

CHAPTER 5

EXPEIMENT RESULT

5.1 Research Result Data

The experiment was done based on insecticidal effect of sulfur on fire ants (*Solenopsis sp.*) by using spraying method. In this experiment, three different concentrations (0.5%, 1.5% and 2.5%) of sulfur, 0.28% of malathion (as positive control) and aquades (as negative control) were used. These three experimental concentrations were chosen by seeing the results of the exploration tests which were done by using 1.5%, 2.5%, 3.5%, 5%, 7.5%, 10%, 25% and 50% concentrations of sulfur. Through the exploration tests, 2.5% of sulfur was found to have 100% killing effect towards fire ants. Hence, other experimental concentrations were reduced to 1.5% and 0.5%. The experiments were repeated for four times and the number of dead ants in each experiment was observed in every hour for first 6 hours and in 24th hour. The results were shown in tables below.

Table 5.1 Number of dead ants in the 1st repetition

Concentration Time	0.5% of Sulfur	1.5% of Sulfur	2.5% of Sulfur	Positive Control (0.28% of Malathion)	Negative Control (Aquades)
1 st hour	0	0	1	15	0
2 nd hour	1	2	5	15	0
3 rd hour	3	5	6	15	0
4 th hour	6	8	9	15	0
5 th hour	9	9	10	15	0
6 th hour	11	11	12	15	0
24 th hour	15	15	15	15	0

Table 5.2 Number of dead ants in the 2nd repetition

Concentration Time	0.5% of Sulfur	1.5% of Sulfur	2.5% of Sulfur	Positive Control (0.28% of Malathion)	Negative Control (Aquades)
1 st hour	0	0	0	15	0
2 nd hour	0	0	0	15	0
3 rd hour	2	4	2	15	0
4 th hour	4	6	6	15	0
5 th hour	8	9	9	15	0
6 th hour	11	10	10	15	0
24 th hour	15	13	15	15	1

Table 5.3 Number of dead ants in the 3rd repetition

Concentration Time	0.5% of Sulfur	1.5% of Sulfur	2.5% of Sulfur	Positive Control (0.28% of Malathion)	Negative Control (Aquades)
1 st hour	0	0	0	15	0
2 nd hour	0	0	2	15	0
3 rd hour	1	1	4	15	0
4 th hour	4	5	7	15	0
5 th hour	9	8	9	15	0
6 th hour	10	11	12	15	0
24 th hour	13	13	15	15	1

Table 5.4 Number of dead ants in the 4th repetition

Concentration Time	0.5% of Sulfur	1.5% of Sulfur	2.5% of Sulfur	Positive Control (0.28% of Malathion)	Negative Control (Aquades)
1 st hour	0	0	0	15	0
2 nd hour	0	0	0	15	0
3 rd hour	0	0	2	15	0
4 th hour	2	4	4	15	0
5 th hour	6	7	8	15	0
6 th hour	12	11	14	15	0
24 th hour	15	15	15	15	0

5.2. Insecticide Potency of Sulfur towards Fire Ants

Table 5.5. Insecticide Potency of Sulfur on Fire Ants

concentrations	hours	Mean	Std. Deviation	N
negative control	1	.0000	.00000	4
	2	.0000	.00000	4
	3	.0000	.00000	4
	4	.0000	.00000	4
	5	.0000	.00000	4
	6	.0000	.00000	4
	24	.0000	.00000	4
	Total	.0000	.00000	28
0.5%	1	.0000	.00000	4
	2	1.2500	2.50000	4
	3	8.7500	6.85390	4
	4	24.1675	7.39357	4
	5	49.5825	8.85798	4
	6	68.7500	10.66033	4
	24	1.0000E2	.00000	4
	Total	36.0714	36.44202	28
1.5%	1	.0000	.00000	4
	2	2.5000	5.00000	4
	3	14.5850	13.29021	4
	4	35.0000	6.38169	4
	5	51.2500	6.85390	4
	6	67.0825	8.64522	4
	24	1.0000E2	.00000	4
	Total	38.6311	35.27066	28

2.5%	1	1.2500	2.50000	4
	2	9.5825	12.04701	4
	3	20.8325	8.76916	4
	4	39.5850	9.06438	4
	5	55.8325	5.00056	4
	6	76.6650	13.87671	4
	24	1.0000E2	.00000	4
	Total	43.3925	35.07619	28
positive control	1	1.0000E2	.00000	4
	2	1.0000E2	.00000	4
	3	1.0000E2	.00000	4
	4	1.0000E2	.00000	4
	5	1.0000E2	.00000	4
	6	1.0000E2	.00000	4
	24	98.7500	2.50000	4
	Total	99.8214	.94491	28
Total	1	20.2500	40.92596	20
	2	22.6665	40.16563	20
	3	28.8335	37.81340	20
	4	39.7505	34.36245	20
	5	51.3330	32.89442	20
	6	62.4995	35.12060	20
	24	79.7500	40.92596	20
	Total	43.5833	42.12849	140

