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Succession of Plant Spesies Following a Forest Fire on Mount Talang, West Sumatera

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Abstract**—** *This research was conducted from May to July 2018. Observation of vegetation was carried out in the ex-fire of Talang Mount area, while identification of vegetation was carried out in the Herbarium Biology Departmen, Faculty of Science and Mathematics Andalas University. The purpose of this study is to identify vegetation that grows after forest fire, to determine the effect of forest fire on the succession processes. Vegetation analysis in natural forest and post-combustion forest was carried out by making observation plots of vegetation with map sizes for seedling level of 2mx2m, sapling level of 5mx5m, pole level of 10mx10m and tree level with a size of 20mx20m. Observation data is carried out with important value index analysis, There are 22 identified vegetations that grow after forest fire. The influence of forest fire on the existence of the succession process indicated by the presence of plants that grow in the post-burning forest area, namely Similac sp and A6 plants.*

Keywords**— Analysis of vegetation, natural forest, post-burnt forest.**

I. INTRODUCTION

Indonesia is one of the countries included in megadiversitas, which is a country that has a high diversity of flora. Forest is a natural resource which is very important because it constitutes a biological diversity as a source of germplasm, the source of the seeds of natural vegetation, the source of forest products such as timber and non-timber, regulating water management, protection against floods and erosion as well as soil fertility, protection of biodiversity for interests of science, culture, recreation, tourism, and so on (Istigono, 2004).

Mount Talang is one of the active volcanoes located in West Sumatra and is administratively located in the district of Koto Anau, Solok District. This mountain has the altitude (elevation) where 2,597 m asl (PVMBA, 2007). On February 1, 2018 Mount Talang forest area affected by fire, the fire started from the top of the mountain and then spread to the southern and eastern slopes of Mount Talang. The negative impact caused by fire in the mountain area is certainly large enough cover damage to parts of the surrounding forests, declining biodiversity, the loss of the seeds of natural vegetation, declining economic value of forests and soil productivity.The impact of wildfires covering all aspects of the ecosystem such as fauna, soil, water, climate, air, and humans. Moreover, the response to the forest fires will impact on the reduction of plant species composition, decrease in the quality and quantity of tree stands caused by heat. Due to the warming fire, the plant's metabolic processes will be disrupted and damaged even death. On the other hand the impact of forest fires will encourage various forms of adaptation of plants to fire, including promoting germination, seed dispersal, and breaking dormancy of certain seeds.

Utomo (2013) adds that the next generation that will appear is determined by the compatibility of the seeds in the ground to be able to grow and flourish. Information about seed reserves in the soil is important in the study of the ecology of an ecosystem because it can describe the existing vegetation on it and also to determine the potential of other types of plants that will grow in these habitats. Ore reserves in secondary forests play an important role as a source of seed to plant colonization process in the succession process.

An examination of the structure and composition of species, forest fires will affect the succession, which would allow the emergence of new types of vegetation and the loss of vegetation types existing in the region. Rahmasari (2011) adds that the succession is happening is an attempt to restore the ecosystem of the environmental conditions both biotic and abiotic components components. The succession of changes can be seen from the composition and structure of the forest vegetation.

Based on these descriptions, the authors conducted a research on "Succession of Plants Spesies Following A Forest Fire on Mount Talang, West Sumatera".

II. MATERIALS AND METHODS

This research was conducted from May to July 2018. Observation of vegetation was carried out in the ex-fire of Talang Mount area, while identification of

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vegetation was carried out in the Herbarium Biology Departmen, Faculty of Science and Mathematics Andalas University. While the tool needed is a map of the location of the study, the Global Positioning System (GPS), thermo-hygrometer, rope, scissors, tape measure, compass, machete, commando knives, drill belgi, camera, identification books and stationery vegetation. Vegetation analysis in natural forest and post-combustion forest was carried out by making observation plots of vegetation with map sizes for seedling level of 2mx2m, sapling level of 5mx5m, pole level of 10mx10m and tree level with a size of 20mx20m. Observation data is carried out with important value index analysis (Soerianegara and Indrawan, 1988).

