

THE RECONDITIONING GROWTH OF PRODUCTION OF CHILI THROUGH THE BANANA HUMP AND MIMBA LEAF EXTRACT

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Abstract: The growth regulators of gibberellin and cytokinins are found in banana hump extract, while natural pesticides are found in the neem leaf extract. These two active ingredients can condition the growth and yield of chilies. There have not been any publications on the use of banana hump extracts and neem leaves to increase the growth and production of chili plants. The writing of this research article aims to explore the diversity of Indonesia's biological resources, among others, sword stalk banana hump extract and neem leaves which can stimulate the growth and yield of red chilies. Data analysis used a randomized block design with two variables and 3 repetitions. The first treatment used banana hump extract which consisted of four percentage levels, namely zero, fifteen, thirty, and forty-five percent, and the second treatment used neem leaf extract which consisted of four percentage levels, namely zero, fifteen, thirty, and forty-five, percent. A total of 600 grams of banana hump granules and neem leaves plus 1 liter of methanol, concentrated to a volume of 250 ml were used in this study. The data discussed included plant height, crown width, leaf area, number of fruits, main branches, wet and dry weight of fruit, wet and dry weight of roots, the incidence of diseases and pests, colony diameter of *Colletotrichum capsici*. The administration of neem leaf extract had a significant effect on crown width 44 and 54 days after planting, while the leaf area had a significant interaction between 44 and 64 days after planting, the main branch had significant interaction between the ages of 54 days after planting, and the incidence of disease had a significant interaction between the ages of 44 days after planting. The findings of the study were that the neem leaf extract had a significant effect on growth, whereas the banana hump extract did not have a significant effect on production because during the five months of the study there was a long dry season, so there was a water deficit which was a limiting factor in the production of fruit formation.

Keywords: Red chili; growth regulator; natural vegetable

1. INTRODUCTION

1.1. Background

Chilli includes fruit vegetables which are additional flavoring ingredients with spicy side dishes. Almost all people need chili sauce after it is processed from raw chili. This condition causes the demand for chili to take place continuously. The cultivation of chili plants often gets problems, namely the presence of aphids and pests and anthracnose diseases on chili caused by the fungus *Colletotrichum capsici*. This study was different from previous studies because the factors discussed were the growth, production, and attack of aphids and anthracnose in chili plants after being given neem leaf extract and banana weevil. Previous studies discussed giving single-factor neem leaf extracts to aphids or diseases anthracnose, and giving banana hump extract to chili production is not a combination of giving both extracts on growth, production, and attack of pests and diseases.

A decrease in chili plant production can be caused by many factors including caused by some harmful fungus, namely anthracnose disease caused by *Colletotrichum capsici* and other fungus chili leaf spot of *Cercospora capsici*, fusarium wilt of *Fusarium oxysporum* f.sp capsici, cause fallopian disease of *Sclerotium rolfsii* (Yanti, 2019). The production of chili can be drastically reduced by these two intruding bodies, so this research is looking for alternatives in suppressing attacks through the administration of banana hump extracts and neem leaves.

The level of national chili needs to be increased from April to June 2019. Based on the Ministry of Agriculture records, the level of national chili needs in April 2019 reached 73,999 tons, in May 75,877 tons, and in June around 77,755 tons, whereas when compared to the national average production level, the need is still relatively fulfilled. Ismail noted, the national average chili production rate per month reached more than 100 thousand tons. As for the details of national production recorded, in April 2019 amounted to 110,707 tons, in May 113,032 tons, while in June it reached 115,357 tons (Republika, 2019).

The development of processed chili export volumes during the period of 2006-2014 has increased with an average value of 43.55% per year. The export quantity of Indonesian chili is always increasing from 1.54 thousand tons in 2006 to 14.35 thousand tons in 2015 although in 2011 it decreased to 8.6 thousand from the year 2010 which was 8.7 thousand tons. While on the other hand, the development of imported chili imports during the period of 2006-2015 increased with an average value of 12.97% per year (Yanuarti and Mudya, 2016).

Tackling pests and major diseases of chili with synthetic pesticides can reduce the level of attack, but the residues hurt the environment, such as water, soil, and air. An alternative way to overcome the residual danger is through the use of plant-based pesticides. Plant-based fungicides are environmentally friendly so they are not harmful to humans, easily biodegradable. The use of vegetable pesticides is relatively inexpensive, easy to obtain, and easy to use (Suleiman, 2010; Andani, 2017).

