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Growth and Production Response of Soybeans Applying Compost and Biofertilizers

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Abstract: In an effort to increase soybeans, the continuous use of chemical fertilizers in the long term without being balanced with the use of organic matter will face serious obstacles and have an impact on soil damage. Alternative solution to deal with this is the use of organic fertilizers and biofertilizers to help improve soil fertility and provide nutrients that are not available to plant. Research was carried out at Experimental Farm of Hasanuddin University Makassar, from April to September 2021. The design used in this study was Split plot design, compost fertilizer dose as the main plot consisting of 4 dose levels: without compost, compost 1 ton ha^{-1}, 2 tons ha^{-1}, and 3 tons ha^{-1}. As a sub-plot, the concentration of biological fertilizer consists of 4 levels, 0.5 l ha^{-1}, 1 l ha^{-1}, 1.5 l ha^{-1} and 2 l ha^{-1}. Results showed that the interaction of compost fertilizer 1 ton ha^{-1} and concentration of biological fertilizer 1 l ha^{-1} gave the earliest flowering age. Similarly, the interaction dose of compost 2 tons ha^{-1} and concentration of biological fertilizer 2 l ha^{-1} gave highest production per hectare (3.4 tons ha^{-1}), and the parameter of bacterial density ($36.3x10^{8}$) was also the highest.

Keywords: Soybean, Compost, Biofertilizer

1. Introduction

Soybean is one of the national mainstay legume crops that supports food diversification programs and supports national food security. Soybeans are widely used as raw materials for processed food and animal feed. In addition, soybean is also a protein-rich plant which has an important meaning as a source of vegetable protein to improve nutrition and overcome malnutrition such as starvation. Soybeans rank third in indonesia's important food crops after rice and maize. In addition, the increasing population consumption of processed soybean products also contributes to increasing the demand for soybean raw materials. Currently, Indonesia's soybean production only meets 35% of its needs [1].

The development of the benefits of soy in addition to being a source of protein, foods made from soy can also be a blood cholesterol lowerer that can prevent heart disease. The important aspect of soybeans as a food source can be seen from the nutritional content in the seeds. Based on the dry weight base per 100 grams, soybeans contain about 40% protein, 20% oil, 35% soluble carbohydrates and insoluble carbohydrates, and 5% ash, besides soy is also a better source of B vitamins compared to other grain group commodities and contains minerals rich in K, P, Ca, Mg, and Fe, as well as other beneficial nutritional components, such as is of lavones that function to prevent various diseases and soy can function as an antioxidant and can prevent cancer [2].

The magnitude of Indonesia's soybean production in meeting domestic needs from year to year is not the same. Soybean production in 2015, 2016, 2017 and 2018 was 963,000 tons, 860,000 tons, 539,000 tons and 983,000 tons with a harvest area of 614,000 ha, 577,000 ha, 356,000 ha and 680,000 ha respectively [3]. Consumer demand for soybeans from year to year has increased significantly. This is in line with its height. public consumption of products derived from soybeans [4]. In an effort to increase crop yields, the continuous use of chemical fertilizers in the long term without being balanced with the use of organic matter will face serious obstacles and have an impact on soil damage. An alternative solution to deal with this is the use of organic fertilizers and biofertilizers to help improve soil fertility and provide nutrients that are not available to plants [5].

The results of research by Pangaribuan et al. stated that the application of liquid organic fertilizer with a concentration of 5 ml L^{-1} provides sweet corn production of 12.39 tons ha^{-1}, from the treatment of liquid organic fertilizer this is not different from the treatment of a combination of liquid fertilizer and inorganic fertilizer [6].

The growth of soybean plants is greatly influenced by soil fertility, but fertile soil can not only be seen from its physical condition but also the content or effectiveness of the living bodies in it. Living bodies such as vegetation and macroflora are the most instrumental in influencing the process of genesis and development of soil profiles, because they are the main source of soil organic matter (BOT). BOT turns out to contribute a lot in maintaining soil fertility. In increasing the fertility of soybean crop productivity, fertilization is one of the important things because fertilization is the addition of nutrients needed by plants in accordance with the recommended dosage [7].