With the formula:

Important Value Index = Relative Density + Relative Frequency (For seedlings and saplings)

Important Value Index = Relative Density + Relative Frequency + Dominance Relative (For pole and tree level)

III. RESULT AND DISCUSSION

3.1 Identification of the Vegetation

Based on the observations of vegetation were carried out in the field, found some vegetation after a forest fire, all the vegetation is identified in the Herbarium Laboratory of the Department of Biology, Faculty of Mathematics and Natural Sciences (MIPA) Andalas University and there is one type of vegetation that can not be identified due to organ reproductive yet complete and include the type of vegetation that is rarely found in tropical rain forests. Vegetation identified species that grow after a forest fire can be seen in Table 1.

Based on observations in natural forests and forest after the fire, suspected early on natural forest vegetation is similar to the post-burn forest vegetation because of the condition of forest belonging to the secondary forest with the ambient temperature and humidity averaging nearly the same, namely 15.1ºC - 19.1ºC and an average humidity of 68%. Presumably because of the overlay in a forest ecosystem that dominates the vegetation growing on post-burn forest areas is similar to natural forests.

The existence of the new vegetation to grow after the fire indicates that fires can influence the seed in the soil deposits to encourage various forms of adaptation of plants to fire, including breaking dormancy of certain seeds. The presence of certain types of seeds are small and lightweight due to the condition of post-burn forest area that opens make the seed easily blown by the wind and can grow back. Utomo (2013) states that the generation plants that appear after fires compatibility is determined by seeds grains to grow and thrive. Ore reserves in secondary forests play an important role as a source of seed to plant colonization process in the succession process.

3.2 Analysis Of Vegetation

Based on observations of vegetation analysis performed on the natural forest area and forest area after the fire, the vegetation found seedlings, saplings, poles and trees. Importance Value Index (IVI) seedlings in natural forests and post-burn forest can be calculated from the sum of the relative density with relative frequency. In plants, the seedlings, the index value is important in natural forests and post-burn forest can be seen in Table 2.

In Table 2 it can be seen that the Family Poaceae can be found in natural forests and forest after the fire. Percentage of important value index *Melastoma trachyphyllum* plant on post-burn forest areas is also higher than the natural forest natural forest I and II. The high importance value index may show a mastery or domination is also high, this shows that the plant is a plant *Melastoma trachyphyllum* pioneer or a beginner who first occupy an open environment after the fire.

Similac sp and A6 plant are growing vegetation after forest fires that are not found in natural forests natural forests I and II. The existence of the new vegetation to grow after the fire indicates that fires can influence the seed in the soil deposits encourage the various forms of plant adaptations to fire. Pictures of *Similac* sp and A6 plants can be seen in Figure 1

Aciana *et al*., (2017) stated that the succession is a process that affects the turn of plants within a certain period. Then Saharjo and Cornelio (2011) adds the cause of the species composition of vegetation changed after the fires allegedly spread along the wind, birds and other animals that eat grains or fruits that help in the speed of growth of new vegetation in the area.

In plants saplings, the index value is important in natural forests and forest post-burn seen in Table 3.

In Table 3 it can be seen that no plant saplings growing in the forest on fire after post-burn forest I and II. This happens because the plant saplings belonging to natural regeneration saplings taller than 1.5 m with a trunk diameter of less than 10 cm, and this is also due to the short time period at the time of observation after the fire broke out three months makes no vegetation included in the category of saplings. In Table 3 types *Gahria javanica* explain important value index is the highest, followed by the type of *Melastoma trachyphyllum*, it indicates that the type of *Gahria javanica* and *Melastoma trachyphyllum* grow to dominate on both natural forest.