The study used a completely randomized design method with giving a solution of chili fruit and neem leaves with concentrations consisting of 0%, 5%, 10%, 15%, and 20% with 4 repetitions. Each replication consisted of 10 nymph aphids, then sprayed 3 x 24 hours. The results of the BNT level of $P \leq 0.05$ obtained the best concentration of 15% to suppress the growth of green aphids (*Aphis gossypii*) in chili plants (Rajab et al., 2018). Research to determine the effect of neem leaf extract as an insecticide on golden snails. The method used was a completely randomized design with the treatment being tested, namely the concentration of neem leaf extract consisting of 0.5%, 1%, 1.5%, 2%, 2.5%, and 4 repetitions. The results obtained that mortality increases with increasing concentration. The highest gold snail mortality occurred at a concentration of 2.5% (Karyadi, 2018.)The study was to find the best concentration of cocor duck leaf extract and neem seeds given to *Spodoptera litura*. The concentrations of cocor duck leaf extract and neem seeds tested were 1%, 2%, 3%, 4% respectively. the best concentration of *Azadirachta indica* seed extract 50 EC at a concentration of 2% with a mortality of 76.67% and decreases feeding activity, larvae weight, and lengthening the development time of *S. litura*. The administration of *K. pinnata* 50 EC extract was slightly toxic and insignificant feed consumption, weight, and duration of development of larvae compared to controls (Paramita et al., 2018). Research using the factorial RAL method consists of 2 factors, namely the application of neem leaf extract and castor leaf. There were 11 treatments with 3 repetitions. The treatments were (P0) PDA media without extract, (P1) PDA + media extract in distilled water, (P2) PDA media + extract inside 10% alcohol, (P3) PDA media + extract in alcohol 50%, (P4) PDA media + extract in 90% alcohol, (P5) PDA media + extract in 10% ethyl acetate, (P6) media PDA + extract in ethyl acetate 50%, (P7) PDA + media extract in ethyl acetate 90%, (P8) PDA media + extract in n-hexane 10%, (P9) PDA media + extract inside n-hexane 50% and (P10) PDA media + deep extract n-hexane 90%

(Ningsih et al., 2013). The result is obtained administration of neem leaf extract with 90% alcohol fraction, castor leaf extract with 10% alcohol fraction, 90%, 10% ethyl acetate fraction and 90% n-hexane fraction has the ability of a vegetable fungicide which can suppress *Colletotrichum capsici* in terms of colony growth and formation spores (Ningsih et al., 2013).

Research giving a combination of treatments between synthetic gibberellin and banana weevil extract can stimulate the growth and production of chilies. The results of the study using a combination treatment of synthetic growth regulators gibberellins (0, 50, 100, 150) ppm and banana hump extract (10, 20, 30) ml / l were proven to have a significant effect on chili yield and chili fruit weight per polybag. The 10 ml / l banana weevil concentration had a significant effect on plant height 20 days after transplanting and an average height of 10.56 cm at 60 days after transplanting (Deden, 2016)

The flowering phase of bean plants is also prone to abortion so that to prevent the loss of flowers can be applied to plant regulating substances, a type of hormone gibberellins (GA3). The hormone gibberellins can stimulate flower growth and fruit formation and strengthen the condition of the stems on bean plants. Also, the flowering phase of the hormone gibberellins has a role in preventing the loss of flowers (Senja, 2019).

This research, namely reconditioning the growth and production of red chilies by giving banana hump extract and neem leaf extract, has not found the same research from various articles. The research articles only focus on the use of synthetic gibberellins in chili plants, and not natural gibberellins from the banana hump. Likewise, the use of neem leaves as a natural fungicide on chili plants is only a single treatment or a combination of several natural fungicides, and not a combination of natural gibberellin growth regulators and natural fungicides, therefore this study was conducted. Several related studies, among others, the results of research

