of geothermal or geothermal energy [4]. Geologically, the Mount Seulawah Agam area is a volcanic pathway that has an impact on the emergence of post-volcanism

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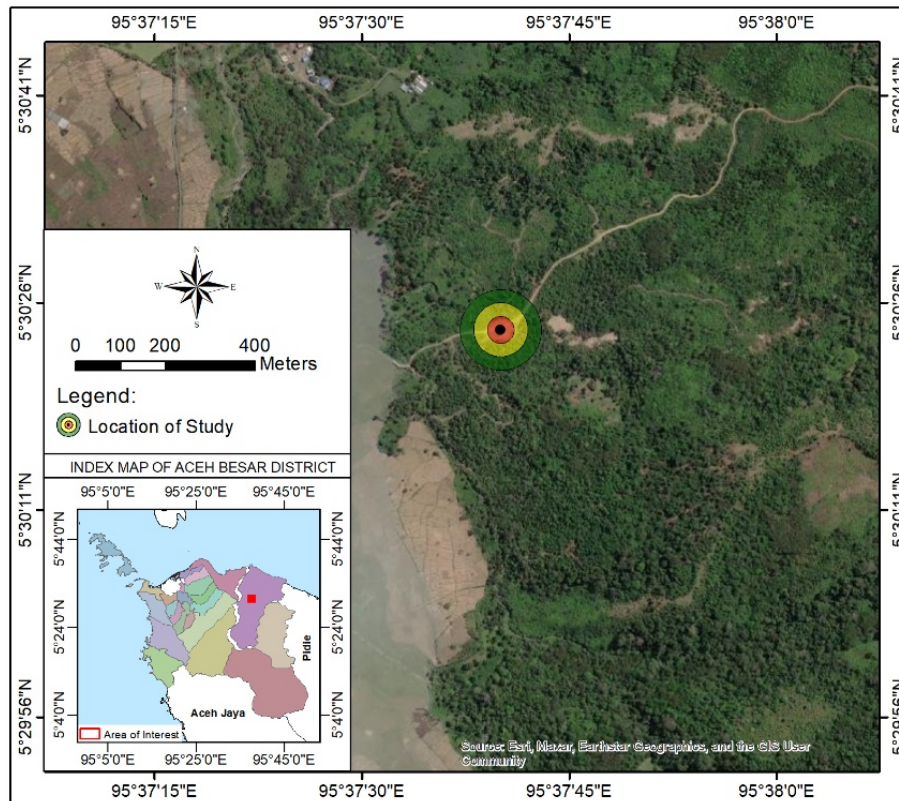


Figure 1. Geothermal Area (Ie Jue hot spring), Lamteuba, Mount Seulawah Agam, Aceh Besar District

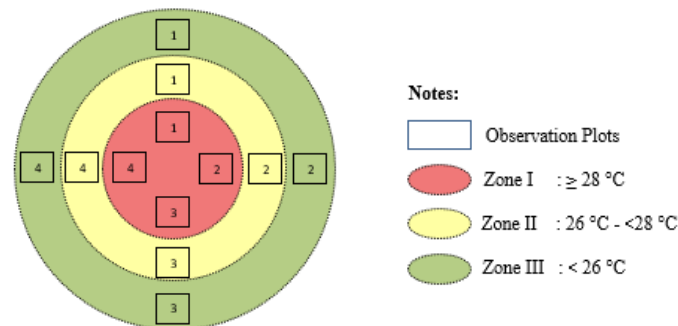


Figure 2. Sketches of observation plots based on soil temperature zones

symptoms [5]. Currently, the area has still been relatively natural and not experienced much disturbance by human activities. Therefore, these environmental conditions is expected to nurture vegetation types that are unique from other areas.