Importance Value Index poles on natural forests and post-burn forest seen in Table 4. In Table 4 it can be seen that there is no plant small trees growing on post-

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burn forest I and II post-burn forest. This happens because the poles are a category of young trees that have a trunk diameter of 10-20 cm. It is also due to the short time period at the time of observation after the fire broke out three months makes no vegetation types included in the category of small trees. This also shows that due to a fire will cause a great impact. This impact will cause the extinction of species of flora that existed before.

The highest index of significant value to both natural forest dominated by family Rhododendrum, then the type of *Vaccinicum vangiaefolium*, *Pandanus tectorius* and *Ficus microcarpa*. The dominant species in a plant community will have an important value index is high, so that the most dominant species of course have an index value of the greatest importance.

Important value index tree level in natural forests and post-burn forest can be seen in Table 5.

In Table 5 it can be seen that the percentage index of the highest importance which both natural forests are a type of plant *Vaccinicum vangiaefolium*. Index values of high importance can show a mastery or domination is also high. In Table 5 it can be seen that there is no vegetation level forest trees that grow on the first post-burn and post-burn forest II. This happens because the level of the tree is a category of adult trees have a diameter of more than 20 cm. With this condition requires a long time to be able to grow into a new plant within a time span of less than one year after the occurrence of a fire. Another possibility is happening is for a complex process of secondary succession requires a fairly long period of time or decades to reach balance or homeostasis.

Resosoedarmo et al., (1986) adds the speed of the succession process is also influenced by several factors including, the early community area damaged by disturbances. The more narrow area of land damage, the faster the process of community dynamics occur. Second, the plant species around the increasingly diverse causes more rapid succession process of vegetation. Thirdly, their presence would be life (seeds, fruits, spores, etc.) which is the main object in the succession of vegetation as well as the diffusion rate. Fourth, the newly formed substrate type also plays a role because it serves as a place to grow for the new plant, the better the quality of the substrate then the better the speed of succession. Fifth, the climatic conditions, especially the wind speed direction with seeds (seeds, fruits, spores, etc).

Table 1. Type of vegetation after wildfires

No.	Family / species	No.	Family / species
1.	*Poaceae*	13.	*Cyperus iria*
2.	*adiantaceae*	14.	*Cyperus kyllingia*
3.	*Gleiceniaceae*	15.	*Cyperus rotundus*
4.	*Ficus microcarpa*	16.	*Asystasia gangetica*
5.	*Melastoma trachyphyllum*	17.	*Gahria javanica*
6.	*Similac sp*	18.	*Croton hirtus*
7.	*Graptopyllum pictum*	19.	*Althernanthera sessilis*
8.	*Podocarpus neriifolius*	20.	*Fimbristylis mileacea*
9.	*Swietenia macrophylla*	21.	*Cleome rutidosperma*
10.	*blechnum vulcanicum*	22.	*Cleome gynandra*
11.	*Peperomia pellucida L*	23.	A6
12.	*Borreria latifolia*		

Description: A6 = species not yet identified its kind

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Table 2. Importance Value Index for seedlings in natural forests and forest post-burn

Family / Species	Importance Value Index (IVI)%			
	Natural forest I	Natural forest II	Post Burned forest I	Post Burned forest II
Poaceae	55.86	60.38	44.41	65.00
Gleiceniaceae	31.98	46.56	13.68	-
adiantaceae	10:13	-	13.68	-
lycopodium cernum	26.58	33.40	-	-
Melastoma trachyphyllum	-	19.66	102.06	98.33
Allaeophania rugosa	21.84	-	-	-
Similac sp	-	-	-	36.67
Graptopyllum pictum	10:13		13:09	-
blechnum vulcanicum	27.48	39.98	-	-
Gaultheria leucocarpa	15.99	-	-	-
A6	-	-	13:09	-
Total	199.99	199.98	200.01	200.00

