Application of Organic and Inorganic Fertilizers Affects the Growth and Biomass Semanggi (*Marsilea crenata* Presl.)

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Abstract— Semanggi (*Marsilea crenata* Presl.) is one of the aquatic plants that have been widely used by the community as food and medicinal raw materials. One of the important factors in cultivating clover is optimal fertilizer management. The incorporation of organic and inorganic nutrients has an effect on soil fertility has been repeatedly demonstrated in several studies, but there are not specific guidelines on clover cultivation. The challenge now is to combine organic matter of different qualities with inorganic fertilizers to optimize nutrient availability for the clover plant. The results of research on clover cultivation have also not been widely carried out. Therefore, it is very important to do this research with the aim of knowing the optimal effect of organic (cow manure) and inorganic (nitrogen, potassium) fertilizers on the growth and yield of clover (*Marsilea crenata* Presl.). The research was conducted at the Screen House of the Faculty of Agriculture, Brawijaya University. The study was designed using a non-factorial randomized block design (RBD) with 8 (eight) treatment combinations of soil types and fertilization [inorganic (N, K) cow manure organic fertilizer (CM)], namely: P0 = soil, without fertilizer; P1 = soil, 138 kg N ha^{-1}; P2 = soil, 136 kg K ha^{-1}; P3 = soil, N and K, 138 and 136 kg ha^{-1}; P4 = soil, 20x10^{3}kg of cow manure ha^{-1}; P5 = soil, 20x10^3 kg of cow manure ha^{-1}, 138 kg N ha^{-1}; P6 = soil, 20x10^3 kg of cow manure ha^{-1}, 136 kg K ha^{-1}; P7 = soil, 20x10^3 kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} with 3 replications, so that 24 experimental units were obtained. Each experimental unit consisted of 5 plants. Growth observations were observed destructively at the ages of 4, 8, 12, 16, 20, 24, 28, 32 days after planting (DAP). The results showed that there was an increase in the growth and yield of biomass in the soil combination, 20x10^3 kg of cow manure ha^{-1} (P4) was compared with the treatment without the addition of organic fertilizers (cow manure) on plant growth and yield parameters, such as stolon length (74.78 cm), number of leaves (160.44), leaf area (1379.28 cm^2), root length (23.85 cm), stomata density and number of stomata (13.25); Stomata width (10.87 cm); Stomata length (19.76 cm), leaf fresh weight (12,907 g), leaf dry weight (1,802 g), total fresh weight 210,830 g, total dry weight 7,823 g, leaf harvest fresh weight (64.19 g); stalk (130.54 g); root (79.75 g); total 274.48 g), harvest dry weight of leaves (11.36 g); stalk (24.88 g); root (9.55 g); a total of 45.78 g) and the chlorophyll a content (0.804 mg.g^{-1}); chlorophyll b (1.121mg.g^{-1}); and total chlorophyll (1.924 mg.g^{-1}).

Keywords: organic fertilizer, inorganic, biomass, semanggi

I. Introduction

Semanggi (*Marsilea crenata* Presl.) is one of the aquatic plants that has been widely used by the community as food. Semanggi (*Marsilea* sp.), Is one of the ferns that usually grows in muddy environments, moist soils, watery places or wet habitats such as rice fields [1], ditches and shallow puddles [2],[3], lakes under full sun and shady conditions have a cosmopolitan distribution, but are rarely distributed in subtropical areas.

So far, people know that the clover plant is a lowland rice weed, some of which use it as a vegetable, medicinal plant [4], and also as a phytoremediation plant [5]–[7]. Indonesian people are more familiar with semanggi as one of the typical culinary delights of the city of Surabaya, East Java Province which has been known since ancient times as "Semanggi Suroboyo". The clover plant commonly consumed by the people of Surabaya and its surroundings is *Marsilea crenata* Presl [5]. Apart from that, it also has plant-derived phytochemical compounds, phytoestrogens are naturally occurring estrogenic compounds that have structural similarities to estrogens [8]–[11]. So that estrogenic activity can play a role in preventing cancer, reducing menopausal symptoms, and other health effects [12].

This clover plant can be found in rice fields in Kendung Village, Sememi Village, Benowo District. Initially this plant for the people of Kendung Village was a wild plant between rice fields. But now it is finally planted as a substitute for rice.

So cultivated by the people of the area. Clover cultivation techniques applied by farmers in Kendung Village, Sememi Village, Benowo District, Surabaya is still the same as rice field cultivation, so it is still not able to produce biomass optimally. Whereas when the clover plant is used as an alternative food and can be used as raw material for medicine, what is prioritized is the high amount of plant biomass. Meanwhile, the need for consumption is quite large, so that it cannot be fulfilled. Currently, clover plants can only be found in a few areas, for example in the West Surabaya area. Apart from the fact that not many farmers are interested in cultivating clover, another factor that is no less important is the nutrient factor.

The availability of nutrients in the soil through proper fertilizer management for medicinal plant species (ethno medicinal) is very important as a step in increasing plant biomass yield and maintaining quality [13]. The main essential nutrients for N, P, and K plants as much as 135, 60 and 132 kg ha^{-1} can increase optimal production of *Centella asiatica* L. Urb. [14], increase growth and production of dry weight consistently [15], sufficiency Ammonium nutrients from nitrogen can increase the absorption of phosphorus and the use of inorganic fertilizers (N, P, K) continuously causes fertilizers to accumulate in the soil, so that the soil becomes hard and difficult to process ([16], potassium is not available in sufficient quantity es as well. resulting in low nitrogen and phosphorus efficiency [17]. To overcome the accumulation of fertilizers into the soil due to the continuous use of inorganic fertilizers (N, P, K), organic fertilization can be done, so as to improve the physical, chemical, and biological properties of the soil [18] and efficient use of fertilizers [19]. The main nutrient elements needed by plants are N and K. Nitrogen is known as one of the most limiting nutrients for plant growth and can be added with organic matter (eg animal manure, crop residues, green manure, etc.) or from inorganic fertilizers (urea, ammonia, nitrates, etc.). Nitrogen can increase growth during the vegetative phase and protein synthesis. According to [20] nitrogen is applied to plants to be taken over by leaves, because it will make the leaves grow well. Sufficient nitrogen in the soil will make plants look greener, meaning that nitrogen plays a role in the formation of chlorophyll for photosynthesis. Meanwhile, potassium plays a role in physiological processes and plant metabolism, such as regulating respiration through stomata, enzymatic activity in starch formation, increasing resistance to drought and disease. In addition, potassium can improve the quality of plants, one of which is to increase the content of starch, oil, or other secondary metabolite compounds. Besides the two elements mentioned above, organic matter such as plant residues can increase N mineralization in the soil [21]–[24]. Changes in N in the soil will increase yields by 26 - 41% [25] and is one of the main plant nutrients involved in chlorophyll synthesis, and affects stomata conductance and photosynthetic. Farmers have traditionally made use of various types of organic matter to maintain or increase the fertility and productivity of their agricultural land. To improve the quality of plants, especially medicinal and aromatic plants, it is mostly done by using organic fertilizers to be acceptable rather than chemical fertilizers [26]–[30]. The beneficial effects of the application of organic fertilizers on the growth and yield of millet and wheat were demonstrated by reported that the addition of compost can significantly increase the productivity of *M.enthaspicata, M. pulegium* and *M. longifolia*, where an increase in composting rates from 3.5 to 7.5 Mg ha-1 resulted in a significant increase in all growth parameters [13]. A significant increase in yield was also reported through the addition of poultry manure to *Curculigo orchioides* Gaertn, and *C. asiatica*. The effect of organic and inorganic fertilizers on the growth and yield of various medicinal plants has been studied by several researchers [31]–[40], the complete substitution of inorganic fertilizers with organic fertilizers such as vermicompost, or farmyard manure. (FYM), however, is not recommended because the nutrient concentration of organic fertilizers is generally low compared to inorganic fertilizers. This requires the application of very large amounts of organic fertilizer to meet the nutritional needs of the plant.

Based on some of the scientific reviews above, one of the efforts to increase the biomass of the clover plant is in fulfilling the right nutrients. Meanwhile, the results of research on the cultivation of clover plants that are in accordance with Good Agricultural Practices (GAP) have not been widely carried out. Therefore it is necessary to conduct research with the aim of obtaining the influence of nitrogen, potassium and optimal cow manure on the growth and yield of biomass of clover (*Marsilea crenata* Presl.). to support the development of clover plants in Indonesia with good cultivation techniques.

