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Assesing the Impact of Pruning and Planting Media on Floating Red Chili Morphology and Yield

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Abstract

Horticultural commodities hold significant economic potential in Indonesia, particularly red chilies, which serve various purposes such as a spicy,traditional spicy, and industrial raw material. This research aims to assess the impact of shoot pruning and planting media composition on the morphology and yield of red chili plants. The study employed a Randomized Factorial Group Desugn (RAKF) with two main treatments : shoot pruning and planting medium composition. Results indicate that pruning shoots at 35 days after planting (P4) enhances the cultivation of red chili plants, as evidenced by improved plant height, earlier flowering, and increased root length. Furthermore, a planting medium composed of soil, cow dung compost, and 2:1:1 husk charcoal (M4) proves to be more beneficial for red chili yield, demonstrated by higher plant height, stem diameter, and root length.

Keywords : pruning, planting media, red chilies

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1. Introduction

Red chili serves multiple purposes, acting as a complementary spice in cooking, a traditional medicinal ingredient, and a raw material for industrial applications [1]. Rich in essential nutrients, including protein, fat, carbohydrates, calcium (Ca), phosphorus (P), and iron (Fe), chilies offer various health benefits [2]. The challenge in enhancing red chili productivity lies in limited harvest areas and cultivation land. One cultivation approach involves pruning the shoots, aiming to expedite plant growth, enhance productivity, and optimize nutritional efficiency [3]. Pruning facilitates increased sunlight exposure, stimulating flower growth and influencing fruit size and quality [5]. It promotes shoot growth, branch multiplication, stem strengthening, and improved air circulation, along with sunlight distribution across plant parts [6]. Meeting water and nutritional needs is essential [7].

Incorporating organic material into the planting medium enhances soil structure and fertility. Cow manure, serving as an organic fertilizer, boosts nutrient availability and fosters soil microorganism development, converting plant residues into humus, a vital nutrient for plants [8]. Additionally, rice husk charcoal is a viable planting medium, offering high water retention and good porosity [9].

Given the shrinking land availability, especially in urban areas, traditional chili cultivation faces challenges. Using pots becomes a suitable alternative for narrow spaces, enabling cultivation and fostering green environments in urban settings [10]. Floating cultivation systems, requiring less water and space, offer an innovative solution. This technique proves beneficial for growing seasonal crops like mustard greens, kale, lettuce, and spinach [11]. The success

of floating systems depends on a balanced medium, meeting nutrient, water, and air requirements for optimal plant growth [12].

2. Materials and Methods

2.1 Materials

This research used nursery trays, ponds measuring (7 × 20 meters) and (10 × 20 meters), small polybags measuring (10 × 10), styrofoam measuring (1 × 2 meters with a thickness of 10 cm), and pots measuring (17 cm high). , top diameter 23.5 cm, bottom diameter 15.5 cm), ruler, digital camera, scales, blender, dry oven, brown paper bag. the materials used in this research were the best-selling varieties of red chili seeds, soil, cow dung compost, rice husk charcoal, water, inorganic fertilizer, and pesticides.

2.2 Data Collection

Growth variables are measured using a ruler. Fruit weight was measured using a digital scale, and dry weight was measured after the material was dried in an oven at 70°C for 48 hours. At harvest time, several data are recorded, such as leaf weight, shoot weight, and fruit weight.

2.3 Methods Eksperimental and Analysis Statistic

This research used a factorial randomized block design consisting of 2 factors: shoot pruning and planting media. The main factor is shoot pruning (P), which consists of 4 levels, namely 14 dap (P1), 21 dap (P2), 28 dap (P3) and 35 dap (P4). The second factor is soil planting media, cow dung compost, and rice husk charcoal consisting of 4 levels: 1:1:1 (M1), 1:2:1 (M2), 1:1:2 (M3), 2:1: 1 (M4). Composed of 16 treatments with three groups, there were 48 experimental units.

The data obtained will be analyzed using the diversity analysis method (Anova) using R studio software. The treatment has a natural effect if the F > F Table is at the 5% test level. Next, to see the differences, further tests were carried out using the Least Significant Difference Test (BNT) method at the 5% level.