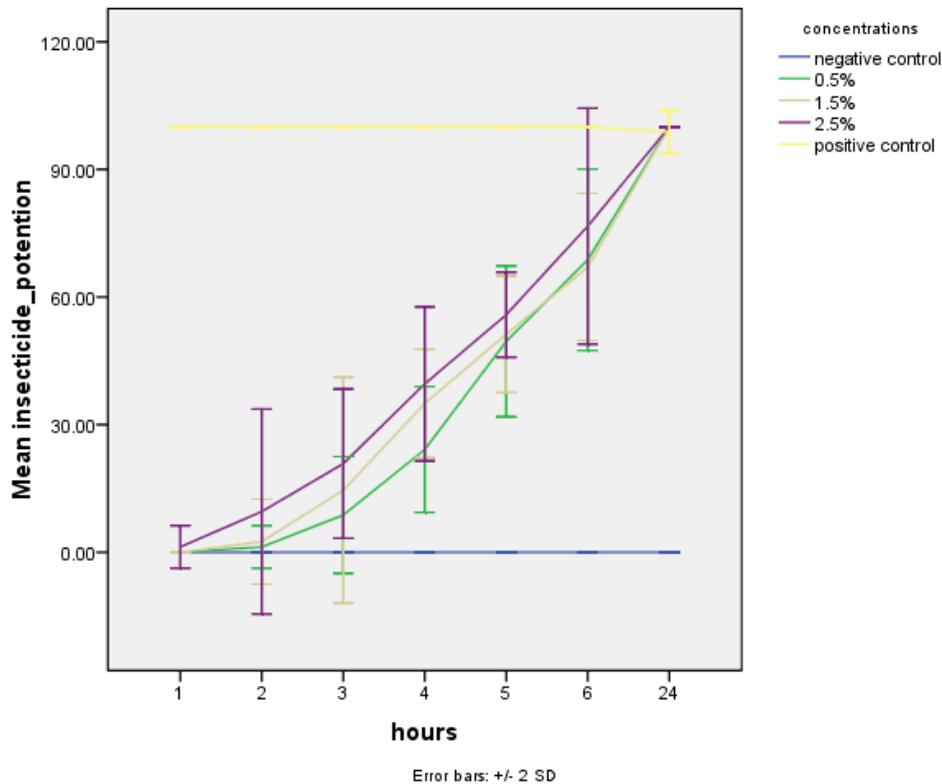


Figure 5.1. Line Chart of Insecticide Potency in Every Treatment per Hour

5.3 Data Analysis

The data acquired from this research was statistically analyzed by SPSS version 17.0. For this research, the appropriate statistical test was One Way Anova Test because the dependent variable (insecticidal potency) was a numeric type and there were two independent variables (time and concentration). Anova test can be used only if the data shows normal distribution and if the variances of the samples are homogenous. So Kolmogorov-Smirnov Normality Test and Levene's Homogeneity Test of Variance were performed on the research data to test for normality and homogeneity.

Based on the Kolmogorov-Smirnov Normality Test, the data distribution of this research showed a significant value of $p=0.200$ ($p>0.05$). Hence, the data has a normal distribution.

The significant value from Levene's Homogeneity of Variance Test was $p=0.067$ ($p>0.05$). It can be concluded that the data is homogenous.

Since the data had a normal distribution and was homogenous, it was eligible to be analyzed by using Anova test. From the result of the test (all p value = 0.000; $p<0.05$), it can be said that there is a significant difference of insecticidal potency on fire ants among all concentrations of sulfur in every hour.

The following statistical test was Pos Hoc Tukey test, a multiple comparison test which was done to know the differences between the groups. If p value of the test is less than 0.05, it can be said that there is significant differences between the groups.

According to the results obtained from this test, the insecticidal potency in all concentrations of sulfur (0.5%, 1.5% and 2.5%) was significantly different compared to negative control and positive control (i.e., $p<0.05$), meanwhile there was no significant difference in insecticidal potency between 0.5% of sulfur and 1.5% of sulfur ($p=0.478$; $p>0.05$).

And also the result of Pos Hoc Tukey Test for time variable showed that there was no significant difference in the insecticidal potency of sulfur in the 1st two hours ($p=0.848$; $p>0.05$).

Pearson correlation test is a statistical test performed to determine the correlation between dependent variable (insecticide potency or number of dead ants) and independent variables (time and concentration). Significant correlation is achieved at p value less than 0.05. The Pearson correlation coefficient (r value) shows us that the strength of correlation between the two variables of the

experiment (weak correlation if $r < 0.500$; moderate correlation if $r = 0.500-0.699$; strong correlation if $r = 0.700-0.799$; very strong correlation if $r > 0.799$).

The results of Pearson test showed that: there is a significant correlation between the concentration of sulfur and number of dead ants ($p=0.000$). In other words, as the concentration increases, the number of dead ants increases; there is a significant correlation between the time of exposure to sulfur and number of dead ants ($p=0.000$), that is, the longer the time of exposure, the stronger insecticidal effect of sulfur; the correlation coefficient (r value) for concentration is 0.786. This value shows us that the correlation between concentration and insecticide potency is strong; the correlation coefficient (r value) for time is 0.628. This value shows us that the strength of correlation between time and insecticide potency is strong.

So it can be concluded that insecticidal potency of sulfur on fire ants had significant correlation with both concentrations and time of exposure.

The Linear Regression test is a statistical analysis test that is performed to investigate the magnificence of independent variables (sulfur concentration and time of exposure) in affecting dependent variable (the insecticide potency). By doing this test, we can know the influence of external factors (i.e., temperature, light, hormonal status and health condition of fire ants) on the death of fire ants.

Based on the R square value in model summary table attached in appendix, the R^2 was equal to 0.743 which meant that 74.3% of dead fire ants were influenced by the sulfur, while 15.7% of were affected by external factors that were not controlled.

The linear regression test also gives an equation that can predict the insecticidal potency in any concentrations that are not observed. The formula of

regression based on the data acquired from this research is $y = 13.995 x_1 + 2.978 x_2 - 5.366$ where y = insecticide potency of sulfur, x_1 = concentration of sulfur, x_2 = time of exposure.