Application of synthetic GA3 treatment with 4 concentration levels, namely: 0 ppm (G0), 20 ppm (G1), 40 ppm (G2), and 60 ppm (G3) and see the effect on the flowering factor, quantity, and quality of curly red chili seeds. The GA3 concentration of 20 ppm had the effect of reducing the rate of loss in the cropping by 42.69%, increasing the number of flowers planted by 33.98%, and an increase in the number of fruit planted by 36.64% (Arifin & Prapto Yudono, 2012). The effect of paclobutrazol and GA3 on the growth and flowering of chilies and determine the proper concentration of paclobutrazol and GA3 on the growth and flowering of chilies. The study consisted of two factors, namely: the first factor the concentration of Paklobutrazol (P) with 4 levels, namely P0: 0 ppm, P1: 250 ppm, P2: 500 ppm, and P3 750 ppm. The second factor is the concentration of GA (G) with 3 levels, namely G0: 0 ppm, G1: 50 ppm, G2: 100 ppm, and G3: 150 ppm. The administration of Paclobutrazol and GA3 affects the growth and flowering of chili plants when applied independently. Paclobutrazol concentration 250 ppm and GA3 50 ppm concentration is the best concentrations in increasing growth and flowering (Adilah et al., 2020). Finally, the results of the study, the provision of 6 concentrations of neem leaf extracts 0%, 1%, 5%, 10%, 15%, 20% affected overcoming anthracnose disease of chilies. The best concentrations were 15% and 20% which in-vitro had the smallest colony diameter growth compared to concentrations of 0%, 1%, 5%, 10% (Muhammad Ali et al., 2008)

1.2 Research Problems

There has been no previous research on giving extracts from banana weevil and neem leaves to reconditioning the growth and production of red chilies, therefore this study was conducted.

1.2 Research Purposes

To determine the changes that occurred in the growth and production of red chilies after giving the extract from banana weevil and neem leaves in certain treatments.

2. METHODS

2.1 Time and Location

Field research was carried out on land belonging to Gapoktan Repeh Rapih, Sukamantri village, Taman Sari sub-district, Bogor. Laboratory analysis was carried out in the environmental biotechnology laboratory of PT Biodiversitas Biotechnology Indonesia and Semeao Biotrop, Bogor. Research began in May ending August 2019.

2.2 Tools and Material

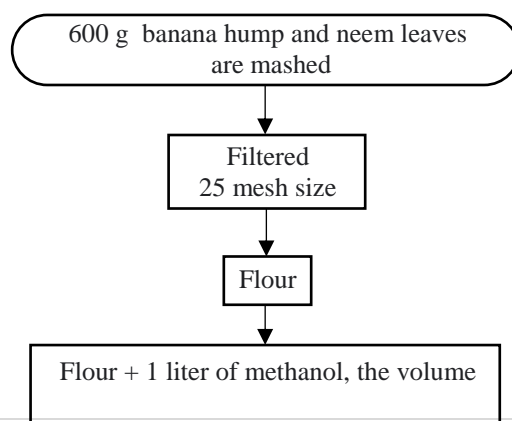
The tools used were seker, rotary evaporator, High-Performance Liquid Chromatography pH meter, analytical balance, tools glass for analyses, microscope, hygrometer, and thermometer. Materials needed for banana weevil, neem leaves, methanol, aqua dest, agar, dextrose, potatoes.

2.3 Methodology

The research consisted of two phases, firstly extracting banana weevil and neem leaves in the laboratory, and secondly giving extracts to red chili plants in farmers' fields.

2.3.1. *Extraction of banana weevil and neem leaves*

Making banana weevil extract. Weigh 600 grams of the banana weevil, then wash and wind dry it in the sun for 1 day. The caudex is cut into small sizes with a knife then blended and sieved with 25 mesh sizes. Flour oven at 60oC for 1 day. Flour plus 1 liter of methanol stirred every 2 hours left for 1 day then filtered and made the volume 1 l with the addition of 100% methanol. 1 liter of extraction is thickened with a rotary evaporator so that the volume is 250 ml. Furthermore, the plants are given according to the research design used. Making neem leaf extract. Weigh 600 grams of neem leaves, then wash and dry the wind in the sun for 1 day, then oven at 60oC for 12 hours. Leaves are blended and filtered measuring 25 mesh. The flour is in an oven at 60oC for 6 hours. The flour is added with 1 liter of methanol, stirred once every 2 hours, left for 1 day, then filtered and made into 1-liter volume with the addition of 100% methanol. 1 liter of extraction is thickened with a rotary evaporator so that the volume is 250 ml. Furthermore, the plants are given according to the research design used. The flow chart for the extraction of banana weevil and neem leaves until the growth regulator product is produced is shown in Figure 1.