Organic fertilizer is a fertilizer made from organic matter, which is renewed and overhauled by soil bacteria into elements that can be used by plants without polluting the soil and water. The results of a study conducted by Sudarsono et al. that the addition of cow shed organic fertilizer of 7.5 tons ha^{-1} resulted in better growth and nutrient absorption of soybean crops and increased soybean yields, compared to 7.5 tons ha^{-1} goat manure more efficiently applied in organic soybean production [8].

Biofertilizers function to improve soil biology, reduce the use of inorganic fertilizers, and are environmentally friendly [9]. Biofertilizers have the potential to increase the fixation of free N, increase P solubility, improve K binding, streamline soil nutrient absorption, improve soil fertility and spur vegetative and generative growth in plants, improve soil physical, chemical, and biological properties and promote root growth, help maintain soil moisture, increase tillering growth, flower quality, fruit and tuber, strengthen resistance to plant pests and diseases and protect plants from infection with root pathogens [10].

The application of biological fertilizers is an effort to improve the condition of the plant environment in terms of providing nutrients, neutralizing soil pH and activating bodies or microorganisms in the soil, so that the soil becomes loose and fertile. Biofertilizers contain macro and micro nutrients so that they are able to provide and improve nutrients and minerals that are indispensable for plants [11].

The results of research by Setiawati et al that the combination of biological fertilizer treatment, Vermikompos and N, P, K increased soybean yield [5]. Effect of different biofertilizer concentrations on lettuce plant growth, a concentration of 80 cc L^{-1} of water is the best concentration for growth and increase in lettuce crop production (*Lactuca sativa* L.) [12]. The use of biological fertilizers accompanied by composting 2.5 tons ha^{-1} is better for the growth and yield of rice plants as well as dehydrogenase activity and has the highest nematode population compared to other treatments, biological fertilizer accompanied by composting 5 tons ha^{-1} has the highest population of earthworms compared to other treatments [13].

Excessive use of synthetic fertilizers can pollute the environment. To overcome these problems, you can use organic fertilizers that are safe for the environment and consumers. The variety of fertilizers on the market and the many formulas of organic fertilizers and biological fertilizers that have been studied and can be used to increase yields, it is necessary to research that has been circulating in the market, namely super biota. This study aims to determine the growth and production response of soybean plants applied organic fertilizers and biological fertilizers.

2. The Methods

Study was conducted during April–September, 2021 at the Experimental Farm of Hasanuddin University, Makassar. The study was carried out using a Splite plot design. Compost fertilizer (k) as the main plot consisting of 4 doses, namely without compost (k0), compost 1 ton ha^{-1} (k1), compost 2 tons ha^{-1} (k2), and compost 3 tons ha^{-1} (k3). The plot child is a concentration of biological fertilizer (h) consisting of 4 levels, namely 0.5 l ha^{-1} (h1), 1 l ha^{-1} (h2), 1.5 l ha^{-1} (h3) and 2 l ha^{-1} (h4) so that there are 16 combinations of treatments, each of which is repeated 3 times. Each treatment unit is made a plot with a size of 4x3 m, the seeds are planted with a tugal system about ±2 cm deep, with a row spacing of 40x15 cm, 3-4 seeds per hole. Compost application is applied 1 week before planting by spreading and mixing evenly on the experimental plot, then watered every afternoon to quickly decomposition. Biofertilizer applications are applied 10, 20, and 30 dap.

The variables observed in this study were as follows: plant height, number of leaves, productive branches, number of pods per plant, flowering age, harvest age, seed weight per per plant, weight of 100 seeds, production per hectare, density of bacteria, protein content. The data obtained were analyzed using a variety of fingerprints (Anova). To find out the difference between treatments, further tests were carried out using Duncan at a confidence level of 95%. To determine the effect of yield components including the number of pods, the weight of seeds per plant, and the weight of seeds per plot on the results were analyzed with Path Analysis.

3. Result

3.1. Plant Height

The DMRT test results in table 1 show that the compost dose treatment (k3) of 3 tons ha^{-1} produces the best average plant height of 49.5 cm and is significantly different from the dose of compost fertilizer of 1 ton ha^{-1}, 2 tons ha^{-1} and control (k2, k2, and k0).

Table 1. *Average plant height (cm) at different doses of compost.*

	Compost Fertilizer Level (k)			
	k0	k1	k2	k3
Average	43,4$_a$	45,1$_a$	46,3$_a$	49,5$_b$
CV (k) DMRT 0,05	(2) 3,12 (3) 3,23 (4) 3,29			

Description: The numbers followed by the same letter mean that they do not differ markedly in the DMRTα=0.05 test. CV: Comparator Value.

