The effect of banana humps size on the vegetative growth of dwarf banana seedling

Muhidin¹*, A Nurmas¹, G R Sadimantara¹, A E Pratama, T C Rakian, G A K Sutariati¹, S Leomo² and D N Yusuf²

¹Department of Agrotechnology, Faculty of Agriculture, Halu Oleo University Kendari, Southeast Sulawesi, Indonesia.
²Department of Soil Science, Faculty of Agriculture, Halu Oleo University, Southeast Sulawesi, Kendari, Indonesia.

E-mail: *muhidinunhalu@gmail.com

Abstract. The aim of the study is to determine the effect of different hump size on banana seedling growth. The study carries out at the Agriculture Farm in Halu Oleo University. The study arranged in single-factor using randomized block design. The factor examined is the difference in the humps size, consists of (1) size 8cm x 8cm x 8cm, (2) size 10cm x 10cm x 10cm, and (3) size 12cm x 12cm x 12cm. The parameter observed were shoot height (cm), leaves number (strands) and stem circumference (cm). The results showed that differences in humps size has affected on the vegetative banana growth. As large as the hump size, some vegetative characteristics are getting higher, such as for the shoot height (cm), number of leaves (strands) and stem circumference (cm). Based on the research, it concluded that the humps size affected the vegetative seedling growth of dwarf banana plants.

1. Introduction

Bananas have become a very common commodity of tropical fruit [1-3] and can be intensively planted as intercropping in both plantation and forestry crops in a business-oriented manner and insertion farming [4]. For humans, bananas have many uses [5], because they can serve as a food replacement containing a lot of calories, protein, carbohydrates, fat [6] vitamins, minerals [7] and antioxidant [8]. The types of banana are three types of banana including cooking, dessert, cooking and roasting bananas [9-11]. National banana production averaged only 7.0 tonnes ha⁻¹ from the potential 35 tonnes ha⁻¹ [12]. Of this number, 4.0 million tonnes are freshly consumed forms of table bananas. It’s believed that about 60% (150 million) of Indonesia's total population (250 million) is like bananas. But the consumption level is only 26.75 kg year⁻¹ or 73.25 grams day⁻¹ per capita banana consumption. The domestic banana market has a massive and wide-open capacity. In Indonesia, bananas demand an annual rise, in line with the growth of population and economic. Increased banana production in Indonesia has faced many challenges, particularly in the limited land that can be used for cultivation. The alternative way to solve this problem is by development of banana cultivar that tolerant to limited solar radiation. Limited solar prove to decrease growth and production in rice [13-15], soybean [16,17] and other commodity such as maize [18,19]. The banana tolerant can be planted as intercropped plant in agroforestry system [20]. Intercropping model is an important activity to enhance banana production, when an economic commodity competes for the same small land area. It is therefore
important to screen a dwarf banana cultivar that is tolerant of shades with high potential yields and easy to multiplication. The research aim was to characterize the effect of hump size on the banana seedling growth.

2. Materials and methods
The study carries out at the Agriculture Farm in Halu Oleo University. The study arranges in single factor using a randomized block design. The factor examined is the difference in the humps size, consists of (1) size 8cm x 8cm x 8cm, (2) size 10cm x 10cm x 10cm, and (3) size 12cm x 12cm x 12cm. The parameter observed were shoot height (cm), leaves number (strands) and stem (cm). The observed data were analysed at a 95% confidence level using Anova and DMRT.

3. Results and discussion

3.1. Shoots height
The data founded that the different hump size has significant effect on shoots height (table 1). Based on the data it indicates that the increase in hump size will increase the shoots height from the beginning of research at 42 day after planting (DAP) to 112 day after planting (DAP).