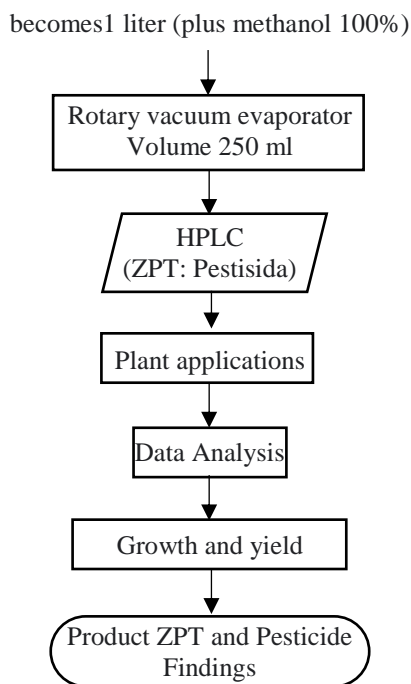


Figure 1 Extraction flow diagram of banana weevil and neem leaves.

The research method used a factorial randomized block experimental design, which consisted of two factors. The first factor is neem leaf extract consisting of four levels, namely: 0% (M0), 15% (M1), 30% (M2), 45% (M3). The second factor is banana weevil extract consisting of four levels, namely: 0% (P0), 15% (P1), 30% (P2), 45% (P3). The data obtained for each observed variable were tested by analysis of variance at the 5% level, if significantly different then continued using Duncan's Multiple Range Test.

2.3.2. Analysis Method

Determine the content of growth regulators for banana weevil extract using the HPLC tool belongs to the biodiversity laboratory, Bogor. Meanwhile to determine the types of pesticides and their content using Gas chromatography-mass spectrometry belongs to the municipal health laboratory, Jakarta

3. RESULTS AND DISCUSSION

3.1 RESULTS



Figure 2 Thickening of neem leaf extract and banana weevil with a rotary vacuum evaporator.

The concentration of the extracts of neem leaves and banana weevils using a Heidolph rotary evaporator with a rotation speed of 70 rpm and a temperature of 40 oC. The time required for thickening from a volume of 500 ml to 250 ml is 1 hour.

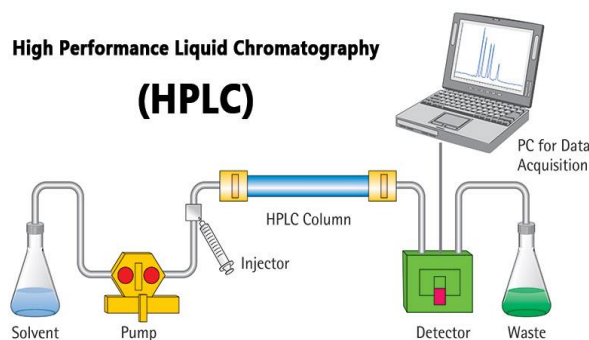


Figure 3 Figure of a tool to determine the content of gibberellin and cytokinin growth regulators from banana weevil extract with High-Performance Liquid Chromatography

High-performance liquid chromatography is used to determine gibberellin and cytokinin content in concentrated extract preparations from banana weevils.



Figure 4 Types and contents of neem leaf extract pesticides by Gass Chromatography-Mass Spectroscopy (GC-MS)

Gass Chromatography and Mass Spectroscopy (GC-MS) were used to determine the type and content of pesticides from the concentrated extract of neem leaves. Table 1 shows the effect of giving neem and banana weevil extracts on plant height variables.

Table 1 Average plant height

Treatment	Average plant height (cm)					
	14 DAP	24 DAP	34 DAP	44 DAP	54 DAP	64 DAP
Neem leaf extract						
M0	24,94	37,29	42,26	44,80	46,28	47,27
M1	25,41	38,30	44,64	47,92	49,79	50,19
M2	24,24	37,20	41,78	44,83	45,89	47,90
M3	22,79	35,42	40,52	45,06	46,64	46,87
Banana hump extract						
P0	23,07	35,54	40,17	43,39	45,33	46,74
P1	23,57	36,87	43,10	45,42	47,27	47,65
P2	25,49	38,04	42,79	46,30	47,41	48,09

P3	25,24	37,76	43,14	47,48	48,59	49,76
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Based on table 1, shows that the treatment of neem leaf extract and banana hump extract for all treatments did not produce results, but the average plant height for each treatment of neem leaf extract and banana hump extract starting from the age of 14 days after planting (14 DAP), 24 DAP, 34 DAP, 44 DAP, 54 DAP, 64 DAP, an increase in plant height. This is due to the active ingredients contained in the neem leaf extract and banana hump extract can stimulate plant height growth. Table 2 shows the effect of giving neem leaf extract and banana weevil on crown width.