3.2. Number of Leaves

Table 2 shows that the combination of compost doses of 3 tons ha^{-1} (k3) and biofertilizer concentrations of 2 l ha^{-1} (h4) produces the average number of leaves, which is 62.0 strands and is significantly different from the combination of compost doses of 1 ton ha^{-1} (k1) and a biofertilizer concentration of 2 l ha^{-1} (h4) which is 38.0 strands.

Table 2. *The average number of leaves (strands) at different doses of compost fertilizer.*

Compost Fertilizer Level (k)	Biofertilizer Concentration (h)			
	h1	h2	h3	h4
k0	39,7$_{a(A)}$	40,0$_{a(A)}$	41,7$_{a(A)}$	49,3$_{a(A)}$
k1	40,7$_{a(A)}$	44,7$_{a(A)}$	50,3$_{a(A)}$	38,0$_{a(A)}$
k2	59,0$_{b(AB)}$	46,3$_{a(AB)}$	45,7$_{a(AB)}$	47,3$_{a(AB)}$
k3	50,7$_{a(B)}$	51,7$_{a(B)}$	44,3$_{a(B)}$	62,0$_{c(B)}$
CV(k) DMRT 0.05 =	(2) 6,21 (3) 6,43 (4) 3,65	CV(kxh) DMRT 0.05 =		(2) 19,23 (3) 20,24 (4) 20,86 (5) 21,29

Description: the numbers followed by the same letter in the main tile column (a, b), (A, B) mean no real difference in the DMRTα test=0.05. CV: Comparator Value.

3.3. Number of Productive Branches

The number of productive branches showed that the treatment of compost doses and biofertilizer concentrations both had no real effect as well as the interaction between compost doses and biofertilizer concentrations. The dose treatment of compost fertilizer of 1 ton ha^{-1} and the concentration of biological fertilizer of 1.5 l ha^{-1} (k1h3) provided the average of the highest number of productive branches, namely 3.7 branches and the lowest in the treatment of compost dose of 2 tons ha^{-1} and the concentration of biological fertilizer 1 l ha^{-1} (k1h2) which was 2.7 branches. This can happen because the adequacy of nutrients in the formation of productive branches has not been met because in this process a greater nutrient intake is needed than other parts of the plant in the vehetative phase and one of the factors that affect the initial growth of plants is the adequacy of nutrients. According to Gardner et al. states that throughout the period of vegetative growth, roots, leaves and stems are parts of the plant that are competitive in the utilization of assimilation results. So it is likely that the proportion of energy needed for the growth process of plant branches is greater than the energy needed for the growth process of other plant parts [14].

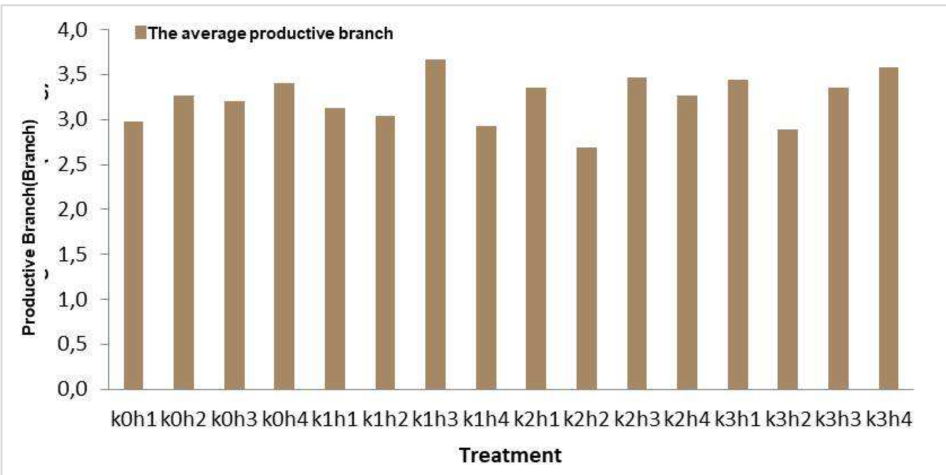

Figure 1. *Bar chart of the average number of productive branches (branches) at various doses of compost and biofertilizer concentrations.*