The results of previous studies indicate that typical vegetations to the volcanic areas were identified where the diversity of vegetation structures increases with the changing of environmental factors, such as the distance from the springs and its relationship with soil temperature, soil pH, air temperature and humidity. These environmental factors affect the typical shape of the vegetation types and correlate with the structure and composition of

the vegetation in the hot spring area [6]. Vegetation tends to decrease gradually when the temperature increases in an area [7]. Areas that have high soil temperatures will affect how rich the plant species are in an area [8].

Based on the initial studies that have been conducted, in the Ie Ju area (Lamteuba, Aceh Besar) it is seen that the physiognomy of the vegetation changes along with the changes in proximity to hot springs. The closer to the hot springs the different types of vegetation predominate and the lower the height of the vegetation, and vice versa. In the area closest to the hot springs and the direction of the flow looks open, only growing with a few types of small plants such as moss, nails, and grass.

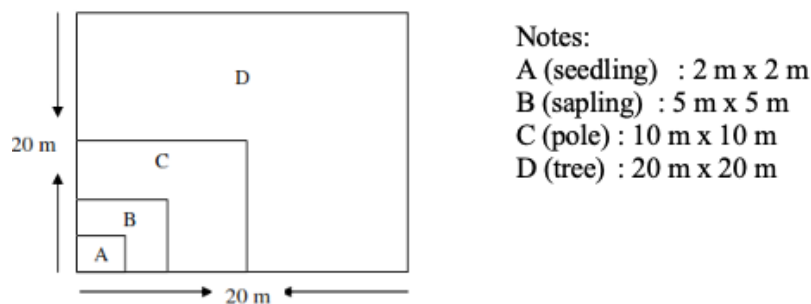


Figure 3. Sample plot sketch of vegetation data collection

Vegetation in the form of shrubs and small trees was only found growing at the distance more than 35 m from the hot spring flow. However, so far no data related to the influence of soil temperature of the Ie Jue Lamteuba area on the surrounding vegetation has been reported. Therefore, this research was conducted to determine the composition and similarity of vegetation types in the geothermal area of Mount Seulawah Agam, Aceh Besar District.

METHODOLOGY

Study sites

The research was conducted in the geothermal area (Ie Jue hot spring), Lamteuba, Mount Seulawah Agam, Aceh Besar District (Figure 1). This research was conducted from August 2019 to August 2020.

Tools and materials

The tools used in this study included a compass, digital camera, Global Positioning System (GPS), stick pH meter, Hagameter, soil tester, cloth meter, lux meter, meter, cardboard, ratchet, stationeries, worksheets, plant scissors, plastic bag, and plant species identification book. The materials used in this study were 70% alcohol, rope, old newspapers, plastic bags, white cardboard, and hanging labels.

Data collection

This study used the multiple square plot method with stratified sampling based on the soil temperature zones. Zone I was at the area with the highest temperature ($\geq 28^\circ\text{C}$); Zone II was the area around geothermal sources which have soil temperatures between 26°C to $<28^\circ\text{C}$; and Zone III was the area around geothermal sources that have a soil temperature $<26^\circ\text{C}$. In each zone, four observation square plots were placed systematically random as can be seen in Figure 2.

In each observation plot, nested plots were made, namely 20 m x 20 m for observation of tree strata (tree diameter ≥ 20 cm), 10 m x 10 m

for pole level (tree diameter 10 cm to < 20 cm), 5 m x 5 m for sapling level (tree diameter < 10 cm, height > 1.5 m) and 2 m x 2 m for seedlings (plant height ≤ 1.5 m). The following is a sample plot scheme carried out in the field (Figure 3).

In each predetermined plot, vegetation was observed at each growth stage, namely seedlings, sapling, poles, and trees. Each plant found in the observation plots is recorded in its name of the plant species (using the plant determination key book (flora book) and flora encyclopedia) and the number of individuals of each species was also recorded. Particularly for the trees, poles, and sapling, the diameters of their trunks were measured. Specimens of plants that could not be identified on site were taken, made as herbarium specimens, and then identified at the Acehense Herbarium, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala, Banda Aceh. The data were then analyzed using the Importance Value Index (IVI) and the Sorenson Similarity Index.

