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Effect of Chicken Manure Fertilizer on Growth of grafting Seedlings of the Conjoined Orange (Citrus Nobilis Sin) Plant and Pomelo (Citrus Grandis L. Osbeck)

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Abstract

This research aims to determine the distribution of chicken manure dosage treatments to the growth of grafting seedlings of varieties of Siamese and Grapefruit. This research is a field experiment conducted in Belancan Village, Kintamani District, Bangli Regency from April to December 2017. This study used a Randomized Block Design (RBD) with 2 factors arranged factorial. Thus in 10 combinations were repeated three times so that in 30 polybags the treatment combination. The interaction between the treatments of chicken manure with citrus varieties (A × J) significantly affected the shoot wet weight variable and the open dry weight variable. The highest wet weight value obtained in the treatment of chicken manure doses of 62.5 grams per polybag (A4) is 57.83 (g) increased 629% when compared to the lowest yield in the treatment of chicken manure 0 grams per polybag (A0) which is only 7.93 (g). In the treatment of shoots wet weight orange varieties obtained the highest value in the treatment of pomelo (JB) In the treatment of chicken manure 65.5 grams per polybag that is 57.83 (g) increased 188.71% when compared with the lowest results of the dosage treatment of chicken manure fertilizer 0 gram per polybag that is 20.03 (g).

Keywords: Grafting; manure; plant varieties.

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1. Introduction

Generally, citrus fruits are favored by people in a whole world, including Indonesia's communities. Orange is a good source of vitamin C, containing 50 mg / 100 ml of fruit juice, as well as vitamin A and protein. So far the availability of citrus fruit in the country has not been sufficient to meet the needs (1).

According to (2), Indonesian citrus fruit production in 2012 was 1,611,784 tons, whereas in 2013 it decreased which only produced 1,411,229 tons. This is caused by the availability of high quality seeds which are still low (3). In 2011 the domestic consumption per capita of oranges reached 2.96 kg/year. Citrus fruit production in Indonesia in 2013 was 4,216 tons (2). The need for fruit including oranges in Indonesia is almost 70% from other countries. From these data it can be seen that the productivity of oranges in Indonesia is still relatively low. The low production of oranges in Indonesia has not been able to meet the people's consumption power both in quality and quantity. In addition, the high interest of the community to prefer imported fruits is an opportunity for imported fruits including oranges to enter (4).

The low production is caused not only by the limited amount of land for planting but also the way of cultivation that is not optimal, especially in nurseries. Data from (2) where in the year 2005 to 2008 production respectively - amounted to 76 324 tons, 63 801 tons, 85 691 tons, 74 249 tons and 76 621 tons.

The success of cultivation of fruit plants, especially those on a large commercial scale, is determined by the availability of quality seeds at the right time, in large quantities and at affordable prices by farmers. The use of seeds and varieties that are not suitable will cause difficulties in subsequent crop management. This mistake will usually be felt a few years later, after the plants produce (5). Therefore, research and development and management of existing nurseries need to be increased in order to meet the growing demands of seed consumers (6). Citrus plants that are commercially cultivated, generally use seedlings derived from grafting.

Manure originates from organic material with raw materials from animal manure and urine which are left to rot with the help of soil microorganisms that can decompose complex organic waste into materials that are easily assimilated by plants. The content of manure depends on the origin of the material used and the extent of decomposition by soil microorganisms (7). Nutrient content in manure greatly determines the quality of manure. Nutrient content in manure does not only depend on the type of livestock, but also depends on the type of food and drink provided, age and physical form of the animal. Manure derived from chicken manure has a higher nutrient content than other types of livestock (8). Hereby, chicken manure contains 2.2% N total, 22.4% C-organic, 2.9% P2O5, and 2.1% K2O (Hartatik and Setiyorini 2009). During the C/N decomposition process the ratio of manure decreases from 20-30/1 to <20/1 (9). Manure will decompose to a stable topsoil so as to enrich soil organic matter for a long time (10). Starting from the conditions that occur, it is necessary to conduct a research on the effect of the influence of chicken manure on the success of grafting of Siamese and Grapefruit plants.