3.4. Number of Pods Per Plant

The number of pods per plant showed that the treatment of compost doses and biofertilizer concentrations both had no real effect as did the interaction between compost doses and biofertilizer concentrations. The dose treatment of compost fertilizer of 1 ton ha^{-1} and the concentration of biological fertilizer of 1.5 l ha^{-1} (k1h3) gave the average number of pods per plant the most, namely 48.1 pods and the lowest in the treatment of compost dose of 1 ton ha^{-1} and the concentration of biofertilizer 2 l ha^{-1} (k1h4) which was 37.6 pods. Parameters that do not have a noticeable influence on the application of compost and biofertilizers indicate that the relatively slow response of organic fertilizers to pod formation. This is in line with Klinton which states that organic fertilizers require time for the decomposition process so that the nutrients needed by plants will be gradually available as well. The time of absorption of nutrients by the roots of plants lasts a relatively long time after the fertilizer is applied [15].

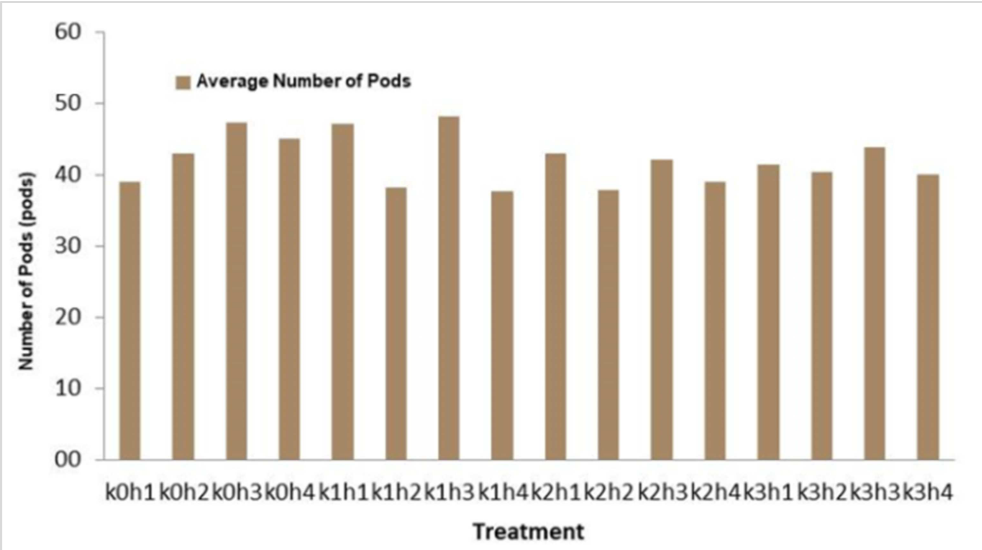

Figure 2. *Bar chart of the average number of pods per plant (pod) at different doses of compost fertilizer and biofertilizer concentrations.*

3.5. Flowering Age

Table 3 shows that the combination of compost dose treatment of 1 ton ha^{-1} (k1), 3 tons ha^{-1} (k3) and biofertilizer concentrations of 2 l ha^{-1} (h4), 1.5 l ha^{-1} (h3), and 1 l ha^{-1} (h2) resulted in the fastest average flowering age of 28.0 dap and differed markedly from the combination of compost doses of 0 ton ha^{-1} (k0), 3 tons ha^{-1} (k3) and biofertilizer concentrations of 0.5 l ha^{-1} (h1), 1.5 l ha^{-1} (h3), 2 l ha^{-1} (h4) which is 29.7 dap.

Table 3. *Average flowering age (dap) at various doses of compost and biofertilizer concentrations.*

Compost Fertilizer Level (k)	**Biofertilizer Concentration (h)**			
	h1	**h2**	**h3**	**h4**
k0	$29,3_{a(A)}$	$29,3_{a(A)}$	$29,7_{b(A)}$	$29,7_{b(A)}$
k1	$28,3_{a(A)}$	$29,0_{a(A)}$	$29,0_{a(A)}$	$28,0_{a(A)}$
k2	$29,3_{a(A)}$	$28,7_{a(A)}$	$28,7_{a(A)}$	$29,0_{a(A)}$
k3	$29,7_{b(B)}$	$28,0_{a(B)}$	$28,0_{a(B)}$	$28,7_{a(B)}$
CV (k) DMRT 0.05 =	(2) 0,78 (3) 0,81 (4) 0,82	NP(kxh) DMRT 0.05 =		(2) 1,57 (3) 1,65 (4) 1,70 (5) 1,74

Description: The numbers followed by the same letter in the main plot column (a, b), (A, B) mean no real difference in the DMRTα test=0.05. CV: Comparator Value.

