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Toxicological Study of Dimlor (A Mixture of Dimethoate and Chlorpyrifos) Against Corn Leaf Aphid, *Rhopalosiphum maidis*. (Fitch) under Different Micro-climatic Condition

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Abstract

Efficacy of Dimlor 662 EC was monitored against corn leaf aphid, *Rhopalosiphum maidis* (Fitch) under three different micro-climatic conditions i.e. seedling of maize sown on plastic pots covered with glass chimneys, seedling in test tubes, and maize leaves placed on petri dishes. Maize leaves and seedling were painted with serial dilutions i.e. 0.0003, 0.0006, 0.0012, 0.0025, 0.0050 and 0.01 percent. It was found effective and statistically non significant in all micro-climatic conditions. A liner regression model was developed between concentration and percentage mortality. The LC₉₀ were calculated as 0.0024, 0.0041 and 0.005 percent, respectively. This study will help in determining appropriate dosage of insecticide for the aphid control would be beneficial in resistance monitoring, IPM development, and product screening.

Introduction

Laboratory bioassay to determine the toxic effects of pesticides on target or nontarget species are carried out for product registration (Guillebeau, 1994), toxicity rankings to elute which pesticides to use as per of integrated pest management (IPM) programs (Hassan, 1989) and the primary screening of putative products for use as novel crop protection agents. Bioassay involve exposing test species to chemicals via topical or residual routes (Hall and Adams, 1990), dietary exposure (Thacker and Hickman, 1990; Wiles and Jepson, 1993) and exposure resulting from inhalation.

Corn leaf aphid *R. maidis* (Fitch) is problem on maize in Barani area (Ghouri *et al.*, 1978), where it appears in early stage of crop i.e before tasseling and sibling whereas, in plain area its incidence on autumn maize after tasseling and sibling which has no importance in crop maturity and field potential (Bolt *et al.*, 1983).

Dimethoate has been proved effective systemic insecticide against sucking pest as maize fruit fly (Halling, 1983). The joint action of mineral oils with some organophosphorus insecticides were more effective against wheat aphid *R. padi* (EL Deeb, 1993). High mortality of English grain aphid and oat-birdchery aphid was observed when treated with dimethoate and carbaryl (Neil *et al.*, 1997). It has been suggested that comparisons between laboratory concentration response data for insect pest might indicate how to use pesticides selectively as a part of IPM programs (Wiles and Jepson, 1992).

It is difficult to control insect without chemicals. However pesticides also have the side effects by destroying the ecology. Therefore, judicious use of chemical is recommended. This involve right formulation, right dosage, appropriate timing and effective application. An attempt is

made to evaluate toxic of insecticide under different micro climatic conditions at similar rate against corn leaf aphid. This study would provide appropriate dosage for the aphid control.

Materials and Methods

Dimlore 662 EC (a mixture of chlorpyrifos and dimethoate provided by Dow Chemical and Pacific Ltd (Pvt), Karachi. Serial dilutions i.e. 0.0003, 0.0006, 0.0012, 0.0025, 0.0050 and 0.01 percent were prepared from stock solution (1%) in distilled water. Corn leaf aphid (*R. maidis*) were collected from maize field at National Agricultural Research Center (NARC), Islamabad.

Serial dilution of Dimlore i.e. 0.0003, 0.0006, 0.0012, 0.0025, 0.0050 and 0.01 percent were tested under three micro climatic conditions. In the first condition seedling of maize were sown on plastic pots covered with glass chimneys, in the second condition seedling were placed in test tubes and in third condition maize leaves were placed on petri dishes. After drying 20 aphids were released in all cases and each concentration had three replicates. A batch of check was placed with each method of treatments. Mortality data were recorded after 24 hours of treatment. After treatment they were placed under control temperature $26 \pm 2^\circ\text{C}$ and relative humidity 60 ± 5 percent. DATA were analyzed by Duncan's Multiple Range Test and regression models were developed calculate LC₉₀.