2. Materials and methods

Place and Time of Research

This research was conducted in Belancan Village, Kintamani Sub-district, Bangli Regency from April 2017 until December 2017.

Materials and Equipment of Research

The materials used are the seeds of the citrus plants, entrees of the Siamese and pomelo plants, chicken manure, and soil.

The tools used in this study are hoes, shovels, scales, gauges, stationery, polybags, bamboo, scales, ovens and saws.

Research design

This research was a factorial experiment with a randomized block design (RBD) consisting of 2 factors: a dose of chicken manure (A) and two varieties of citrus plants namely: conjoined oranges (JS) and grapefruit (JB). The details of the treatment are as follows:

The first factor is chicken manure dose (A) which consists of 5 levels namely K0 (0 tons/ha = 0 grams/polybag), K1 (10 tons/ha = 25 grams/polybag), K2 (15 tons/ha = 37,5 grams/polybag), K3 (20 tons/ha = 50 grams/polybag) and K4 (25 tons/ha = 62.5 grams/ polybag). The second factor is 2 varieties of citrus plants, namely: conjoined citrus varieties (Citrus nobilis sin) (JS) and pomelo citrus varieties (Citrus grandis L. Osbeck) (JB). Thus there are 10 combinations and repeated 3 times so that it takes 30 experimental polybags filled with 1 orange per plant as ample. After randomization carried out on each test, the polybag layout was made in the experiment.

The variables observed in this study were the growth of the first shoots after paste, length of shoots, number of leaf buds, total leaf area of shoots, root wet weight, root stem wet weight, shoot wet weight, root oven dry weight, stem oven dry weight, and oven dry weight shoots.

Data Analysis

Observation data were tabulated, then analyzed statistically using analysis of variance in accordance with the design being carried out. First the diversity test was conducted so that it was obtained variance. If the treatment has a significant effect, then the analysis is continued to look for a single effect of each of the nested factors with a LSD level of 5%.

3. Results and Discussion

Research Results

The results of statistical analysis of all the variables observed in this study are presented in Appendix 1 to 11. Significance of the effect of chicken manure (A) and Variety (J) doses and their interactions (AxJ) on the observed variables is presented in Table 1.

Table 1
The significance of the effect of chicken manure (A) doses and citrus plant varieties (J) and their interactions with all observed variables

No	Variable	Treatment		Interac-tion
		Chicken manure (A)	Varieties orange plant (J)	
1	Emergence of Shoots (HSP)	**	ns	ns
2	Shoot Height (cm)	**	ns	ns
3	Number of Leaf Buds (strands)	**	ns	ns
4	Broad Leaf of Buds (cm ^{2})	ns	ns	ns
5	Wet Weight of Root (g)	ns	ns	ns
6	Wet Weight of stem (g)	ns	ns	ns
7	Weight Wet of shoots (g)	**	**	*
8	Oven Dry Weight of Roots (g)	ns	ns	ns
9	Oven Dry Weight of the stem (g)	ns	ns	ns
10	Oven Dry Weight of shoots (g)	**	**	*

Information:

* = significant effect (P <0.05)

** = very significant effect (P <0.01)

ns = no significant effect (P ≥0.05)

Based on Table 1 shows that the effect of interaction (A × J) between chicken manure fertilizer A and citrus plant varieties (J) has no significant effect (P≥0.05) on several observed variables, except on wet weight of shoots (gram) has a significant effect (P) <0.05) and oven dry weight of shoots (gram) have a significant effect (P <0.05). In the orange varieties (J) had no significant effect on some of the observed variables, except that the wet weight of shoots variable (gram) had a very significant effect (P <0.01) and the oven dry weight of shoots variable had a very significant effect (P <0, 01). While the chicken manures (A) have no significant effect for some variables except for the stem shoots height (cm) which has a very significant effect (P <0.01), the emergence of shoots (HSP) has a very significant effect (P <0.01), the number of leaf buds (strands) has a very significant effect (P <0.01), the wet weight of the

shoots (gr) has a very significant effect (P <0.01) and the dry weight of the shoots (gr) has a significant effect (P <0.01). The average of all variables observed in the treatment of chicken manure (A) and citrus varieties (J) can be seen in Table 2.