Table 2 Average crown width

Treatment	Average crown width (cm)					
	14 DAP	24 DAP	34 DAP	44 DAP	54 DAP	64 DAP
Neem leaf extract						
M0	23,97	32,09	35,00	38,13a	40,41a	36,51
M1	25,02	33,23	38,94	43,69b	43,77b	39,68
M2	23,43	33,94	36,21	41,52b	39,70a	38,24
M3	22,80	31,79	34,15	41,96b	40,07a	37,91
Extract hump banana						
P0	23,50	30,92	33,69	39,83	39,62	37,77
P1	23,64	34,67	36,75	40,66	40,51	37,59
P2	24,58	32,88	38,06	41,48	41,54	37,66
P3	23,50	32,58	35,81	43,32	42,28	39,33

Note: The average value on the same line followed by the same letter is not significantly different according to the DMRT test at the 5% level.

Table 2 shows that the tabulated giving of neem and banana weevil extracts has an increase in crown width starting from the age of 14,24,34,44,54 days after planting, but decreasing at the age of 64 days after planting because the plants are old. Table 3 shows the effect of giving banana weevil extracts on the interaction of leaf area.

Table 3 Average interactions of plant leaf area

		Plant leaf area interaction (cm ²)				
	Treatment	P0	P1	P2	P3	
Age 44 DAP	M0	33,64 abcd	28,99 a	35,80 bcde	40,21 de	
	M1	33,17 bcde	30,98 ab	34,70 bcde	31,17 ab	
	M2	33,11 abc	39,75 cde	31,11 ab	36,27 bcde	
	M3	33,03 ab	40,70 e	31,61 ab	30,77 ab	
Age 64 DAP	M0	20,83 b	22,91 bcd	23,58 bcde	34,08 h	
	M1	21,07 b	20,98 b	31,25 gh	29,65 fgh	
	M2	15,34 a	26,40 cdef	22,16 bc	27,39 efg	
	M3	11,17 a	27,29 deg	22,69 bc	23,35 bcd	

Description: The average value in the same row followed by the same letter does not differ according to the DMRT test at the 5% level.

Based on table 3, there was an interaction at the age of 44 and 64 days after planting between the administration of neem leaf extract and banana weevil on leaf area variables. Table 4 shows the effect of giving neem leaf extract and banana weevil on the number of fruit.

Table 4 The average number of fruits

Treatment	The average number of fruits (g)		
	44 DAP	54 DAP	64 DAP
Neem leaf extract			
M0	4,86	8,78	5,14

M1	5,97	11,61	8,19
M2	4,89	8,94	6,36
M3	5,44	10,08	6,58
Banana hump extract			
P0	4,44	9,39	6,44
P1	5,42	9,72	6,31
P2	5,47	8,19	5,28
P3	5,83	12,11	8,25

The average treatment of Neem leaf extract and banana hump extract on the number of fruits for all ages does not indicate a difference. Table 5 shows the effect of giving neem leaf extract on the interaction of the number of main branches.

Table 5 Average main branch interactions

		Main branch interactions			
Treatment		P0	P1	P2	P3
54 DAP	M0	40,00ab	48,00abc	43,00abc	59,11bc
	M1	36,67ab	66,89c	41,33ab	83,77d
	M2	52,22bc	40,00ab	67,33c	43,33abc
	M3	46,89abc	33,33a	51,33abc	50,22abc

Description: The average value in the same row followed by the same letter does not differ according to the DMRT test at a 5% level.

The administration of neem leaf extract and banana weevil gave a significant interaction effect on the main branches aged 54 days after planting.

Table 6 shows the effect of giving neem leaf extract and banana weevil on fruit wet and dry weight.