RESULTS AND DISCUSSION

Vegetation type composition

Species composition is the arrangement of the number of individuals present in a plant community. This research found the vegetation composition in the Seulawah Agam geothermal area, Aceh Besar District were consisted of a total of 611 individuals and were identified to 65 species and 37 families with various growth rates of seedlings, saplings, poles, and trees. The highest number of species was found at the growth rate of saplings (36 species), seedlings (28 species), poles (22 species), and trees (17 species), respectively (Figure 4). This number of species found was higher than in the Ie Suum geothermal manifestation area, Mesjid Raya District, Aceh Besar District (34 species) [9] and in the Gemuhak hot springs area of South Sumatra (40 species) [6], but lower than in the lowland tropical forest area, Ulu Gadut, West

Sumatra(155 species) [10]. Differences in species within an area are caused by the differences of habitat environmental conditions that affect the growth of these species. Plant growth is strongly influenced by environmental physical and chemical factors which include temperature, humidity, light intensity, and nutrients in the soil [11]. The results of research in the Telaga forest of Gunung Leuser National Park (TNGL) also say that the high species richness in a habitat is caused by environmental

physical and chemical factors that are suitable for the growth and development of plants in the area [12].

This research area was divided into three observation zones based on soil temperature in the Seulawah Agam geothermal area, Aceh Besar District and it showed different numbers of species and individuals in each zone (Table 1). The division served a purpose to observe the

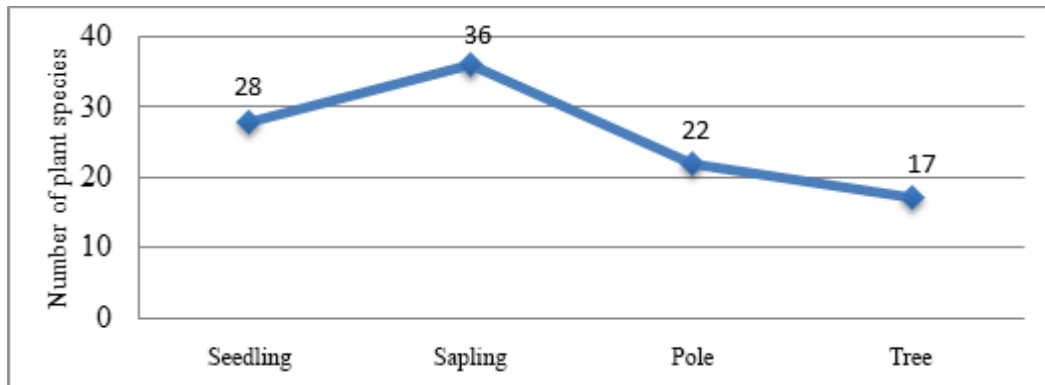


Figure 4. Composition of vegetation types in the geothermal area of Mount Seulawah Agam, Aceh Besar District

Table 1. The number of vegetation types present in each observation zone in the Seulawah Agam geothermal area, Aceh Besar District

No	Observation Zone Based on Soil Temperature	Number of Species				Total	Number of Individuals				Total
		Se	Sa	Po	Tr		Se	Sa	Po	Tr	
1	Zone I ($\geq 28^{\circ}\text{C}$)	23	20	9	8	60	171	34	17	12	234
2	Zone II ($26^{\circ}\text{C} < 28^{\circ}\text{C}$)	12	18	10	9	49	132	34	18	22	206
3	Zone III ($< 26^{\circ}\text{C}$)	12	18	15	11	56	92	30	26	23	171

Seedling (Se); Sapling (Sa); Pole (Po); Tree (Tr)

