Morphological Study Of Rumput Mutiara (Hedyotis corimbosa L) From Various Locations In Central Java

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Abstract. Indonesia is a country rich in medicinal plants such as rumput mutiara (Hedyotis corimbosa L). To find new sources of medicinal plants as well as trying to cultivate them, rumput mutiara was chosen as study material. To be able to carry out intensive cultivation, morphological studies of the rumput mutiara are needed. Differences in body morphological characters were analyzed using the Statistical Analysis System (SAS) of the third height at different locations. The SAS results showed that the parameters of root length, plant height, segment length, stem diameter, number of branches, leaf width, leaf length and flower stem length showed significant differences between treatments (height). Furthermore, P2 (altitude treatment between 201 to 400 meters above sea level) shows the highest results compared to other treatments.

1. Introduction
Indonesia is one country "megadiversity" which is rich in biodiversity [1]. Indonesia is an archipelago of about 9 million km2 located between two oceans and two continents with approximately 17,500 pieces island long coastline is about 95,181 km. The geographical conditions lead Indonesia into a country's state megabiodiversity [2]. According to WHO estimates, more than 80% of the population of developing countries depend on traditional medicine for health problems [3]. Plants produce a wide range of active compounds provide pharmacological effects. Generally, the active compound is not an important role in the metabolism of plants, so it is often referred to as secondary metabolites [4, 5]. It is estimated that about 30,000 plants found in tropical rain forests, some of which are known to have medicinal properties [1]. One of these medicinal plants are Rumput mutiara (Hedyotis corimbosa L.) that potential as an anti-cancer drug [6]. The Rumput mutiara is classified by Kingdom: Plantae, Class: Dicotyledoneae Order: Rubiales, Family: Rubiaceae, Genus: Oldenlandia, Species: Hedyotis corimbosa L., Synonym: Oldenlandia corymbosa L. Lamk. [7]. Common name of the Rumput mutiara being name of the area are called as grassy square, the flower egg belungkas, leaves pearl, Rumput mutiara (Jakarta), katapen, erek-erek polo (Java), pengka (Makassar), Malaysia call it flower egg, Chinese call shui xian ciao [5].

The shape of the rumput mutiara that grows scattered is upright or oblique. The plant is not too sturdy or rather weak. Plant stems with a height of 15-50 cm, grass stems quadrangular, bald or with very short scales, with a thickness of 1 mm and brownish green to grayish, have many branches, branching from the base of the stem. The root system of herbaceous plants has tap roots about 1 mm in diameter, with threadlike branches, dirty white [8]. It has many relatively small leaves, faces crossing 2-5 cm long, leaf tips shaped and base of thorny leaves and bones in the middle, pale green,
small scales along the leaf edges, with leaf stalks very short or almost seated and have short hair at the edges.

Flowers come out of the axilla, white and shaped like a small umbrella, like compound flowers 2-5 buds, flower stalk (stem) taut as wire length of 5-10 mm. The flowering period is from January to December. The fruit is round brown in shape and the tip is cracked, the green fruit is red petal, producing a round brown seed that can be used for propagation [8]. Its ecology and distribution thrives on moist soil and is easy to grow on the side of the road, the edge of the ditch / drainage canals and various places that get enough sunlight and water. On the island of Java, it grows in areas with a height of 1-800 m above sea level, but can also reach heights of 1425 m above sea level [9]. In Java Island, the Rumput mutiara grows in the lowlands to the highlands, ranging from 1-1425 m above sea level. Fertile Rumput mutiara in moist soil by the roadside, or in abandoned soil, rumput mutiara seeds are reproduced by Seeds [10]. The rumput mutiara (Hedyotis corymbose L.) is a medicinal plant in the form of herbs and is widely used for treatment. This plant grows on sufficiently watery land such as road sides or untreated land [11]. Based on research [12] the rumput mutiara extract can stimulate apoptosis and can be used as an alternative treatment for cancer. In addition to the ethanol extract of the rumput mutiara also can increase the activity of M immunoglobulin in mice [13].