3. Results and Discussion

3.1 Result

The research results showed that the height of red chili plants continued to increase until the 13th week in all treatments. However, pruning at 35 days after planting showed higher plant height than at 14 days after planting, 21 days after planting, and 28 days after planting. This indicates that pruning at 35 days after planting is more effective in cultivating red chili plants. Apart from that, there was no significant difference in the planting media treatment. However, the height of the red chili plants in the 2:1:1 (m4) planting medium showed a higher plant height (figure 1). this shows that plants with a 2:1:1 planting medium get a more loose planting medium for plant growth.

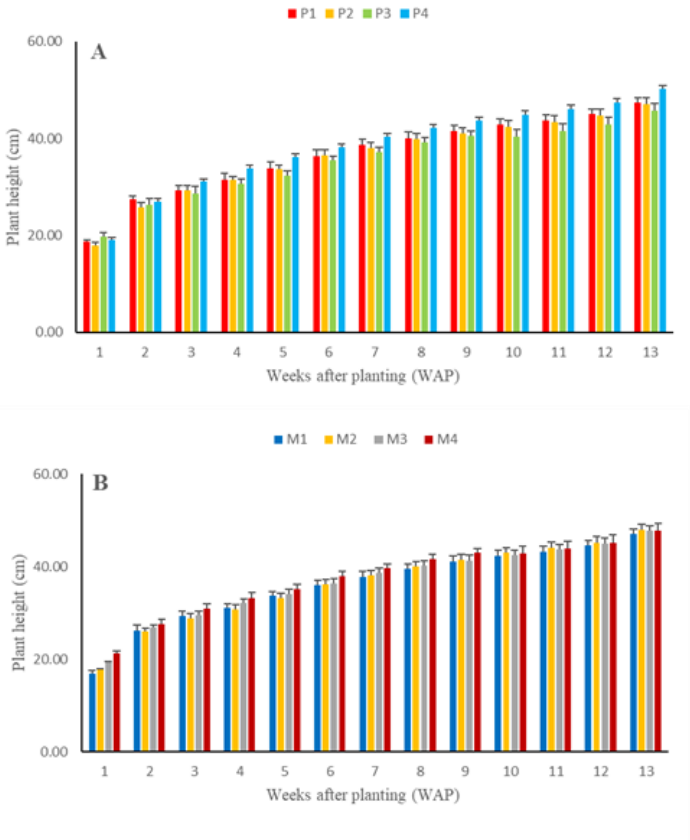


Figure 1. Plant height is influenced by pruning shoots (a) and planting media (b)

The shoot pruning treatment on red chili plants showed no significant difference between the planting media treatments other than that the 2:1:1 (M4) planting media produced a larger stem diameter. This can happen because the roots supply sufficient nutrients to the plant stem for the plant's vegetative growth process because the composition of the soil planting medium is more abundant and balanced, so it can help more optimal nutrient absorption in the plant growth process.

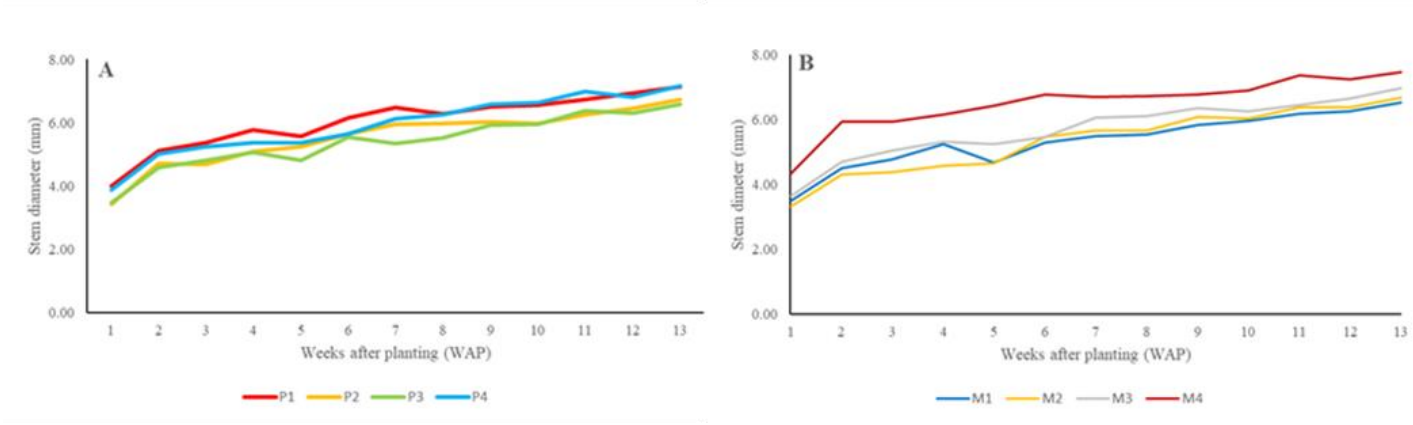


Figure 2. Stem diameter is influenced by pruning shoots (a) and planting media (b)