Table 1. The effect of hum size on shoots height of banana seedling from 42 day after planting (DAP) to 112 day after planting (DAP).

| Treatment (Different of Hump Size) | 42 DAP | 56 DAP | 70 DAP | 84 DAP | 98 DAP | 112 DAP |
|----------------------------------|--------|--------|--------|--------|--------|--------|
| U₁ (8 cm x 8 cm x 8 cm)          | 4.5a   | 6.2a   | 7.7a   | 9.4a   | 10.8a  | 12.9a  |
| U₂ (10 cm x 10 cm x 10 cm)       | 5.5a   | 7.5a   | 9.3a   | 11.0ab | 13.2a  | 15.5ab |
| U₃ (12 cm x 12 cm x 12 cm)       | 7.9b   | 10.1b  | 11.7   | 15.0b  | 17.5b  | 20.0b  |
| Duncan 0.05                      | 2=2.15 | 2=2.81 | 2=3.26 | 2=3.93 | 2=3.77 | 2=3.77 |
|                                  | 3=2.26 | 3=2.95 | 3=3.42 | 3=4.13 | 3=3.93 | 3=3.93 |

Note: Number followed by the same letter are not significant different at 5% percent DMRT means stages.

3.2. Number of leaves
The data founded that the different hump size has no significant effect on the leaf number (table 1). Based on the data it indicates that the increase in hump size will not increase the number of leaves significantly from the beginning of research at 42 day after planting (DAP) to 112 day after planting (DAP).

Table 2. The effect of hum size on leaf number of banana seedling from 42 day after planting (DAP) to 112 day after planting (DAP).

| Treatment (Different of Hump Size) | 42 DAP | 56 DAP | 70 DAP | 84 DAP | 98 DAP | 112 DAP |
|----------------------------------|--------|--------|--------|--------|--------|--------|
| U₁ (8 cm x 8 cm x 8 cm)          | 2.1    | 3.1    | 4.1    | 5.1    | 6.6    | 7.6    |
| U₂ (10 cm x 10 cm x 10 cm)       | 2.6    | 3.1    | 4.3    | 5.5    | 7.3    | 7.9    |
| U₃ (12 cm x 12 cm x 12 cm)       | 3.4    | 4.0    | 4.6    | 6.0    | 7.4    | 8.3    |
3.3. Stem circumference

The results showed that the different of hump size has significant differences to stem circumference the parameter stem circumference of the stem (table 3). Based on the data also it indicates that the increase in hump size will increase the circumference of the stem.

Table 3. The effect of hump size on stem circumference of banana seedling from 42 day after planting (DAP) to 112 day after planting (DAP).

| Treatment (Different of Hump Size) | 42 DAP | 56 DAP | 70 DAP | 84 DAP | 98 DAP | 112 DAP |
|-----------------------------------|--------|--------|--------|--------|--------|--------|
| U₁ (8 cm x 8 cm x 8 cm)           | 3.2a   | 4.0a   | 4.6a   | 5.5a   | 6.4a   | 7.2a   |
| U₂ (10 cm x 10 cm x 10 cm)        | 3.9a   | 4.9ab  | 5.7a   | 6.3ab  | 7.1a   | 8.0a   |
| U₃ (12 cm x 12 cm x 12 cm)        | 5.1b   | 6.1ab  | 7.5b   | 8.2b   | 9.3b   | 10.3b  |
| Duncan 0.05                       | 2=1.17 | 2=2.81 | 2=1.69 | 2=1.91 | 2=1.80 | 2 = 1.74 |
|                                  | 3=1.27 | 3=2.95 | 3=1.78 | 3=2.00 | 3=1.89 | 3 = 1.83 |

Note: Number followed by the same letter are not significant different at 5% percent DMRT means stages.

In general, research shows that the larger the hump size as a seedling source, the greater the potential for growth, especially for the vegetative growth, such as shoots height and leaf wide. The results also showed that the micro hump was very potential as a source of seedling. The seedling propagation through micro hump takes longer. It needs more extended maintenance, but the potential for seedlings produced will be more numerous than using tillers as a source of seedling. The use of micro hump will also be more efficient if many seedlings are to be propagated at a farmer scale. Therefore, this study will support the plant cultivation model to produce superior seedling in large quantities, quickly and uniformly, so that plant cultivation efforts can immediately follow the availability of superior clone lines in the farmers.

4. Conclusions

The result showed that the hump size has significant effect on shoots height and stem circumferences of banana seedling and has not significant effect on number of leaves.

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