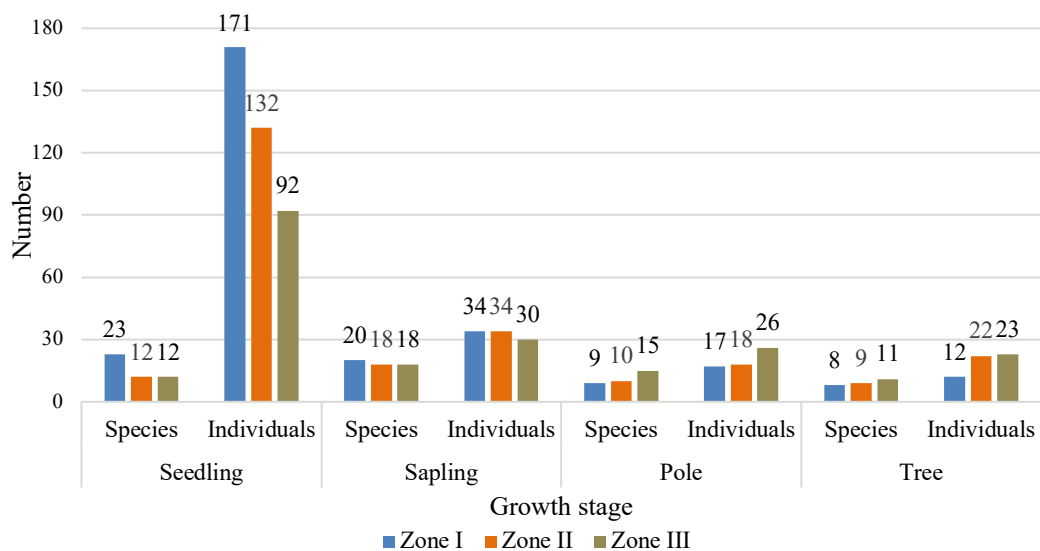


Figure 5. Number of vegetation species and individuals of different strata in different zones

ability of plant species to live and adapt to different soil temperatures.

The composition of vegetation types in the Seulawah Agam geothermal area, Aceh Besar District varies based on the growth rate in each observation zone (Table 1). The growth rate of

[14]. The existence of plant species based on soil temperature zones in the Seulawah Agam geothermal area, Aceh Besar District can be seen in Table 2.

There were 16 plant species from 16 families found particularly in every observation zone in

Table 2. Presence of plant species based on soil temperature zones in the Seulawah Agam geothermal area, Aceh Besar District

Species existence	Number of species
Only in Zone I	43
Only in Zone II	34
Only in Zone III	39
In All Zones	16

seedling was found the most in Zone I with 23 plant species while tree found the least with 8 species Zone I was the closest area to the geothermal crater which has $\geq 28^{\circ}\text{C}$ soil temperature, which affects the composition of vegetation growth rates. The results of research in the area of Mount Merapi after the pyroclastic fire said that the most common types of herbaceous plants were 42 species [13].

In Zone II, the growth rate of sapling was most commonly found, which consisted of 18 plant species, while the tree was the least found with 9 plant species. As it is known that the research area in Zone II is an area that has a soil temperature between 26°C to $<28^{\circ}\text{C}$ so the soil temperature in this zone will affect the composition of vegetation types at different growth stages. The composition of the types of vegetation growth rates in Zone III that was most commonly found was the growth rate of saplings, which consisted of 18 plant species. While the growth rate of trees is the least vegetation growth rate found in Zone III, namely 11 plant species. As it is known that the research area in Zone III is an area that has a soil temperature $<26^{\circ}\text{C}$ so the soil temperature will affect the composition of each type of vegetation.

