

## BIBLIOGRAPHY

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## ABSTRACT

This research was conducted purposely to determine the insecticidal efficacy of White flag for the control of diamondback moth and white fly and to determine should white flag is phytotoxic in cabbage.

The extract of white flag and varying water dilution ratio are the treatments and they are as follows: 1:0, 1:1, 1:2, 1:4 and 1:8. Untreated was included to serve as the basis for comparison while Selecron with the recommended rate of 30 ml/ 16 li water was the standard insecticide.

The results of the research indicated the weak control of all the treatments of White flag at the rates 1:0, 1:1, 1:2, 1:4 and 1:8 dilution ratio against DBM and white fly of cabbage. As a result, all the treatments were moderately damaged comparable with the untreated while the damage on the standard treatment of Selecron was small to negligible. White flag are phytotoxic at the rates of 1:0, 1:1 and 1:0 dilution ratio while the lower rates at 1:4 and 1:8 dilution ratio were non phytotoxic. Highest yield of good quality were gathered on the standard treatment of Selecron insignificantly better with the treatments of Whiteflag at the rates of 1:2, 1:4 and 1:8 dilution ratio.

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## RESULTS AND DISCUSSION

### Count of DBM Larva

The count of DBM larva as affected by the treatment is presented in data Table 1. The data table presents the relatively higher count of DBM larvae in all the treatments of White flag with the dilution rates of 1:0, 1:1, 1:2, 1:4, 1:8 insignificantly different with the untreated during the scheduled first until the third assessments. The same level of insect count was recorded on the standard treatment of Selecron. But as the fourth assessment was done, the count of DBM larvae on the standard treatment of Selecron and the treatments of White flag with the dilution rates of 1:2 and 1:4 were recorded to be significantly lower in comparison with the untreated. On the other hand, highest count of larvae was recorded on the most diluted treatment of White flag at 1:8 ratio insignificantly different with the untreated. It was likewise observed that the larval count on the two highest rates of White flag with the dilution rates of 1:0 and 1:1 were relatively lower insignificantly different with the standard treatment of Selecron and significantly lower than the untreated. Except for the rates of White flag with the dilution ratio of 1:2, the scheduled fifth assessment indicated the generally small count of DBM larvae in all the treatments of White flag with the dilution ratio of 1:0, 1:1, 1:4 and 1:8 comparatively similar with the standard treatment of Selecron and significantly lower in comparison with the untreated.



Table1. Count of DBM larva /10 plants as affected by the treatments

| TREATMENT     | RATES OF<br>WHITEFLAG : H <sub>2</sub> O<br>RATIO | SEQUENCE OF ASSESSMENTS |                 |                 |                 |                 |
|---------------|---------------------------------------------------|-------------------------|-----------------|-----------------|-----------------|-----------------|
|               |                                                   | 1 <sup>st</sup>         | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 5 <sup>th</sup> |
| T1-Whiteflag  | 1:0                                               | 1.67a                   | 3.00a           | 2.33a           | 1.00b           | 0.66b           |
| T2-Whiteflag  | 1:1                                               | 2.33a                   | 2.67a           | 2.00a           | 1.67b           | 1.00b           |
| T3-Whiteflag  | 1:2                                               | 4.33a                   | 3.33a           | 3.00a           | 0.33b           | 1.33ab          |
| T4-Whiteflag  | 1:4                                               | 1.67a                   | 3.33a           | 2.67a           | 0.67b           | 1.00b           |
| T5- Whiteflag | 1:8                                               | 2.33a                   | 4.00a           | 3.67a           | 4.00a           | 2.00ab          |
| T6-Selecron   | 3tbsp/16 L H <sub>2</sub> O                       | 1.00a                   | 3.33a           | 2.67a           | 0.67b           | 0.33b           |
| T7-Untreated  |                                                   | 3.33a                   | 4.33a           | 4.00a           | 2.33ab          | 3.33a           |

Means within each vertical column followed by the same letter are not significantly different at 0.05 DMRT

### Count of Whitefly

The population of whitefly based on the rating scale of 1-9 is presented in data Table 2. The data table presents the presence of whitefly in all the treatments of White flag with the dilution rates of 1:0, 1:1, 1:2, 1:4, 1:8, the standard treatment of Selecron which were insignificantly different with the untreated during the scheduled first until the second assessments. But as the sixth assessment was done, the count of whitefly showed treatment differences where there was a least count on the standard treatment of Selecron significantly lower than the untreated. The count of whitefly in all the treatments of White



flag was insignificantly different with the untreated. However, as the assessment was continued until the scheduled seventh assessment, very obvious that the count of Table 2.