II MATERIAL AND METHOD

The research was conducted in a greenhouse in the experimental garden of Brawijaya University Malang, East Java, Indonesia (7° 56'19.6" South Latitude and 112°37'05.1" East Longitude at an altitude of 506 meters above sea level). The research was conducted in March-May 2020. The materials used by clover seeds were obtained from the Kendung village cultivation center, Sememi Village, Benowo District, Surabaya City, East Java, Indonesia, cow manure, urea, KCl, alluvial soil, planting tubs/pots, rulers, digital cameras, and stationery.

The study was designed using a non-factorial randomized block design (RBD) with 8 (eight) treatment combinations of soil types and fertilization [inorganic (N, K) cow manure organic fertilizer (CM)], namely: P0 = soil, without fertilizer; P1 = soil, 138 kg N ha^{-1}; P2 = soil, 136 kg K ha^{-1}; P3 = soil, N and K, 138 and 136 kg ha^{-1}; P4 = soil, $20x10^3$kg of cow manure ha^{-1}; P5 = soil, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}; P6 = soil, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}; P7 = soil, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} with 3 replications, so that 24 experimental units were obtained.

Each treatment unit contained five plastic pots measuring 42 cm, 32 cm wide, and 14 cm high, filled with alluvial soil weighing 7 kg (P0-P7), and some were added with organic fertilizer (cow manure) as much as 800 g/pot. (Planting medium according to treatment P4-P7). The number of plants per pot of 8 plants, so the total crop is 960 plants. Furthermore, each treatment consists of 5 plants, and each observation requires 3 sample plants to be observed destructively. Observations were made 4, 8, 12, 16, 20, 24, 28, 32 days after planting (DAP).

Measurement of growth components is observed by taking samples of plants produced by each plant in each experimental unit, including 1) Stolon length (cm). The stolon length is calculated from the starting point of growth. 2). The number of leaves counted the number of leaves (strands) that open perfectly. 3). Leaf area (cm^2) by taking clover plant leaves is then measured by the formula Leaf Area (cm^2) = Total Paper Weight (Wr) (g) / Total Replica Weight (Wt) (g) x Paper Area (cm^2) 4). Root length (cm) is done by measuring the longest root using a ruler from the base of the root to the tip of the root. 5). Stomata density, the preparation of preparations for stomata observation was carried out by the stomata printing method [41]; namely, the lower surface of the leaves was smeared with nail polish and allowed to dry. Then the nail polish is peeled off using insulation and placed on a glass object. The preparations were observed under an Olympus BX 51 computer microscope and an Olympus DP 24 camera with a 400x magnification.

Measurement of production components is observed by taking sample plants produced by each individual plant in each experimental unit, including 1). Leaf fresh weight (g), leaf fresh weight measurements were carried out once every 4 days for 32 days after planting (DAP) by weighing the prunings (leaves, stalks, roots, total) produced by each plant. 2). Leaf dry weight (g), leaf dry weight measurement was carried out once every 4 days for 32 days after planting (DAP) by weighing the dry weight of the prunings (leaves, stalks, roots, total) which had been oven at 105°C for one day. 3). Total fresh weight (g), measurement of fresh weight (leaf, stalk, root, complete) is carried out every 4 days for 32 days after planting (DAP) by weighing the results of the trimmings (leaves, stalks, roots, total) produced each time. Individual plants. 4). Total dry weight (g), measurement of dry weight (leaf, stalk, root, total) is carried out every 4 days for 32 days after planting (DAP) by weighing the dry weight of the prunings (leaves, stalks, roots, total) that have been oven at 105o C for 1 day. 5). Fresh harvest weight (g), measurement of wet leaf weight is carried out at harvest by weighing the fresh weight (leaves, stalks, roots, total) produced by each plant. 6). Harvest dry weight (g), measurement of dry leaf weight was carried out at harvest by weighing the dry weight (leaves, stalks, roots, total) which had been oven at 105o C for 1 day. 7). Chlorophyll content, analysis methods of chlorophyll a and b [42]. Weight 1 g of clover leaves then extracted (crushed with a porcelain cup) with 85% acetone solvent in a centrifuge. Filter and take the filtrate. Add the filtrate to a 100 ml measuring flask. Then add the same solvent so that the solution becomes 100 ml— spectrophotometer at λ 645 nm and λ 663 nm. The amount of chlorophyll is calculated using the chlorophyll formula. a = 12.7 D-663 - 2.69 D-645 (mg / l). chlorophyll b = 22.9 D-645 - 4.68 D-663 (mg / l). Chlorophyll Total = 20.2 D-645 + 8.02 D-663 (mg / l). The chlorophyll a or b levels were then converted into $mg.g^{-1}$ of leaves.

Data analysis

Data analysis using analysis of variance (ANOVA) was carried out to examine the effect of treatment combinations on plant growth. If there is a significant effect on the treatment, it is followed by a different test using LSD at the 5% level [43]

III RESULTS AND DISCUSSION

Response of organic and inorganic fertilizers to the Growth Components

Stolon lengths

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on the length of the stolons at the observation ages of 12,16,20,24, and 32 DAP ($p<0.05$). The total size of the stolons is presented in Table 2. Based on the presentation of Table 2 above that at the age of 12 DAP, the length of the stolon in soil treatment, $20x10^3$ kg of cow manure ha-1 (P4), is 8.80 cm longer than the soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, $20x10^3$ kg of cow manure ha^{-1} , 138 kg N ha^{-1} (P5), soil treatment, $20x10^3$ kg cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from stolon length in soil treatment, $20x10^3$ kg cow manure fertilizer ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the lowest stolon length was found in soil treatment, 136 kg K ha^{-1} (P2) of 3.96 cm.

Stolon length at observation age 16 DAP, stolon length in soil treatment, $20x10^3$ kg of cow manure ha-1 (P4) is 16.67 cm longer than soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 136 kg K ha^{-1} (P6), soil treatment, $20x10^3$ kg cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the length of the stolons in soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5). Furthermore, the lowest stolon length was found in soil treatment, without fertilizer (P0) (control) of 7.62 cm.

At the age of 20 DAP observations, soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) of 29.37 cm produced a longer stolon than soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha-1 (P7), but not different from soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5) and soil treatment, $20x10^3$ kg cow manure ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the lowest stolon length was found in soil treatment, without fertilizer (P0) of 14.38 cm.

Stolon length at observation age 24 DAP soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) of 41.08 cm produced longer stolons than soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha-1 (P6). Furthermore, the lowest stolon length was found in soil treatment, without fertilizer (P0) of 19.25 cm.

Stolon length at the age of observation 28 DAP soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) of 56.16 cm resulted in a longer stolon than soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, $20x10^3$ kg cow manure ha-1, 138 kg N ha^{-1} (P5), soil treatment, 20x10^3 kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and soil treatment, 20x10^3 kg of cow manure ha-1, N and K, 138 and 136 kg ha^{-1} (P7). Furthermore, the lowest stolon length was found in soil treatment, without fertilizer (P0) of 24.39 cm.

Stolon length at the age of observation 32 DAP soil treatment, 20x10^3 kg of cow manure ha^{-1} (P4) produced the longest stolon of 74.78 cm compared to soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, 20x10^3 kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from stolon length in soil treatment, 136 kg K ha^{-1} (P2), soil treatment, 20x10^3 kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5), soil treatment, 20x10^3 kg cow manure ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the lowest stolon length was found in soil treatment, without fertilizer (P0) of 34.13 cm.

Number of Leaves

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on the number of leaves at the observation age 4,8,12,16,20,24 and 32 DAP ($p<0.05$). The average number of leaves is presented in Table 3.

Based on the presentation of Table 3, the number of leaves at the observation age of 4 DAP, soil treatment, 20x10^3 kg of cow manure fertilizer ha^{-1} (P4) resulted in 3.44 more leaves compared to soil treatment, without fertilizer (P0), treatment soil, 138 kg N ha^{-1} (P1), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, 20x10^3 kg cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the number of leaves in soil treatment, 136 kg K ha^{-1} (P2), soil treatment, 20x10^3 kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5), and soil treatment, 20x10^3 kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the lowest number of leaves is on the soil, without fertilizer (P0) of 1.22.

The number of leaves at the observation age of 8 DAP, soil treatment, 20x10^3 kg of cow manure ha^{-1} (P4) produced 5.78 more leaves compared to soil treatment, without fertilizer (P0), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, 20x10^3 kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and soil treatment, 20x10^3 kg of manure cows ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the number of leaves in soil treatment, 138 kg N ha^{-1} (P1), and soil treatment, 20x10^3 kg of cow manure ha $^{-1}$, 138 kg N ha^{-1} (P5). Furthermore, the lowest number of leaves is in the soil, without fertilizer (P0) of 2.78.