3.6. Ripening Age

The harvest age showed that the treatment of compost doses and biofertilizer concentrations both had no real effect as well as the interaction between compost doses and biofertilizer concentrations. The dose of compost is 0 tons/ha and the concentration of biofertilizer is 1.5 l ha^{-1} (k0h3), the dose of compost ppuk is 2 tons ha^{-1} and the concentration of biofertilizer is 0.5 l ha^{-1} (k2h3) provides the longest average harvest life of 73.7 dap and the fastest in the treatment of compost dose of 0 tons/ha and the concentration of biofertilizer 1 l ha^{-1} (k0h2), the dose of compost is 1 ton/ha and the concentration of biofertilizer is 1 l ha^{-1} (k2h2), and the dose of compost is 1 ton ha^{-1} and the concentration of biological fertilizer is 1.5 l ha^{-1} which is 73.0 dap. Harvest age is one of the characters that shows the interaction between plants and the surrounding environment. The harvest age in this study was 2 days longer than the harvest age of the Dega 1 variety in general.

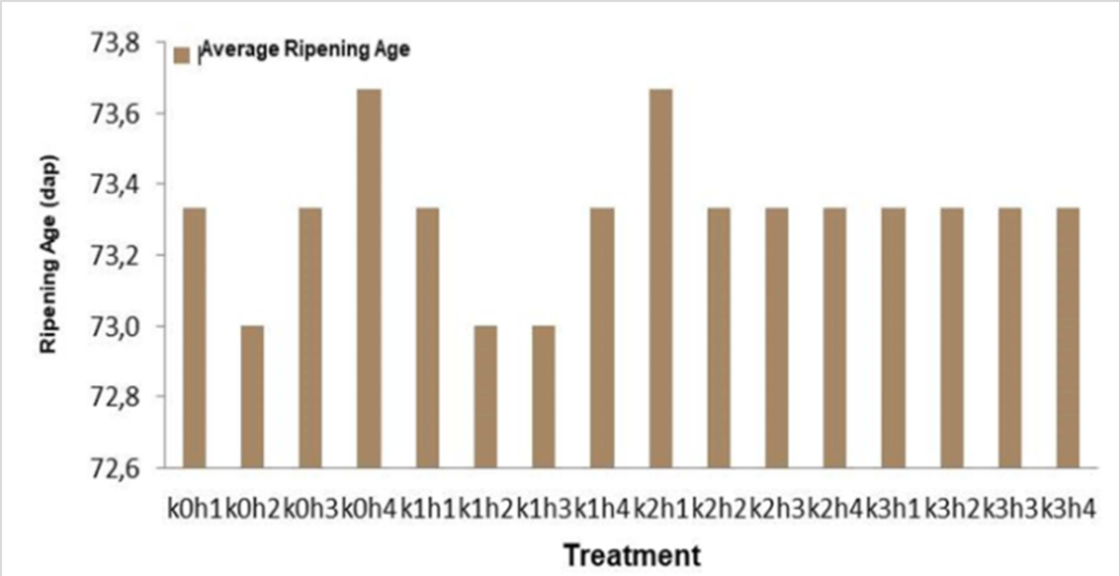

Figure 3. *Bar chart of average harvest age (dap) on various doses of compost fertilizer and biofertilizer concentrations.*

3.7. Seed Weight Per Plant

The dmrt test results in table 4 show that the biological fertilizer concentration (h3) treatment of 1.5 l ha^{-1} produces the best average weight of seeds per plant, which is 19.8 g and is significantly different from the concentration of biological fertilizer 1 l ha^{-1}, which is 17.5 g.

Table 4. *Average seed weight per plant (g) at various concentrations of biofertilizers.*

	Biofertilizer Concentration (h)			
	h1	h2	h3	h4
Average	$17,6_a$	$17,5_a$	$19,8_b$	$18,5_a$
CV(k) DMRT 0,05	(2) 1,78 (3) 1,87 (4) 1,92			

Description: The numbers followed by the same letter mean that they are not significantly different in the DMRTα test=0.05. CV: Comparator Value.

