Journal of Geography Science and Education
Vol. 5., No. 1, April 2023, pp. 7-12
ISSN 2685-5801, eISSN 2685-581X
http://journal.univetbantara.ac.id/index.php/jgse/index

Mapping the Distribution of Invasive Alien Species Acacia (Accacia decurrens) in Thekelan Hiking Trail Area, Kopeng Resort, Mount Merbabu National Park

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Received 25 December 2022; accepted 20 January 2023; published 25 April 2023

ABSTRACT

Kopeng Resort is one of Mount Merbabu National Park resorts located in Getasan District, Semarang Regency, Central Java. Where in this area, there is a hiking trail called Thekelan. Besides that, Mount Merbabu National Park has problems regarding invasive alien species, one of which is the Acacia plant (*Accacia decurrens*) which also grows on the Thekelan hiking trail. Therefore, this study aims to determine the spatial distribution of invasive plants in the Mount Merbabu National Park area located in the Kopeng Resort area. The data collection method used in this study was using GPS's survey where if you find an acacia plant, you will mark it or dots so that later the output will be a kml file which can be processed in the ArcGIS software. The data processing method uses Arcgis software so that it is in the form of a map, and the height of the acacia plant points will be known. The results showed that the distribution of acacia plants in the area around the climbing route of Mount Merbabu Thekelan was classified as very dense at an altitude of 1,847 masl to 2,153 masl with moderate to steep slopes. Whereas at altitudes ranging from 2,153 to the peak, which has very steep slopes, the density of acacia decreases. 153 meters above sea level with moderate to steep slopes.

KEYWORDS

Acacia decurrens
Biodiversity
Invasive Alien Species
Mount Merbabu National Park
Spatial Distribution

1. Introduction

Indonesia is one of the countries known as mega biodiversity because it has strategic geographical conditions (Rokhmah et al., 2020). Given these conditions, this country has high biodiversity and high genetic diversity, even though it only has 1.3% of the total earth's area (Fau, 2020). However, there are plants that can be dominant or dominate which can reduce diversity or can kill other types of plants in a place. It can even become weeds around the plants being cultivated because it can be detrimental to the plants being cultivated (Ramlan et al., 2019). The dominating plants can be called invasive alien plants so it needs to be managed so they don't disturb other plants (Pambudi and Purwaka, 2019).

Invasive alien plants which are also known as invasive alien species (IAS) are plants that are not native species in that area which in large numbers can affect the habitat they invade (Nursanti and Adriadi, 2018). These plants grow fast, cause disturbances and threats to local ecosystems, habitats and plant species and have the potential to damage these habitats (Susilo et al., 2020). Therefore, its presence must be monitored and controlled. Acacia (*Acacia decurrens*) is a type of IAS plant that influences the growth of endemic plants in the Mount Merbabu National Park area. Acacia is popular Indonesia is one of the countries known as mega biodiversity because it has strategic geographical conditions (Rokhmah et al., 2020). Given these conditions, this country has high

ISSN 2685-5801 (print) | 2685-581X (online)
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The presence of invasive alien plant species in Mount Merbabu National Park needs special attention and proper handling. Therefore it is important to carry out a plant inventory, one of which is the spatial distribution of plants in an area. By carrying out an inventory of invasive plant data it is more measurable so that changes can be more detectable and as a preventive measure in protecting biodiversity in Mount Merbabu National Park. In fact, these invasive alien plants are a major problem in protected areas worldwide (Yuliana and Lekitoo, 2018). One example of an invasive plant that is being widely discussed is the Acacia plant (*Acacia decurrens*) in Mount Merbabu National Park. If there is no proper management of the invasive alien species.

Thus the research aims to identify the spatial distribution of invasive plants in the Mount Merbabu National Park area located in the Thekelan hiking trail, Kopeng Resort area. In the long term, this data is important as one of the management efforts to protect natural species in the area.

