Effect of Tobacco Pesticide on the Population of Major Pests and Yield of Groundnut and Sesame Intercropping Plantation
(Case at Jokekone Village, Taungdwingyi Township, Magway Region)

Khin Myint Mar
Ass. Prof. Dr. Khin Myint Mar
Associate Professor, Department of Zoology
University of Magway
Myanmar

Abstract: This study was conducted in field experiment of groundnut and sesame intercropping plantation in Jokekone Village, Taungdwingyi Township, Magway Region during December 2012 to March 2013. Two pesticides, the synthetic pesticide (Shweseta Brand, a mixture of N-cyano-N-methyl acetamidino) and tobacco pesticide (home-made) were tested for the control of major insect pests. The experimental design was replicated three times in pesticide-free and pesticide-affected plots. A plot measuring 2m x 2m was chosen for field experiment. In the present study, the results revealed that all the three species (Nezara viridula, Dysdercus cingulatus and Aulacophora foveicollis) of major pests were comparatively controlled by the synthetic pesticide as well as tobacco pesticide. The average yield of groundnut was (862.0 Kg/ha) in control plots, (1223.7 Kg/ha) in tobacco pesticide plots, and (1195.8 Kg/ha) in synthetic pesticides plots. The average yield of sesame seed was (305.8 Kg/ha) in control plots, (472.8 Kg/ha) in tobacco pesticide plots and (528.0 Kg/ha) in synthetic pesticide plots. According to the yield, the average yield of groundnut in tobacco and the synthetic pesticide treated plots was approximately the same and higher than that in control plots. The average yield of sesame in tobacco pesticide treated plots was slightly lower than that in the synthetic pesticide treated plots, but higher than that in control plots. It was suggested that the tobacco pesticide was equally effective as the synthetic pesticide in controlling the pest population and also in yield of crops. From the data obtained, it was suggested that bio-pesticide is cheap and easy access to farmers and ecofriendly to our environment.

Keywords: Intercropping, Nezara Viridula, Dysdercus Cingulatus, Aulacophora Foveicollis, Tobacco Pesticide, Yield.
1. INTRODUCTION

All over the world the use of pesticides is increasing because of the need to feed the world’s ever-expanding population while the amount of land available for food production is diminishing (Dugje et al., 2008). Pesticides are known to have played a significant role in the improvement of crop yields during the last four to five decades (Khan et al., 2010). The behavior of a pesticide in the environment depends on its stability, physico-chemical properties, the nature of the medium into which it is applied, the organisms present in the soil, and the prevailing climatic conditions (Graham-Bryce, 1981). Some of the negative effects of pesticide misuse include low crop yield, destruction of soil micro-fauna and flora, and undesirable residue accumulation in food crops (Edwards, 1986).

In advanced countries, strict pesticide regulation and enforcement mechanisms are put in place to ensure their safe use and proper handling. The control schemes for the sale and use of pesticide is based on scientific data that support its effectiveness against target pests and not unduly hazardous to human health and the environment. Pesticide use in most developing countries is, however, based solely on manufacturer’s recommendations. These recommendations include data on toxicological and environmental properties of the pesticides. Although useful, those may not be appropriate under local conditions since they were tested under different agro-climatic and socio-cultural conditions. Over the last decades, farmers and growers have changed the way of food production in order to meet the expectations of consumers, governments and more recently, food processors and retailers. In doing so, they have made many changes to the way they farm, including the extensive use of pesticides. They have done this principally to prevent or reduce agricultural losses to pests, resulting in improved yield and greater availability of food, at a reasonable price, all year round (Raghavendra et al., 2006).

Intercropping is “the cultivation of two or more crops at the same time in the same field”. A wide range of crops such as tomato-maize, maize-legume, maize-velvet bean, maize-cowpea in Africa and pigeon pea-maize, maize-potato in Asia can be used for intercropping. Generally there are four basic types of intercropping: namely mixed intercropping, row intercropping, strip intercropping and relay intercropping (Ramert et al., 2001). It is a traditional practice that has persisted over years among the farming community of the developing world. Mixed cropping and intercropping are known to reduce insect pest infestations. Natural enemies of the insect pests may be enhanced by mixed cropping through improved shelter, humid conditions and possible availability of food sources (honey or nectar) (Shivaprasad, 2008).

Myanmar is developing country based on agriculture. Sesame and groundnut plants are major oil seed crops in the middle region, the dry zone of Myanmar. Therefore, Magway Region is so called “large pot of oil” in Myanmar. For many years, crop rotations have been recommended in Myanmar because of the temporal diversity they provide in plant species and their resource requirements. Intercropping is an important planting system in the study area where mixed intercropping of groundnut and sesame plants was commonly farmed.