3.8. Production Per Hectare

Table 5 shows that the combination of compost dose treatment of 2 tons ha^{-1} (k2) and biofertilizer concentration of 2 l ha^{-1} (h4), resulted in the highest production of 3.4 tons ha^{-1} and differed markedly from the combination of compost dose of 1 ton ha^{-1} (k1) and biofertilizer concentration of 1 l ha^{-1} (h2) which was 1.9 tons ha^{-1}.

Table 5. *Average production per hectare (ton ha^{-1}) at various doses of compost and biofertilizer concentrations.*

Compost Fertilizer Level (k)	Biofertilizer Concentration (h)			
	h1	h2	h3	h4
k0	$_{(C)}2,1_{a(A)}$	$_{(C)}2,3_{a(A)}$	$_{(CD)}3,0_{b(A)}$	$_{(D)}3,0_{b(A)}$
k1	$_{(C)}2,4_{a(A)}$	$_{(C)}1,9_{a(A)}$	$_{(CD)}2,0_{a(A)}$	$_{(D)}2,0_{a(A)}$
k2	$_{(C)}2,3_{a(AB)}$	$_{(C)}2,7_{a(AB)}$	$_{(CD)}3,0_{b(AB)}$	$_{(D)}3,4_{d(AB)}$
k3	$_{(C)}3,0_{b(B)}$	$_{(C)}3,3_{cd(B)}$	$_{(CD)}3,3_{cd(B)}$	$_{(D)}3,1_{bc(B)}$
CV(k) DMRT 0.05 =	(2) 0,66 (3) 0,69 (4) 0,70	CV(h) DMRT 0.05 =		(2) 0,31 (3) 0,33 (4) 0,34
CV(k) DMRT 0.05 =	(2) 0,96 (3) 1,01 (4) 1,04 (5) 1,06 (6) 1,08 (7) 1,09			

Description: The numbers followed by the same letter in the main tile column (a, b, c, d), (AB) and the tile child row (C, D) mean no real difference in the DMRTα=0.05 test. CV: Comparator Value.

3.9. Bacterial Density

Table 5 shows that the combination of compost dose treatment of 2 tons ha^{-1} (k2) and biofertilizer concentration of 2 l ha^{-1} (h4), resulted in the highest bacterial density of $36.3x10^8$ and differed markedly from the combination of compost dose of 2 tons ha^{-1} (k1) and biofertilizer concentration of 1 l ha^{-1} (h2) which was $4.7x10^6$.

Table 6. *Average density of bacteria at different doses of compost and concentration of biofertilizers.*

Compost Fertilizer Level (k)	Biofertilizer Concentration (h)			
	h1	h2	h3	h4
k0	$12,7x10^6_a$	$10,7\ x10^6_a$	$26,0\ x10^6_a$	$8,3\ x10^6_a$
k1	$32,3\ x10^7_b$	$18,7\ x10^6_a$	$7,0\ x10^6_a$	$14,7\ x10^6_a$
k2	$9,7\ x10^6_a$	$4,7\ x10^6_a$	$13,3\ x10^6_a$	$36,3\ x10^8_c$
k3	$27,7\ x10^7_{ab}$	$26,3\ x10^6_a$	$8,7\ x10^6_a$	$9,7\ x10^6_a$

Compost Fertilizer Level (k)	Biofertilizer Concentration (h)			
	h1	h2	h3	h4
CV(kxh) DMRT 0.05 =	(2) 26,9 (3) 30,3 (4) 32,4 (5) 33,2 (6) 34,6 (7) 36,1 (8) 38,3			

Description: The numbers followed by the same letter in the main tile column and the tile child row mean no real difference in the DMRTα=0.05 test. CV: Comparator Value.

3.10. Path Analisys

The table of cross-fingerprints against production per hectare is presented in table 7. Characters with a direct positive influence on productivity are the characters of the number of pods per plant (0,499), the weight of seeds per plant (0,137), and the weight of seeds per plot (0,346), these characters tend not to have a direct effect on productivity, except for the character of seed weight per plant. The character of the weight of seeds per plant (-0,754) indicates the value of a negative indirect influence on productivity.

