CHAPTER I. INTRODUCTION

1.1 Background

Pegagan (*Centella asiatica*) is a medicinal plant that contains active ingredients in the form of essential oils, flavonoids, triterpenoid steroids, triterpenoid acids, triterpenoid glycoside esters, and asiaticides. Triterpenoids improve mental function and provide a calming effect, making them the most important compound in Pegagan. These compounds can also improve blood circulation to the brain because they revitalize blood vessels. Asiatiocides are part of triterpenoids that function to strengthen and improve the repair of skin cells, stimulate blood cells and the immune system, and act as a natural antibiotic. Pegagan also contains calcium, magnesium, phosphorus, zinc, copper, and beta-carotene, as well as vitamins B1, B2, B3, and C. Other chemical contents are thankuniside, isotankuniside, madecassoside, brahmic acid, madasiatic acid, meso-inositol, centellosidea, carotenoids, mineral salts such as potassium, sodium, magnesium, calcium, and iron, vellarine, and tannins substances that are useful for maintaining body health.[1]

Pegagan has long been used in Indonesia as a traditional medicine, in fresh, dried, and herbal forms.[2] In addition to being used for traditional medicine, Pegagan can be found in several cosmetic ingredients. Research by Fauzi, et al (2014) proves that this plant has pharmacological effects. For example, in Australia, Pegagan has

[1] Sutardi, "Kandungan Bahan Aktif Tanaman Pegagan dan Khasiatnya untuk Meningkatkan Sistem Imun Tubuh," *Litbang Pertanian* 35, no. 3 (2016): 121–130.

[2] Yuda Purwana Roswanjaya, Siti Chotimah, and Lukita Devy, "Induksi Produksi Asiatikosida Pegagan (*Centella asiatica* [L] Urban) Menggunakan Stimulan Biologi pada Kondisi Ternaungi," 15, no. 3 (2013): 24–30.

been used as a medicine for wound healing, inflammation, rheumatism, asthma, hemorrhoids, tuberculosis, leprosy, dysentery, fever, and appetite enhancer.[3]

Farmers collect wild-growing Pegagan will face obstacles due to the decreasing availability of Pegagan in nature. This is because most farmers are still collecting it wildly. Another obstacle is the lack of knowledge in cultivating the Pegagan plant itself. Therefore, it is necessary to cultivate Pegagan to maintain its availability so that Pegagan does not become extinct if used for a long period of time and farmers continue to collect it in the wild. The development of Pegagan cultivation under tree stands in overlap with plantation plants, forestry, and in farmers' yards is an alternative cultivation system considering that Pegagan plants will grow well on shaded land with a light intensity of 30-40%.[4]

Pegagan cultivation is intended to be able to produce a large number of crowns, because the parts used as simplicia are the leaves, petioles, and stolons. One of the factors that supports plants in growing and producing optimally is the availability of nutrients. If plants do not get enough nutrients from the soil, efficient fertilization can be achieved by considering the condition of the soil, the environment, and the basic needs of plant nutrients. By knowing the basic nutrient needs of Pegagan plants, the dosage of fertilizer can be determined more precisely. Providing nutrients in the form of fertilizers with inappropriate doses is also a waste of labor

[3] Fauzi, Sutarmin, and Endang Broto Joyo, "Kajian Pemupukan Urea terhadap Produksi dan Kandungan Asiatikosida pada Tanaman Pegagan," (2014).

[4] Yuda Purwana Roswanjaya, Siti Chotimah, and Lukita Devy, "Induksi Produksi Asiatikosida Pegagan (*Centella asiatica* [L] Urban) Menggunakan Stimulan Biologi pada Kondisi Ternaungi," 15, no. 3 (2013): 24–30.

and costs.[5] One type of fertilizer that can be used to increase the productivity of Pegagan is Plant Growth Promoting Rhizobacteria or PGPR.