2. Method

The research was conducted in the Mount Merbabu National Park (TNGMb) area on the Thekelan hiking trail from basecamp to Post 3 which is located in the Kopeng Resort area, Getasan District, Semarang Regency, Central Java. This research was conducted in October 2022.

2.1. Tools and Materials

The tools and materials used in this study included GPS, GIS software, digital cameras, basic maps of the TNGMb area, maps of the distribution of identified IAS species, Landsat image maps of the TNGMb area, stationery, and tally sheets. The research method consists of survey stages, data collection, and data processing.

2.2. Data Collection Stage

Primary data collection was carried out by direct observation on the thekelan hiking trail regarding invasive acacia plants. Locations where there are acacia trees are then marked or dotted using the GPS Essential application. The output is a file in the form of kml which is then processed using ArcGIS so that it becomes a map of the distribution of acacia plants. In addition, secondary data collection was obtained through literature studies from documents, journals and books.

2.3. Data Processing Stage

Inventory data on the distribution of acacia plants that have been obtained in the form of kml are processed into maps using ArcGIS. The processing of the map also uses other materials, namely base maps of Mount Merbabu National Park and Landsat image maps of the Mount Merbabu National Park area. Then the map was analyzed using a quantitative approach using spatial analysis by taking the coordinates of invasive plants in the Mount Merbabu National Park area using a GPS tool (GPS essential).

3. Results and Discussion

3.1. Acacia Plant

The acacia plant (*Acacia decurrens*) is a woody plant originating from Africa and Australia (Rahayu et al., 2015). In inland New South Wales, Acacia plants grows in temperate to cool coastal climates but does not thrive in hot or dry areas. In addition, Acacia plants is also tolerant of various growing conditions. Therefore, acacia plants are foreign plants in Indonesia. The scientific classification of this acacia is that it has Kingdom Plantae, Division Spermatophyta; Angiospermae Sub Division; Class Magnoliopsida; Order of Fabales; Fabaceae family; Mimosoideae sub-family; Acacia genus; and *Acacia decurrens* Species. Acacia can grow well in cool climates but is difficult to grow in hot environments. Besides that, Acacia can grow well in areas with high rainfall of 600 – 2000 mm per year (Untoro et al., 2017). In fact, this plant can grow the earliest in areas after volcanic eruptions or forest fires. however, because it is easy to grow, this plant can become invasive.

Acacia trees have a fairly high adaptability. This plant can grow in soil with little nutrient content, grasslands, logged-over land, eroded soil, rocky soil, and alluvial soil. In addition, this plant can also grow well in laterite soil. Lateritic soils are soils with high iron and aluminum oxide content. However, in an environment that has a high level of salinity, this plant is quite difficult to adapt. Trees from the genus Acacia require rainfall between 1500-4000 mm per year. But this plant can also be found in areas with dry climates and an average rainfall of 1500-2300 mm per year.

3.2. Condition of Mount Merbabu National Park Area

The Mount Merbabu National Park area has topographical conditions which are mostly in the form of hills, ravines, steep cliffs and mountains with an altitude of around 3142 meters above sea level. The condition of the slopes on Mount Merbabu also varies. In the northern part of the mountain, most of them have a slope of about 0-25%, the western part has a slope of about 25-40%, and in the eastern part of Magelang Regency has a slope of more than 40%. The Thekelan hiking trail has an average slope of about 26% and a maximum slope of 60.5%.

