CHAPTER 6

DISCUSSION

Based on the fact that sulfur is an effective insecticide and fungicide and less toxic to humans than many other synthetic insecticides, a research was conducted to test its insecticidal effect on fire ants (*Solenopsis sp.*) by using spraying method.

In this experiment, there were a total of five containers, each of which was sprayed with three different concentrations (0.5%, 1.5% and 2.5%) of sulfur, 0.28% of malathione (as positive control) and sterile water (as negative control). Then 15 fire ants were put into each container and the number of dead fire ants in each container was observed in 1^{st} hour, 2^{nd} hour, 3^{rd} hour, 4^{th} hour, 5^{th} hour, 6^{th} hour and in 24^{th} hour. The experiments were repeated for four times.

One-way Anova test for each hour was performed to analyze the effect of insecticidal potency of sulfur, and it showed that different concentrations of sulfur gave different insecticidal effects towards fire ants in every hour (all p value = 0.000; $p<0.05$).

The analysis was then, proceeded to Pos Hoc Tukey test to know which concentration groups had significant difference in insecticidal potency including positive and negative controls. This test told us that there were significant differences in insecticidal potency among all concentrations compared to negative control ($p=0.000$; $p<0.05$) and positive control as well ($p=0.000$; $p<0.05$), meanwhile 1.5% and 2.5% of sulfur have no significant difference in insecticidal potency ($p = 0.478$; $p>0.05$).

The results of Pearson correlation test for this research were p value = 0.000 for concentration against insecticide potency and p = 0.000 for time against

insecticidal potency respectively. It means that insecticidal potency (number of dead fire ants) had significant correlation with both sulfur concentration and time of exposure. The Pearson correlation coefficient for concentration (r=0.786) showed that the correlation between concentration and insecticide potency was strong. The correlation coefficient for time (r=0.628) showed that correlation between time and insecticide potency was also strong.

The Linear Regression test was used to know the influence of external factors that were not controlled on the insecticidal effect. Based on the R square value obtained from this test 74.3% of fire ants died due to sulfur while 15.7% was due to the influence of external factors. The linier regression test also produced the predictive equation ($y = 13.995\ x_1 + 2.978\ x_2 - 5.366$) that could be used to predict the insecticidal potency of any concentrations that were not observed, where y = insecticide potency; x_1 = sulfur concentration; x_2 =time of exposure.

According to the results of all above tests, it is clear that sulfur has an insecticidal effect on fire ants (*Solenopsis sp.)* yet it cannot compete with the potent insecticide, Malathion (0.28%), which is widely used in community.

Sulfur acts as an insecticide by disrupting the metabolic processes of fire ants that absorb it and by partially dissolving the newly secreted wax that makes part of their exoskeletons, softening them. As the concentration of sprayed sulfur increases, the number of dead ants increases. And the longer the time of exposure, the stronger insecticidal effect of sulfur.

The weakness of this study was that the external factors such as temperature, sunlight and humidity were not controlled. Moreover, physical wellbeing and other health problems of fire ants could have influence on insecticidal potency of sulfur.