PGPR is a bacterium that lives around the roots of plants and is very beneficial for the physiological processes of plants and their growth. The use of PGPR as a biofertilizer is a contribution of biotechnology to increase the productivity of a plant. This is achieved by nutrient mobilization, growth hormone production, nitrogen fixation or activation of disease resistance mechanisms, and increasing the secondary metabolites of a plant. This PGPR can be made from various plant roots of legumes that have microorganisms in their root nodules, one of which is the root of the Mimosa plant.[6] The Mimosa plant comes from the same family as the legume plant, namely *Fabaceae* so that the roots also have microorganisms in the root nodules like other legume plants.

The use of PGPR is expected to be a solution and alternative in increasing the productivity and triterpenoid content of Pegagan plants. As Putri, et al (2019) stated in their research, PGPR can affect leaf area and plant height because microbes from the roots of *Leguminosae* plants contain *Rhizobium* sp. and *Azotobacter* sp. bacteria which can fix nitrogen (N) elements in the atmosphere that can be used for plant growth. PGPR can also produce IAA, cytokinin, auxin, and gibberellin which play a role in cell elongation.

[5] Noverita Sprinse Vinolina, "Kandungan Metabolit Sekunder (*Centellosida*) Pegagan (*Centella asiatica*)," in *Seminar Nasional PERAGI*, 2017, 1–8.

[6] Aspira Laila et al., "Pembuatan PGPR (*Plant Growth Promoting Rhizobacteria*) dari Akar Bambu dan Putri Malu," *Seminar Nasional Bersama FMIPA Unita* (2021): 66.

In addition to PGPR, the growing medium also plays an important role in plant production. The ability of the growing medium to support growth is highly dependent on optimal conditions and nutritional inputs in the form of natural fertilizers, one of which is cow manure.[7] Research related to the use of growing mediums and various types of fertilization for medicinal plants has been extensive. However, the use of growing medium and the use of PGPR from Mimosa root to increase the production of triterpenoids has not been widely discussed, so it is an opportunity to be used as an interesting material for the study of medicinal plants. Therefore, it is necessary to research the administration of PGPR from Mimosa root on Pegagan to determine the right dosage and its effect on the growth, production, and triterpenoid content of Pegagan.

1.2 Problem Formulation

1. How does Pegagan (*Centella asiatica*) respond to growing medium?
2. How does the Pegagan (*Centella asiatica*) respond to the application of Plant Growth Promoting Rhizobacteria (PGPR) from Mimosa root?
3. How does Centella *asiatica respond* to the combination of the growing medium and the application of Plant Growth Promoting Rhizobacteria (PGPR) from Mimosa root?

[7] Mustika Tripatmasari, Catur Wasonowati, and Vidya R Alianti, "Pemanfaatan Naungan dan Pupuk Kotoran Sapi terhadap Pertumbuhan dan Kandungan Triterpenoid Pegagan (*Centella asiatica* L.)," *Agrovogor* 3, no. 2 (2010): 137–145.

1.3 Research Objective

1. To determine the response of Pegagan (*Centella asiatica*) to the growing medium.
2. To determine the response of Pegagan (*Centella asiatica*) to the application of Plant Growth Promoting Rhizobacteria (PGPR) from Mimosa root.
3. To determine the response of Pegagan (*Centella asiatica*) to the combination of the growing medium and the application of Plant Growth Promoting Rhizobacteria (PGPR) from Mimosa root.

1.4 Research Benefit

The benefits of research are divided into two, namely practical benefits and theoretical benefits.

1. Practical Benefit.

   The research is expected to help researchers increase the productivity of Pegagan (*Centella asiatica*) by using Plant Growth Promoting Rhizobacteria (PGPR) from Mimosa root and reducing the use of inorganic fertilizers as well as knowing the composition of the best growing medium for Pegagan growth.
2. Theoritical Benefit.

   Research can be used as a basis for further research and as a study material to develop new knowledge in the use of Plant Growth Promoting Rhizobacteria (PGPR) and other organic fertilizers.