Growth response of binahong (*Anredera cordifolia* (L.) Steenis) accessions from lowland and highland as affected by technological packet

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Abstract. The objective of the research is to identify the growth response of binahong accessions from lowland and highland as affected by technological packet. This study used a factorial RBD with two treatments. Factor I: Plant accession named A1 from lowland medan johor; A2 from highland barus jahe karo; A3 from lowland medan sunggal. Factor II: binahong cultivation technology package, named P1: planting medium top soil: compost: manure (3: 1: 1); 25% shade; natural GR bamboo shoot extract 40%; liquid organic fertilizer 10 ml / l; P2: top soil: compost: manure (2: 1: 1); 25% shade; bamboo shoots extract 40%; liquid organic fertilizer 20 ml / l; P3: top soil: compost: manure (3: 1: 1); 25% shade; bamboo shoots extract 60%; liquid organic fertilizer 10 ml / l; and P4: top soil: compost: manure (2: 1: 1); 25% shade; bamboo shoots extract 60%; liquid organic fertilizer 20 ml / l. The results showed on 7, 8 and 9 WAP, the accession of binahong significantly affected plant length and number of leaves. The application of technological packet unsignificantly affected plant length of binahong at 7 to 11 WAP. Shoot-root ratio among the treatments was not significant.

1. Introduction

Binahong (*Anredera cordifolia* L.), family of *Basellaceae*; contains secondary metabolites with medicinal properties. This plant can cure typhoid, ulcers, colitis, rheumatism, gout, and hemorrhoids, treat swelling and blood clots, and prevent strokes. Binahong contains various chemical compounds including organic acids, anthocyanins, saponins, glucans, carotene, mucopolysaccharides such as L-arabinose, D-galactose, L-rhamnose, aldonic acid, also contains vitamins A, B, and C [1-3]. This plant grows and spreads on other plants, and can reach more than 5 m in length, and this plant has a long life [4]. Single-stemmed binahong leaves, green, heart-shaped, 3-7 cm wide and 5-10 cm long, thin leaves have pointed leaf tips but at the base are notched with flat edges and smooth surface [5].

Accession is a plant population that has variations due to different places to grow, it also affects plant growth and production when used as planting material, as in the research [6] using accessions of Kemang, Ciaruten, Cijujung, and Gasol, high yields of accession basil were obtained. Kemang is significantly bigger than Ciaruten and Gasol and the number of Ciaruten leaves is more than Kemang, Gasol accession has a wider leaf size than the other three accessions, this shows that the four accessions have different morphological characters. Binahong plants can be cultivated in the highlands and lowlands, it can also withstand cold, humid environments and can be cultivated by generative propagation using seeds or vegetatively using rhizome roots but generally using a lot of vegetative propagation [7].
The cultivation technology package is a combination of liquid organic fertilizer, shade, and natural growth regulator bamboo shoot extract and liquid organic fertilizer which contain more than one element of nutrients because it was solution from the decomposition of organic materials from plant residues, animal and human waste. When compared with inorganic fertilizers, this fertilizer also has a binding agent so that the fertilizer solution applied to the soil surface can be directly used by plants. Liquid organic fertilizers generally do not damage soil and plants even though they are used as often as possible. [8].

Based on the description above, the use of technology package is very necessary to increase the productivity of the binahong plant and the difference in accessions also affects the growth and productivity of the binahong plant, therefore this study aims at the effect of providing a technology package on the growth of the binahong plant.

2. Materials and methods

2.1. Study area and materials

The research was conducted at the screen house, Faculty of Agriculture, Universitas Sumatera Utara (3°33'25.3N 98°39'16.2E) with an altitude of ± 32 m above sea level on May until September 2020. The ingredients used are root rhizome of binahong, chicken manure, topsoil, sand, polybag, natural GR (growth regulator). The measurement were meter, oven and analytic scale.

2.2. Procedures

This study used a factorial randomized block design (RBD) with two treatments and three block as follows : Factor I: plant accession named A1: accession of plants 1 lowland Jalan Aswad Medan Johor (N: 03031.139 'E: 098040.018'); A2: plant accession 2 highland Barus Jahe Karo (N: 0306°941 'E: 098034'859'); A3: accession of plants 3 lowland Jalan Amperea No.24 B Setia Budi Medan Sunggal (N: 03034.495 'E: 098038,192") and Factor II: binahong cultivation technology package, named P1: top soil planting media: compost: manure (3: 1: 1); 25% shade; natural GR bamboo shoot extract 40%; liquid organic fertilizer 10 ml / L.