The high and low vegetation composition in the Seulawah Agam geothermal area, Aceh Besar District in each observation zone is caused by several environmental factors. The results showed that the success of each species to live in an area was influenced by its ability to adapt optimally to all environmental physical factors (temperature, light, humidity, soil structure), biotic factors (interactions between species, competition, parasitism), and chemical factors (water availability, pH, oxygen, nutrients in the soil) and others that interact with each other

the Seulawah Agam geothermal area, Aceh Besar District. The types of vegetation found were *Flacourtia rukam*, *Cynodon dactylon*, *Meyna spinosa*., *Cyperus rotundus*, *Chromolaena odorata*, *Stachytarpheta jamaicensis*, *Vitex pinnata*, *Streblus asper*, *Fagraea fragrans*, *Melia azedarach*, *Erioglossum rubiginosum*, *Ficus rasemosa*, *Alstonia scholaris*, *Macaranga gigantea*, *Aralia* sp., dan *Aleurites moluccana*. *Flacourtia rukam* was one of the plants found in every observation zone, meaning that this type of plant can adapt from the normal to high soil temperature gradients in tropical forests. It can adapt to a wide range of temperatures, rainfall, and soil conditions but is not resistant to frost and saline conditions [15].

Environmental factors, such as soil, air, humidity, temperature, light, and water, can affect the growth and development of plants [16]. The existence of the 16 types of vegetation indicated that they have relatively better adaptability and tolerance compared to others, especially to the high soil temperature factor, while other types of vegetation tend to only be able to live in a particular zone. Some plants have succeeded in growing in diverse environmental conditions so these plants tend to be widespread in an area [17]. Although these species were always present in every observation zone, they were not always classified as the dominant species, because in each zone the types that dominate were different. So that these types of vegetation can be used as a reference for the selection of vegetation types in the same area that has a higher soil temperature.

The importance value index (IVI) of vegetation types in a community is one of the parameters that able to show the role of vegetation types in that particular community. Calculation results showed that *Cynodon dactylon* had the highest

environmental conditions and the presence of other species in the area [19]. The IVI values of the five most dominant vegetation types of each growth rate in the Seulawah Agam geothermal area, Aceh Besar District can be seen in Table 3

Table 3. The five dominant species at each growth stage in the Seulawah Agam geothermal area, Aceh Besar District

Growth Rate	Dominant Species	KR (%)	FR (%)	DR (%)	IVI (%)
Seedling	<i>Cynodon dactylon</i>	22,78	12,85	-	35,64
	<i>Desmodium triflorum</i>	20,25	2,85	-	23,11
	<i>Cyperus rotundus</i>	11,39	7,14	-	18,53
	<i>Chromolaena odorata</i>	6,58	10,00	-	16,58
	<i>Stachytarpheta jamaicensis</i>	5,82	8,57	-	14,39
Sapling	<i>Meyna spinosa</i>	12,24	5,55	-	17,80
	<i>Streblus asper</i>	8,16	6,94	-	15,10
	<i>Erioglossum rubiginosum</i>	7,14	6,94	-	14,08
	<i>Flacourtia rukam</i>	5,10	5,55	-	10,65
	<i>Vitex pinnata</i>	5,10	5,55	-	10,65
Pole	<i>Meyna spinosa</i>	13,11	14,58	10,16	37,86
	<i>Alstonia scholaris</i>	8,19	8,33	9,96	26,49
	<i>Streblus asper</i>	8,19	8,33	6,92	23,45
	<i>Vitex pinnata</i>	8,19	6,25	7,74	22,19
	<i>Fagraea fragrans</i>	8,19	6,25	7,26	21,71
Tree	<i>Ficus racemosa</i>	19,29	12,82	34,22	66,33
	<i>Melia azedarach</i>	19,29	15,38	15,17	49,85
	<i>Vitex pinnata</i>	17,54	15,38	11,13	44,06
	<i>Aleurites moluccanus</i>	8,77	7,69	11,97	28,44
	<i>Erioglossum rubiginosum</i>	7,01	10,25	4,92	22,19

