JURNAL PENELITIAN PROGRESSIF

VOL 3 NO 1 | Februari 2024 | Terbit: 26 Februari 2024 | E-ISSN: 2963-4369

The Effect of Banana Peel Extract (Musa paradisiaca L.) on the Growth of Chili Peppers (Capsicum frutescens L.)

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Abstract

To determine the effect and to determine the volume of extract of giving kepok banana peel extract (*Musa paradisiaca* L) on the growth of cayenne pepper (*Capsicum frutescens* L). The population in this study includes all types of cayenne pepper. This study used a Completely Randomized Design (CRD) with 4 treatments and 3 replications. The results of the study for stem height (cm) were calculated based on the analysis of variance, the average value starting at the age of 10 days was the calculated F value (1.28) < F table (3.48), at the age of 15 days the calculated F value (8.45) > F table (3.48), at the age of 20 days the calculated F value (11.82) > F table (3.48) and at the age of 25 days the calculated F value (10.72) > F table (3.48). Thus it can be concluded that the administration of kepok banana peel extract has a significant effect on the growth of cayenne pepper plants at the age of 15, 20 and 25, while at the age of 10 days there is no effect.

Keywords : Extract, Effect, Banana , Cayenne Pepper

INTRODUCTION

Chili peppers (Capsicum frutescens L.) are a vegetable commodity that Indonesians cannot do without in their daily lives. According to Warisno (2010), Indonesians prefer the spiciness of chili peppers over pepper. This is in contrast to people in Europe, America, and several Asian countries who prefer the spiciness of pepper. Chili peppers are used as a kitchen spice, a main ingredient in the sauce industry, the chili powder industry, the instant noodle industry, and even the pharmaceutical industry. Red chili powder contains many nutrients such as calcium, iron, and various vitamins, making it widely used as a cooking ingredient. In general, chili peppers contain nutrients including fat, protein, carbohydrates, calcium, phosphorus, iron, vitamins A, B1, B2, and C, as well as alkaline compounds such as capsaicin, oleoresin, flavonoids, and essential oils. Meanwhile, many other nutrients are still needed by our bodies. The nutrients the body needs include carbohydrates, protein, and vitamins (Yassir, 2021).

According to research by the Ministry of Health, cayenne pepper can be used medicinally. It can replace massage oil to relieve pain, rheumatism, shortness of breath, and itching. The oil is commonly used to relieve muscle aches, joint pain, toothaches , coughs, asthma, irritation, colic, dizziness, and flatulence. The leaves, with their strong, spicy aroma, are also used to treat sore throats caused by colds and polio.

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The growth of a plant is influenced by two factors, namely factors from within the plant itself, and factors from the environment, such as water, soil, temperature and temperature. Soil has various components that can affect the growth of a plant, good soil for cayenne pepper plants is loose, fertile, porous, and contains a lot of humus or organic matter (decomposition of plant and animal remains), which is a plant growth medium with certain properties. As research conducted by Safiah, et al. 2023 California lemon (Citrus limon) shoot cuttings using natural PGR coconut water.

One of the key components of good soil structure is its high organic content, derived from household waste. Banana peels are one example of unused and underutilized household waste. However, banana peels, without realizing it, contain lignin. According to Syafrudin (2004), the fresh weight ratios of banana stems, leaves, and fruit are 63, 14, and 23%, respectively. Banana stems have a specific gravity of 0.29 g/cm3, fiber length 4.20–5.46 mm, and lignin content of 33.51%.

In general, banana peels also contain substances that can be utilized, one of which is as a natural fertilizer for plants. Most people are not yet aware of the benefits of banana peels, so they are simply thrown away and left to pile up as waste that can pollute the environment and damage environmental sustainability. There are several factors causing the lack of public interest in utilizing banana peels. Among them, limited public knowledge about the contents of banana peels. Banana peels, which have not been optimally utilized by the community , can be used as liquid fertilizer, because banana peels contain elements P, K, Ca, Mg, Na, Zn, each of which functions for plant growth and development which has an impact on maximum production (Soeryoko hery, 2011). Hanum's (2012) research obtained results that the water content of pectin produced by banana peels ranges from 9.52-11.88%.