Shoot pruning at 14 DAP (P1) showed the highest number of productive branches (Ganbar 3). However, interestingly, the tallest flowering age was found at 35 after pruning (P4). This can happen due to external factors. One external factor that can influence is the environment because this factor can influence hormones in plants influence the vegetative processes of each plant.

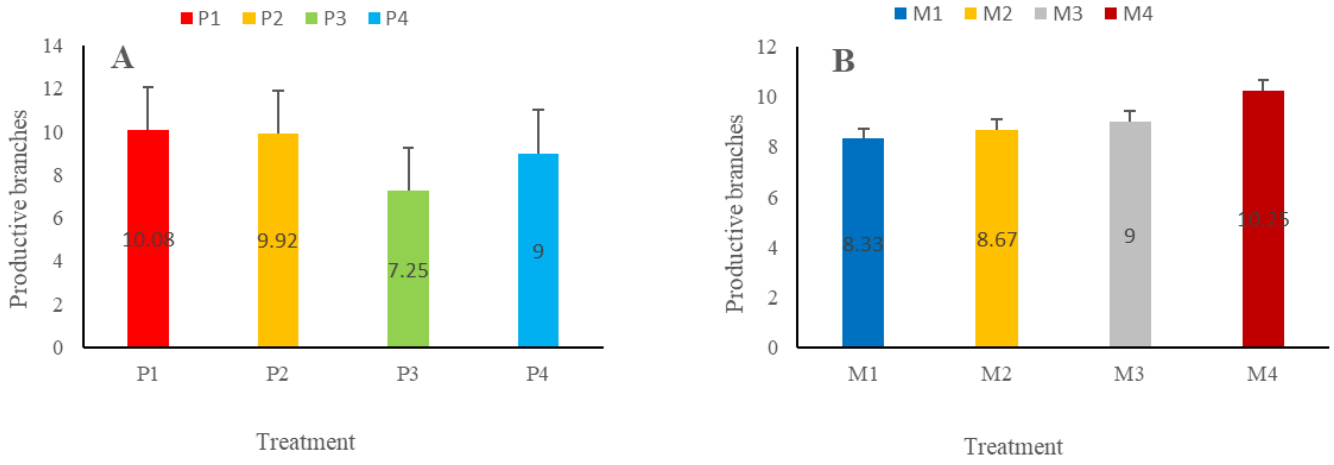
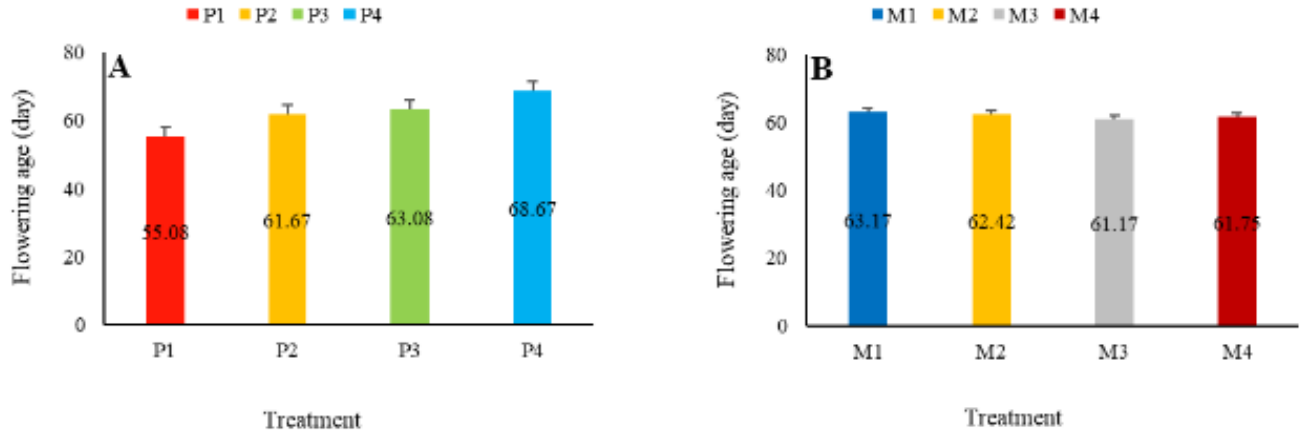