IVI in the growth rate of seedling, which is equal to 35.64%. At the sapling and pole level, *Meyna spinosa* was the species with the highest IVI at 17.80% and 37.86%, respectively. Meanwhile, at the tree level, *Ficus racemosa* was the type with the highest IVI at 66.33%. The high IVI value indicates that a species is dominant and has higher adaptability than other species. A type of vegetation can affect the stability of the ecosystem because it is dominant over other types [18]. The species that has the highest IVI value means that it has the most important role in an ecosystem. A species has the most dominant influence on changes in

The IVI values of vegetation in the Seulawah Agam geothermal area, Aceh Besar District varied based on its growth rate (Table 3). The dominant species at the seedling growth rate that had the highest IVI were *Cynodon dactylon* (35.64%), followed by *Desmodium triflorum* (23.11%), and *Cyperus rotundus* (18.53%), respectively. *Meyna spinosa* was the most dominant species found in the sapling and pole growth rate at 17.80% and 37.86%, respectively. *Ficus racemosa* was the most dominant species found in tree growth rate (66.33%), followed by *Melia azedarach* (49.85%), and *Vitex pinnata* (44.06%). The value of this species was much

higher than the IVI value of other species at each growth stage. Vegetation types that have an IVI value of $\geq 10.00\%$ are the types that are included as the main constituent of the vegetation community in an area [20].

Frequency at the growth rate of the pole, which is equal to 14.58%. At the tree growth rate, the highest relative frequency values were *Melia azedarach* and *Vitex pinnata*, each of which was 15.38%. Based on the relative frequency values,

Table 4. Important value index of vegetation in each observation zone in the Seulawah Agam geothermal area, Aceh Besar District

Observation Zone	Growth Rate	Dominant Species	KR (%)	FR (%)	DR (%)	IVI (%)
Zone I	Seedling	<i>Cynodon dactylon</i>	16,37	10,00	-	26,37
	Sapling	<i>Meyna spinosa</i>	23,52	8,00	-	31,52
	Pole	<i>Meyna spinosa</i>	17,64	21,42	20,33	59,41
	Tree	<i>Vitex pinnata</i>	25,00	27,27	25,71	77,98
Zone II	Seedling	<i>Desmodium triflorum</i>	37,87	5,00	-	42,87
	Sapling	<i>Aralia</i> sp.	11,76	13,04	-	24,80
	Pole	<i>Meyna spinosa</i>	27,77	26,66	18,96	73,41
	Tree	<i>Ficus racemosa</i>	31,81	18,18	51,40	101,40
Zone III	Seedling	<i>Cynodon dactylon</i>	52,17	20,00	-	72,17
	Sapling	<i>Erioglossum rubiginosum</i>	16,66	12,50	-	29,16
	Pole	<i>Fagraea fragrans</i>	15,38	10,52	15,62	41,53
	Tree	<i>Melia azedarach</i>	17,39	17,64	19,71	54,75

Zone I ($\geq 28^{\circ}\text{C}$); Zone II ($26^{\circ}\text{C} - < 28^{\circ}\text{C}$); and Zone III ($< 26^{\circ}\text{C}$)

The relative density (KR) value of *Cynodon dactylon* was a type of vegetation at the growth rate of seedlings that has the highest relative density value compared to other types of Relative Density, which is equal to 22.78%. While *Meyna spinosa* is a type of vegetation at the sapling growth rate that has the highest relative density value compared to the others, which is equal to 12.24%. Then *Meyna spinosa* is also a type of vegetation at a pole growth rate that has the highest relative density value compared to other types of KR, which is equal to 13.11%. *Ficus racemosa* and *Melia azedarach* are vegetation types at tree growth rates that have the highest relative density values compared to other KR species, which is 19.29%. The high relative density of these plant species is due to the large number of individuals found in each observation zone.

Relative Frequency (FR) Value of *Cynodon dactylon* species is the highest type of seedling growth rate, which is equal to 12.85%. While the highest Relative Frequency at the sapling growth rate was found in the types of *Streblus asper* and *Erioglossum rubiginosum*, which were 6.94% each. Then the type *Meyna spinosa* is the type that has the highest Relative

it can be seen the proportion between the number of trees in a species with the number of other species in the community can describe the distribution of individuals in the community. The spread and growth of individual trees are strongly influenced by seed germination, soil topography, and other environmental factors [21].