Table 7. *Path analisys of production per hectare (tons/ha).*

Character	Direct Influence	Indirect Influence			Total
		NP	WS	WSP	
NP	0,499	0	-0,754	0,382	0,382
WS	0,137	-0,754	0	0,876	0,259
WSP	0,346	0,637	0,876	0	1,859

Description: Number of Pods (NP), Weight of Seeds Per Plant (WS), Weight of Seeds Per Plot (WSP).

4. Discussion

The application of compost fertilizer has a noticeable influence on the change in plant height in soybean crops. The high nitrogen content will have an effect on plant height, compost fertilizer is able to increase the vegetative growth rate of soybean plants. From this study, it can be seen that the higher the dose of compost given, the higher the plant height will be. It is suspected that the compost used has sufficient nutrient content such as C, N, P_2O_5 and K_2O_4. According to Sipayung et al. that plant height is one of the growth indicators, growth indicators are needed to approach the value of plant growth in absorbing nitrogen compounds used by plants to form amino acid compounds that will be converted into proteins [16]. In vegetable crop research, the highest average plant height was found in plants that received more nutrients. Vegetative growth of plants indicated by the high growth of plants the nutrient that plays a role is nitrogen. Nutrients that contain higher nitrogen will spur vegetative growth [17]. Furthermore, according to Sayekti *et al* that the application of organic fertilizer in the form of manure and compost is able to increase plant height, fresh weight of the canopy, BOD of water, and catfish weight compared to without the application of organic fertilizers [18].

Applying commopos and biofertilizers with high doses and concentrations can spur more leaf growth. Nutrients contained in compost and biofertilizers can help the availability of plant nutrients so that soybean plants show a better number of leaf yields compared to other treatments. In addition, the content of microorganisms in biological fertilizers can also increase the efficiency of nutrient absorption and help provide nutrients in the soil to be available to plants. According to Setiaji and Basry, EM4 serves to help the provision and absorption of nutrients in plants, effectively control the development of parasitic and pathogenic populations in the soil, and improve the physical, chemical, and biological properties of the soil [19]. One of the functions of EM4 that can help the absorption of nutrients may cause nutrients from inorganic fertilizers that are applied as much as 50% of the recommended dose to be absorbed more effectively. This is in line with the research results of Sipayung et al. that the use of Brassica compost and biofertilizers obtained a higher number of leaves than the use of chemical fertilizers. The ability of Brassica compost and biofertilizers has a better ability to provide nutrients to soybean plants than to use chemical fertilizers [16].

The application of compost and biofertilizers at a dose of 3 tons ha^{-1} and a concentration of biological fertilizers of 1.5-2 l ha^{-1} is able to accelerate the flowering life of soybean plants compared to other treatments and the flowering age of the Dega 1 variety (according to the description of the variety). In the initial generative phase, the need for nutrients, especially the P element in this combination of treatments, is well met so that the flower formation process can run perfectly. According to [20] that the element P serves as a raw material for the formation of a certain amount of protein, helping assimilation and exhalation while accelerating flowering, ripening of seeds and fruits.

The biological fertilizer used in this study has a complete content of macro and micro nutrients so that the production produced can be close to the production potential of the soybean varieties used. Macronutrients in the form of N, P_2O_5, and K_2O as well as micronutrients in the form of C-Organic, Fe, Mn, Cu, Zn, Pb, Co and Mo and have an acidic pH in accordance with the soil pH in this study field. Research results of Zulkifli and Herman, says that biofertilizers contain low nitrogen (N), phosphate (P) and potassium (K) nutrients, and contain abundant micronutrients and are necessary for plant growth [21]. Applying different doses of biofertilizers leads to the growth and production of different soybean crops and the right dose will accelerate the rate of root formation. Furthermore, Handayanto stated that at the time of seed formation, phosphorus compounds stored in leaves and stems are stored in the form of seeds, and at the time of ripening three-fourths of all phosphorus in plants are already stored in seeds in order to get maximum results [22].

Production per hectare is an important component used in this study. The highest production was obtained at the dose treatment of compost 2 tons ha^{-1} and the concentration of biological fertilizer 2 l ha^{-1} with an average production value of 3.4 tons ha^{-1}. This combination of dosage and concentration is appropriate for increased soybean production. According to Nugraha et al. that increasing the yield of soybean crops can be done by using biological fertilizers. Based on the results of existing studies until now, it shows that the application of biological fertilizers at different doses shows a different plant height response [23]. And according to Suwahyono states that microbes in biological fertilizers applied to plants are able to bind nitrogen from the air, dissolve fospat bound in the soil break down complex organic compounds into simpler compounds and spur plant growth [24].