RESEARCH METHODS

This study used a Completely Randomized Design (CRD) with four treatments and three replications. These treatments are shown in the following table:

Treatment	Connected		
	U_1	U_2	U_3
P_0	$P_0 U_1$	$P_0 U_2$	$P_0 U_3$

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P_1	$P_1 U_1$	$P_1 U_2$	$P_1 U_3$
P_2	$P_2 U_1$	$P_2 U_2$	$P_2 U_3$
P_3	$P_3 U_1$	$P_3 U_2$	$P_3 U_3$
P_4	$P_4 U_1$	$P_4 U_2$	$P_4 U_3$

Information:

P_0 : without using banana peel extract

P_1 : 25 ml banana peel extract + 75 ml Aquades

P_2 : 50 ml banana peel extract + 50 ml Aquades P_3 : 75 ml banana peel extract + 25 ml Aquades P_4 : 100 ml banana peel extract

In the first treatment (P0) Treatment without banana peel extract in the planting medium using only distilled water. The second treatment (P1) Treatment by giving 25 ml of banana peel extract in the soil medium with 75 ml of distilled water. The second treatment (P2) Treatment by giving 50 ml of banana peel extract in the soil medium with 50 ml of distilled water. The third treatment (P3) Treatment by giving 75 ml of banana peel extract in the soil medium with 25 ml of distilled water. The fourth treatment (p4) treatment by giving 100 ml of banana peel extract in the soil medium.

RESULTS AND DISCUSSION

Based on the results of research on the effect of banana peel extract on the growth of cayenne peppers, data on stem height was obtained from measurements of cayenne pepper plant growth and tabulated into a table to facilitate calculations. The data is presented in the table below:

Observations on the effect of administering kepok banana peel extract (*Musa paradisiaca* L) on the growth of cayenne pepper (*Capsicum frutescens* L) were carried out 10-25 days after planting and can be seen as follows:

a. The first measurement of the stem height of the cayenne pepper plant was 10 days after planting or 5 days after being given the extract of kepok banana peel (*Musa paradisiaca* L).

Table 1. 1. Height of cayenne pepper plants (cm) at 10 days after planting.

Treatment	**Connected**			**Amount**	**Rate- rate**
	U1	U2	U3		
P_0	7	7,5	7	21,5	7,1
P_1	9	8	9,5	26,5	8,8

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P_2	8	7,5	9	24,5	8,1
P_3	10	9	9	28	9,3
P_4	8	8	7,5	23,5	7,8
Amount	42	40	42	124	41,1

Based on table 1.1 above, it appears that the average height of cayenne pepper plants at the age of 10 days is 9.3 cm, which is highest in treatment P_3. Furthermore, the lowest average height of cayenne pepper plants is 7.1 cm, which is highest in treatment P_0.

To determine the effect of administering kepok banana peel extract (*Musa paradisiaca* L) on the growth of cayenne pepper (*Capsicum frutescens* L) at the age of 10 days, the following variance test was carried out:

Table 1.2. Analysis of Variance to test the effect of treatment on plant height measurements (cm) of cayenne pepper at 10 days of age.

SK	**DB**	**JK**	**KT**	**F count**	**F table**	
					5%	**1%**
Treatment	4	8,54	4,54	1,28	3,48	5,99
Error	10	35,4	3,54			
Total	14					

Because the calculated F value (1.28) < F table (3.48) , the treatment did not affect the height of cayenne pepper plants (*Cpsicum frutescens* L) at the age of 10 days.

b. The second measurement of the height of the cayenne pepper plants at the age of 15 days after planting or 10 days after being given the extract of kepok banana peel (*Musa paradisiaca* L).

Table 1.3. Height of cayenne pepper plants (cm) at 15 days after planting.

Treatment	**Connected**			**Amount**	**Rate- rate**
	U1	U2	U3		
P_0	15	16	15	46	15,3
P_1	16	15	15,5	46,5	15,5
P_2	16	17	17	50	16,6
P_3	18	17	18	53	17,6
P_4	17	16	16	49	16,3
Amount	82	81	81,5	244,5	81,3

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Based on table 1.3 above, it appears that the highest average height of cayenne pepper plants at the age of 15 days is 17.6 cm, which is found in treatment P $_{3.}$ Furthermore, the lowest average height of cayenne pepper plants is 15.3 cm, which is found in treatment P $_{0.}$

To determine the effect of administering kepok banana peel extract (*Musa paradisiaca* L) on the growth of cayenne pepper (*Capsicum frutescens* L) at the age of 15 days, the following variance test was carried out:

Table 1.4. Analysis of Variance to test the effect of treatment on plant height measurements (cm) of cayenne pepper at 15 days of age.