2. Materials And Methods
This study was conducted in Universitas Sebelas Maret Laboratory from May to October 2019. Materials and equipment or instruments used in this study were thermometer, ruler, altitude meter, lever, calipers and open camera. The materials are rumput mutiara from 20 locations with a height of 1 m above sea level up to 600 m above sea level and implemented in June to September 2019 as shown in Table 1.

| S1: Kudus (54 masl) | S11: Temanggung (580.6 masl) |
|---------------------|-------------------------------|
| S2: Tembalang (212 masl) | S12: Rembang (57.4 masl) |
| S3: Blora (72.6 masl) | S13: Pati (41.8 masl) |
| S4: Marina (2 masl) | S14: Kendal (33.3 masl) |
| S5: Gajah Mungkur (103 masl) | S15: Pekalongan (147 masl) |
| S6: Surakarta (123 masl) | S16: Batang (160.5 masl) |
| S7: Sidoharjo (200 masl) | S17: Jepara (23.1 masl) |
| S8: Grobogan (23 masl) | S18: Purwokerto (452 masl) |
| S9: Ungaran (398 masl) | S19: Magelang (325.5 masl) |
| S10: Girimarto (538 masl) | S20: Sleman (178.6 masl) |

The research method started by measure and observe their morphology which consisting of 32 characters, namely: 1. Type Roots, 2. The length of the roots, 3. The number of roots, 4. Colors root, 5. Type stems, 6. Plant height, 7. Long sections stem, 8. Stem diameter, 9. Number of branches, 10. Trunks Color, 11. Petiole, 12. Each leaf, 13. The shape of the leaf blade, 14. Leaf width, 15. The length of the leaves, 16. Leaf bone, 17. leaf base, 18. The tip of the leaf, 19. The leaf edges, 20. The leaf color, 21. Leaf hairs. 22. The length of the flower stalk, 23. The number of flowers in one stalk, 24. The number of petals, 25 The number of petals, 26 . Total pistil, 27. flower color, 18. Flower scents, 29. The diameter of the fruit, 31. Location of fruit, 32. The number of pieces in one stalk. Using the Statistical Analysis System, the data were analized.

3. Results
After observation, it was found that out of the 32 characters involved in the parameter indicates that the 22 characters were not difference from the 20 observation sites and only 10 characters that shows the differences in the data, which are: 1. The length of the roots, 2. Plant height, 3. Long Segment, 4. The diameter of the rod 5. The number of branches, 6. The width of the leaf, 7. Long leaves, 8. The tip of the leaf, 9. Leaf color, 10. The length of the flower stalk. All the obtained 10 difference characters is shown in Table 2.
Table 2. Data distribution Rumput mutiara 20 different locations.

| CODE | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 | S12 | S13 | S14 | S15 | S16 | S17 | S18 | S19 | S20 |
|------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| PA   | 3.5| 3.0| 2.5| 3.5| 4   | 4   | 4.5| 5   | 4.5| 5   | 4   | 4   | 4.5| 4.5| 8.0| 5.5| 8   |     |     |     |
| TT   | 3   | 3.0| 3.0| 3.5| 3.5| 4   | 4.5| 4   | 4.5| 4.5| 4.5| 5   | 5.5| 5.5| 4   | 4.5| 4   | 8   | 5.5 | 2.0 |
| PR   | 2   | 3.0| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5| 2.5 |
| GB   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
| JC   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   | S   |
| LD   | 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5| 0.5 | 0.5 |
| PD   | 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2| 0.2 | 0.2 |
| UO   | 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6| 0.6 | 0.6 |
| WD   | 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8| 0.8 | 0.8 |
| PTB  | 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0| 1.0 | 1.0 |

Information:
PA: Long Root
LD: width leaf
TT: High Plants
PD: Long leaves
DB: Diameter
UD: Edge
PR: Long Segment
WD: Color Leaves
JC: Number of Branches
PTB: Long Stems Flower
RM: Tapered
TM: Blunt
H: Green
HK: Chartreuse

4. Discussion
4.1. Statistical Analysis System
The observation of the morphologies of the 20 locations, grouped into 3 altitude location or a place as shown in Table 3.