The number of leaves at the observation age of 12 DAP, soil treatment, 20x10^3 kg of cow manure ha^{-1} (P4) produced 11.78 more leaves compared to soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), but not different from the number of leaves in soil treatment, 20x10^3 kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5), soil treatment, 20x10^3 kg cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and soil treatment, 20x10^3 kg cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), then the lowest number of leaves was found in the soil, without fertilizer (P0) of 2.78.

The number of leaves at the observation age of 16 DAP, soil treatment, 20x10^3 kg of cow manure ha-1 (P4) produced 29.22 more leaves compared to soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, 20x10^3 kg of cow manure ha-1, 136 kg K ha^{-1} (P6) and soil treatment, 20x10^3 kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the number of leaves in the soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil, 20x10^3 kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5), then the lowest number of leaves was found in soil treatment, 20x10^3 kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7) of 13.89.

The number of leaves at the observation age of 20 DAP, soil treatment, 20x10^3 kg of cow manure ha^{-1} (P4) produced 64.89 more leaves compared to other treatments, but did not differ from the number of leaves in soil treatment, 138 kg N ha^{-1} (P1). Furthermore, the lowest number of leaves was found in soil treatment, 136 kg K ha^{-1} (P2) of 26.44.

The number of leaves at the observation age of 24 DAP, soil treatment, 20x10^3 kg of cow manure ha^{-1} (P4) produced more leaves of 5.78 compared to soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, 20x10^3 kg cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and soil treatment, 20x10^3 kg cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the number of leaves without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), and soil treatment, 20x10^3 kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5). Furthermore, the lowest number of leaves was found in soil treatment, 20x10^3 kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7) of 40.33.

The number of leaves at the observation age of 28 DAP, soil treatment, 20x10^3 kg of cow manure ha^{-1} (P4) produced more leaves of 142.44 compared to soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), on soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, 20x10^3 kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the number of leaves, soil treatment, 20x10^3 kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5), and soil treatment, 20x10^3 kg of manure cattle ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the lowest number of leaves was found in soil treatment, 136 kg K ha^{-1} (P2) of 47.44.

The number of leaves at the observation age of 32 DAP, soil treatment, 20x10^3 kg of cow manure ha^{-1} (P4) resulted in 142.44 more leaves than the soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), on soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, 20x10^3 kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5), and soil treatment, 20x10^3 kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the number of leaves in soil treatment, 20x10^3 kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the lowest number of leaves was found in the soil, without fertilizer (P0) of 83.00.

Leaf area

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on leaf area at the ages of observation 4,8,12,16,20,24 and 32 DAP ($p <0.05$). The mean leaf area is presented in Table 4.

Table 4, shows that at the age of 4 DAP observations, soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), resulted in a leaf area of more than 13.41 cm^2 compared to the leaf area in the treatment without fertilizer (P0), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different with the number of leaves in soil treatment, 138 kg N ha^{-1} (P1), on soil treatment, 136 kg K ha^{-1} (P2), treatment of $20x10^3$ kg of cow manure ha^{-1} (P4), and soil treatment, $20x10^3$ kg cow manure fertilizer ha^{-1}, 138 kg N ha^{-1} (P5). Furthermore, the smallest leaf area was found in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7) of 7.91 cm^2.

Leaf area at the observation ages of 8.24, and 28 DAP, treatment of $20x10^3$ kg of cow manure ha^{-1} (P4), resulted in more leaf area of 33.57 cm^2, 564.04 cm^2, and, respectively, 1210.61 cm^2 compared to the leaf area in other treatments. Furthermore, the smallest leaf area at the observation age 8 and 28 DAP was found in the treatment without fertilizer (P0), respectively 13.99 cm^2, and 268.70 cm^2, while at the observation age 24 DAP was found in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7) of 242.83 cm^2, and

Leaf area at the age of observation 12 DAP, treatment $20x10^3$ kg of cow manure ha^{-1} (P4), resulted in a leaf area of 53.64 cm^2 more than the leaf area in the treatment without fertilizer (P0), in the soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and soil treatment, $20x10^3$ kg of fertilizer cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different from the number of leaves in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5). Furthermore, the smallest leaf area was found in soil treatment, N and K, 138 and 136 kg ha^{-1} (P3) of 24.21 cm^2

Leaf area at the age of 16 DAP observations, treatment of $20x10^3$ kg of cow manure ha^{-1} (P4), resulted in more leaf area of 132.95 cm^2 compared to soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), on soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the number of leaves in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5), and soil treatment, $20x10^3$ kg of cow manure. ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the smallest leaf area was found in the treatment without fertilizer (P0) of 57.25 cm^2

Leaf area at the observation age of 20 DAP, treatment of $20x10^3$ kg of cow manure ha^{-1} (P4), resulted in a leaf area of more than 314.95 cm^2 compared to soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), on soil treatment, 136 kg K ha^{-1} (P2), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not different from the number of leaves on soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5), and soil treatment, $20x10^3$ kg cow manure ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the smallest leaf area was found in the treatment without fertilizer (P0) of 117.78 cm^2

Leaf area at the age of observation 32 DAP, treatment $20x10^3$ kg of cow manure fertilizer ha^{-1} (P4), resulting in more leaf area of 1379.28 cm^2 compared to leaf area in the treatment without fertilizer (P0), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different from the number of leaves on), soil treatment, 138 kg N ha^{-1} (P1), on soil treatment, 136 kg K ha^{-1} (P2), soil treatment, 20x103 kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5) and soil treatment, $20x10^3$ kg of fertilizer cow manure ha^{-1}, 136 kg K ha^{-1} (P6). Furthermore, the smallest leaf area was found in soil treatment, N and K, 138 and 136 kg ha^{-1} (P3) of 467.17 cm^2.

Root Length

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on root length at the observation ages of 4,8,12,16,20,24 and 32 DAP ($p < 0.05$). The average root length is presented in Table 5.

Table 5, shows that at the age of observation 4, 8, and 12 DAP soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4), produced longer roots of 8.65 cm, 9.67 cm, and 10.03 cm, respectively compared to the root length. In soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5), and soil treatment, $20x10^3$ kg cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6). On observations 4, 8, and 12 DAP, the most minor root lengths were found in soil treatment, without fertilizer (P0), respectively 6.02 cm, 6.44 cm, and 7.07 cm.

The root length of the observation age 16, 20, 24, and 28 DAP soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4), resulted in longer roots of 11.78 cm, 17.19 cm, 22.32 cm, and 20.68 cm, respectively compared to the length roots in other treatments. On observations 16, 24, and 28 DAP, the minor root lengths were found in soil treatment, without fertilizer (P0), respectively 6.02 cm, 6.44 cm, and 7.07 cm. The smallest root length at the observation age of 16 DAP was found in soil treatment, without fertilizer (P0) of 7.31 cm, observation age of 20 DAP, at $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7) of 10.03 cm. The age of observation of 24 DAP was found in soil treatment, without fertilizer (P0) of 12.57 cm, and the period of observation of 28 DAP was found in soil treatment, N and K, 138 and 136 kg ha^{-1} (P3) of 12.56 cm.

The root length of the observation age 32 DAP, soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) produced 23.85 cm longer roots compared to the root length in soil treatment, 138 kg N ha^{-1} (P1), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1} (P5), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and treatment $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different from soil treatment, without fertilizer (P0), and treatment soil, 136 kg K ha^{-1} (P2). Furthermore, the smallest root length was found in soil treatment, 138 kg N ha^{-1} (P1) of 13.89 cm. The research findings showed that the root length increased from 4 DAP to 32 DAP observations.

Stomata density

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on the number, width, and length of the stomata ($p < 0.05$). The mean stomata are presented in Table 6.

Observation of the number of stomata in Table 6 shows that soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4), produces a higher number of stomata by 13.25 cm compared to the number of stomata in soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1} (P2), soil treatment, 20x103 kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and $20x10^3$ kg of cow manure ha $^{-1}$, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different from soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg of cow manure fertilizer ha^{-1}, 138 kg N ha^{-1} (P5), the least number of stomata was found in the treatment without fertilizer (P0) of 8.08 cm. Furthermore, soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) produced the widest stomata of 10.87 cm compared to the treatment without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, $20x10^3$ kg of fertilizer cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and treatment $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5), treatment without fertilizer (P0) resulted in stomata less wide by 6.31 cm.

Density according to the length of stomata, soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) produced the longest stomata of 19.76 cm compared to the size of stomata in the treatment without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 20x103 kg of cow manure ha^{-1}, 136 kg K ha-1 (P6) and $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7) but not different real with soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1} , 138 kg N ha^{-1}(P5), treatment without fertilizer (P0) resulted in stomata less wide by 12.39 cm.