Table 2
Average of all variables observed in the treatment of chicken manure (A) and citrus varieties (J)

PERL.	MT	TT	JDT	LD	BBA	BBB	BKOA	BKOB
A0	16.50 a	27.00 d	6.67 c	356.90 e	27.92 a	10,67 a	11.52 a	4.93 a
A1	13.50 b	29,15 c	11,17 b	422.87 d	17.22 a	8,47 a	5,97 a	3.48 a
A2	13.00 b	31.23 c	19.50 a	807.95 c	25.32 a	8.52 a	9.65 a	4,28 a
A3	11.67 b	37.83 b	19.67 a	924.22 b	16.88 a	8.28 a	7,60 a	4.15 a
A4	12.00 b	43.43 a	19.67 a	1613,37 a	27,90 a	14.53 a	12.87 a	5,32 a
BNT 5%	1.87	3.78	7.44	922.95	14.36	7.71	12.87	2.02
JS	13,20 a	33.22 a	15.87 a	809.05 b	25,40 a	9.04 a	9.72 a	4.15 a
JB	13.47 a	34.24 a	14,80 a	841.07 a	20.69 a	11,15 a	9.32 a	4,72 a
BNT 5%	1.18	2.39	4.71	583.72	9.08	4.88	3.78	1.27

Description:

1. MT = Emergence of Shoots (HSP)
2. TT = Shoot Height (cm)
3. JDT = Number of Leaf Buds (strand)
4. LD = Broad Leaf of Buds (cm ^{2})
5. BBA = Wet Weight of Root (g)
6. BBB = Wet Weight of stem (g)
7. BKOA = Oven Dry Weight of Roots (g)
8. BKOB = Oven Dry Weight of the stem (g)

Discussion

The results of the statistical analysis showed that the interaction between the treatment of chicken manure and citrus plants varieties significantly affected the wet weight of shoots variable (g) and the oven dry weight of shoots (g) (Table 3). The treatment of chicken manure dosage and citrus plant varieties have very significant effect on the variable wet shoots and oven dry weight of shoots. The highest value of wet weight of shoots obtained in the treatment of chicken manure doses of 62.5 grams per polybag (A4) in the treatment of varieties of conjoined orange (JS) is 20.03 (g) increased 629.25% when compared with the lowest yield on fertilizer treatment chicken manure fertilizer 0 grams per polybag (A0) with a value of 9.87 (g) in the treatment of the same citrus plant varieties, significantly different from the treatment of 32.5 grams of chicken manure per polybag (A2) with a value of 14.20 (g), very significant difference with the treatment of 50 grams of chicken manure (A4) and 25 grams of chicken manure per polybag with a value of 12.63 (g) and 8.27 (g), respectively. Whereas the treatment of chicken manure dosage in the treatment of pomelo (JB) varieties which obtained the highest value was on the treatment of chicken manure 62.5 grams per polybag (A4) that is 57.83 (g) increased 142.20% when compared to the lowest value obtained in the treatment of chicken manure 0 grams per polybag (A0) with a value of 7.93 (g) significantly different from the treatment of chicken manure 25 grams per polybag (A1) with a value of 36.30 (gr) but very significantly different from the treatment doses of chicken manure 50 grams per polybag (A3) with a value of 17.20 (g) and the treatment of chicken manure 37.5 grams per polybag (A2) with a value of 23.80 (g).

Furthermore, the increase in wet weight of shoots in the chicken manure dose treatment of 62.5 grams per polybag (A4) was supported by the increase in shoot oven dry weight variable, the highest value of the shoot oven dry weight obtained by chicken manure treatment at 62.5 grams per polybag

(A4) in the treatment grapefruit plant varieties (JB) with the highest value of 18.70 (g) increased by 868.91% when compared to the lowest yield obtained in the treatment of 0 gram chicken manure dosages per polybag that is only 1.93 (g). The value of increasing the wet weight of shoots is influenced by nutrient content contained in chicken manure, one of which is N content, where this content has a very high influence on the vegetative development of plants. According to (11), the fresh weight of a plant is influenced by the element N that is absorbed by the plant, water content and nutrient content that is present in tissue cells of plant.