Each 400 g bamboo shoots are blended and added with 1000 ml of distilled water for 40%, 600 g bamboo shoot added with 1000 ml of distilled water for 60%. The shade was made by using bamboo and covered with a 25% black paraset to reduce light intensity to the planting area. P2: top soil planting media: compost: manure (2: 1: 1); 25% shade; natural GR of bamboo shoots extract 40%; liquid organic fertilizer 20 ml / L ;P3: top soil planting media: compost: manure (3: 1: 1); 25% shade; natural GR for bamboo shoots extract 60%; liquid organic fertilizer 10 ml / L; P4: top soil planting media: compost: manure (2: 1: 1); 25% shade; natural GR for bamboo shoots extract 60% and 20 ml/L of liquid organic fertilizer.

First, the leaf axillary tubers of binahong planted in topsoil and compost with a ratio of 1: 1 in a mini polybags (5 cm x 15.5 cm) until 3-4 leaves appear. Then, this seedling transferred to medium polybags (15 cm x 35 cm) with treatments soil planting media without shedding the soil from the seed roots.

Application of Natural GR bamboo shoot extract (on first day) and liquid organic fertilizer (on fourth day) carried out in the same weeks started on the 6 weeks after planted (WAP).

Watering was done twice a day in the morning and evening according to plant conditions. Bamboo and plastic rope carried out as a place to support the plants and as a place for plant tendrils.

Observation of plant length was carried out by measured the caulis of the plant from the base of the stem to the tip of the plant using a meter. The maximum opened leaves in the primary stem was counted as the number of leaves. Both of this observation were carried out after 7 WAP or 1 week after application of GR. Ratio of shoot-root was defined after harvest at 15 WAP [2], whereas shoot and root dried well in the oven at 70°C for 2 days.
2.3. Data analysis
The analysis of variance (ANOVA) was using for comparison of the means, if there were significant differences between data then proceed with Duncan's Multiple Range Test at the level of \( \alpha = 5\% \).

3. Results and discussion

3.1. Plant length
Table 1 showed the data observation and length variation of binahong. The plant length at 7, 8 and 9 weeks after planting (WAP), the accession of binahong was significantly affected plant length of binahong but insignificant at 10 and 11 WAP. Plant length at 7 - 9 wap showed that highland accession (A2) and lowland accession (A1) were not significantly different, while two lowland accessions A1 and A3 showed significant differences. This is indicated that binahong from highland to lowland were adaption to environment in the early placed and then continued their growth well. Results from study of grass *Elymus nutans* indicated that altitude had no significant effect on plant height and root depth [9] in some places binahong was also a weed. In contrast, the application of technological packet insignificantly affected plant length of binahong at 7 to 11 WAP.

| WAP | Plant accessions | Technological packet | Mean       |
|-----|------------------|----------------------|------------|
|     |                  | P1 | P2 | P3 | P4 |     |
| 7   | A1 low land      | 80.18 | 66.11 | 65.11 | 58.33 | 67.43<sup>a</sup> |
|     | A2 highland      | 80.44 | 58.66 | 73.44 | 83.22 | 73.94<sup>a</sup> |
|     | A3 lowland       | 47.33 | 32.67 | 38.50 | 33.33 | 37.96<sup>b</sup> |
|     | **Mean**         | 69.32 | 52.48 | 59.02 | 58.29 | 59.78 |
| 8   | A1 low land      | 112.11 | 86.67 | 95.22 | 72.11 | 91.53<sup>a</sup> |
|     | A2 highland      | 99.55 | 72.77 | 96.44 | 107.55 | 94.08<sup>a</sup> |
|     | A3 lowland       | 64.67 | 54.67 | 53.83 | 46.00 | 54.79<sup>b</sup> |
|     | **Mean**         | 92.11 | 71.37 | 81.83 | 75.22 | 80.13 |
| 9   | A1 low land      | 138.55 | 118.55 | 133.88 | 111.00 | 125.50<sup>a</sup> |
|     | A2 highland      | 147.55 | 102.78 | 150.55 | 126.55 | 131.86<sup>a</sup> |
|     | A3 lowland       | 89.00 | 92.33 | 89.50 | 54.33 | 81.29<sup>b</sup> |
|     | **Mean**         | 125.03 | 104.55 | 124.64 | 97.29 | 112.88 |
| 10  | A1 low land      | 222.00 | 172.88 | 182.89 | 174.78 | 188.14 |
|     | A2 highland      | 182.22 | 152.99 | 210.44 | 183.77 | 182.36 |
|     | A3 lowland       | 143.17 | 134.83 | 153.33 | 126.67 | 139.50 |
|     | **Mean**         | 182.46 | 153.57 | 182.22 | 161.74 | 170.00 |
| 11  | A1 low land      | 231.44 | 196.11 | 194.55 | 194.44 | 204.14 |
|     | A2 highland      | 202.55 | 179.22 | 223.88 | 202.78 | 202.11 |
|     | A3 lowland       | 164.50 | 176.00 | 184.17 | 164.33 | 172.25 |
|     | **Mean**         | 199.50 | 183.78 | 200.87 | 187.18 | 192.83 |