Response of organic and inorganic fertilizers to the Yield Components

Leaf fresh weight

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on leaf fresh weight at the observation ages of 4,8,12,16,20,24 and 32 DAP ($p < 0.05$). The average leaf fresh weight is presented in Table 7.

Based on Table 7, it shows that the age of observation 4 DAP, soil treatment, $20x10^3$ kg of cow manure fertilizer ha^{-1}(P4) produces fresh leaf weight that is heavier by 0.133 g compared to fresh leaf weight in soil treatment, without fertilizer (P0), treatment soil, 138 kg N ha^{-1}(P1), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 136 kg K ha^{-1}(P6) and $20x10^3$ kg cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different from soil needs, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). The smallest fresh weight was found in the treatment, without fertilizer (P0) of 0.047 g.

Observation ages 8 and 12 DAP resulted in heavier leaf fresh weight in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4), respectively 0.276 g and 0.514 g but not significantly different from leaf fresh weight in soil treatment. $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). The lowest fresh leaf weight was found in the treatment without fertilizer (P0) of 0.123 g and 0.167 g, respectively.

Leaf fresh weight at the age of 16 DAP observations, soil treatment, $20x10^3$ kg of cow manure fertilizer ha^{-1}(P4) resulted in leaf fresh weight weighing 1.464 g compared to leaf fresh weight in other treatments. The smallest fresh leaf weight was found in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha ha^{-1} (P7) of 0.512 g.

Leaf fresh weight at the observation age of 20 DAP soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) is more weight of 2,788 g compared to leaf fresh weight in soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1} (P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). The smallest fresh leaf weight was found in soil treatment, 138 kg N ha^{-1}(P1) of 1,234 g.

Leaf fresh weight at the observation age of 24 DAP resulted in a heavier leaf fresh weight in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) of 4.974gr but not significantly different soil treatment $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). The lowest fresh leaf weight was found in the treatment without fertilizer (P0) of 1.882 g.

Fresh leaf weight at the age of 28 and 32 DAP observations, in soil treatment, $20x10^3$ kg of cow manure fertilizer ha^{-1}(P4) is heavier, respectively 5,642 g and 12,907 g compared to other treatments. The smallest fresh leaf weight was found without fertilizer (P0), respectively 2.237 g and 6.036 g.

Leaf Dry Weight

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on leaf dry weight at the observation ages of 4,8,12,16,20,24 and 32 DAP ($p < 0.05$). The average leaf dry weight is presented in Table 8.

Based on Table 8, it shows that at the age of 4 DAP observations on soil treatment, $20x10^3$ kg of cow manure fertilizer ha^{-1}(P4) produces leaf dry weight that is heavier by 0.047 g compared to dry leaf weight in other treatments but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). The smallest leaf dry weight was found in the treatment without fertilizer (P0) of 0.015 g.

Leaf dry weight at the age of 8 DAP observations resulted in heavier leaf dry weight in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) of 0.198 g compared to dry leaf weight in other treatments, then the smallest leaf dry weight was found in the treatment. Without fertilizer (P0) of 0.022 g.

Leaf dry weight at the observation age of 12 DAP resulted in a heavier leaf dry weight in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) of 0.183 g compared to leaf dry weight in the treatment without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment,

$20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6) and $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different from soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), and soil treatment $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). The smallest leaf dry weight was found in the treatment without fertilizer (P0) of 0.030 g.

Leaf dry weight at the observation age of 16 DAP in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) resulted in leaf dry weight that was heavier by 0.216 g compared to leaf dry weight in other treatments but not significantly different from soil treatment, 20x103 kg cow manure fertilizer ha^{-1}, 138 kg N ha^{-1}(P5). The smallest leaf dry weight was found in the treatment without fertilizer (P0) of 0.082 g.

Leaf dry weight at the observation age of 20 DAP resulted in a heavier leaf dry weight in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) of 0.496 g compared to leaf dry weight in the treatment without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha-1 (P2), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), and $20x10^3$ kg of manure fertilizer cows ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). The smallest leaf dry weight was found in the treatment without fertilizer (P0) of 0.185 g.

Leaf dry weight at the observation age of 24 and 28 DAP resulted in heavier leaf dry weight in soil treatment, 20x103 kg of cow manure ha^{-1}(P4) of 0.866 g and 1.442 g respectively compared to dry leaf weight in other treatments, then The smallest leaf dry weight was found in the treatment without fertilizer (P0) of 0.380 g and 0.437 g, respectively.

Leaf dry weight observed at 32 DAP in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) resulted in leaf dry weight that was heavier by 1.802 g compared to dry leaf weight in other treatments but not significantly different from soil treatment, $20x10^3$ kg of fertilizer cow manure ha^{-1}, 138 kg N ha^{-1}(P5) and soil treatment, 136 kg K ha^{-1} (P2). The smallest leaf dry weight was found in the treatment without fertilizer (P0) of 0.671 g.

Total Fresh Weight

Variance analysis showed that the addition of organic and inorganic fertilizers had a significant effect on the total fresh weight at the observation age 4,8,12,16,20,24 and 32 DAP ($p < 0.05$). The mean total fresh weight is presented in Table 9.

Based on the presentation of Table 9, it shows that at the age of 4, 8.24, and 28 DAP in soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) produces a total fresh weight that is heavier, respectively 0.643 g, 1.199 g, 17.221 g, and 193,770 g compared to total fresh weight in other treatments. The smallest total fresh weight of observation age 4, 8, and 24 DAP was found in the treatment, without fertilizer (P0), respectively 0.280 g, 0.598 g, and 7,288 g. In contrast, at the observation age 28 DAP, soil treatment, 136 kg K ha^{-1}(P2), produces the smallest total fresh weight of 75.011 g.

Total fresh weight at the observation age of 12 DAP, soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) resulted in a total fresh weight that was heavier by 1,867 g compared to the total fresh weight in other treatments but not significantly different from soil treatment, $20x10^3$ kg cow manure fertilizer ha^{-1}, 138 kg N ha^{-1}(P5). The smallest total fresh weight is found in the treatment without fertilizer (P0) of 0.783 g.

Total fresh weight at the observation age of 16 and 20 DAP produces the heaviest total fresh weight in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) of 3,866 g and 9,396 g respectively compared to the total fresh weight in soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, 20x103 kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5) and soil treatment, 20x103 kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). The smallest total fresh weight in the 16 DAP observations was found in the fertilizer-free treatment (P0) of 1,669 g, while in the 20 DAP observations, there were soil treatment treatments, 136 kg K ha^{-1}(P2) of 4.609 g.

Total fresh weight at the observation age of 32 DAP, soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) produces a total fresh weight that is heavier of 210,830 g compared to the total fresh weight in soil treatment, without fertilizer (P0), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment$20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1}(P5) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). The smallest total fresh weight was found in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), 102,482 g.

Total Dry Weight

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on the total dry weight at the observation age 4,8,12,16,20,24 and 32 DAP ($p < 0.05$). The mean total dry weight is presented in Table 10.

Table 10 shows that at the age of observation 4 and 8 DAP, in soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) produces a total dry weight of 0.149 g and 0.206 g, respectively compared to the total dry weight in the treatment without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). The smallest total dry weight was found in the treatment without fertilizer (P0) of 0.053 g and 0.087 g, respectively.

Total dry weight at observation age 12 and 16 DAP, soil treatment, $20x10^3$ kg of cow manure fertilizer ha^{-1}(P4) resulted in total dry weight of 0.485 g and 0.603 g respectively compared to total dry weight in other treatments, but not different. Accurate with total dry weight in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5). The smallest total dry weight was found in the treatment without fertilizer (P0) of 0.117 g and 0.220 g, respectively.

The total dry weight at the observation age of 20 DAP, soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) produced a total dry weight of 1,588 g compared to the total dry weight in other treatments. Still, it was not significantly different from the total dry weight in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). The most negligible total dry weight is found in the treatment without fertilizer (P0) of 0.473 g.

Total dry weight at observation age of 24.28 and 32 DAP, in soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) resulted in a total dry weight of 3.011 g, 4.829 g, and 7.823 g, respectively compared to the total dry weight. In other treatments, The smallest total dry weight was found in the treatment without fertilizer (P0) of 1.096 g, 1.562 g, and 2.653 g, respectively.

Harvest Fresh Weight

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on the fresh weight of the harvest ($p < 0.05$). The average harvest fresh weight is presented in Table 11.

Based on the presentation of Table 11, the fresh weight of the leaves, roots, and total harvest in soil treatment, 20x103 kg of cow manure ha^{-1}(P4), is more than 64.19 g of leaf weight compared to soil treatment without fertilizer (P0), soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). Furthermore, the smallest fresh weight on leaves is soil treatment, without fertilizer (P0) of 18.18 g.

