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CHEMICAL CONTROL OF ANGOUMOIS GRAIN MOTH *SITOTROGA CEREALELLA* (OLIV.)

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The studies made to find out the effectiveness of phostoxin, fumazone, EDCT and nogos against Angoumois grain moth revealed that phostoxin at the rate of 100 pellets per 1000 cu. ft. gave 100 per cent mortality of the pest in all stages after two weeks of application. Fumazone at the rate of 20 lbs. per 1000 cu. ft. after three weeks of application also gave 100 per cent mortality of larval, pupal and adult stages while 82.3% mortality of eggs. EDCT at the rate of 20 lbs. per 1000 cu. ft. and nogos at the rate of 20 ml. per cu. meter proved ineffective against eggs but they gave 80-100 per cent mortality of other stages of the pest.

INTRODUCTION

Sitotroga cerealella (Oliv.) (Gelechiidae, Lepidoptera) commonly known as Angoumois grain moth, first recorded in Angoumois, France has been reported to be a serious pest of stored maize and sorghum. It has also been found damaging stored products like wheat, rice, dried fruits, walnut, chestnut, garlic, melon seeds, red beans and biscuits (Candura, 1943; Rahman and Khan, 1944 and Rout *et al.*, 1969). A loss of 40% in weight to stored maize and sorghum (Parkin, 1956) and 100% damage to maize cobs has been reported due to this pest (Moutia and Mamet, 1943 and Cotton, 1956).

Rout *et al.*, (1969) reported 100% mortality of eggs and adults and less than 100% that of larvae and pupae after 24 hours of application of phostoxin at the rate of 110 pellets per 1000 cu. ft. Degesch (1970) reported complete elimination of all stages of development of this pest with phostoxin at the rate of 75-225 pellets per 1000 cu. ft. The information about the control of this pest by the use of fumazone, EDCT and nogos does not appear to exist.

The present studies were undertaken to find out the comparative

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effectiveness of phostoxin, fumazone, EDCT and nogos against this pest.

MATERIALS AND METHODS

The adults of *Sitotroga cerealella* (Oliv.) collected from maize stores were liberated in glass jars (5 lb. capacity) containing maize grains and cobs for mass rearing. One month after the liberation of the pest about one pound of maize grains, thus infested were added to each of the 288 earthen glazed jars (11 lb. capacity) containing four lb. of uninfested maize grains. The mouths of the jars were covered with muslin cloth and tightened with rubber rings in order to avoid the escape of the pest. Jars were kept undisturbed for about 25 days in order to ensure further multiplication of the pest. Thereafter nogos (F_1) at the rate of 10 ml (D_1), 15 ml (D_2) and 20 ml (D_3) per cu. meter; EDCT (F_2) and fumazone (F_3) each at the rate of 10 lb. (D_1), 15 lb. (D_2) and 20 lb. (D_3) per 1000 cu. ft. and phostoxin at the rate of 75 pellets (D_1), 100 pellets (D_2) and 125 pellets (D_3) per 1000 cu ft. were put into these jars and their mouths covered with lids and mud-plastered to make them airtight. A check (D_4) was also maintained.

Observations on the mortality of the pest were recorded after 24 hours (I_1), 48 hours (I_2), 72 hours (I_3), one week (I_4), two weeks (I_5) and three weeks (I_6) of fumigation. There were 16 treatments including check and each treatment was replicated thrice at each interval.

At the end of each interval mouths of the jars were kept open for 8 hours for aeration and escape of the residual fumigants. Samples of grains weighing 8 oz. each were taken from each jar and kept in plastic bags. The samples were analysed for the number of living and dead eggs, larvae, pupae and adults. The colour and hatching of eggs were the criteria used to differentiate between living and dead eggs. Living eggs were reddish white in colour whereas the dead ones were brownish black. The grains of each sample were cut with the help of a knife in order to check the mortality of larval and pupal stages. The living and dead larvae and pupae were ascertained by putting them in concentrated KoH while living and dead adults were confirmed by pricking needle into their body. The data so collected were subjected to statistical analysis.

RESULTS

The results of the effectiveness of nogos, EDCT, fumazone and

phostoxin against the eggs, larvae, pupae and adults of *Sitotroga cerealella* (Oliv.) are given as follows:

Eggs:

The mortality of eggs with nogos (36.9-39.3%) and EDCT (35.2-38.3%) was almost similar to that obtained under check (34.2-41.7%) indicating the ineffectiveness of these chemicals against the eggs of the pest. Fumazone at the rate of 20 ml. per cu. meter (D_3) gave minimum mortality of 55.4% after 24 hours and the maximum mortality of 82.2% after three weeks of treatment. The corresponding mortality figures obtained with the other two doses (D_1 and D_2) of this chemical respectivelly were 33.9% and 40.4% after 24 hours and 53.1% and 68.2% after three weeks of the treatment. Phostoxin at the rate of 75, 100 and 125 pellets/1000 cu. ft. gave egg mortality of 54.0%, 63.1 per cent and 78.9% after 24 hours of application as against 87.6%, 98.9% and 100% after one week of the treatment. However, all the three doses of phostoxin gave cent per cent mortality of eggs following two weeks of its application. Out of 96 combinations of 4 fumigants, 4 doses and 6 intervels, combinations $F^4D_3I_6$, $F_4D_3I_5$, $F_4D_2I_6$, $F_4D_2I_5$, $F_4D_1I_6$ and $F_4D_1I_5$ gave 100% mortality of the eggs of the pest.