Figure 3. Number of productive brunches affected by pruning shoots (a) and planting media (b)



Gambar 4. Age of flowering is influenced by pruning shoots (a) and planting media (b)

Pruning at 14 days after planting (P1) showed higher fruit weight compared to pruning at 21 days after planting, 28 days after planting, and 35 days after planting. This indicates that pruning for 14 days is more effective; this can happen because the effect of the plant where the shoots are pruned causes an increase in the number of productive branches and the number of fruit that appear. Furthermore, the 1:1:3 (M3) planting medium produces higher fruit weight; this is due to sufficient nutrients so that the nutrients absorbed by the plant can be supplied to the stem and then to the fruit so that it can help optimize the growth process of the chili fruit.

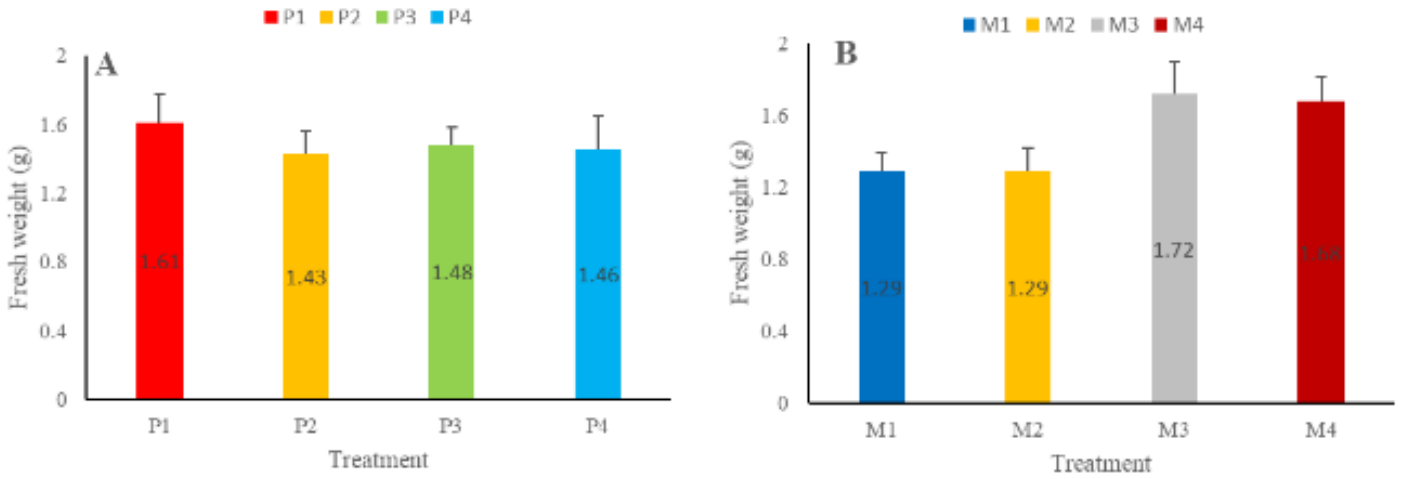


Figure 5. Fruit weight affected by pruning shoots (a) and planting media (b)

Based on the research results, it shows that there is no significant difference in the shoot pruning treatment 35-day pruning showed higher root length than 14,21 and 28-day pruning. This indicates 35-day pruning is more efficient in plant cultivation and root growth of red chilies. Furthermore, there was no significant difference in the treatment of planting media composition. The root length of red chili plants with the planting media composition (M4) shows a higher root length (Figure 6). This indicates that plants have a better texture, so the root coverage is broader and longer