Furthermore, the fresh harvest weight of the stalk of soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4), produces more fresh weight of stalks of 130.54 g compared to fresh weight of stalks in soil treatment, without fertilizer (P0), soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), soil treatment, 20x103 kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). Furthermore, the smallest fresh weight on the stalk is in the soil treatment, without fertilizer (P0) of 58.27 g.

Fresh weight of harvest roots in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) more leaf weight of 79.75 g compared to soil treatment, without fertilizer (P0), soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5) and Soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). Furthermore, the smallest fresh root weight was soil treatment, without fertilizer (P0) of 35.13 g.

Total fresh weight of harvest on soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) more leaf weight of 79.75 g compared to soil treatment, without fertilizer (P0), soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg cow manure fertilizer ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, $20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1}(P5) and treatment soil, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). Furthermore, the smallest total fresh weight is soil treatment, without fertilizer (P0) of 111.57 g.

Harvest Dry Weight

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on dry weight ($p < 0.05$). The average dry weight of the harvest is presented in Table 12.

Based on the presentation of Table 12, the dry weight of harvested leaves on soil treatment, $20x10^3$ kg of cow manure fertilizer ha^{-1}(P4), is 11.36 g more leaf weight compared to soil treatment, without fertilizer (P0), soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1} (P3), and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6). Furthermore, the smallest dry weight on leaves is soil treatment, without fertilizer (P0) of 5.40 g.

Furthermore, the harvest dry weight of the stalk in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4), produces 24.88 g more fresh weight of the stalk than the dry weight of the stalk in soil treatment, without fertilizer (P0), soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), giving N fertilizer at a dose of 12.3 g / pot + K at a dose of 12.1 g / pot (P3), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). Furthermore, the smallest dry weight on the stalk is the provision of N fertilizer at a dose of 12.3 g / pot + K at a dose of 12.1 g / pot (P3), amounting to 11.99 g.

Harvest dry weight of roots in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) more weight of dry roots of 9.55 g compared to soil treatment, without fertilizer (P0), soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 136 kg K ha^{-1} (P6) and soil treatment, $20x10^3$ kg cow manure fertilizer ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from giving N fertilizer at a dose of 12.3 g / pot + K at a dose of 12.1 g / pot (P3), Soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). Furthermore, the smallest root dry weight is soil treatment, without fertilizer (P0) of 3.09 g.

The total dry weight of harvest on soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) more leaf weight of 45.78 g compared to soil treatment, without fertilizer (P0), soil treatment, without fertilizer (P0), soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), giving N fertilizer at a dose of 12.3 g / pot + K at a dose of 12.1 g / pot (P3), soil treatment, $20x10^3$ kg of fertilizer cow manure ha^{-1}, 136 kg K ha^{-1}(P6) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7), but not significantly different from soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). Furthermore, the smallest total dry weight is soil treatment, without fertilizer (P0) of 20.98 g.

Chlorophyll content

The results of the analysis of variance showed that the addition of organic and inorganic fertilizers had a significant effect on chlorophyll content ($p<0.05$). The average chlorophyll content is presented in Table 13.

Based on the presentation of Table 13, that soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) yields 0,8041 $mg.g^{-1}$ higher (chlorophyll A) than soil treatment, without fertilizer (P0) soil treatment, 138 kg N ha^{-1}(P1), soil treatment, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), soil treatment, $20x10^3$ kg cow manure ha-1, 138 kg N ha^{-1}(P5), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7). Furthermore, the lowest amount of chlorophyll content was found in soil treatment, without fertilizer (P0) of 0, 697 $mg.g^{-1}$

Chlorophyll b content, soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) produced higher chlorophyll b of 1.121 $mg.g^{-1}$ than soil treatment, without fertilizer (P0) soil treatment, 138 kg N ha^{-1}(P1), treatment soil, 136 kg K ha^{-1} (P2), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1}(P5), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1}(P7). Furthermore, the lowest amount of chlorophyll content was found in soil treatment, without fertilizer (P0) of 0,826 $mg.g^{-1}$.

The total chlorophyll content in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4), produced a higher total chlorophyll of 1.523 $mg.g^{-1}$ compared to soil treatment, without fertilizer (P0) soil treatment, 138 kg N ha^{-1}(P1), treatment soil, 136 kg K ha^{-1}(P2), soil treatment, N and K, 138 and 136 kg ha^{-1}(P3), soil treatment, $20x10^3$ kg cow manure ha^{-1}, 138 kg N ha^{-1}(P5), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6), soil treatment, $20x10^3$ kg of cow manure ha^{-1}, N and K, 138 and 136 kg ha^{-1} (P7). Furthermore, the lowest amount of chlorophyll content was found in soil treatment, without fertilizer (P0) of 1.523 $mg.g^{-1}$

Clover plants need nutrients in order to grow. Good growth can produce higher biomass. So that the yields also increase. The application of various doses of organic and inorganic fertilizers gave different results and effects on stalk length, root length, stolon length, and number of tillers. fresh weight of leaves, roots, stalks and total dry weight of leaves, roots, stalks and total. Based on the observation that the efforts to provide various doses of organic and inorganic fertilizers can support the growth of clover plants. This can be seen from the results of its growth which also affect the biomass of the clover plant.

The results of the analysis show that the age of observation 4-12 DAP soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1}(P6) are able to produce longer stalks than other treatments. The combination of organic fertilizers from cow manure and inorganic K fertilizers can meet the needs of the clover plant so that the stem length is longer than the treatment without fertilization (control), single inorganic fertilization and organic fertilization from cow manure. Based on the results of research from [44], increasing the K content applied from 0 to 120 kg ha^{-1} increased the average plant height by about 7% compared to the control treatment. Similar results reported that the application of K at 125 kg ha^{-1} had shown significantly the highest plant height in shallots. In the research of [45], the maximum root length yield was 26.5 cm in green beans obtained from treatment given a higher dose of K fertilizer. The application of K fertilizer is able to increase root length and produce higher potassium levels.

The stolon is an extension of the clover plant's shoot that grows horizontally parallel to the soil surface. The stolons in this study appeared and grew at 12 DAP. The longest stolon length in clover was produced by soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) compared to other treatments. This proves that the application of organic cow manure fertilizer is more supportive of the growth of the semanggi plant so that its growth is more optimal. The provision of organic material in the form of cow manure can be an effort to improve soil quality.

But at 32 DAP, the longest stolon was produced in the soil treatment, 136 kg K ha^{-1}(P2), soil treatment, 136 kg K ha^{-1}(P2) and soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1}(P5). Based on the observations at 32 DAP, it can be seen that the organic fertilizer from cow manure and inorganic N fertilizers given can support the growth of the clover plant, especially in its stolon. Cow manure organic fertilizer and inorganic N fertilizer when combined can also affect the growth of longer stolons. The results of this study can be seen that organic fertilizers from cow manure and inorganic fertilizers containing N nutrients can be absorbed optimally by the semanggi plants. This is because N nutrients are fast release fertilizers.

This research was conducted in a green house, so there is no effect of rainfall on plant growth. Clover plants are given water regularly according to the watering schedule, so that they can control the N fertilizer given and can dissolve in water according to the dosage. The loss of fertilizer due to leaching was very small. in this study. In accordance with the statement of [46] that nitrate dissolves easily in the soil, especially in areas with high rainfall. However, because the research on soil treated with N-NH4 + and N-No3- was made in the dry season and irrigation was carried out by providing water as needed. So that it does not cause excess water and does not cause fertilizer N leaching. The longer root length in this study resulted in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) compared to control treatment or other treatments. It can be judged that the organic fertilizer from cow manure is given a crumb texture, so that the particles that make up the fertilizer can easily decompose in the soil. In addition, this organic fertilizer from cow manure contains complete NPK nutrients even though the percentage of each nutrient element is small. According to [47] statement that cow manure has a high fiber content, namely cellulose. In the organic fertilizer, cow manure contains a high enough C / N ratio, namely> 40, the macro element content is 0.5% N; 0.25% P_2O_5; 0.5% K_2O and 0.5% moisture content.

The ability of organic fertilizer from cow manure that can be integrated with the planting medium in a polybag, makes it easier for the roots to grow well. So, the length is better than other treatments. According to [48]–[52] stated that organic cow fertilizer can improve the chemical, biological, and physical properties of the soil. These physical properties can improve soil structure, can improve soil chemical properties into a function of soil chemical properties and biological properties can make the soil looser because in cow's organic fertilizer there are microorganisms that can break down organic matter so that the soil is more loose. According to research by [53] root vigor in organic fertilizer application was lower than inorganic fertilizer application in 20 DAP. But the root strength of the two treatments was almost the same at 40 DAP. From 60 DAP of *Stevia rebaudiana* Bertoni, the root vigor of organic fertilizer was 0.481 mg / g, and the root vigor of inorganic fertilizer was 0.425 mg / g, so that the root vigor of organic fertilizer was very high. Along with the growth process, the root strength of the two treatments began to decrease, but there was a decrease in the root growth rate of organic fertilizers which was slower than the cultivation of chemical fertilizers, and until the yield of the root strength from cultivation of organic fertilizers was higher than that of inorganic fertilizers.