Results and Discussion

The dose-response relationship is the most important single principle in toxicological studies which leads to efficient use of insecticide with minimal disruption to the ecosystem (Anwar *et al.*, 1990). Dimlore was found to be equally

Table 1: Percent mortality of corn leaf aphid under different micro climate condition by application of Dilore 24

%Conc.	Method 1	Method 2	Method 3
Control	21.60 ± 7.63d	31.67 ± 7.63c	30.00 ± 10.00c
0.0003	71.67 ± 10.10c	40.00 ± 5.00c	80.00 ± 0.00c
0.0006	81.67 ± 7.60bc	60.00 ± 20.00bc	88.33 ± 10.40bc
0.0012	76.67 ± 7.60c	60.26 ± 26.45bc	85.00 ± 5.00bc
0.0025	96.67 ± 5.70ab	90.00 ± 5.00ab	85.00 ± 10.00
0.0050	98.33 ± 2.80ab	100.00 ± 0.00a	85.67 ± 5.77a
0.0100	100.00 ± 0.00b	98.33 ± 2.88a	100.00 ± 10.00a

The figure followed by the same letter in column are not significant different at P<0.01.

effective against corn leaf aphid when tested under different micro climatic condition. Significant mortality (85-100%) was recorded at higher concentration (0.0025-0.01%) in three different conditions of treatment compared with after 24 hours of treatment. Test at low concentrations (0.0003-0.001 percent) gave significant mortality results (Table 1). Dimethoate controlled the english grain aphid and oat bird cherry aphid with nine percent increase in wheat yield (Neil *et al.*, 1997). It was also found effective at 0.03 percent in reducing corn leaf aphids population and increasing the yield (Grandhale *et al.*, 1986). Similar results have also been reported by Geeshler (1989). Chlorpyrifos (0.025%) was also reported effective when applied after treatment against this pest (Verma *et al.*, 1988).

Table 2: Regression model of Dimlor against corn leaf aphid under three different micro climatic conditions after 24 hours.

LC ₉₀	Methods	Regression model
0.0021	1	Y = 5.74 + 407.09 (X = 1.148)
0.0011	2	Y = 5.19 + 434.12 (X = 1.645)
0.0055	3	Y = 5.87 + 124.36 (X = 1.294)

LC₉₀ were calculated for each test condition (Table 2) were 0.0021, 0.0041 and 0.0055 percent respectively at test procedures 1, 2 and 3 after 24 hours of treatment followed by slopes of regression equation which were 5.74, 5.19 and 5.87 respectively, indicating the same variation of susceptibility of corn leaf aphid to Dimlor. Statistical analysis gave similar results in all procedures. Russian wheat aphid was found to be more susceptible to chlorpyrifos than dimethoate in contact toxicity experiment by Dip-test method, whereas the systemic toxicity of dimathoate were found to be more than chlorpyrifos (Bayoun *et al.*, 1995). A linear relationship between concentration of insecticides and percentage of mortality was observed. Similar results were observed when dimethoate, methamidophos and primicarb were tested against cereal arthropod, e.g. *R. padi* (Heyer, 1995). Bioassay methods needs refinement for reproducibility (Leeper *et al.*, 1988). A FAO recommended method

(FAO, 1970) determining resistance in peach aphid was replaced by two methods due to time consumption and ambiguity in results. Topical application methods incl a rapid dip test that has been used successfully in UK *Myzes persicae*, *M. solanin* and *Apis fabe*, a spray re test that is applicable to wide range of compound ind systemic insecticide (Busvine, 1980).

Dimlor, a mixture of systemic and contact insecticid be used for the control of aphid successfully because are exposed to both mode of action of insecticide field. Moreover any one of these procedure can be us a rapid bioassay technique when it is desirable to q determine the cause of failure and for determination appropriate dosage.

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