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**Effect of entomopathogenic fungi and some plant extracts and their joint action on some biochemical aspects of the cowpea aphid, *Aphis craccivora*.**

**A THESIS**

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### SUMMARY AND CONCLUSION

Aphids are considered most serious pests all over the world. They have a wide host range, and may transmit plant pathogenic viruses. As a result of wide spread application of chemical control and their harmful impact of natural enemies and environment, necessitate the use of new types of insecticides which have new different modes of action that are effective, much safer to human and ecosystem and could be useful as alternatives for the integrated management approach.

**The aim of this study was to:**

1. Determine the pathogenicity of entomopathogenic fungi *Beauveria bassiana* and *Metarhizium anisopliae* against adult stage *Aphis craccivora* Koch.
2. Evaluate the toxicity of some of plant extracts (lupine, lemon grass, moringa and chilli pepper) against adult stage *A. craccivora*.
3. Study the effect of plant extract on mycelium growth rate of entomopathogenic fungi.
4. Study the effect of combination between entomopathogenic fungi and lupine extract against *A. craccivora*
5. Study the effect of entomopathogenic fungi, plant extracts and mixture of them on biochemical of treated *A. craccivora*.

### **1. Susceptibility of *A. craccivora* to entomopathogenic fungi *B. bassiana* and *M. anisopliae*:**

Entomopathogenic fungi *B. bassiana* and *M. anisopliae* have been used against adult stages of *A. craccivora* with series of concentrations  $10^6$ ,  $5 \times 10^6$ ,  $10^7$ ,  $5 \times 10^7$ , and  $10^8$  spore/ml. Results showed that *M. anisopliae* was more pathogenic as compared to *B. bassiana* since the  $LC_{50}$  values were  $8.03 \times 10^6$  and  $1.19 \times 10^7$  spores/ml for both *M. anisopliae* and *B. bassiana*, respectively.

### **2. Susceptibility of *A. craccivora* to plant extracts:**

When applying the crude plant extracts using leaf dipping method, results showed that lupine extract was the most effective extract against *A. craccivora* followed by lemon grass, moringa and chilli pepper. The  $LC_{50}$  values of them were 2.6, 5.2, 13.2 and 38.68 gm% respectively.

### **3. Effect of the most effective plant extract on mycelium growth rate of fungi**

Results proved that lupine extract was compatible with both entomopathogenic fungi; *B. bassiana* and *M. anisopliae*, at two concentration applied  $LC_{25}$  and  $LC_{50}$  but application of lemon grass extract at two concentration,  $LC_{25}$  and  $LC_{50}$ , on *B. bassiana* and *M. anisopliae* caused complete inhibition of its mycelium growth of two entomopathogenic fungi.

**4. The joint action of lupine plant extract with the tested two isolated entomopathogenic fungi; *B. bassiana* and *M. anisopliae* against *A. craccivora*:**

The results of combination between *B. bassiana* and *M. anisopliae* with lupine extract (LC<sub>25</sub> and LC<sub>50</sub>) for both proved that Lupine (LC<sub>50</sub>) level combination with *B. bassiana* at LC<sub>25</sub> level against *A. craccivora* revealed a potential effect while the combination of Lupine (LC<sub>25</sub>) with *M. anisopliae* at LC<sub>25</sub> caused potential effect, other combination treatments revealed an additive effect.

**5. Acute LC<sub>50</sub> effect of the tested entomopathogenic, botanical crude extracts and their mixture (at concentration gave potential effect) on some biochemical level of *A. craccivora*:**

All the tested treatments significantly decreased the level of total soluble protein, GOT activity and GPT activity. Total carbohydrates were non significantly changed as compared to control after treatment with both types of fungi, either after 24 or 72 hr post treatment. Treatment by the plant extract caused the same effect. *B. bassiana* significantly reduced triglycerides content of treated aphids 72 hr post treatment, while lemon grass had no effect on triglycerides content, but treatment with lupine led to significant increase in this type of lipids. Addition



of fungi to the plant extract caused low effect on proteins and their metabolizing enzymes and carbohydrates. The combination of fungus *B. bassiana* and lupine extract caused a significant decrease in triacylglycerols content in adult aphid after 24 hr post treatment .

Defensive enzymes such as esterases and phenoloxidases were studied. Alpha esterases and phenoloxidases were significantly activated after 24 hr post treatment with entomopathogenic fungi. Also The results indicated that treatment of aphids with plant extracts activated defensive enzymes such as esterases and phenoloxidases. In general ,esterases was more higher in the case of treatment with lemon grass than that of lupine, and the activation was continued after 72 hr, except lupine .

Addition of the fungus *M. anisopliae* to lupine extract significantly increased all defensive enzymes activity after 72 hr post treatment. Esterases increased at all treatment of mixtures as compared with control.

Therefore, it could be concluded that using such botanical extracts (lupine, lemon grass, moringa and chilli pepper acetonc extract),entomopathogenic fungi (*B. bassiana* and *M. anisopliae*) and mixture of lupine extracts with the two entomopathogenic fungi had strong insecticidal activities

## SUMMARY

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against cowpea aphid, the insecticidal activities were time and dose-dependent and may be useful in a manner for reducing the hazards and harmful effect of cowpea aphid. Entomopathogenic fungi may also be triggered by the combination of other safe products like plant extracts. Also, the study attempts to elucidate if it is possible to rationalize the use of such tested materials Via IPM program on legumes crop or not.