Larvae:

The highest dose (D_3) of all the fumigants gave the highest mortality of the larvae of the pest after each interval as compared to other two doses (D_1 and D_2). The minimum larval mortality of 45.0%, 64.1%, 65.8% and 75.6% with D_3 each of nogos, EDCT, fumazone and phostoxin was recorded after 24 hours of application and the maximum mortality of 93.7 per cent, 99.8 per cent, 100 per cent and 100 per cent was observed after three weeks of the treatment. Phostoxin however, also gave 100 per cent mortality after two weeks of the treatment. Further, out of all the 96 combinations of four fumigants, four doses and six intervals, the combinations $F_4D_3I_6$, $F_4D_3I_5$, $F_4D_2I_6$, $F_4D_2I_5$, $F_3D_3I_6$ and $F_3D_2I_6$ gave 100% mortality of the larvae of the pest.

Pupae:

The highest dose (D_3) of all the fumigants gave highest mortality of the pupae of the pest after each interval as compared to other two doses (D_1, D_2). The minimum pupal mortalities of 40.6 %, 51.7%, 61.5% and 64.4 per cent

were obtained with nogos, EDCT, fumazone, and phostoxin after 24 hours of the treatment whereas the maximum mortalities of 79.8%, 99.8%, 100% and 100% were obtained after three weeks of treatment. However, 100% mortality was also obtained with D_3 of phostoxin after 2 weeks of its application. Further, out of all possible combinations of 4 fumigants, 4 doses and 6 intervals, the combinations $F_4D_3I_6$, $F_4D_3I_5$, $F_4D_2I_6$, $F_4D_2I_5$ and $F_3D_3I_6$ gave 100% pupal mortality.

Adults:

The highest dose (D_3) of all the fumigants proved highly effective against the adults of the pest after each interval as compared to other two doses (D_1, D_2). In case of nogos, EDCT and fumazone the minimum mortalities of 59.1 per cent, 64.5 per cent, 74.7 per cent were obtained after 24 hours of treatment and the maximum mortalities of 99.5 per cent, 100 per cent and 100 per cent were obtained after three week of the treatment. However, the highest dose of fumazone (D_3) gave 100 per cent adult mortality after two weeks of the treatment. In case of phostoxin 100 per cent mortality of adults was obtained with D_3 after 24 hours, with D2 after one week and with D_1 after two weeks of the treatment. Further, out of all the 96 combinations of 4 fumigants, 4 doses and 6 intervals the combinations $F_4D_3I_6$, $F_4D_3I_5$, $F_4D_3I_4$, $F_4D_3I_3$, $F_4D_3I_2$, $F_4D_3I_1$, $F_4D_2I_6$, $F_4D_2I_5$, $F_4D_2I_4$, $F_4D_1I_6$, $F_4D_1I_5$, $F_3D_3I_6$, $F_3D_3I_5$, $F_3D_2I_6$, $F_3D_1I_6$ and $F_2D_3I_6$ gave 100 per cent mortality of the adults of the pest.

DISCUSSION

Studies made on the chemical control of this pest have shown that phostoxin at the rate of 100 pellets per 1000 cu. ft. respectively gave 62.3%, 59.4%, 50.7% and 83.5% mortality of eggs, larvae, pupae and adults after 24 hours of application but after two weeks of application it gave 100% mortality of the pest in all stages. Phostoxin at the rate of 125 pellets per 1000 cu. ft. also gave 100% mortality after two weeks of application, in case of eggs, larvae and pupae but in case of adults after 24 hours of application. These findings are in agreement with those of Degesch (1970) who used phostoxin at the rate of 75-225 pellets per 100 cu. ft. and got complete eradication of the pest and are partially at variance with the results

of Rout *et al.* (1969) who reported 100% mortality of eggs and adults and less than 100 % in case of larvae and pupae after 24 hours of application when applied at the rate of 110 pellets per 1000 cu. ft. The variation in results may be due to the difference in doses and type of containers used. The results of fumazone, EDCT and nogos cannot be compared because these fumigants have not been previously used to control this pest.

Phostoxin at the rate of 100 pellets/1000 cu. ft. is recommended for the complete eradication of *Sitotroga cerealella* within a period of two weeks. The next best fumigant against this pest is fumazone at the rate of 20 lbs./ 1000 cu. ft. which has given 82.2% mortality of eggs and 100% mortality of rest of the developmental stages of the pest within a period of 3 weeks. EDCT at the rate of 20 lbs./1000 cu.ft. and nogos at the rate of 20 ml./cu. meter have proved ineffective against the eggs of the pest but can control effectively (79.8-99.8%) the other developmental stages of the pest within a period of 3 weeks.

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