Table 6 Average fruit wet weight and fruit dry weight (g)

Treatment	Average fruit wet weight (g)				The average dry weight of fruit (g)			
	44 DAP	54 DAP	64 DAP	74DAP	44 DAP	54 DAP	64 DAP	74 DAP
Neem leaf extract								
M0	26,63	18,04	16,00	11,96	21,63	13,68	13,42	6,33
M1	24,42	26,40	21,88	16,60	20,79	22,74	17,94	9,69
M2	20,53	25,76	20,40	17,29	16,31	21,31	16,10	9,92
M3	26,74	19,74	19,14	18,50	22,63	15,07	15,00	9,38
Banana hump extract								
P0	22,10	24,81	16,74	19,60	17,51	19,61	12,67	11,32
P1	26,54	23,72	20,13	14,83	22,17	19,40	16,79	8,00
P2	26,81	20,17	20,18	14,58	22,04	16,47	16,17	7,92
P3	22,86	21,25	20,38	15,33	19,63	17,32	16,83	8,08

The average treatment of neem leaf extract and banana hump extract does not give different results for all the wet weight of the fruit and dry weight of the fruit. The compound content in both extracts on average treatment does not stimulate the results on the wet and dry weight of the fruit. Table 7 shows the effect of giving neem and banana weevil extracts on root wet and dry weight.

Table 7 Average root wet weights and root dry weights

Treatment	Average root wet weight (g)				Average root dry weight (g)			
	44 DAP	54 DAP	64 DAP	74 DAP	44 DAP	54 DAP	64 DAP	74 DAP
Neem leaf extract								
M0	3,35	5,67	7,08	9,08	0,33	1,73	2,22	3,42
M1	3,58	6,50	6,50	11,42	0,36	1,78	2,08	3,67
M2	4,95	6,58	8,08	10,83	0,47	1,81	2,59	3,75
M3	4,99	7,25	6,75	12,00	0,49	1,85	2,22	4,33
Banana hump extract								

P0	4,25	6,83	6,50	10,25	0,40	2,01	2,13	3,42
P1	3,98	6,67	7,67	10,67	0,41	1,50	2,21	3,75
P2	4,21	6,33	7,42	10,42	0,39	2,00	2,71	3,75
P3	4,44	6,17	6,83	12,00	0,45	1,67	2,07	4,25

The average independent treatment of neem leaf extract and banana hump extract did not affect all variables of root dry weight and root wet weight. Table 8 shows the effect of giving neem leaf extract on the interaction of disease incidence in fruit.

Table 8 Average interaction of disease events in the fruit

		Interaction of disease occurrence in the fruit (%)			
Treatment		P0	P1	P2	P3
44 DAP	M0	1,01a	1,31a	4,17a	3,70a
	M1	3,70a	0,00a	3,70a	0,00a
	M2	20,37b	0,00a	0,00a	0,00a
	M3	0,00a	0,00a	0,00a	0,00a

Description: The average value in the same row followed by the same letter does not differ according to the DMRT test at the 5% level

The administration of neem leaf extracts and banana weevils gave a significant interaction effect on the incidence of disease 44 days after planting. Table 9 shows the effect of giving neem and banana weevil extracts on pest incidence.

Table 9. The average incidence of pest attack

		The average incidence of pest attack (%)					
Treatment		14 DAP	24 DAP	34 DAP	44 DAP	54 DAP	64 DAP
Neem leaf extract							
	M0	2,51	3,94	3,72	4,63	6,52	4,94
	M1	0,52	1,14	1,24	2,97	3,01	2,95
	M2	2,85	4,16	2,64	5,06	4,94	5,01
	M3	1,48	2,12	2,35	3,47	5,35	2,94
Banana hump extract							
	P0	1,60	2,43	2,22	4,84	4,65	4,06
	P1	2,94	3,98	3,38	4,12	5,16	3,85
	P2	1,66	3,37	2,71	4,09	5,70	4,34
	P3	1,17	1,58	1,63	3,07	4,32	3,59

The average self-treatment of Neem leaf extract and banana hump extract does not affect all the occurrences of pest attack. Table 10 shows the effect of neem leaf extract on the diameter development of *Colletotrichum capsici* fungi colonies.

Table 10 The average diameter of a mushroom colony *Colletotrichum capsici* on the media PDA days after inoculation

		The average diameter of a mushroom on a PDA (cm)			
Treatment		2 DAI	4 DAI	6 DAI	8 DAI
Neem leaf extract					
	M0	6,79	7,79	8,23	8,37
	M1	6,48	6,92	7,17	7,30
	M2	6,37	7,27	7,31	7,34
	M3	6,75	7,38	7,45	7,45

Explanation: DAI is the day after inoculation

The average concentration treatment of neem leaves in the age of the termination of the MO treatment compared with the treatment of M1, M2, M3 occurred the repression of colony diameter, although there is no difference in each treatment. The inhibitory percentage of

diameter colonies, with the formula: $THR = (D1-D2)/D1 \times 100\%$, where: THR: The relative resistance level of the test pathogenic colony with treatment D1 = Colony diameter Test at control D2 = Colony diameter on treatment (Kumar et al., 2007).