The relative dominance (DR) value of *Meyna spinosa* is a type of vegetation at a pole growth rate that has the highest relative dominance value compared to other types of DR, which is 10.16%. Meanwhile, *Ficus racemosa* is a type of vegetation at a tree growth rate that has the highest relative dominance value compared to other types, namely 34.22%. The species that dominate an area are expressed as species that have wide adaptability and tolerance to environmental conditions [22].

The Important Value Index of vegetation types in each observation zone were varied (Table 4). Based on Table 4 it is known that the most dominant important value index of the growth rate of seedlings in zone I is *Cynodon dactylon* which is 26.37%. The most dominant value index of sapling growth rate in the zone I was

Meyna spinosa, which was 31.52%. The most dominant value index of pole growth rate in zone I is *Meyna spinosa* which is equal to 59.41%. While the importance value index of the tree growth rate in zone I, the most dominant was the *Vitex pinnata* type, which was 77.98%.

Type *Cynodon dactylon* is a type of plant that can adapt to extreme environmental conditions compared to other types of grass because it has seeds that are small and easily spread quickly [23]. This is following the research area in zone I which is an extreme area characterized by higher soil temperatures compared to other areas. *Meyna spinosa* is a type of plant that belongs to the Rubiaceae family which includes thorny shrubs or small trees that are spread in tropical and subtropical regions of the world. About 11 of these species are distributed from Tropical Asia to Southeast Asia, two or three species are found in India [24].

The most dominant index of importance value of seedling growth rate in zone II was *Desmodium triflorum*, which was 4.87%. The most dominant value index of the sapling growth rate in zone II is *Aralia* Sp., which is 24.80%. The most dominant index of importance value of pole growth rate in zone II was *Meyna spinosa*, each of which was 73.41%. While the importance value index of the tree growth rate in zone II, the most dominant is the *Ficus racemosa*, which is 101.40%. *Desmodium triflorum* is a plant that can grow from the lowlands to the highlands at an altitude of 5-1500 meters above sea level. Until now, the

optimal height for this plant to grow is unknown [25]. This is also the case with the research area which has an altitude range of 237-263 meters above sea level. The height at which it grows is very influential on plants and needs to get the main attention because it is difficult to modify. Altitude affects air temperature, sunlight, air humidity, and wind. The higher a place, the lower the temperature of the place and the less intensity of sunlight. Factors of temperature and light intensity are used in the classification of plants, namely lowland and highland plants [26].

The most dominant value index of seedling growth rate in zone III was *Cynodon dactylon*, which was 72.17%. The most dominant index of the importance value of the growth rate of saplings in zone III was *Erioglossum rubiginosum*, which was 29.16%. The most dominant index of importance value of pole growth rate in zone III is *Fagraea fragrans*, which is 41.53%. The most dominant value index of tree growth rate in zone III is the *Melia azedarach*, which is 54.75%. A high IVI value means that a species is dominant and has better adaptability than other species. A type of vegetation can affect the stability of the ecosystem because it is dominant over other types [18].

Similarity of Vegetation Types

The community similarity index describes how similar the structure and species composition of the stands are compared. The similarity index

Table 5. Index values of similarity of vegetation types based on temperature zoning in the Seulawah Agam geothermal area, Aceh Besar District

Growth Rate	Observation Zone	Zone I	Zone II	Zone III
Seedling	Zone I	100		
	Zone II	12,78	100	
	Zone III	12,78	13,00	100
Sapling	Zone I	100		
	Zone II	18,90	100	
	Zone III	19,10	18,78	100
Pole	Zone I	100		
	Zone II	10,89	100	
	Zone III	15,89	16,40	100
Tree	Zone I	100		
	Zone II	10,25	100	
	Zone III	12,00	12,33	100

Zone I ($\geq 28^{\circ}\text{C}$); Zone II ($26^{\circ}\text{C} - < 28^{\circ}\text{C}$); and Zone III ($< 26^{\circ}\text{C}$)

value ranges from 0-100%, where the higher similarity index value indicates the higher level of similarity between the two communities being compared [27]. The results of the analysis of the similarity of vegetation types in the Seulawah Agam geothermal area, Aceh Besar District can be seen in Table 5.