Moreover, it is cheap and easy to access for rural people. For the above reasons, the field experiment was conducted to investigate the effects of tobacco mixed with other ingredients as home-made pesticides on population dynamics of major pests on groundnut and sesame intercropping field and the yield. Therefore, the objectives of this study were to introduce the efficiency of tobacco pesticides (home-made) to gardeners and farmers, to compare the effects of tobacco pesticide with the synthetic pesticides on the population of some pests of groundnut and sesame and to compare the yield of groundnut and sesame in the experimental plots.

2. REVIEW OF LITERATURE

Glover-Amengor and Tettch (2008) concluded that the yield trends observed so far showed that lower rates of application of pesticides may be more desirable as they reduce the pesticide burden on the environment and are more economical as far as cost of pesticides is concerned. Lindane did not have any advantage over the other pesticides as it caused the least increase in yield. Moreover, the pesticides also
affect the microbial population of the soil even though micro-organisms are responsible for most of the degradation of pesticides in the soil.

Aswathanarayanareddy et al., 2006 reported that all the intercropped treatments were significantly superior in reducing the pest infestation on chilli and had significantly higher yield compared to sole crop of chilli. According to Mogahed (2003) the average yield of potato was enhanced significantly in intercropped plots compared to those, with sole crop of potato.

This may be attributed to presence of certain volatile substance present in the intercrop plants that might restrict colonization of the main crops by important pests. However, further work is needed to elucidate the underlying phenomenon more comprehensively.

Aye Aye Maw (2007) reported the effectiveness of neem pesticide on the population of some insect pests of groundnut and Mungbean cultivation, Magway Region, Myanmar.

In 2012, Deshmukh et al. concluded that nicotinic acid derivatives showed the promising activities against green peach aphids, *Myzus persicae*, American boll worm, *Helicoverpa armigera* and stored grain pest, maize weevil *Sitophilus zeamais*.

In 2012, Meles et al. investigated the insecticidal and repellent properties of selected medicinal plants collected from Sofoho, Axum, North East Africa. In which tree tobacco has powerful chemicals like nicotine and anabasine. These chemicals are important in repelling and killing of insects but need other investigation of the insecticidal property of this extract.

3. MATERIALS AND METHODS

3.1 Study area

The experiment was carried out in Joke Kone Village, Taungdwingyi Township, Magway Region (19° 59'1.8" N latitude and 95° 23' 14.6" E longitude (Fig. 1). Experiment was conducted from December 2012 to February 2013.

![Fig. 1 Map of the study area (Jokekone Village, Taung dwin gyi Township, Magway Region)](image-url)
3.2 Experimental design and treatments

Field experiment was carried out during December 2012 to March 2013 at the Jokekone Village, Taung dwin gyi Township, Magway Region. Pesticide treatments consisted of the application of synthetic pesticide (a mixture of N-cyano-N-methyl acetamidine, Shweseta Brand) and tobacco pesticides (home-made) for the control of insect pests. Control plots received water only. The experimental design was replicated three times in pesticide-free and pesticide-affected plots.

A plot measuring 2m x 2m was chosen for field experiment. Each plot with 3.75 cm between the plots was to minimize inter-plot interference. No fertilizer was applied in this experiment, however, the fertilizer residues of the previous crops were probably remained in the field. The number of groundnut and sesame plants was approximately the same in all control and pesticide treated plots.

Preparation of Tobacco pesticides (home-made)

Firstly, dried tobacco (125.11kg) and Menthol (13.34kg) were ground. Then a total of dried tobacco, and menthol powder, nitrogen fertilizer (967.54 kg), detergent (0.5 Kg), monosodium glutamate (0.453592 kg) were mixed thoroughly, immersed in a container with water (80 liter) and sealed for seven days. After that home-made pesticide was ready to use and diluted with water in a ratio of (1: 25).

Application of pesticides

The two pesticides were sprayed beginning two weeks after emergence of pests. Spraying was done in evening when it was cool and not windy to avoid pesticide drift. The pesticide solutions were sprayed two times to the experimental plots uniformly on the plants at 2-weekly intervals until harvesting was completed. During the first spraying time, the average temperature in the experimental plots was about 27˚C and the second spraying time that in the experimental plots was about 25˚C.

Insect collection and identification

The pest species from experimental plots were collected randomly by hand picking and insect net. The collected specimens were placed in the plastic containers and transported to Department of Zoology. Then, the specimens were identified following after (Nair, 1995 and Ghosh, 1940).

Statistical analysis

Data obtained was analyzed using Microsoft Excel (2013). Descriptive statistics, the mean number of pests and percent of crop yield, were presented.