The interaction of shoot oven dry weight variable with the highest value in the treatment of chicken manure 62.5 grams per polybag in column varieties of grapefruit plants (JB) that is 18.70 (g) increased 8.68.91% when compared to the results of the dissection obtained in the treatment of chicken manure 0 grams per polybag that is 1.93 (g), significantly different from the treatment of chicken manure 50 grams per polybag (A3) that is with a value of 10.43 (g) and very significantly different treatment of chicken manure 37 , 5 grams of per polybag (A2) and 25 grams of chicken manure treatment per polybag (A1) are 5.77 (g) and 5.73 (g) respectively (Table 6). Whereas the treatment of chicken manure dosage (A) located in the treatment of Siamese citrus fertilizer varieties (JS) obtained the highest value in the treatment of chicken manure 62.5 grams per polybag that is 7.17 (g) increased 868.91% when compared the lowest value obtained in the treatment of chicken manure 0 25 grams per polybag (A1) is 2.70 (g) significantly different from the treatment of chicken manure dose 37.5 grams per polybag with a value of 5.00 (g) and very significantly different with 50 grams of chicken manure treatment per polybag (A3) and 0 grams of chicken manure dosage treatment per polybag (A0) with values of 3.80 (g) and 3.67 (g), respectively.

The increasing of oven dry weight of the shoots on the treatment of chicken manure doses of 62.5 grams per polybag in both plant varieties, namely varieties of pomelo (JB) and conjoined oranges (JS) is supported by increasing leaf broad variable, variable number of leaf buds and variable height of shoots. The high K element in chicken manure fertilizer plays an important role in the transport of photosynthate to the sink, namely young leaves or buds that are growing. The element N functions to form proteins and improve vegetative growth of plants such as plant height and number of leaves. The high plant growth and number of leaves will affect or correlate with leaf area values.

The increasing of oven dry weight of shoots is caused by higher N content of chicken manure fertilizer causing plants to have more leaves with greener leaves so that photosynthesis runs well. The results of photosynthesis are used for plant development and growth, including increasing the length or height of plants, forming new branches and leaves, expressed in the wet and dry weights of plants. The higher the photosynthate produced it is assumed the higher the photosynthate is transplanted so that the wet and dry weight of the plant will increase. Additional of fresh weight caused by division and enlargement of cells in plant tissue. The division and enlargement of cells in plants is influenced by the results of photosynthates produced by chlorophyll. The amount of chlorophyll in plants is influenced by the element N as a constituent. Nitrogen element is important in plant growth, especially as building blocks of chlorophyll, fat, enzymes and other compounds (12).

The increasing number of shoots is influenced by the amount of nitrogen (N) in chicken manure. According to (13) the function of nutrients, namely the element N is as a building material for amino acids, proteins, enzymes, nucleic acids and alkaloids. Deficiency of N will increase the process of cell division and enlargement, besides that function of N in the physiological and biochemical

processes of plants, namely maintaining photosynthetic capacity, the element of N plays a role in accelerating plant growth, increasing plant height and stimulating the formation of shoots, improving quality especially its protein content and stimulating vegetative growth (stems and leaves).

4. Conclusion

Based on the results of this study, it can be concluded that the interaction between the treatments of chicken manure doses with the treatment of citrus plant varieties (A × J) has a significant effect on the variable fresh weight of shoots and oven dry weight of shoots. The highest value of wet weight of shoots was obtained in the treatment of chicken manure doses of 62.5 grams per polybag (A4) in the treatment of varieties of conjoined orange (JS) is 20.03 (g) increased by 10.32% when compared with the lowest results on chicken manure 0 gram per polybag (A0) with a value of 9.87 (g). In the treatment of citrus plant varieties (J), the wet weight of shoots was significantly different in the treatment of 62.5 grams of chicken manure per polybag (A4) and in the treatment of 25 grams of chicken manure dose per polybag (A1) with each value of 57.83 (g) increased 184.87% compared with the treatment of varieties of conjoined orange (JS) which is 20.3 (g) and 36.30 (g) increased 238.93% compared to the treatment of varieties of conjoined orange (JS) namely 8, 27 (g).

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