SUMMARY

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The present work describes the relationship between the rate of development of resistance to fenitrothion , profenofos , azadirachtin and ***B.thuringiensis*** in the potato tuber moth , ***Phthorimaea operculella*** (Zeller) and pattern of cross-resistance of the selected strains to various other compounds which were also investigated . Also the activity of esterases and glutathione s-transferases was studied .

1-Development of resistance to pesticides :

The rate of development of resistance to Fenitrothion , Profenofos , azadirachtin and ***B.thuringiensis*** in ***P. operculella*** (Zeller) had been studied for 20 , 15 , 20 and 15 generations of selection with those compounds , respectively . The level of selection was at the LC_{50} pesticides. One - old day egg and first instar larvae were chosen for selection.

1.1-Rate of development of resistance to fenitrothion :

The resistance ratio increased from 1.6- fold in G_1 to 20.6-fold in G_4 . With further selection , the level of resistance dropped to 13.3- fold in G_5 , then increased again to 24.1-fold in G_8 , with further selection the resistance ratio was

highly to that of G_{15} . With continuous selection to G_{20} , a 65.3-fold resistance ratio was obtained .

1.2 - Rate of development of resistance to Profenofos :

The resistance ratio reached to 9.4 – fold in the first generations of selections . With further selection , the resistance level increased sharply and reached 25.1 – fold in G_9 , followed by a slow increase in resistance during the next generations of selection until G_{11} . A rapid increase in resistance was observed in G_{13} recoding 37.6 –fold , followed by 54.99 – fold at the end of selection.

1.3-Rate of development of resistance to Neemazal :

The resistance ratio was constant from G_1 to G_3 (1– fold). With further selection , the level of resistance increased to 4.2 – fold in G_{12} then dropped to 3.1- fold in G14 . In G_{15} , resistance began to rise again to level similar to that of G_{15} . With continuous selection to G_{20} , a 8.9 – fold resistance value was obtained .

1.4- Rate of development of resistance to Dipel 2X (*Bacillus thuringiensis*) :

The resistance level to Dipel 2X (***B. thuringiensis)*** reached 1.6 – fold in G_1 to 3.6 – fold in G_4 and no change was observed during the next five generations . With

further selection , a slight increase in the degree of resistance was noticed in the succeeding generations of selection . At the end of selection , a 11.9 – fold resistance was attained .

The ***P . operculella*** possess high resistance potential to the organophosphours compounds (Fenitrothion and Profenofos) where susceptible individuals are still present , so it returns to its susceptibility easily when the population be free of selection .

However , with the progress of Neemazal (Azadirachtin) selection, many susceptible individuals are still present . Thus the tolerant strain of ***P. operculella*** may rapidly lost its resistance characteristics. While, selection with ***B . turingiensis*** cause gradually increasing in resistant individuals , so it may difficult to lost its resistance characteristics .

2- Pattern of cross – resistance to pesticides :

The cross – resistance to six pesticides belonging to different groups . The impact of selection procedures on the pattern of cross – resistance was also studied in generations 5 , 10, 15 and 20 of selection with fenitrothion

and Neemazal and 5 , 10 and 15 of selection with profenofos and Dipel 2X , ***Bacillus thuringiensis*** .

2.1- Pattern of cross – resistance to pesticides in fenitrothion :

Selection with fenitrothion 20 generations induced 65.2 – fold resistance to fenitrothion . This was a accompanied by high resistance to profenofos (14.3 – fold), and by low resistance to Super misrona (6.35) , Boric acid (6 –fold) , Dipel 2X (5.6 – fold) and Neemazal (5.1 – fold).

2.2 Pattern of cross – resistance to pesticides in profenofos :

Resistance to profenofos was 54.99 – fold at the 15 *th* generation of selection . This was a accompanied by high resistance Fenitrothion (10.16 – fold) and by low resistance to Neemazal (6.3 – fold) Super misrona (5.76 – fold) and Dipel 2X (6.1- fold) and Boric acid (1.2 – fold).

2.3 – Pattern of cross resistance to pesticides in Neem –Azal ;

Resistance to Neemazal (8.9- fold) was a accompanied by high resistance to Profenofos (25.18 – fold) ; moderate resistance to Fenitrothion (8.7 – fold) , Super misrona (5.8 – fold) , Dipel 2X (4.79 – fold) and Boric acid (4 –fold) .

2.4- Pattern of cross – resistance to pesticides in Dipel 2X – resistant strain :

After 15 generations of selection with Dipel 2X , 11.9 –fold resistance was attained . The pattern of cross-resistance different chemicals , resistance for profenofos was high (18.6 – fold) , moderate resistance to fenitrothion (8.9 – fold) , and by low resistance to Boric acid , Super misrona and Neemazal (7.6 , 5 and 4.49 – fold , respectively).

2- Biochemical studies on resistance *P. operculella* :

Enzyme pattern of esterases and glutathione s-transferases (GST) during generations of selection with Fenitrothion , Profenofos , Neemazal and Dipel 2X in the potato tuber moth , ***Phthorimaea operculella*** were investigated.

3.1 – Biochemical study on fenitrothion – resistant strain :

Selection with fenitrothion produced 65.2 – fold and the level of esterase and GST activity were 0.8 and 1.14 times higher than in the parent strain . Resistance to fenitrothion was related to increase in esterase and GST activities . This showed that a 65.2 – fold increase in resistance to fenitrothion appeared to be due to the

combined action of the two resistance mechanisms altogether .

3.2- – Biochemical study on profenofos – resistant strain :

The strain selected with profenofos was 54.99 –fold resistant to profenofos . However , esterase and GST activity level only 2.3 and 1.8 – fold higher than those of the P- strain , respectively . Resistance to profenofos was related to the increase in esterase and GST activities .

3.3 – Biochemical study on Neem –Azal – resistant strain :

Selection with Neemazal for 20 generations produced only 8.9 – fold increase in resistance . The levels of esterase and GST activities were 1.5 and 0.91 – fold compared to the P-strain , respectively . No correlation was found between resistance to Neemazal and esterase or GST activity . It seemed that GST enzymes were not play an important for Neemazal resistance , while esterases might play a minor role.

3.4 – Biochemical study on Dipel 2X – resistant strain :

The strain selected with Dipel 2X was 11.9 – fold to Dipel 2X . The level of esterase and GST

activities were 1.3 and 1.2 – fold higher than in the P-strain , respectively .