4. RESULT

4.1 Mean number of insect pest population

In the experiment, three species of insect pest viz. *Dysdercus cingulatus*, *Aulacophora foveicollis* and *Nezara viridula* were recorded as the adult stage on the sesame groundnut intercropping planation. Traditional races of sesame (black sesame) and groundnut (twin ta ni) were planted for 3 months. The efficiency of tobacco pesticide (home-made) was tested comparitively with that of synthetic pesticide (shweseta Brand) which was popularly used in Myanmar. For the total of six times of specimen collection, pest species were collected during the present study (initial 1 times, tested 4 times and just before harvest 1 time) (Table 1).

Before the first spraying time, the mean number of *Dysdercus cingulatus* was 2.33/per plot in control plots, 1.67/per plot in tobacco pesticide treated plots and 2.00/ per plot in synthetic pesticide treated plots. After the first spraying time, the mean number of *Dysdercus cingulatus* was 2.33/per plot in control, 1.33/per plot in tobacco pesticide and 1.33/per plot in synthetic pesticide. Before the first spraying time, the mean number of *Aulacophora foveicollis* was 1.67/per plot in control, 1.67/per plot in tobacco pesticide and 1.67/per plot in synthetic pesticide. After the first spraying time, the mean number of *Aulacophora foveicollis* was 2.67/per plot in control, 1.33/per plot in tobacco pesticide and 1.33/per plot in synthetic pesticide. Before the first spraying time, the mean number of *Nezara viridula* was 5.33/per plot in control, 5.33/per plot in tobacco pesticide and 5.00/per plot in synthetic pesticide. After the first spraying time, the mean number of *Nezara viridula* was 5.33/per plot in control, 2.67/per plot in tobacco pesticide and 2.33/per plot in synthetic pesticide (Fig. 2).
Table 1. Number of pests collected in the experimental plots during first and second spraying time

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C1  C2  C3  Tp1  Tp2  Tp3  Sp1  Sp2  Sp3</td>
<td>C1  C2  C3  Tp1  Tp2  Tp3  Sp1  Sp2  Sp3</td>
</tr>
<tr>
<td>1</td>
<td>Dysdercus cingulatus</td>
<td>2  3  2  2  1  2  2  3  1</td>
<td>3  2  2  1  2  1  2  1  1</td>
</tr>
<tr>
<td>2</td>
<td>Aulacophora foveicollis</td>
<td>2  1  2  2  2  1  1  2  2</td>
<td>5  2  1  1  1  2  2  1  1</td>
</tr>
<tr>
<td>3</td>
<td>Nezara viridula</td>
<td>7  5  4  9  3  4  6  5  4</td>
<td>7  3  6  4  2  2  3  2  3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C1  C2  C3  Tp1  Tp2  Tp3  Sp1  Sp2  Sp3</td>
<td>C1  C2  C3  Tp1  Tp2  Tp3  Sp1  Sp2  Sp3</td>
</tr>
<tr>
<td>1</td>
<td>Dysdercus cingulatus</td>
<td>2  1  1  3  1  1  4  1  2  3  2  2  0  1  0  1  0  0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Aulacophora foveicollis</td>
<td>1  2  2  3  1  1  2  3  2  2  3  2  1  0  1  0  0  1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Nezara viridula</td>
<td>4  3  3  5  2  3  2  6  5  5  6  5  2  1  2  1  2  0</td>
<td></td>
</tr>
</tbody>
</table>

C- control; Tp- Tobacco pesticide; Sp- Synthetic pesticide

Fig. 2. Number of pests collected in the experimental plots during the first spraying time

Before the second spraying time, the mean number of *Dysdercus cingulatus* was 1.33/per plot in control, 1.67/per plot in tobacco pesticide and 2.33/per plot in synthetic pesticide. After the second spraying time, the mean number of *Dysdercus cingulatus* was 2.33/per plot in control, 0.33/per plot in tobacco pesticide and 0.33/per plot in synthetic pesticide. Before the second spraying time, the mean number of *Aulacophora foveicollis* was 1.67/per plot in control, 1.67/per plot in tobacco pesticide and 1.67/per plot in synthetic pesticide. After the second spraying time, the mean number of *Aulacophora foveicollis* was 2.67/per plot in control, 0.33/per plot in tobacco pesticide and 0/per plot in synthetic pesticide. Before the second spraying time, the mean number of *Nezara viridula* was 3.33/per plot in
control, 3.33/per plot in tobacco pesticide and 4.33/per plot in synthetic pesticide. After the second spraying time, the mean number of *Nezara viridula* was 5.33/per plot in control, 1.67/per plot in tobacco pesticide and 1.00/per plot in synthetic pesticide (Fig. 3).