Leaves become plant organs used for photosynthesis. From the research results, soil treatment, $20x10^3$ kg of cow manure fertilizer ha^{-1}(P4) produced more and wider leaves than the control treatment, N fertilizer treatment, K fertilizer treatment or a combination of both. Soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) gives variations in the number and area of leaves. It is suspected that organic fertilizer from cow manure is sufficient to provide nutrients in the soil and can support the growth of the clover plant. Sufficient nutrients will make the clover plant able to carry out the photosynthesis process properly. So that the number of leaves is more and the leaf area is wider. The results of this study are the same as those of [54] that the increase in leaf area also indicates that it may be due to nitrogen supply from manure, *Sesamum indicum* L [55], in wheat [56].

Nitrogen gives leaves their green color and is beneficial in enhancing all plant development at all stages. Sufficient nitrogen supply is also beneficial in the photosynthesis process. Produced a significant effect on 21 DAP of 4 kg / plot of cow manure on the number of leaves of mustard plants. In the process of leaf vegetative growth, plants need more nitrogen. In addition, it also affects the leaf area parameter which produces wider leaves in the treatment of 4 kg of cow manure / plot compared to the treatment of urea fertilizer [57]. This is because the mustard plant absorbs more nutrients in cow manure compared to the addition of volatile urea. So that what goes into the soil and is absorbed by plants is small in number. Research from [58] also supports that the application of a single inorganic fertilizer such as N or P alone has no effect on the increase in total leaf area recorded at high N or P conditions compared to low N or P conditions, which shows that the relatively high nutrient supply had little effect on leaf expansion of 'Hongyang' kiwifruit. This is because other environmental factors such as water or light may be the main limiting factors directly affecting further leaf expansion when there is an adequate supply of nutrients. There is little effect on the total leaf count when a single inorganic fertilizer containing just one nutrient is applied together with an organic fertilizer.

Stomata in soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) produced more stomata, wider and longer in shape than in the control treatment without N, K, Cow Manure (P0). The treatment that resulted in wider leaves also resulted in a greater number of stomata, wider and longer. According to the statement of [59] that the size of the stomata is getting smaller if the density of the stomata is getting denser because the number of stomata is also influenced by the size of the stomata, namely the length and width. This is related to the photosynthesis process. the photosynthesis process. In the research of 49, it was found that the stomata density of oil palm plants had not been the most dense, namely in the treatment given inorganic fertilizers. Even so, the leaf chlorophyll content tended to decrease at the 8th month compared to the 4th month after planting. The application of organic fertilizers and compound NPK up to the highest dose has not been able to increase the chlorophyll content of immature palm oil by the end of the year. This is predicted because the fertilization dose is still insufficient or plants need a longer time to respond to fertilization.

Fresh weight in plants is the weight that shows the result of metabolic activity in clover plants. Metabolic activity is the process by which chemical reactions occur so that plants can survive. In this study, the leaves, roots, and total fresh weight were observed. The fresh weight of the roots showed that the results varied for each observation age, but the soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) was able to produce the heaviest root fresh weight compared to other varieties. Except at the age of 12, 16, and 20 DAP observations, the treatment of cow manure at a dose of 800 g / pot + K. fertilizer at a dose of 12.1 g / pot (P6) also produced heavier root fresh weight. The assistance of adding potassium fertilizer to the provision of organic cow manure in treatment P6 can help plants form carbohydrates from photosynthesis. In the journal [59] explains that K fertilization is an important fertilizer in increasing plant growth and yield. There are various sources of potassium fertilizer and based on the potassium content and type of chemical formula, this fertilizer can be used in different soil conditions. Generally, K is usually taken up earlier than nitrogen and phosphorus and its absorption increases faster than dry matter production. This means that K accumulates early in the growing period and is then transferred to other parts of the plant. In terms of the growth parameters of leaf fresh weight and total, it can be seen that organic fertilizer from cow manure is more capable of producing a treatment weight of soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) which is heavier than other treatments. This is because the nutrients contained in the organic fertilizer of cow manure can be used optimally in the photosynthesis process. So that it can affect the fresh weight of each age of observation.

Dry weight is the accumulation of CO2 assimilation during plant growth and development. Based on the results of the study, the dry weight of the roots, leaves and total was the heaviest, namely the soil treatment, $20x10^3$ kg of cow manure

ha^{-1} (P4). This can be due to the fact that fertilizer is based on the statement of [60] that organic fertilizer from cow manure is one of the best organic fertilizers available and is a very valuable resource. This type of fertilizer can increase soil fertility and increase the development of the root system and plant vigor and make it less susceptible to disease and pest attacks. In addition, cow manure organic fertilizer is an excellent growing medium for garden plants. The organic fertilizer is mixed into the soil or used as a growing medium for plants and vegetables as a nutrient-rich fertilizer. Cow manure organic fertilizer is usually used before planting, that is, at the beginning because the mineralization process is slow.

Biomass of Growth and Yield Components of Clover Plants at Various Doses of Organic and Inorganic Fertilizers

High fresh yields of yield in soil-treated plants, soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4) compared to the control treatment. However soil, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5) and soil, $20x10^3$ kg of cow manure ha^{-1}, 136 kg K ha^{-1} (P6) produces leaf and root fresh weights that do not differ from fresh weights resulting from soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4). Meanwhile, stalk fresh weight and total in soil treatment was $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5) produced fresh weight that did not differ from soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4). Based on the results of this study, it can be said that the application of organic fertilizer from cow manure is able to provide sufficient nutrients for the clover plant so that it can survive to produce higher biomass, it is in accordance with the opinion[61]. In the journal [60] that the presence of sufficient K-available in the soil ensures plant survival. When sufficient potassium is available in plants, plants are more resistant to pathogens and stimulate root growth [62]–[64]. Better root growth [65] will result in more nutrient absorption so that it can be used in metabolic processes, especially protein synthesis from amino acids and ammonium ions. The results of this synthesis can affect plant growth and production [66]. The special effects of potassium in nutrient absorption [67], respiratory regulation, transpiration, enzymes and affect photosynthetic translocation [68], [69] which regulates the transportation system, as a result photosynthetic can be well distributed so that it does not occur at the site of photosynthetic accumulation. Research from [44] also resulted that applying K at 120 kg ha^{-1} increased tuber yields by about 47% compared to control treatment (12.96 tonnes ha^{-1}). Likewise, the results of research by [70] showed that the yield of sweet corn crops, [71] rice, [72] *Portulaca oleracea* L, increased due to a combination of organic fertilizer with NPK fertilizer compared to control treatment. The recommended dosage from the research is three-quarter NPK and half of organic fertilizer.

The yield of dry weight in plants was also higher in soil treatment, $20x10^3$ kg of cow manure ha^{-1}(P4) compared to the control treatment. This can be caused by plants that are more optimal in absorbing organic fertilizers from cow manure. Compared with the application of a single inorganic N fertilizer which is volatile than that which is absorbed by the plant. Whereas in soil treatment, $20x10^3$ kg of cow manures ha^{-1}, 138 kg N ha^{-1}(P5) yield of dry weight is also not different from soil treatment, $20x10^3$ kg of cow manure ha^{-1} (P4). It is suspected that the addition of N fertilizer to the application of organic cow manure in soil treatment, $20x10^3$ kg of cow manure ha^{-1}, 138 kg N ha^{-1} (P5) can help the soil to avoid nitrogen deficiency. With the addition of N from a single inorganic fertilizer, it can affect the absorption of nitrogen more effectively. So that it can meet the vegetative needs of the clover plant and can increase the plant biomass. This is similar to the results of research from [44] that the K application produces a very significant effect. The increased K content encouraged tubers with a much higher dry matter content compared to unfertilized plots. The maximum dry matter content of shallot tubers (10.42%) was recorded with K application at a higher level of 120 kg ha^{-1}. On the other hand, a minimum dry matter content (9.20%) was detected in the control for K.