The similarity index at each growth stage in the Seulawah Agam geothermal area, Aceh Besar District generally varied in each observation zone, with an average below 50%. This condition indicated that there are quite significant differences in plant structure at various growth stages. A comparison of the similarity index values for the growth rate of the seedlings among the three observation zones that had the highest similarity was found between zones II and zone III, which was 13.00%, while the dissimilarity of plant species at the seedling level in the comparison of the two zones was equal to 87.00%. Low species similarity is caused by variations in physical and chemical environmental conditions, as well as interactions between species along the observation zone [27]. The observed research areas were classified as extreme areas, which is characterized by high soil temperatures, which range from $<26^{\circ}\text{C}$ to $\geq 28^{\circ}\text{C}$. So, it can be concluded that although the two zones are the highest compared to the other zones, there is no similarity in plant species at the seedling level in each observation zone.

While the sapling level plant species similarity index among the three observation zones had the highest species similarity between zone I and III, which was 19,10%, while the seedling level plant species dissimilarity in the comparison of the two zones was 80,90%. A community is considered completely different if the similarity index value is $< 50\%$, and it is said that a community is the same if the similarity index value is $\geq 75\%$ [28]. So it can be concluded that although the two zones had the highest similarity compared to the other zones, there is no similarity in plant species at the sapling level in each observation zone.

The highest similarity index value at the pole growth rate was found in zone II and zone III, which was 16.40%. Meanwhile, the lowest similarity index values were found in zone I and II, which were 10,89%. Mangurran (1988) states that a community is considered completely different if the similarity index value is $<50\%$, and it is said that a community is the same if the similarity index value is $\geq 75\%$ [28]. So it can be concluded that there are differences in the similarity index of pole-level plant species in each observation zone. This is influenced by environmental factors found in

the area which causes the similarity of different plant species.

Meanwhile, the highest similarity index value for tree growth was found in zone II and zone III, namely 12,33%, with the index of dissimilarity in the types of the two zones, namely 87,67%. Meanwhile, the lowest species similarity index at the tree growth rate was found in zones I and II, which was 10,25%, with the index value for the type dissimilarity of the two zones, namely 89,75%. The existence of differences in the index of similarity in a species, which is caused by variations in environmental conditions and interactions between species in the study area causes the species that live to also vary [29]. The higher the similarity index value, the fewer different species composition, and conversely the lower the similarity index, the more different species composition [30].

CONCLUSION

The composition of plant species in the Seulawah Agam geothermal area, Aceh Besar District, found as many as 611 individuals from 65 identified plant species starting from the growth stages of seedlings, saplings, poles, and trees. In zone I, the most dominant species found based on growth rate were seedlings (*Cynodon dactylon*), saplings (*Meyna spinosa*), poles (*Meyna spinosa*), and trees (*Vitex pinnata*). In Zone II, the most dominant species found based on growth rate were seedlings (*Desmodium triflorum*), saplings (*Aralia* sp.), poles (*Meyna spinosa*), and trees (*Ficus racemosa*), while in the Zone III the most dominant types found based on growth rate were seedlings (*Cynodon dactylon*), sapling (*Erioglossum rubiginosum*), pole (*Fagraea fragrans*), and tree (*Melia azedarach*). Meanwhile, the similarity of plant species in each observation zone in the Seulawah Agam geothermal area, Aceh Besar District, is classified into the low category, which is at an average below 50%.

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