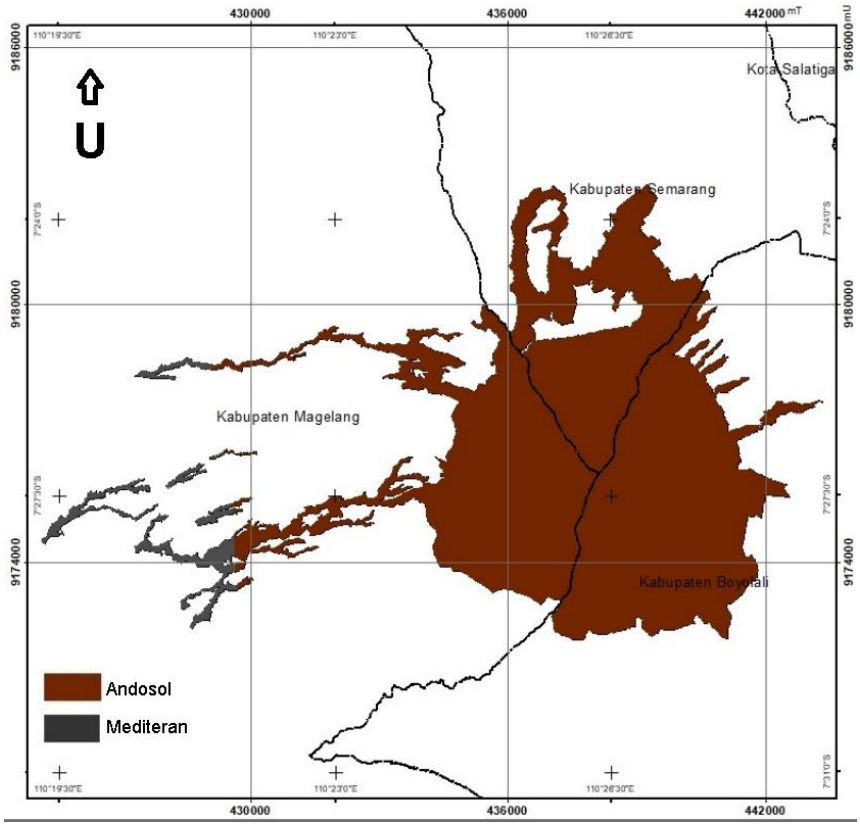

Fig. 1. Merbabu National Park Soil Type Map

ISSN 2685-5801 (print) | 2685-581X (online)
Journal of Geography Science and Education
Vol. 5., No. 1, April 2023, pp. 7-12

Based on the soil type map above, the Kopeng Resort area located in Semarang Regency is dominated by andosol soils. Andosol soil or also called volcanic soil is a type of soil that occurs as a result of deposition from volcanic weathering, a mixture of minerals and organic matter.

3.3. Figures and Tables

The distribution of acacia plants that have been identified and mapped to find out how much they invade an area.