In general, agricultural crop production depends on many factors that can increase soil fertility, one of which is through the application of organic and inorganic fertilizers. The need to use renewable energy and in order to reduce the cost of fertilizing crops, therefore the use of organic fertilizers is starting to be developed all over the world [73], vegetative growth of tomato (*Lycopersicum esculentum* Mill.) [74], yield and biomass *Vetiveria zizanioides* L. [75]

IV CONCLUSION

The results prove that the soil combination, $20x10^3$ kg of cow manure ha^{-1} (P4) was effective in increasing the growth and yield of semanggi plant biomass, which was significantly different compared to other treatments at the age of 32 DAP. This is shown in the growth and yield parameters of plant biomass such as stolon length (74.78 cm), number of leaves (160.44), leaf area (1379.28 cm^2), root length (23.85 cm), stomata density and number of stomata (13,25); Stomata width (10.87 cm); Stomata length (19.76 cm), leaf fresh weight (12,907 g), leaf dry weight (1,802 g), total fresh weight 210,830 g, total dry weight 7,823 g, fresh leaf harvest weight (64.19 g); stem (130.54 g); root (79.75 g); total 274.48 g), dry weight of leaf harvest (11.36 g); stem (24.88 g); root (9.55 g); total 45.78 g) and chlorophyll a content (0.804 $mg.g^{-1}$); chlorophyll b (1.121 $mg.g^{-1}$); and total chlorophyll (1,924 $mg.g^{-1}$). Therefore, it is recommended to apply cow manure (organic fertilizer) which is good for *Marsilea crenata* Presl. and open up opportunities for further broader research.

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Table 1.Fertilizer treatment on Semanggi (*Marsilea crenata*) planted on aluvial soil

Treatment (unit)	**Soil**	**Cow Manure (CM)**	**Nitrogen (N)**	**Potassium (K)**
	(kg ha^{-1})			
P0	Soil	omitted	omitted	omitted
P1	Soil	omitted	138	Omitted
P2	Soil	omitted	omitted	136
P3	Soil	omitted	138	136
P4	Soil	20.10^3	omitted	Omitted
P5	Soil	20.10^3	138	Omitted
P6	Soil	20.10^3	omitted	136
P7	Soil	20.10^3	138	136

P0 = Soil; P1 = Soil, 138N:0K:0 CM kg ha^{-1}; P2= Soil, 0N:136K:0 CM kg ha^{-1}; P3 = Soil, 138N:136K:0CM kg ha^{-1}; P4 = Soil, 0N:0K:20.10^3CM kg ha^{-1}; P5 = Soil, 138N:0K: 20.10^3CM kg ha^{-1}; P6 = Soil, 0N:136K:20.10^3CM kg ha^{-1}; P7 = Soil 138N:136K:20.10^3CM kg ha^{-1}.

Table 2. Average stolon length for each observation age

Treatment (unit)	Stolon Length at The Age of Observation The Day After Planting (DAP)					
	12	16	20	24	28	32
	(cm)					
P0	3.97 a	7.62 a	14.38 a	19.25 a	24.39 a	34.13 a
P1	4.72 a	9.06 a	15.39 ab	22.29 a	28.33 a	42.56 a
P2	3.96 a	10.91 ab	20.29 abcd	25.96 ab	37.89 a	63.39 c
P3	4.61 a	11.87 abc	27.30 cd	27.33 ab	30.19 a	41.18 a
P4	8.80 c	16.67 c	29.37 d	41.08 c	56.16 b	74.78 c
P5	5.84 ab	16.14 bc	25.34 bcd	26.68 ab	29.52 a	63.58 c
P6	7.74 bc	11.05 ab	27.19 cd	34.69 bc	31.09 a	62.54 bc
P7	5.82 ab	9.95 a	17.92 abc	24.02 ab	29.99 a	48.44 ab
LSD (5%)	2.80	5.29	10.60	12.14	16.01	14.91
C.V. (%)	28.12	25.90	27.33	25.05	27.33	15.82

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 3. Average number of leaves for each observation age

Treatment (unit)	Number of Leaves at The Age of Observation The Day After Planting (DAP)							
	4	8	12	16	20	24	28	32
	Strands							
P0	1.22 a	2.78 a	5.22 a	14.56 a	27.44 ab	70.56 cd	54.00 ab	83.00 a
P1	1.33 a	5.22 bc	5.78 ab	16.00 a	49.67 bc	69.89 cd	64.78 ab	90.56 a
P2	2.22 abc	3.67 ab	6.89 abc	14.22a	26.44 a	47.11 ab	47.44 a	92.67 a
P3	2.11 ab	3.11 a	6.22 abc	22.67 ab	38.56 ab	62.44 abc	68.22 ab	95.44 a
P4	3.44 c	5.78 c	11.78 d	29.22 b	64.89 c	86.56 d	142.44 c	160.44 c
P5	2.67 bc	4.22 abc	9.67 cd	22.00 ab	39.33 ab	68.56 bcd	104.56 bc	114.89 ab
P6	2.33 abc	4.00 ab	8.89 abcd	18.89 a	38.78 ab	44.67 a	88.44 abc	147.22 bc
P7	1.67 ab	3.22 a	9.11 bcd	13.89 a	26.78 ab	40.33 a	81.67 ab	86.11 a
LSD (5%)	1.27	1.71	3.68	9.28	23.17	22.56	55.66	37.93
C.V. (%)	34.04	24.39	26.42	27.99	33.94	21.04	39.02	19.91

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 4. Average leaf area for each observation age

Treatment (unit)	Leaf Area at The Age of Observation The Day After Planting (DAP)							
	4	8	12	16	20	24	28	32
	(cm^2)							
P0	8.48 ab	13.99 a	29.81 ab	57.25 a	117.78 a	264.09 a	268.7 a	472.31 a
P1	11.39 bc	20.35 a	41.86 abc	88.82 abc	134.29 a	366.36 a	626.79 a	977.17 ab
P2	11.17 bc	14.00 a	26.87 a	60.03 a	162.57 a	233.57 a	357.08 a	858.44 ab
P3	13.41 c	14.62 a	24.21 a	74.48 ab	201.4 ab	303.68 a	316.38 a	467.17 a
P4	13.19 c	33.57 b	53.64 c	132.95 d	314.95 b	564.04 b	1210.61 b	1379.28 b
P5	11.42 bc	19.48 a	47.09 bc	107.74 cd	213.52 ab	365.25 a	534.8 a	1099.36 b
P6	8.27 ab	18.10 a	35.17 ab	105.95 bcd	225.44 ab	262.339 a	382.59 a	956.58 ab
P7	7.91 a	19.89 a	30.83 ab	86.68 abc	127.95 a	242.83 a	311.71 a	503.91 a
LSD (5%)	3.16	7.87	17.97	31.68	113.74	171.50	387.75	541.74
C.V. (%)	16.95	23.34	28.35	20.27	34.69	30.11	44.19	36.86

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 5. Average root length of each observation age

Treatment (unit)	Root Length at the age of Observation The Day After Planting (DAP)							
	4	8	12	16	20	24	28	32
	(cm)							
P0	6.02 a	6.44 a	7.07 a	7.31 a	10.19 ab	12.57 a	14.50 a	21.38 cd
P1	6.64 a	6.92 a	7.18 a	7.57 a	10.49 ab	13.59 ab	12.96 a	13.89 a
P2	7.17 a	7.39 a	7.86 a	9.08 a	13.97 c	15.50 bc	15.56 a	20.58 bcd
P3	6.90 a	6.87 a	7.39 a	7.68 a	11.13 abc	14.29 ab	12.26 a	14.01 a
P4	8.65 b	9.67 b	10.03 b	11.78 b	17.19 d	22.32 d	20.68 b	23.85 d
P5	6.85 a	6.93 a	7.57 a	8.99 a	11.88 abc	14.06 ab	13.92 a	15.91 a
P6	7.39 ab	7.99 ab	8.50 ab	9.22 a	13.00 bc	17.72 c	16.03 a	16.77 ab
P7	6.73 a	7.00 a	7.90 a	8.56 a	10.03 a	13.43 ab	14.16 a	17.54 abc
LSD (5%)	1.39	1.70	1.54	2.31	2.91	2.90	4.18	4.11
C.V. (%)	11.24	13.09	11.09	15.04	13.58	10.74	15.89	13.05

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 6. Average stomata density

Treatment (unit)	Number of Stomata	Stomata Width	Stomata Length
		(cm)	
P0	8.08 a	6.31 a	12.39 a
P1	9.92 abc	7.51 ab	15.66 b
P2	10.42 abc	8.18 abc	16.90 bc
P3	11.83 cd	8.39 abc	18.26 bc
P4	13.25 d	10.87 c	19.76 c
P5	11.17 bcd	9.50 bc	16.85 bc
P6	10.25 abc	7.70 ab	15.84 b
P7	8.75 ab	6.51 a	16.60 b
LSD (5%)	2.61	2.69	3.03
C.V. (%)	14.25	18.93	10.47