Population of whitefly in rating scale of 1-9 as affected by the treatments

| TREATMENT      | RATES OF<br>WHITE<br>FLAG : H <sub>2</sub> O<br>RATIO | SEQUENCE OF<br>ASSESSMENTS |                 |                 |                 |                 |                 |                 |        |
|----------------|-------------------------------------------------------|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--------|
|                |                                                       | 1 <sup>st</sup>            | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> | 5 <sup>th</sup> | 6 <sup>th</sup> | 7 <sup>th</sup> |        |
| T1-White flag  | 1:0                                                   | 2.20a                      | 2.20a           | 4.0a            | 2.10c           |                 | 2.07b           | 1.67a           | 1.13c  |
| T2-White flag  | 1:1                                                   | 2.40a                      | 2.70a           | 3.8ab           | 2.73a           |                 | 2.60a           | 2.06a           | 1.33c  |
| T3-White flag  | 1:2                                                   | 2.20a                      | 2.70a           | 3.7ab           | 3.06a           |                 | 1.93b           | 2.33a           | 1.73b  |
| T4-White flag  | 1:4                                                   | 2.33a                      | 2.30a           | 3.4bc           | 2.80a           |                 | 2.53a           | 2.40a           | 1.87ab |
| T5- White flag | 1:8                                                   | 2.40a                      | 2.30a           | 3.7ab           | 3.0a            |                 | 2.60a           | 2.33a           | 2.13a  |
| T6-Selecron    | 3tbsp/16 L<br>H <sub>2</sub> O                        | 2.33a                      | 2.70a           | 3.06c           | 2.33b           |                 | 2.67a           | 2.20a           | 1.80a  |
| T7-Untreated   |                                                       | 2.13a                      | 2.40a           | 3.9ab           | 2.86a           | 2.80a           | 2.53a           | 2.20a           |        |

Means within each vertical column followed by the same letter are not significantly different at 0.05 DMRT

whitefly was small to negligible comparable with the standard treatment of Selecron and significantly smaller than the untreated.

### Degree of Insect Damage

The insect damage as affected by the treatments is presented in data Table 3. The data table presents the damaged treatments of White flag. All the dosage treatments of White flag with the dilution rates of 1:0, 1:1, 1:2, 1:4 and 1:8 were damaged. At first, the damage was recorded to be slight to moderate but worsen as the assessment was continued during the scheduled second assessment at 50DAT. Within this time span of

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assessment, the damage in all the treatments of White flag was insignificantly different with the untreated while the damage on the standard treatment of Selecron were generally

Table 3. Degree of insect damage (rating scale of 1-9) as affected by the treatments

| TREATMENT      | RATES OF WHITE FLAG<br>: H <sub>2</sub> O RATIO | SEQUENCE OF ASSESSMENT |                 |
|----------------|-------------------------------------------------|------------------------|-----------------|
|                |                                                 | 1 <sup>st</sup>        | 2 <sup>nd</sup> |
| T1-White flag  | 1:0                                             | 3.67ab                 | 5.67ab          |
| T2-White flag  | 1:1                                             | 4.33ab                 | 6.33ab          |
| T3-White flag  | 1:2                                             | 3.67ab                 | 5.67ab          |
| T4-White flag  | 1:4                                             | 4.33ab                 | 6.33ab          |
| T5- White flag | 1:8                                             | 3.67ab                 | 5.67ab          |
| T6-Selecron    | 3tbsp/16 L H <sub>2</sub> O                     | 1.67b                  | 3.67b           |
| T7-Untreated   |                                                 | 5.00a                  | 7.00a           |

Means within each vertical column followed by the same letter are not significantly different at 0.05 DMRT

small to slight significantly smaller than the untreated and in all the treatments of White flag.

#### Phytotoxicity

The phytotoxicity as affected by the treatments is presented in data Table 4. It is clearly presented in the data table the phytotoxicity effect of White flag on the crop cabbage. Among the five treatments of White flag, the extreme and severe phytotoxicity was observed from the treatments with the dilution rates of 1:0 and 1:1. Slight phytotoxicity was recorded on the treatment of White flag with the dilution ratio of 1:2.