Table 3. The morphologies of the 20 locations, grouped into 3 altitude location.

| Height between 1 masl to 200 masl, (P1) consisting of: | Height between 201 masl to 400 masl, (P2) consisting of: | Height between 401 masl to 700 masl, (P3) consisting of: |
|---------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|
| S1: Kudus (54 masl)                                     | S2: Tembalang (212 masl)                                 | S10: Girimartto (538 masl)                                |
| S3: Blora (72.6 masl)                                   | S9: Ungaran (398 masl)                                   | S11: Temanggung (580.6 masl)                              |
| S4: Marina (2 masl)                                     | S19: Magelang (325.5 masl)                               | S18: Purwokerto (432 masl)                                |
| S5: Gajah Mungkur (103 masl)                            | S6: Surakarta (123 masl)                                 | S7: Sidoharjo (200 masl)                                  |
| S8: Grobogan (23 masl)                                  | S12: Rembang (57.4 masl)                                 | S13: Pati (41.8 masl)                                     |
| S14: Kendal (33.3 masl)                                 | S15: Pekalongan (147 masl)                               | S16: Batang (160.5 masl)                                  |
| S17: Jepara (23.1 masl)                                 | S20: Sleman (178.6 masl)                                 |                                                          |

Once grouped into 3 groups and averaged, the obtained data are presented in Table 4. Furthermore, the analyzed data with the SAS application, showed in the Figure 1. SAS analysis results showed that root length parameter is significant difference between treatments (altitude), (Pr > F less than 0.05) is 0.03, in detail P1 has the same character as the P2, P3 while the characters have long roots that no similar with P2 and P1. Treatment that produces longest root length P2 is treatment that is 7.93 cm, while the shortest is P3 is 3.67 cm. While the variable coefficient is 15.73, meaning less than 30%, so that the data presented did not need any data transformations.

Based on the analysis of SAS showed that plant height parameter is significant difference between treatments (altitude), (Pr > F less than 0.05) is 0.001, in detail P1, P2 and P3 have a high character which is no similar. The treatment resulted in the highest plant height P2 treatment is 44.33 cm, while the shortest is P3 is 22.67 cm. While the variable coefficient is 5.93, meaning less than 30%, so that the data presented did not need any data transformations. The analysis results is indicate in the Figure 2.

From the analysis of SAS indicate that parameter segment length is significant difference between treatments (altitude), (Pr > F less than 0.05) is 0.03 as shown in Figure 3. More detail P1 has
the same character with P3, while the P2 segment length has a character that is no similar to the P1 and P3. The treatment resulted in a P2 longest segment is treatment that is 2.63 cm, while the shortest are P1 is 2.11 cm. While the variable coefficient is 6.49, meaning less than 30%, so that the data presented did not need any data transformations.

Table 4. Average data for the Rumput mutiara SAS (Statistical Analysis System).

| Treatment | Block | PA | TT | PR | DB | JC | LD | PD | PTB |
|-----------|-------|----|----|----|----|----|----|----|----|
| P1        | 1     | 4.85 | 31.38 | 1.86 | 1.11 | 6.44 | 0.35 | 1.69 | 0.60 |
| P1        | 2     | 5.50 | 34.00 | 2.10 | 1.05 | 5.50 | 0.30 | 1.85 | 0.65 |
| P1        | 3     | 7.88 | 33.75 | 2.38 | 1.33 | 10.50 | 0.48 | 2.18 | 0.68 |
| P2        | 1     | 8.30 | 45.00 | 2.50 | 1.30 | 13.00 | 0.90 | 2.30 | 0.60 |
| P2        | 2     | 7.50 | 47.00 | 2.50 | 1.20 | 15.00 | 0.80 | 2.10 | 0.60 |
| P2        | 3     | 8.00 | 41.00 | 2.90 | 1.20 | 16.00 | 0.70 | 2.30 | 0.70 |
| P3        | 1     | 4.00 | 22.00 | 2.20 | 1.10 | 8.00  | 0.30 | 1.70 | 0.80 |
| P3        | 2     | 3.00 | 23.00 | 2.00 | 1.00 | 9.00  | 0.40 | 1.50 | 0.90 |
| P3        | 3     | 4.00 | 23.00 | 2.20 | 1.10 | 8.00  | 0.30 | 1.70 | 0.80 |