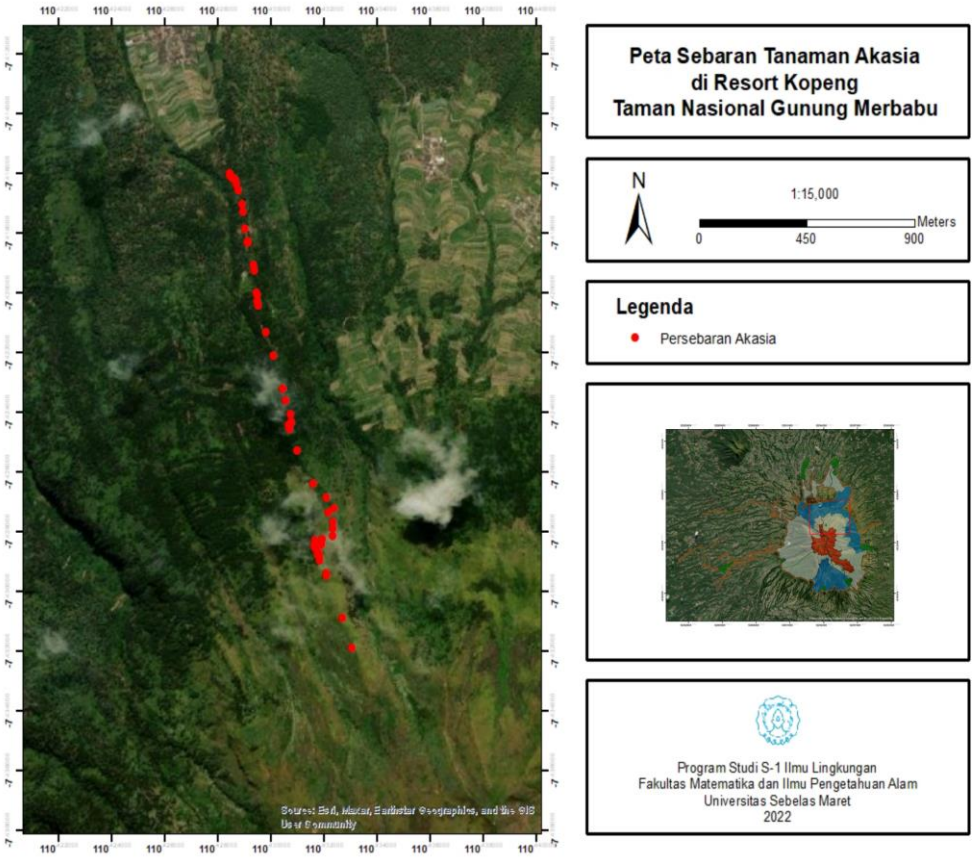

Fig. 2. Acacia Plant Distribution Map

Based on the map above, it can be seen that the distribution of acacia around the Thekelan hiking trail area is very dense. At the beginning of the hiking trail or base camp which is at an altitude of 1,847 meters above sea level to post 2 which is at an altitude of 2,153 meters above sea level. The area is included in the jungle zoning area where the land is dominated by forests. This forest land is located on a moderate to steep slope that allows rainwater run off which causes the soil to become fertile so that it grows a lot of vegetation, including acacia plants. In addition, the temperature of the Thekelan hiking trail in the Kopeng resort is around 15 - 21 degrees Celsius, which is the optimal temperature for the growth of acacia plants, so that the distribution of acacia in this area is relatively dense and has the potential to become an invasive plant.

On the map it can be seen that the distribution of acacia plants is starting to decrease in density on the hiking trails that begin to enter open land areas which are dominated by grass and savanna plants. These acacia plant has an elongated pattern that goes down the slope from top to bottom. This area ranges from an altitude of 2,153 meters above sea level to a peak with an altitude of around 3,140 meters above sea level. On open land in the Mount Merbabu National Park area, especially in the Kopeng Resort area, the slopes are very steep so that water will flow very quickly and make it difficult for vegetation, including acacia plants, to grow.

4. Conclusion

Invasive alien plants are plants that are not native species in a place that have fast growth, cause disturbances and threats to local ecosystems, habitats and plant species and have the potential to damage habitats. One of the invasive plants in Mount Merbabu National Park is the Acacia plant (*Acacia decurrens*). The distribution of acacia plants in the area around the hiking trail of Mount Merbabu Thekelan is classified as very dense at an altitude of 1,847 meters above sea level to 2,153 meter above sea level with moderate to steep slopes. In the hiking trail area with altitudes ranging from 2,153 to the peak which has very steep slopes, the distribution of acacia plants begins to decrease in density.

Acknowledgment

In the preparation of this journal, various parties have provided motivation, guidance, and support for researchers. Therefore, the researcher would like to express gratitude and appreciation to all parties.

First, thank God Almighty for the healthy giving and ability to complete this research. Then, the researcher also expressed his sincere appreciation to Mr. Dr. Muhammad Amin Sunarhadi, S.Si., MP and Mr. Muhammad Indrawan, S.Si., M.Sc. as lecturer in the Biogeography course of the Environmental Science Study Program, Faculty of Mathematics and Natural Sciences, Sebelas Maret University for their guidance and knowledge which later became the basis for researchers' knowledge in compiling this journal. Then thank you and express your sincere appreciation to Mr. Andy as our field supervisor, Mr. Nur Khojim as the Head of Kopeng Resort,

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