![Number of pests](image)

Fig. 3. Number of pests collected in the experimental plots during the second spraying time

### 4.2 Average of yield of groundnut and sesame

The crops were harvested when they were fully matured; sesame was firstly and groundnut secondly harvested. The yield of seeds per plot was weighed and recorded. The results were expressed as kg per hectare.

The average yield of groundnut was (862.0 Kg/ha) in control plots, (1223.7 Kg/ha) in tobacco pesticide plots, and (1195.8 Kg/ha) in synthetic pesticides plots. The average yield of sesame seed was (472.8 Kg/ha) in control plots, (305.8 Kg/ha) in tobacco pesticide plots and (528.0 Kg/ha) in synthetic pesticide plots. The percent yield of groundnut was 37% in tobacco treated plots and the synthetic pesticide treated plots each while that was 26% in control plots. The percent yield of sesame was 36% in tobacco and 41% in the synthetic pesticide treated plots while that was 23% in control plots.

### 5. DISCUSSION

Since nearly 300 years ago the tobacco extract as a plant spray in parts of Europe. Throughout the 18th century, tobacco, in crude form, as an aqueous extract or as a dust, was employed as an insecticide. Many scientists reported that water extract of tobacco leaves have been used to protect seeds and plants to control plum curculio on nectarine trees. Since 1690, tobacco was employed as a contact insecticide and nicotine fumigation was performed by heating tobacco and blowing the smoke on infected plants. Tree-tobacco has powerful chemicals like Nicotine and anabasine. These chemicals are important in repelling and killing of insects (Meles *et al.*, 2012).

In this experiment, tobacco pesticide and the synthetic pesticide were applied to control the population of three major pests viz., *Nezara viridula*, *Dysdercus cingulatus* and *Aulacophora foveicollis*. The mean number of *N. viridula* was the highest in all experimental plots before the first spraying time (date, 28.7.2012). It was followed by *D. cingulatus* and *A. foveicollis*. After the first spraying time, the mean number of the pests was slightly lower than that before spraying in all experimental plots.

Before the second spraying time (date, 4.8.2012), the mean number of *N. viridula* was also fairly high in all experimental plots and followed by *D. cingulatus* and *A. foveicollis*. After the second spraying time, the mean number of *N. viridula* was very much lower in all plots treated with tobacco pesticide and the synthetic pesticide. However, the mean number (5.33/plot) of *N. viridula*, (2.67/plot) of *A. foveicollis* and (2.33/plot) of *D. cingulatus* were found in control plots. After the second spraying time, only the mean number (0.33/plot) of *D. cingulatus* was found in all tobacco pesticide treated plots and the synthetic...
pesticide treated plots. Only the mean number (0.33/plot) of A. foveicollis was also present in tobacco pesticide treated plots and no pests in the synthetic pesticide treated plots. Only the mean number (1.67/plot) of N. viridula was present in tobacco pesticide treated plots and the mean number (0.33/plot) in the synthetic pesticide treated plots.

In 2012, Deshmukh reported nicotine or related compounds give significant effect on toxicity to the stored grain pests.

In the present study, all the three species of major pests were comparatively controlled by the synthetic pesticide as well as tobacco pesticide (home-made).

According to yield, the percent yield of groundnut was 37% in tobacco treated plots and the synthetic pesticide treated plots each while that was 26% in control plots. The percent yield of sesame was 36% in tobacco and 41% in the synthetic pesticide treated plots while that was 23% in control plots. According to yield, the average yield of groundnut in tobacco treated plots and the synthetic pesticide treated plots was the same and higher than that in control plots. The average yield of sesame in tobacco pesticide treated plots was slightly lower than that in the synthetic pesticide treated plots, but higher than that in control plots.

But, it needs further investigation in the insecticidal property of this extract. From the present work, it was suggested that the population of three major pests can be controlled efficiently by tobacco pesticide as well as the synthetic pesticide. The use of tobacco as pesticides could effectively produce low cost with greater profit than those of the other pesticides.

6. CONCLUSION

This study concludes that: 1) All three species of major pests can be relatively controlled by the tobacco pesticide (home-made) as well as synthetic pesticide. 2) This study proved that insect pests can be managed effectively with bio-pesticide. 3) According to the yield, the average yield of groundnut and sesame in tobacco and the synthetic pesticide treated plots was probably the same yield and higher than that in control plots. Furthermore, it was suggested that bio-pesticide is cheap and easy access to farmers and ecofriendly to our environment.

7. RECOMMENDATION

a. Farmers should use home-made pesticide for the control of major pests.
b. Farmers should intercrop other crops with groundnut.
c. Farmers should work hard to improve the quality of biopesticides.

8. REFERENCES