Table 4. Phytotoxicity (rating scale of 1-9) as affected by the treatments

| TREATMENT      | RATESWHITE FLAG :<br>H <sub>2</sub> O RATIO | 1 <sup>ST</sup> AND LAST<br>ASSESSMENT |
|----------------|---------------------------------------------|----------------------------------------|
| T1-White flag  | 1:0                                         | 9.00a                                  |
| T2-White flag  | 1:1                                         | 7.00a                                  |
| T3-White flag  | 1:2                                         | 3.00b                                  |
| T4-White flag  | 1:4                                         | 1.00b                                  |
| T5- White flag | 1:8                                         | 1.00b                                  |
| T6-Selecron    | 3tbsp/16 L H <sub>2</sub> O                 | 1.00b                                  |
| T7-Untreated   |                                             | 1.00b                                  |

Means within each vertical column followed by the same letter are not significantly different at 0.05 DMRT

the treatments of White flag where there was no phytotoxicity observed were the treatments with the dilution ratio of 1:4 and 1:8 comparably similar with the standard treatment of Selecron and the untreated.

#### Classification of Harvest

The quality of harvest as affected by the treatment is presented in data Table 5. It is presented in the data table the 100% class A harvest (sound or no damage harvest) on the treatments of White flag with the dilution rates of 1:2, 1:4 and 1:8 similar with the standard treatment of Selecron and significantly higher than the only 70.0% and 83.3% Table 5.

Classification of harvest (%) as affected by the treatments



| TREATMENT      | RATES OF WHITE FLAG AND H <sub>2</sub> O RATIO | QUALITY OF HARVEST CLASS A | CLASS B |
|----------------|------------------------------------------------|----------------------------|---------|
| T1-White flag  | 1:0                                            | 70%                        | 30.0%   |
| T2-White flag  | 1:1                                            | 83.3                       | 16.7    |
| T3-White flag  | 1:2                                            | 100.0                      | 0.0     |
| T4-White flag  | 1:4                                            | 100.0                      | 0.0     |
| T5- White flag | 1:8                                            | 100.0                      | 0.0     |
| T6-Selecron    | 3tbsp/16 L H <sub>2</sub> O                    | 100.0                      | 0.0     |
| T7-Untreated   |                                                | 6.0                        | 40.0    |

Means within each vertical column followed by the same letter are not significantly different at 0.05 DMRT

class A harvests of the treatment of White flag with the dilution rates of 1:0 and 1:1 and the untreated with the class A harvest of only 60%. Since price is dependent upon the quality of harvest and income is one of the basis in determining the effect of the treatments, the possible income on the last three treatments of White flag is anticipated to be significantly higher since the harvest were all class A.

#### Total yield (tons/ha)

The yield as affected by the treatments is presented in data Table 6. It is clearly presented in the data table the highest yield of good quality equivalent to 74.0, 77.08 and 80.07 tons/ha on the three treatments of White flag with the dilution rates of 1:2, 1:4 and 1:8 comparable with the standard treatment of Selecron and significantly higher than the treatment of White flag with the dilution rates of 1:0 , 1:1 with the yields of 50.32 and 56.80 tons/ha respectively and on the untreated with the only yield of 48.10 tons/ha.



It has been presented in data Table 4 the phytotoxicity of the three highest rates of White flag and this may serve as the explanation for the obtained low yield in comparison with the three lower rates. It was likewise reported by Saxena and Koul (1977) that White flag are anti-feedant and arrest insect growth. These findings may serve as the explanation for the presence of DBM larvae and whitefly in all the treatments of White flag.

Table 6. Total yield (tons/ha) as affected by the treatments

| TREATMENT      | RATES<br>WHITE<br>FLAG<br>RATIO | QUALITY OF<br>HARVEST<br>CLASS A | CLASS B | TOTAL<br>TONS/HA |
|----------------|---------------------------------|----------------------------------|---------|------------------|
| T1-White flag  | 1:0                             | 35.02                            | 15.30   | 50.32            |
| T2-White flag  | 1:1                             | 56.80                            | 0.00    | 56.80            |
| T3-White flag  | 1:2                             | 70.66                            | 0.00    | 74.66            |
| T4-White flag  | 1:4                             | 77.08                            | 0.00    | 77.08            |
| T5- White flag | 1:8                             | 80.07                            | 0.00    | 80.07            |
| T6-Selecron    | 3tbsp/16 L H <sub>2</sub> O     | 84.54                            | 0.00    | 84.54            |
| T7-Untreated   |                                 | 28.93                            | 19.20   | 48.1             |

Means within each vertical column followed by the same letter are not significantly different at 0.05 DMRT

### Climatological Data

There was no climatological data gathered that may show the status of weather throughout the duration of the trial because the said information were not yet formally released from the weather station at BSU, La Trinidad, Benguet at the time they were needed. But by observation, strong intensity of rainfall usually affects the trial by washing off insects on the plants like DBM and aphids. However, strong intensity rainfall was not encountered throughout the duration of the trial. Likewise there was no abrupt change of temperature to a freezing point throughout the duration of the trial, a temperature that might





frozen insects. The recorded sunshine was generally bright throughout favorable for the experimental plants for their physiological processes like photosynthesis.



## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

### Summary

The research titled “Evaluation of White flag for efficacy against diamondback moth and whitefly on cabbage” was conducted at the Balili, Experimental Station purposely to determine the rates effective for the control of the above two insects and to determine if the plant is phytotoxic. The efficacy of White flag was determined using the extract diluted with varying volume of water which is as follows: 1:0, 1; 1, 1; 2, 1:4 and 1:8. Untreated was included as the basis of comparison while Selecron with the recommended rate of 30 ml/16 li water was the standard insecticide.

By using the electric powered blender, the sap of the chopped rhizomes of White flag was extracted. Filtering the debris followed by pouring the extract on cleaned 1.0 li capacity beaker with sanitized fine clothing at the top. The cabbages in the open field where the treatments were applied were planted on a five meters long plot with a total number of 13 plants per pot. The plots were assigned with a corresponding treatment by following the randomized complete block design with three replications (RCBD). The application of the treatments started 15 days after transplanting at weekly interval until two weeks before the scheduled harvest. The 2.0 li capacity sprayer equipped with fine nozzle was used in applying the treatments. The effect of the treatments was determined by adopting the evaluation parameters which are as follows: count of DBM larvae and whitefly, degree of insect damage, percent DBM shoot damaged plants, the quality of harvest and total yield.

The results of the trial indicated the less effective performance of White flag with the dilution rates of 1:0, 1:1, 1:2, 1:4 and 1:8 against DBM larva. This was evidenced by the relatively high count of larva in all the treatments of White flag almost

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insignificantly different with the untreated. So far only the standard treatment of Selecron offered the good control of DBM. On the other hand, the count of larva in all the treatment of White flag were recorded to be generally small comparable with the untreated and significantly lower to the untreated during the scheduled 5<sup>th</sup> assessment. The same trend of effect of the treatments was observed against whitefly. Likewise all the dosage treatments of White flag with the dilution rates of 1:0, 1:1, 1:2, 1:4 and 1:8 were damaged. The damage was slight to moderate during the scheduled first assessment and worsen progressively during the scheduled second assessment at 50 DAT. It has also been observed the phytotoxicity of White flag in crop cabbage. As observed, the two most phytotoxic were the dilution rates of 1:0 and 1:1. The treatment with the dilution ratio of 1:2 was slightly phytotoxic while the dilution ratio of 1:4 and 1:8 were completely non phytotoxic like the standard Selecron.

Based on quality, the harvest were 100% class A on the treatments of White flag with the dilution rates of 1:2, 1:4 and 1:8 similar with the standard treatment of Selecron and significantly better than the only 70.0% and 83.3% class A harvests of the treatment of White flag with the dilution rates of 1:0 and 1:1 and the only 60.0 % class A harvest from the untreated. As to the total yield, highest yield of good quality equivalent to 74.0, 77.08 and 80.07 tons/ha were gathered on the treatments of White flag with the dilution rates of 1:2, 1:4 and 1:8 comparable with the standard treatment of Selecron and significantly higher than the 50.32 and 56.80 tons/ha yields of the two highest dosage treatment of White flag (1:0, 1:1) and the untreated with the only yield of 48.10 tons/ha.



## Conclusions

1. White flag is relatively less effective in suppressing the population of DBM and whitefly in crop cabbage.
2. White flag with the dilution rates of 1:4 and 1:8 are not phytotoxic. The rates with the dilution rates of 1:2, 1: 1 and 1:0 are phytotoxic.

## Recommendations

White flag, even if relatively less effective against DBM and white fly, is recommended for the control of the insect pests in cabbage. The dilution rates of 1:4 and 1:8 are recommended since they are the treatments with the highest yield of good quality. White flag is recommended since it has many advantages over the synthetic insecticides like being environment friendly, cheap and readily available when needed since they are growing abundantly in the locality.



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