The combination of compost and biofertilizer is one of the right methods to maximize the potential of soybean production and is an environmentally friendly and sustainable cultivation technique. This combination is able to suffice the availability of nutrients in the process of pod formation. The compost used in this study contains C-organic, nitrogen, phosphorus, and potassium so that the main nutrients for soybean plants can be met to support the growth and production process. This is in line with Sutejo that fertilization has an important role in supporting the process of cell division and the formation of new organs in plants [25]. Nitrogen (N) plays a role in the formation of new cells, element P plays a role in activating enzyme enzymes in the process of photosynthesis of element K affecting the development of meristem tissue which can affect the length and width of leaves. And research conducted by Rosiana et al. that the provision of straw compost of 2.5 tons ha^{-1} coupled with compound biological fertilizer of 400 g ha^{-1} gave the highest production yield per clump [26]. Applying organic matter through straw compost with 2.5 tons ha^{-1} with biological fertilizer 400 ha^{-1} can increase production yields because with available organic matter can increase nitrogen uptake.

The results of the analysis of bacterial density in the soil in each treatment show that the addition of compost and biological fertilizers will increase the density of soil microbes. The density of soil bacteria will affect the fixation and absorption of nitrogen nutrients in soybean plants which will ultimately affect soybean growth and production and improve soil physical properties. This is in line with the opinion of Hungrı´a et al.; Sutanto; Rahmawati that legume plants such as soybeans have long been known to be plants capable of symbiosis with nitrogen-fixing bacteria (N) in the air by forming nodules on their roots. Rhizobium is a bacterium that is able to replace soil N lost due to leaching, evaporation, binding by other minerals, and absorption by plants. Rhizobium associated with legume plants is able to produce 300 kg of N ha^{-1} of ksasi and is able to meet 94% of its nitrogen needs. Plant responses vary greatly depending on soil conditions and the effectiveness of the native population [27-29]. Noertjahyani suggests that the administration of inoculants B. japonicum and Pseudomonas sp. in soybeans it is able to increase the weight of 100 grains and the yield of seeds per plant. In addition, Rhizobium bacteria also have a positive impact on the physical and chemical properties of the soil [30].

Path analisysis one of the analyses that can separate the direct and indirect influences of a correlation. This becomes very important in knowing the main secondary character that directly affects the variety of productivity. Added that cross-fingerprint analysis can calculate characters that contribute importantly to the increase in hybrid maize yields [31-33]. Based on the cross-fingerprint table, quantitative characters such as the number of pods, the weight of seeds per plant, and the weight of seeds per plot can represent soybean production, thus affecting the high and low production.

5. Conclusion

1. The use of compost at a dose of 3 tons ha^{-1} gives the best results on the parameters of plant height and flowering age. The use of a biofertilizer concentration of 2 l ha^{-1} gives the best results on the parameters of the number of leaves. The use of a biofertilizer concentration of 1.5 l ha^{-1} gives the best results on the parameters of seed weight per plant.
2. The highest production per hectare was obtained at a dose treatment of compost 2 tons ha^{-1} and a biofertilizer concentration of 2 l ha^{-1} with an average value of 3.4 tons ha^{-1}. Then in the treatment of the dose of compost fertilizer 3 tons / ha and the concentration of biological fertilizer 1 l ha^{-1} and the treatment dose of compost fertilizer 2 tons ha^{-1} and the concentration of biological fertilizer 1.5 l ha^{-1} with an average value of 3.3 tons ha^{-1}. The lowest production per hectare is found in the treatment of compost doses of 1 ton ha^{-1} and biofertilizer concentrations of 1 l ha^{-1} with an average value of 1.9 tons ha^{-1}.
3. The interaction of compost dose treatment of 1 ton/ha and biofertilizer concentration of 1 l ha^{-1} is found in the parameters of flowering age (28 dap), the interaction of compost doses of 2 tons/ha and biofertilizer concentrations of 2 l ha^{-1} a is found in the production parameters per hectare (3.4 tons ha^{-1}), and bacterial density parameters ($36,3x10^8$).

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