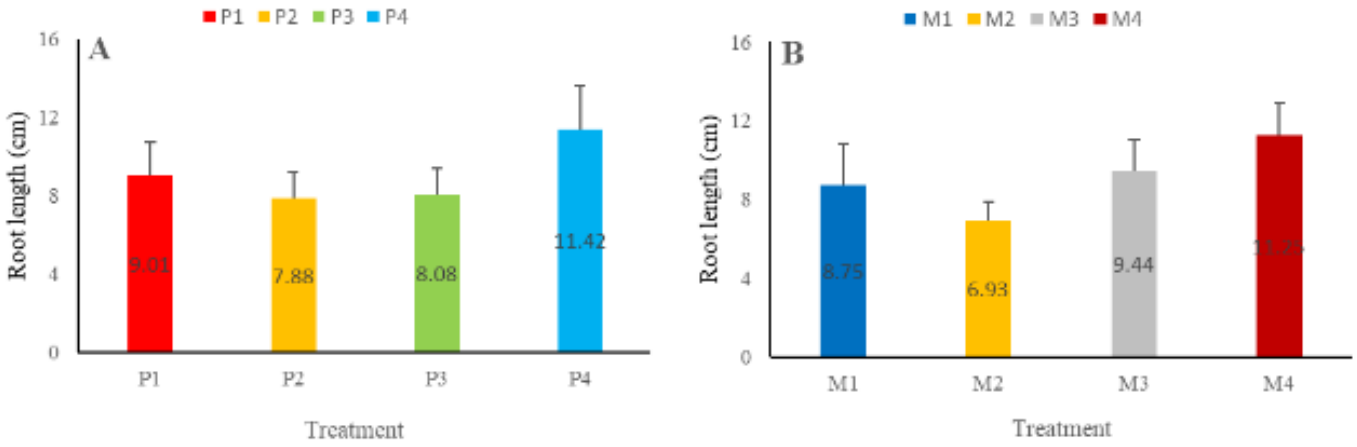


Figure 6. Root length is influenced by pruning shoots (a) and planting media (b)

3.2 Disscusion

Pruning demonstrates its effectivenes by promoting the highest average plant height, indicating accelerated growth and increased height in red chili plants. This growth is attributed to enhanced sunlight capture, optimizing the photosynthesis process [13]. Shoot pruning plays a crucial role in both vegetative growth and plant yield. By stimulating the potential growth of pruned shoots, the plant produces more new branches, aligning with the goal of increasing productive units and influencing overall plant production [13]. Apical dominance control is a key outcome of pruning, eliminating it and encouraging the growth of new units. The

removal of the plant's top disrupts apical dominance, fostering the development of new shoots in the axillary stem [14]. Plants with limited growth negatively impact photosynthesis, leading to suboptimal canopy development, including stems and leaves. Notably, pruning at 35 days after planting yields the highest total plant weight.

They have limited root development, resulting in stunted canopy growth. The root weight value is related to the ability of the roots to absorb water. Sources with a low weight value indicate that root growth tends to be long and thin. Root development is good if supported by soil structure in good condition [15]. Pruning shoots significantly affect crop yields. The greater the number and weight of fruit after pruning, the greater the number of branches formed and the greater the number of flowers and fruit produced. If there are more lateral shoots, you will get maximum production results. The growth of lateral shoots can cause the formation of many stem branches in the axils of the main stem; pruning the shoots also causes the plant to have many components so that many flowers are formed. The many flowers that grow can be interpreted as the presence of good crop yields [16].

A suitable planting medium will stimulate plant vegetative growth, increasing plant productivity and flowering. Good plant productivity can be obtained from good vegetative growth. Flower production is closely related to plant height, stem diameter, and number of productive branches. Growing media is one of the external factors that significantly influences plant yields. Planting media affects the growth of red chili roots. They are planting media (M4) with a higher soil composition than cow dung compost, and rice husk charcoal produced higher root length values than growing media (M1), (M2), and (M3). This is a natural phenomenon carried out by roots [17].

In suboptimal planting medium conditions, root development is hindered, impacting the overall growth of the plant. Hindered root growth also impedes crown development, as roots play a crucial role in transporting water and nutrients to canopy organs, including stems and leaves [18]. Adequate water and nutrient support from the growing medium are essential for promoting healthy root development in plants [19].

4. Conclusion

Pruning red chili plants at 35 days after planting (P4) enhances growth, as evidenced by increased plant height, earlier flowering, and longer roots. Additionally, the planting medium composition of 2:1:1 (M4) significantly influences chili plant yield, reflected in increased plant height, stem diameter, and root length.

5. Acknowledgement

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