Furthermore, the level of isolation of the isolates of *Colletotrichum* spp. On the active ingredient fungicide can be seen from the relative barrier level (THR), to determine the criteria: very sensitive (SS): $THR > 90\%$, sensitive (S): $75\% < THR \leq 90\%$, Medium Resistance (RS): $60\% < THR \leq 75\%$, resistance (S): $40\% < THR \leq 60\%$, very resistant (SR): $THR \leq 40\%$ (Kumar et al., 2007)15 (25). Based on the formula obtained inhibitory colony diameter in table 11. Table 11 shows the effect of neem leaf extract on the inhibition of *Colletotrichum capsici* fungal colonies.

Table 11 Average inhibition of mushroom colony diameter in PDA media

The average inhibition of colony diameter <i>Colletotrichum Capsici</i> on PDA media (CM)						
Treatment	2 DAI	4 DAI	6 DAI	8 DAI	Total	Rata-rata
Neem leaf extract						
M1	6,19	11,17	12,88	12,78	43,02	10,76
M2	6,37	6,67	11,18	12,30	36,52	9,13
M3	0,59	5,26	9,48	10,99	26,23	6,58

The barrier level relative diameter of the largest colony is ordered starting treatment of M3, M1, M2. The relative resistance levels of the three treatments include the very resistant categories.

3.2 DISCUSSION

3.2.1. General conditions during the study

The average monthly climate conditions for the city of Bogor, starting from March, April, May, June, and July 2019, the data comes from BMKG 2019. Monthly climate average data is used as a guideline for the suitability of climatic factors during the 5 months of the study, namely: monthly average temperature 26.35 °C, average humidity 81.81% / month, average rainfall 24.61 mm / month, the average length of solar radiation is 7.79 / month = 233.7 / day = 9.7 hours/day, the average wind speed is 2.33 km/hour = 1.05 km/hour. The optimal temperature for growth is between 25-28 degrees Celsius, the optimal relative humidity for 80% growth, rainfall between 1,500-2,500 mm / year for 5 months of research = 300-500 mm / month, the intensity of sunlight with long radiation (photoperiodicity) 10-12 hours a day (Mahrus Ali, 2017).

3.2.2. Components of plant growth and production

Neem leaf extract concentration consists of 4 levels, namely: 1). M0 = 0% (100 ml water), 2). M1 = 15% (15 mg neem extract/100 ml water), 3). M2 = 30% (30 mg neem extract/100 ml water), 4). M3 = 45% (45 mg neem extract /100 ml water), and 4 levels of banana hump extract concentration consisting of 1). P0 = 0% (100 ml water), 2). P1 = 15% (15 mg hump extract/100 ml water), 3). P2 = 30% (30 mg hump extract /100 ml water), 4). P3 = 45% (45 mg hump extract/100 ml water). The respective percentages of neem leaf extract and banana hump extract and the calculations are guided by first making the two extracts of the mother liquor from neem leaves and banana hump. 600 grams of neem leaf flour are added with 1 liter of methanol, also 600 grams of banana hump flour are added with 1 liter of methanol, next then the two solutions are extracted using a rotary vacuum evaporator until a thick solution of 250 ml is formed. The percentage concentration of neem leaf extract and the percentage concentration of banana hump extract did not affect the increase in height of chili plants.

Neem leaf extract has a significant effect on crown width but does not occur in banana weevil extract. The administration of neem leaf extracts and banana weevils had a significant interaction effect on the leaf area at 44 days after planting. The administration of neem and banana weevil extracts had a significant interaction effect on the main branches at 54 days after planting. The administration of neem and banana weevil extracts had a significant interaction effect on disease incidence in chilies at 44 days after planting.

Some of the previous literature that supports the results of this study can be described in the following statement.

The application of liquid organic fertilizer in kapok banana hump concentration 10%, 20%, 30% does not affect the height of stems of okra plants (Wea, 2018).

The different results of the study were that the doses of banana hump consisting of 0, 10, 20, 30 grams/polybags had an impact on the increase in leaf length, the number of leaves, root weight, fresh weight, and dry weight of oil palm seedlings in the pre-nursery. The dose of 20 grams/polybag stimulated the increase in leaf length of oil palm seedlings in the pre-nursery compared without treatment, as well as for variables of leaf number, root weight, fresh weight, and plant dry weight (Sitinjak, 2019).

