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Biochemical and biological effects of some plant extracts compared with a chemical insecticide against *Spodoptera littoralis* (Boisd)

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Abstract

Accordingly, this study was planned to investigate the effect of cold water and alcoholic extracts of *Trigonella foenum* (fenugreek) and *Lupinus luteus* (yellow lupine) on the biological attributes and biochemical responses of the 4th instar larvae of *Spodoptera littoralis* (the cotton leafworm).

The main objective of this study is to investigate the possibility of using plant extracts as insecticides to control the cotton leafworm.

Thus, in our study a recommended pesticide namely chlorpyrifos (dursban) was used as a reference to compare its effect on some biological and biochemical aspects of the 4th instar larvae of the cotton leafworm with those obtained from water and alcoholic extracts of fenugreek and yellow lupine.

Results indicated that both water and alcoholic extracts of fenugreek and yellow lupine were effective against the cotton leafworm, especially at the concentration of 10%; while fenugreek extract was the most effective agent as it affects larval, pupal and adult stages of the tested insect. It also reduce protein level, alkaline and acid phosphatases levels.

Thus we can conclude that extracts of fenugreek and yellow lupine can be used as a good insecticide against cotton leafworm.

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SUMMARY

Laboratory experiments were carried out in physiology department in Plant Protection Institute, Zagazig, Sharkia to evaluate the efficiency of water and alcoholic extracts of both of fenugreek and yellow lupine against some biological and biochemical aspects of the 4th instar larvae of the cotton leafworm compared with chlorpyrifos.

1-Biological studies:

1.1-Biological effects of water extract of fenugreek on the cotton leafworm:

Water extract of fenugreek had toxic effect especially at 10% concentration which increased larval mortality (27.5%) and decreased pupation (72.5%). It also shortened both of male longevity 7 days and female longevity 7.8 days. Also, it decreased adult emergence (62.1%) and increased both of adult malformation 33.33% and number of eggs/female (952.33).

1-2- Biological effects of alcoholic extract of fenugreek on the cotton leafworm:

This extract had toxic effect on larval and adult stages of the tested insect as it caused the highest larval mortality 60%, pupal malformation (6.25%) and adult malformation (31.5%). The lowest adult emergence(50%), pupation(40%), pupal weight(0.4g /pupa) and number of eggs/female was also recorded at 10% concentration (863.801); while chlorpyrifos at 0.97 ppm recorded larval mortality (6.67%) and pupation (93.33%). It shortened male longevity 6.67 days and increased female longevity 10 days. It decreased adult emergence (75.55%) and increased adult malformation 19.24% and number of eggs/female (1990) in comparison with the control.

SUMMARY

1-3-Biological effects of water extract of yellow lupine on the cotton leafworm:

Water extract of yellow lupine prolonged pupal duration 15.5 days, male longevity 7.5 days and female longevity 5.5 days. It increased larval mortality (45%), pupal mortality (22.7%) and adult malformation (30.7%). The lowest number of females (15.4%) and number of eggs laid per female (900) were also recorded when larvae were treated types of extract and concentration.

1-4-Biological effects of alcoholic extract of yellow lupine on the cotton leafworm:

The treated larvae using alcoholic extract of yellow lupine at 10% concentration had prolonged pupal duration 16 days and shortened male longevity 7.1 days and female longevity 5.2 days. Also, it increased larval mortality (45%) and pupal mortality (9.1%). It recorded the lowest pupal weight (0.4 g/pupa), pupation (55%), adult emergence (68.2%) and number of eggs laid per female (885). The highest adult malformation (39.73%) was recorded at that concentration.

2- Biochemical studies:

2-1-Biochemical studies of fenugreek extracts:

From preliminary comparison, it was cleared that alcoholic extract of fenugreek was the most effective on the cotton leafworm where at 10% concentration it decreased total soluble protein (TSP) activity (10.45 ± 0.65 ug/g), levels of acid phosphatase activity (ACP) (3.47 ± 0.47 U/L) and levels of alkaline phosphatase activity (ALP) (0.044 ± 0.011 U/L); while chlorpyrifos at 0.97 ppm recorded 18.08 ± 0.14 ug/g of (TSP) activity, 7.6 ± 0.06 U/L of (ACP) activity and 2.4 ± 0.43 U/L of (ALP) activity.

2-2-Biochemical studies of yellow lupine extracts:

Alcoholic extract of yellow lupine was the lowest effectiveness on biochemical attributes of the cotton leafworm, where at 10% concentration it caused the lowest reduction in glutamic oxaloacetic transaminase (GOT) activity (0.61 ± 0.069 U/L) and glutamic pyruvic transaminase (GPT) (2 ± 0.14 U/L); while chlorpyrifos at 0.97 ppm recorded 0.68 ± 0.008 U/L of (GOT) activity and 2.31 ± 1.33 U/L of (GPT) activity.

3-HPLC analysis of phenolic compounds in alcoholic extracts of fenugreek and yellow lupine:

3-1-Phenolic compounds in fenugreek seeds extract:

Among the phenolic compounds of fenugreek seeds; Gallic acid, syringic acid, cumaric acid, ferulic acid, noringenin, querctin and cinamic acid were detected. Gallic acid was a common acid which was detected in alcoholic extract of fenugreek.

3-2-Phenolic compounds in yellow lupine seeds extract:

Among the phenolic compounds of yellow lupine seeds, catechin, syringic acid, vanillin, ferulic acid, noringenin, querctin and cinamic acid were detected. Catechin was the main phenolic acid which was detected in alcoholic extract of yellow lupine.



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