Description: A6 = Species of unknown species

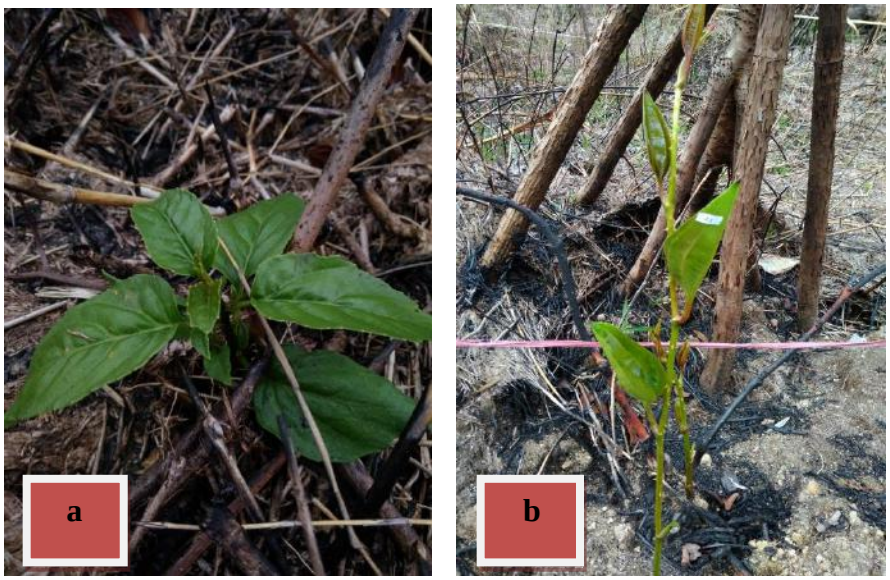

Fig.1: Vegetation growing seedlings after forest fires that are not found in natural forests. a) A6, b) Similac sp

Table 3. Importance Value Index saplings on natural forests and post-burn forest

Family / species	Importance Value Index (IVI)%			
	Natural forest I	Natural forest II	Post Burned forest I	Post Burned forest II
Melastoma trachyphyllum	38.99	48.19	-	-
Gahria javanica	86.90	69.80	-	-
Rhododendrum	37.21	-	-	-
Ficus microcarpa	36.90	-	-	-
Anaphalis javanica	-	42.35	-	-
A7	-	39.64	-	-
Total	200.00	199.98	-	-

Description: A7 = Species of unknown species

Table 4. Importance Value Index poles on natural forests and post-burn forest

Family / Species	Importance Value Index (IVI)%			
	Natural forest I	Natural forest II	Post Burned forest I	Post Burned forest II
Rhododendrum	94.88	82.55	-	-
Vaccinicum vangiaefolium	76.99	57.98	-	-
Pandanus tectorius	68.38	62.00	-	-
Ficus microcarpa	59.75	52.12	-	-
Litsea Sp	-	45.26	-	-
Total	300.00	299.91	-	-

Table 5. important value index tree level on natural forests and post-burn forest

Family / species	Importance Value Index (IVI)%			
	Natural forest I	Natural forest II	Post Burned forest I	Post Burned forest II
Vaccinicum vangiaefolium	68.40	55.87	-	-
Podocarpus elangatus	55.37	52.61	-	-
Eucalyptus alba	55.87	45.28	-	-
Ficus microcarpa	60.53	47.25	-	-
Litsea sp	-	44.01	-	-
Macaranga mauritania	59.82	54.98	-	-
Total	299.99	300.00	-	-

IV. CONCLUSION

There are 22 identified species of vegetation that grow after a forest fire. The influence of forest fires on the succession process as indicated by the type of plant that grows in the post-burn forest areas namely *Similac sp* and A6 plants at the seedling stage that does not exist in natural forests and the increase in the percentage of importance value index (IVI) plant seedlings on post-burn forest like plants *Poacea* and *Melastoma trachyphyllum*.

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