Figure 1. Root length duncan grouping for means of treatment (Alpha = 0.05)

Figure 2. Plant height duncan grouping for means of treatment (Alpha = 0.05)
Using SAS analysis, the results showed that stem diameter parameter significant difference between treatments (altitude), (Pr > F less than 0.05) is 0.24 as shown in Figure 4. More detail P1, P2 and P3 have the same character of stem diameter. Treatment that produces longest stem diameter is P2 treatment is 1.23 cm, while the shortest is P3 is 1.07 cm. While the variable coefficient is 7.71, meaning less than 30%, so that the data presented did not need any data transformations. From the analysis of SAS indicates that the parameter number of branches significant difference between treatments (altitude), (Pr > F less than 0.05) is 0.03 as shown in Figure 5. More detail P1 has the character of a number of branches equal to P3, while P2 has the character of a number of branches which is no similar as P1 and P3. The treatment resulted in the highest number of branches is P2 treatment is 14.67 cm, while the least is P1 which is 7.48 cm. While the variable coefficient is 16.07, meaning less than 30%, so that the data presented did not need any data transformations. Analysis results with SAS indicate that leaf width parameter is significant difference between treatments (altitude), (Pr > F less than 0.05) is 0.03 as shown in the Figure6. More detail P1 has the same wide character leaves with P3, while P2 has a wide character leaves which is no similar as P1 and P3. The treatment produces leaf widest width P2 treatment that is 0.8 cm, while the narrowest is P3 is 0.33 cm. While the variable coefficient is 20.62, meaning less than 30%, so that the data presented did not need any data transformations. From the analysis of SAS indicate that leaf length parameter is significant difference between treatments (altitude), (Pr > F less than 0.05) is 0.04 as shown in Figure 7. more detail P1 has the same character of leaf length with P2 and P3, while P2 has a character long leaves that are no similar as P3. Treatment that produces longest leaf length P2 is treatment that is 2.23 cm, while the shortest is P3 is 1.63 cm. While the variable coefficient is 7.62, meaning less than 30%, so that the data presented did not need any data transformations.
From the results of the analysis showed that the flower stalk length parameter SAS significant difference between treatments (altitude), \(P_{r>F} \less 0.05\) is 0.04 as shown in Figure 8. In detail P1 has a character of the same flower stalk length with P2, P3 has a character while long flower stalks are no similar as the P2 and P1. Treatment that produces longest flower stem length is treated P3 is 0.83 cm, while the shortest is P2 which is 0.63 cm. While the variable coefficient is 7.25, meaning less than 30%, so that the data presented did not need any data transformations.
5. Conclusion

From the results of the Statistical Analysis System analysis, parameters of root length, plant height, segment length, stem diameter, number of branches, leaf width, leaf length, and flower stem length show significant differences between treatments (height). Furthermore, P2 (treating altitudes between 201 and 400 meters above sea level) shows the highest results compared to other treatments. From the results of this analysis it can be seen that the differences in morphology of rumput mutiara are more caused by environmental conditions in which it grows, there is no indication of differences in types of pearl grass, so that it is possible by different ways of cultivation that will affect the growth and rumput mutiara product.

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Figure 8. Flower stalk length duncan grouping for means of treatment (Alpha = 0,05).
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