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 7. Average leaf fresh weight for each observation age

Treatment (unit)	Leaf Fresh Weight at The Age of Observation The Day After Planting (DAP)							
	4	8	12	16	20	24	28	32
	(g)							
P0	0.047 a	0.123 a	0.167 a	0.676 ab	1.332 ab	1.882 a	2.237 a	6.036 a
P1	0.069 ab	0.140 a	0.178 ab	0.717 ab	1.234 a	1.916 a	2.737 a	7.794 ab
P2	0.106 cde	0.120 a	0.229 abc	0.660 a	1.469 ab	2.074 a	3.046 a	9.523 b
P3	0.118 de	0.144 a	0.218 abc	0.766 ab	1.818 ab	2.687 ab	3.490 a	6.891 ab
P4	0.133 e	0.276 b	0.514 d	1.464 c	2.788 c	4.974 c	8.287 c	12.907 c
P5	0.101 bcde	0.249 b	0.366 cd	1.050 b	2.193 bc	3.832 bc	5.642 b	9.834 b
P6	0.083 bc	0.129 a	0.340 bc	0.861 ab	1.956 abc	2.663 ab	4.129 ab	7.62 ab
P7	0.091 bcd	0.138 a	0.301 abc	0.512 a	1.420 ab	2.247 a	3.404 a	7.153 ab
LSD (5%)	0.03	0.06	0.11	0.38	0.90	1.25	1.90	3.00
C.V. (%)	10.46	19.29	32.37	25.95	28.93	25.55	26.97	20.22

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 8. Average leaf dry weight for each observation age

Treatment (unit)	Leaf Dry Weight at The Age of Observation The Day After Planting (DAP)							
	4	8	12	16	20	24	28	32
	(g)							
P0	0.015 a	0.022 a	0.030 a	0.082 a	0.185 a	0.380 a	0.437 a	0.671 a
P1	0.016 ab	0.230 a	0.043 a	0.097 ab	0.212 ab	0.432 ab	0.481 a	0.915 ab
P2	0.026 bc	0.027 a	0.057 ab	0.125 ab	0.219 ab	0.476 ab	0.396 a	1.318 bc
P3	0.028 cd	0.032 a	0.099 abc	0.103 ab	0.316 bc	0.576 bc	0.746 ab	1.101 ab
P4	0.047 e	0.198 b	0.183 c	0.216 c	0.496 d	0.866 d	1.442 c	1.802 c
P5	0.037 de	0.041 a	0.139 bc	0.218 c	0.449 d	0.673 c	1.018 b	1.269 bc
P6	0.029 cd	0.028 a	0.088 ab	0.150 b	0.390 cd	0.457 ab	0.594 a	1.119 ab
P7	0.020 abc	0.340 a	0.054 ab	0.110 ab	0.280 abc	0.468 ab	0.577 a	0.990 ab
LSD (5%)	0.01	0.2	0.09	0.07	0.13	0.17	0.36	0.58
C.V. (%)	9.943	15.557	58.897	27.390	23.139	17.831	29.074	28.907

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 9. Average total fresh weight for each observation age

Treatment (unit)	Total Fresh Weight at The Age of Observation The Day After Planting (DAP)							
	4	8	12	16	20	24	28	32
	(g)							
P0	0.280 a	0.598 a	0.783 a	1.669 a	4.907 ab	7.288 a	82.106 ab	131.223 abc
P1	0.290 a	0.621 a	0.944 ab	1.862 a	5.083 ab	7.668 a	137.350 bc	182.084 bcd
P2	0.432 b	0.657 ab	1.110 abc	2.367 ab	4.609 a	8.580 a	75.011 a	190.703 cd
P3	0.467 b	0.747 ab	1.208 bc	2.390 ab	6.572 ab	9.811 a	81.830 ab	116.142 ab
P4	0.643 c	1.199 c	1.867 d	3.866 c	9.396 c	17.221 c	193.770 c	210.830 d
P5	0.419 b	0.832 b	1.511 cd	3.116 bc	7.377 bc	13.189 b	106.970 ab	157.941 abcd
P6	0.449 b	0.713 ab	1.439 c	2.983 bc	7.043 abc	9.981 a	104.650 ab	186.274 cd
P7	0.450 b	0.690 ab	1.191 abc	2.053 a	5.705 ab	7.438 a	88.891 ab	102.482 a
LSD (5%)	0.07	0.21	0.41	0.90	2.54	3.20	57.86	69.54
C.V. (%)	32.043	25.901	18.709	20.176	22.922	18.008	30.364	24.863

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 10. Average total dry weight of each observation age

Treatment (unit)	Total Dry Weight at The Age of Observation The Day After Planting (DAP)							
	4	8	12	16	20	24	28	32
	(g)							
P0	0.053 a	0.087 a	0.117 a	0.220 a	0.473 a	1.096 a	1.562 a	2.653 a
P1	0.063 ab	0.098 ab	0.152 ab	0.251 a	0.520 a	1.273 ab	1.721 a	3.433 ab
P2	0.112 cd	0.117 abc	0.196 ab	0.328 ab	0.722 ab	1.415 ab	1.665 a	5.597 c
P3	0.134 de	0.165 cd	0.274 bc	0.334 ab	1.172 cd	1.898 cd	2.169 ab	3.697 ab
P4	0.149 e	0.206 d	0.485 d	0.603 d	1.588 e	3.011 e	4.829 c	7.823 d
P5	0.129 de	0.166 cd	0.383 cd	0.509 cd	1.279 cde	2.132 d	3.058 b	4.789 bc
P6	0.098 bcd	0.123 abc	0.215 ab	0.458 bc	1.375 de	1.682 bc	2.402 ab	5.277 bc
P7	0.089 abc	0.144 bc	0.184 ab	0.312 a	0.931 bc	1.502 abc	2.137 ab	3.900 abc
LSD (5%)	0.04	0.15	0.15	0.13	0.41	0.41	1.33	1.86
C.V. (%)	20.361	20.695	34.074	20.209	23.050	13.315	30.982	22.892

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 11. Average harvest fresh weight at 32 DAP

Treatment (unit)	Harvest Fresh Weight at 32 DAP			
	Leaf	Stalk	Root	Total
	(g)			
P0	18.18 a	58.27 a	35.13 a	111.57 a
P1	20.88 ab	69.92 ab	41.22 ab	132.02 ab
P2	32.86 b	61.31 a	47.52 ab	141.70 ab
P3	32.64 b	63.31 a	51.43 ab	147.38 ab
P4	64.19 d	130.54 c	79.75 c	274.48 d
P5	58.33 cd	113.58 bc	64.02 bc	235.92 cd
P6	51.99 cd	71.23 ab	62.47 bc	185.69 bc
P7	46.67 c	85.54 ab	49.43 ab	181.65 bc
LSD (5%)	12.62	44.44	23.01	55.99
C.V. (%)	17.70	31.06	24.39	18.13

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 12. Average harvest dry weight at 32 DAP

Treatment (unit)	Harvest Dry Weight at 32 DAP			
	Leaf	Stalk	Root	Total
	(g)			
P0	5.40 a	12.49 ab	3.09 a	20.98 a
P1	6.21 a	15.34 abc	4.10 a	25.64 ab
P2	6.46 a	12.91 ab	5.24 ab	24.61 ab
P3	7.93 ab	11.99 a	6.53 abc	26.47 ab
P4	11.36 c	24.88 d	9.55 c	45.78 d
P5	10.43 bc	20.44 cd	8.74 bc	39.61 cd
P6	7.44 ab	16.97 abc	4.95 ab	29.37 ab
P7	8.08 ab	17.80 bc	5.23 ab	31.10 bc
LSD (5%)	3.09	5.41	3.81	8.97
C.V. (%)	22.31	18.59	36.72	16.82

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation, Day After Planting (DAP)

Table 13. Average chlorophyll content

Treatment (unit)	chlorophyll a	chlorophyll b	Total chlorophyll
	($mg.g^{-1}$)		
P0	0. 697 a	0.826 a	1.523 a
P1	0. 701 a	0.879 b	1.581 b
P2	0. 733 b	0.901 b	1.633 c
P3	0. 762 de	0.952 c	1.719 de
P4	0. 804 f	1.121 f	1.924 g
P5	0. 771 e	1.051 e	1.821 f
P6	0. 752 cd	0.994 d	1.744 e
P7	0. 742 bc	0.939 c	1.680 cd
LSD (5%)	15.94	33.34	46.73
C.V. (%)	1.22	1.98	1.56

Note: Numbers accompanied by the same letter in the same row and column show no significant difference based on the LSD test at the 5% level, CV = Coefficient of Variation