SK	DB	JK	KT	F count	F table	
					5%	1%
Treatment	4	10,73	2,68	8,45	3,48	5,99
Error	10	3,17	0,317			
Total	14					

Because the calculated F value (8.45) > F table (3.48), the treatment had a very significant effect on the height of cayenne pepper plants (*Cpsicum frutescens* L) at the age of 15 days.

To determine the effect of stem height (cm) on cayenne pepper plants between treatments (the median value of the treatment), the calculation was continued to the analysis (follow-up test). The form of follow-up test used was the Significant Difference Test (LSD). The results for each treatment can be seen in the table below:

Table 1.5. Generally the tall young plant starts ripening the cabbage at the age of 15 days after sowing.

Treatment	Rata-rata SD
P $_0$	**15.3 ± 15.3 ^{a}**
P $_1$	**15.5± 15.5 ^{a}**
P $_4$	**16.3 ± 16.3 ^{b}**
P$_2$	**16.6 ± 16.7 ^{b}**
P $_3$	**17.6 ± 17.7 ^{b}**

Description: Numbers followed by the same letter in the same column indicate no significant difference in the BNT test.

c. The third measurement of the height of the cayenne pepper plants at the age of 20 days after planting or 15 days after being given the extract of kepok banana peel (*Musa paradisiaca* L).

Table 1.6. Height of cayenne pepper plants (cm) at 20 days after planting.

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Treatment	Connected			Amount	Rate- rate
	U1	U2	U3		

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P_0	20	20,5	20	60,5	20,1
P_1	20	22	21	63	21
P_2	22	22	21	65	21,6
P_3	24	23	23	70	23,3
P_4	21	20	20	61	20,3
Amount	107	107,5	105	319,5	106,3

Based on table 1.6 above, it appears that the highest average height of cayenne pepper plants at the age of 20 days is 23.3 cm, which is found in treatment P_3. Furthermore, the lowest average height of cayenne pepper plants is 20.1 cm, which is found in treatment P_0.

To determine the effect of administering kepok banana peel extract (*Musa paradisiaca* L) on the growth of cayenne pepper (*Capsicum frutescens* L) at the age of 20 days, the following variance test was carried out:

Table 1.7. Analysis of Variance to test the effect of treatment on plant height measurements (cm) of cayenne pepper at 20 days of age.

SK	**DB**	**JK**	**KT**	**F count**	**F table**	
					5%	**1%**
Treatment	4	19,73	4,93	11,82	3,48	5,99
Error	10	4,17	0,417			
Total	14					

Because the calculated F value (11.82) > F table (3.48), the treatment had a significant effect on the height of cayenne pepper plants (*Cpsicum frutescens* L) at the age of 20 days.

To determine the effect of stem height (cm) on cayenne pepper plants between treatments (the median value of the treatment), the calculation was continued to the analysis (follow-up test). The form of follow-up test used was the Significant Difference Test (LSD). The results for each treatment can be seen in the table below:

Table 1. 8. Rate of maturity of tall young plants: Cabbage ripens at the age of 20 days after planting.

Treatment	**Rata-rata SD**
P_0	**20.1 ± 20.2 [a]**
P_4	**20.3± 20.3 [a]**
P_1	**21 ± 21 [b]**
P_2	**21.6 ± 21.7 [b]**

P 3	**23.3 ± 23.3 b**

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Description: Numbers followed by the same letter in the same column indicate no significant difference in the BNT test.

d. The fourth measurement of the height of the cayenne pepper plants at the age of 25 days after planting or 20 days after being given the extract of kepok banana peel (*Musa paradisiaca* L).

Table 1.9. Height of cayenne pepper plants (cm) at 25 days after planting.

Treatment	**Connected**			**Amount**	**Rate- rate**
	U1	U2	U3		
P_0	24	25	24	73	24,3
P_1	24	26	25	75	23
P_2	26	26	25	77	25,6
P_3	28	29	28	85	28,3
P_4	24	24	25	73	24,3
Amount	126	130	127	383	125,5

Based on table 1.9 above, it appears that the average height of cayenne pepper plants at the age of 25 days was the highest, namely 28.3 cm, which was found in treatment P_3. Furthermore, the lowest average height of cayenne pepper plants was 23 cm, which was found in treatment P_1 .