Giving 0%, 15%, 30%, 45% concentration from neem leaf extraction and banana hump extraction can increase plant crown increment at the age of 44 days, and 54 days after planting, while at the age of 14 days, 24 days, 34 days, and 64 days after planting did not increase the crown of the plant. Giving a combination concentration of 0%, 15%, 30%, 45% of neem leaf extraction and banana hump extraction, was able to increase leaf area at 44 days and 64 days after planting, but there was no increase in leaf area at 14 days, 24, days, 34, days, 54 days after planting. Giving a single concentration of 0%, 15%, 30%, 45% of neem leaf extraction and banana hump extraction, was not able to increase the number of fruit, wet fruit weight, dry fruit weight, wet and dry weight of shoots, and roots for all ages of observation. from 14, 24, 34, 44, 54, 64 days after planting.

This is because the extraction of banana humps containing natural growth regulators, namely: gibberellin 132.70 mg / L and cytokinins consisting of kinetin 102.17 mg / L, and zeatin 87.06 mg / L obtained from the results of environmental biotechnology laboratory analysis of PT Biodiversity Biotechnology Indonesia, Bogor City-West Java by using the method of high-performance liquid chromatography are estimated that the concentration is not sufficient to increase the growth and production of chili plants (source from the testing laboratory of PT Biodiversitas Bioteknologi Indonesia Tahun 2019).

Based on this laboratory analysis, it is felt that it is necessary to provide a growth regulator for banana hump extraction more than three times or to increase the concentration of growth regulator substance for banana hump extraction.

Giving a 45% solution concentration derived from the fermentation of local microorganisms of banana hump could increase the variables of plant height, number of leaves, number of productive branches, and fruit weight per plant compared to the control but did not affect the concentration of 30% (Azizy *et al.* 2020).

Giving 4 levels of neem leaf fermentation concentration, namely: 1). M0 = 0% (control), 2). M1 = 15% (15 ml neem + 85 ml water), 3). M2 = 30% (30 ml neem + 70 ml water), 4). M3 = 45% (45 ml neem + 55ml water). The concentration of banana hump fermentation consists of three varieties, namely: Ambon, kepok, and horn with a concentration of 30% (30 ml + 70ml water). The results showed that the fermentation treatment of three banana hump varieties had an effect on the variable of stem diameter, number of leaves, crown width, and fruit length, but did not affect the number of fruits, fruit weight, fruit diameter, and weight of chili plants (Tobing *et al.*, 2020).

4. CONCLUSIONS

Growth and production can be reconditioned through the application of banana weevil extracts and neem leaves which can be seen from a significant contribution to the growth of several variables, as well as the potential to increase chili production when water is available for plants.

Gibberellins and cytokinins did not affect the growth components of the variables of plant height, stem diameter, and canopy width, at 14, 24, 34, 44, 54, 64 days after planting, but the combination of gibberellin, cytokinins, and natural compounds of neem leaf extract affected leaf area at the age of 44 days, and 64 days after transplanting. Gibberellins and cytokinins did not affect the production components of the variables of fruit number, wet weight and dry weight of fruit, wet weight and dry weight of roots and canopy, but the combination of gibberellin and cytokinins affected the number of branches at 54 days after transplanting. The combination of growth regulators from gibberellin, kinetin, and natural compounds from neem leaf extracts had an effect on disease incidence at the age of the plant 44 days after planting. Gibberellins and cytokinins and natural compounds from neem leaf extract did not affect the incidence of pests. The combination of gibberellin, cytokinins, and natural compounds from neem leaf extract also did not affect disease incidence.

The growth and production of chili plants are influenced by climatic factors during the study, were at the time of the research there was a long dry season. Climatic factors that are not by the requirements for plant growth and production, namely: average humidity, too low average rainfall so that there is less water for the process of plant photosynthesis and plant metabolism which has an impact on the fruit formation process, the average sunshine intensity is less which also affects the photosynthesis process so that fruit formation and plant growth will be disrupted.

Banana weevil and neem leaves that will be used as extracts should not be dried in the oven, but drying should be done naturally in the morning sun so that there is no evaporation of active ingredients (growth regulators and pesticides). Planting chilies preferably in wet months, because water is the main component of weight building and other organs.

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