Note: Means followed by the different letter in the same group indicated significantly different based on Duncan’s Multiple Range Test (p=0.05)
3.2. Number of leaves
The data observation and number of leaves of binahong can be seen in table 1. The results of variance indicate that at 7, 8 and 9 weeks after planting (WAP) the accession of binahong significantly affected for number of leaves, but insignificant at 10 and 11 WAP. Further tests?? plant length at 7 - 9 WAP showed that highland accession (A2) and lowland accession (A1) were not significantly different, while two lowland accessions A1 and A3 showed significant differences. This is indicated that binahong from highland to lowland were adaption to environment in the early placed and then continued their growth well as well as they showed at plant height. The same thing had on plant height, the application of technological packet insignificantly affected number of leaves of binahong at 7 to 11 WAP.

| WAP | Plant accessions | Technological packet | Mean |
|-----|------------------|----------------------|------|
|     |                  | P1      | P2      | P3      | P4      |
| 7   | A1 low land      | 35.00   | 25.44   | 34.11   | 33.33   | 31.97<sup>a</sup> |
|     | A2 highland      | 32.44   | 24.77   | 37.11   | 37.33   | 32.91<sup>a</sup> |
|     | A3 lowland       | 28.67   | 20.83   | 19.17   | 19.17   | 21.96<sup>b</sup> |
|     | Mean             | 32.04   | 23.68   | 30.13   | 29.94   | 28.95   |
| 8   | A1 low land      | 47.77   | 35.00   | 46.11   | 43.11   | 43.00<sup>a</sup> |
|     | A2 highland      | 37.22   | 28.55   | 48.00   | 44.33   | 39.53<sup>ab</sup> |
|     | A3 lowland       | 37.50   | 26.17   | 27.22   | 23.83   | 28.68<sup>b</sup> |
|     | Mean             | 40.83   | 29.91   | 40.44   | 37.09   | 37.07   |
| 9   | A1 low land      | 63.66   | 54.44   | 68.66   | 69.11   | 63.97<sup>a</sup> |
|     | A2 highland      | 49.66   | 42.11   | 61.66   | 62.44   | 53.97<sup>ab</sup> |
|     | A3 lowland       | 52.50   | 36.83   | 45.50   | 39.33   | 43.54<sup>b</sup> |
|     | Mean             | 55.27   | 44.46   | 58.61   | 56.96   | 53.83   |
| 10  | A1 low land      | 73.66   | 62.11   | 80.44   | 82.11   | 74.58   |
|     | A2 highland      | 58.22   | 55.55   | 74.11   | 74.99   | 65.72   |
|     | A3 lowland       | 66.17   | 46.50   | 52.33   | 47.33   | 53.08   |
|     | Mean             | 66.02   | 54.72   | 68.96   | 68.14   | 64.46   |
| 11  | A1 low land      | 83.66   | 68.89   | 83.33   | 89.11   | 81.25   |
|     | A2 highland      | 67.00   | 62.99   | 82.55   | 82.77   | 73.83   |
|     | A3 lowland       | 73.17   | 52.67   | 58.17   | 54.17   | 59.55   |
|     | Mean             | 74.61   | 61.52   | 74.68   | 75.35   | 71.54   |

Note: Means followed by the different letter in the same group indicated significantly different based on Duncan’s Multiple Range Test (p=0.05)

3.3. Shoot-root ratio
Shoot-root ratio among the treatments was not significant as describe at table 3. The results of this study was same [10] whereas the significantly effect by application of bamboo extract was only showed on the plant length at 5-10 week after planted, but the application of bamboo shoot extract did not significantly effect on shoot dry weight and root dry weight.
4. Conclusions

Medan Johor accessions show better growth than other accessions. The use of the binahong P3 cultivation technology package (topsoil planting media: compost: manure (3: 1: 1); shade 25%; natural GR 60% bamboo shoot extract and liquid organic fertilizer 10 ml / l) increases plant length growth and number of leaves. The interaction of the treatment of the binahong cultivation package and the origin of the planting material had no significant effect on all observed parameters.

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