To determine the effect of administering kepok banana peel extract (*Musa paradisiaca* L) on the growth of cayenne pepper (*Capsicum frutescens* L) at the age of 25 days, the following variance test was carried out:

Table 1.10. Analysis of Variance to test the effect of treatment on plant height measurements (cm) of cayenne pepper at 25 days of age.

SK	**DB**	**JK**	**KT**	**F count**	**F table**	
					5%	**1%**
Treatment	4	33,04	8,26	10,72	3,48	5,99
Error	10	7,7	0,77			
Total	14					

Because the calculated F value (10.72) > F table (3.48), the treatment had a significant effect on the height of cayenne pepper plants (*Cpsicum frutescens* L) at the age of 25 days.

To determine the effect of stem height (cm) on cayenne pepper plants between treatments (the median value of the treatment), the calculation was continued to the analysis (follow-up test). The form of follow-up test used was the Significant Difference Test (LSD). The results for each

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treatment can be seen in the table below:

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Table 1.11. Average stem height of cayenne pepper plants at 25 days after planting.

Treatment	**Rata-rata SD**
P 4	**24,3 ± 23,01[a]**
P 0	**24.3± 24.3 [a]**
P2	**25.6 ± 25.7 [b]**
P 1	**26 ± 23 [b]**
P 3	**28.3 ± 28.3 [b]**

Description: Numbers followed by the same letter in the same column indicate no significant difference in the BNT test.

e. Calculation for the height of cayenne pepper plants (*Cpsicum frutescens* L) from 10-25 days after planting.

Table 1.12. Calculation for the height of cayenne pepper plants (*Cpsicum frutescens* L) from 10-25 days after planting.

H / P	10 days	15 days	20 days	25 days	**Amount**	**Rate- rate**
P 0	7,1	15,3	20,1	24,3	66,8	16,7
P 1	8,8	15,5	21	23	68,3	17,07
P2	8,1	16,6	21,6	25,6	71,9	17,9
P 3	9,3	17,6	23,3	28,3	78,5	19,6
P 4	7,8	16,3	20,3	24,3	68,7	17,1
Amount	41,1	81,3	106,3	125,5	354,2	88,37

Based on table 1.12 above, it can be seen that the average height of cayenne pepper plants at the ages of 10, 15, 20, and 25 days was the highest, namely 19.6 cm, which was found in treatment P 3 , then followed by P 2 , P 4 , and P 1, while the lowest average height of cayenne pepper plants was 16.7 cm, which was found in treatment P 0 .

Based on the research results, the discussion of plant stem height for the effect of giving kepok banana peel extract (*Musa paradisiaca* L) on the growth of cayenne pepper (*Capsicum frutescens* L) is clearly visible for each treatment by conducting observations using ANOVA.

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Observations on the stem height of cayenne pepper plants are conducted to determine their growth . Plant growth depends on water and nutrients in the soil.

The first ten days of observation showed that there was no effect on the height of the cayenne pepper plants, whereas for the 15th, 20th and 25th days of observation, there was a very significant effect on the height of the cayenne pepper plants.

For stem height (cm) calculated based on the analysis of variance, the average value starts at the age of 10 days, the calculated F value (1.28) < F table (3.48), at the age of 15 days the calculated F value (8.45) > F table (3.48), at the age of 20 days the calculated F value (11.82) > F table (3.48) and at the age of 25 days the calculated F value (10.72) > F table (3.48). Thus, it can be concluded that the administration of kepok banana peel extract has a significant effect on the growth of cayenne pepper plants at the age of 15, 20 and 25, while at the age of 10 days there is no effect.

CONCLUSION AND RECOMMENDATIONS

Based on the research results, the effect of Kepok banana peel extract on the growth of cayenne peppers was clearly evident for each treatment, as plant growth depends on water and soil nutrients. The application of Kepok banana peel extract significantly affected the growth of cayenne pepper plants. Stem height was significantly affected at 15, 20, and 25 days, while there was no significant effect at 10 days.

The suggestions that can be followed and implemented are as follows :

1. To the community to be able to take advantage of banana peel extract as a liquid fertilizer .
2. The community is expected to utilize waste to make useful and beneficial materials.
3. Researchers are expected to be able to continue this research on other species .

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