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# Quantitative Estimation of DDT by GLC in Different Strains of *Musca domestica* L. by Using Hexane as Well as Diethyl Ether

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**Abstract:** Estimation of DDT by GLC (gas liquid chromatography) in the PCSIR strain of *Musca domestica* L. Shows that 59.69 ng/fly DDT was found in the sample extracted with hexane and 55.74 ng/fly in the sample extracted with diethyl ether after treatment with 2.0 ug/fly. In the Holland strain, 18.3 ng/fly DDT was found in the sample extracted with hexane and 17.1 ng/fly in the sample extracted with diethyl ether. In the Malir strain 4.35 ng/fly DDT was found in the sample extracted with hexane and 1.29 ng/fly in the sample extracted with diethyl ether.

**Key Words:** DDT, GLC, *Musca domestica*

## Hem Hexane Hem Diethyl Ether Kullanılarak *Musca domestica*'nın Değişik Suşlarında DDT'nin GLC Yöntemiyle Nicel Hesaplanması

**Özet:** *Musca domestica* L.'nın PCSIR soyunda DDT'nin GLC Yöntemiyle hesaplanması sonucunda, sinek başına 2,0 ug'lık uygulamadan sonra hexane kullanılarak özütlenen örnekte 59,69 ng/sinek, diethyl ether kullanılarak özütlenen örnekte ise 55,74 ng/sinek bulunmuştur. Holland soyunda hexane kullanılarak özütlenen örnekte 18,3 ng/sinek, diethyl ether kullanılarak özütlenen örnekte ise 17,1 ng/sinek DDT bulunmuştur. Malir soyunda hexane kullanılarak özütlenen örnekte 4,35 ng/sinek, diethyl ether kullanılarak özütlenen örnekte ise 1,29 ng/sinek DDT bulunmuştur.

**Anahtar Sözcükler:** DDT, GLC, *Musca domestica*

## Introduction

The *in vivo* metabolism of DDT in susceptible and resistant strains of houseflies as a whole has been studied by GLC and HPLC (1-6). In this connection, the residue of DDT in different strains has been used as a parameter. In the present study, the residue of DDT after *in vivo* metabolism was also utilized to find the resistance phenomenon in the PCSIR (susceptible) strain, Holland strain (resistant standard) and a newly found Malir strain (resistant) of *Musca domestica* L.

## Materials and Methods

### Rearing technique:

The rearing technique described by Ashrafi et al. (7) was used for all strains, and only adult flies (3 days old) were used during the experiment.

### Detection and isolation:

For detection and isolation of organochlorine pesticide from the animal tissue, gas liquid chromatography (GLC) (with electron capture detector ECD) was performed, and fat was extracted from the animal tissue, by the method of Gale and Hofberg (8), and Holden and Marsden (9). Later, the process of sorption was carried out in chromatographic columns of alumina and silica (10).

For the quantitation of pesticide, a Beckman GLC apparatus equipped with an electron captured detector with a radioactive source for the supply of electrons, i.e., NJ-63, was used. The instrumental parameters used are tabulated below:

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| Parameters | Instrument | |
|---|---|---|
| Column length | 3 ft. | 1 ft. |
| Column internal diameter | 4 mm. | 4 mm. |
| Packaging material | 3% SE-30 on chromosorb-w | 5 % Q.F-1 on chromosorb-w |
| Column temperature | 150ºC | 150ºC |
| Detector temperature | 200ºC | 200ºC |
| Injector temperature | 175ºC | 175ºC |
| Gas flow $N_2$ | 40 ml/min | 40 ml/min |
| Chart speed | 2 ml/min | 2 ml/min |
| Electron source | "Ni-63" | "Ni-63" |

**Results**

Quantitative estimation of DDT was carried out by GLC in treated flies. The peak heights obtained by the injection of the treated samples read on a calibration curve (Fig.1) were prepared by using different quantities of standard DDT (Figs. 2-6). The results are as follows:

In the case of *Musca domestica* L. (PCSIR strain), the quantity of DDT was found to be 59.68 ng/fly in the hexane extracted sample and 55.74 ng/fly in the diethyl ether extracted sample (Figs. 7,8) when treated with a dose of 2.0 ug/fly (Table).

In the case of *Musca domestica* L. (Holland strain), the quantity of DDT was calculated to be 18.3 ng/fly in the hexane extracted sample and 17.1 ng/fly in the diethyl ether extracted sample (Figs. 9,10), when treated with a dose of 8.8 ug/fly (Table).

In the case of *Musca domestica* L. (Malir strain), the quantity of DDT was calculated to be 4.35 ng/fly in the hexane extracted sample (Figs. 11,12), when treated with a dose of 19.0 ug/fly (Table).

**Discussion**

Gale and Hofberg (8) reported a gas chromatographic (GC) procedure for the determination of chlordimeform in emulsifiable concentrate formulations containing about 45 % active ingredient. Laboratory repeatability of better than 1 % was 1.2 % for the formulation. During these investigations, a gas chromatographic (GC) procedure was used as well for the comparative quantitative determination of DDT in susceptible and resistant strains of *Musca domestica* L. for this purpose, a susceptible PCSIR strain and two resistant strains, Holland (standard) and Malir, were used. A sample from the susceptible PCSIR strain having 2.0 ug of DDT reproduced 59.68 ng of DDT by GLC, and reproducibility was found to be approximately 0.3 %. The Holland sample, which had 8.8 ug of DDT, reproduced 17.1 ng of DDT by GLC, and reproducibility was about 0.02 %, while the Malir sample, which had the maximum quantity of DDT (19.0 ug/fly), reproduced only 4.35 ng of DDT by GLC, and the reproducibility was 0.022 %. The variation from the results of recent work and of Gale and Hofberg (8) may be due to difference in insecticide or resistant factor.

Szymczynski et al. (11) studied the samples of adipose tissue from the abdominal cavity which were taken at random during surgery on the abdominal cavity. The samples were taken and then analyzed for the presence of chlorinated pesticides by means of gas chromatography. All the analyzed samples contained β-BHC, y-BHC or Lindane, HCB, pp'-DDE and DDT isomers. PCSIR, Holland and Malir were treated with DDT by means of injection and the unmetabolized amount of DDT (remaining in the body in its original form) was estimated by gas chromatography. The results show that minimum degradation takes place in the case of the susceptible PCSIR strain and with maximum amount of DDT in its actual form. In the case of the resistant Holland strain, a lower amount of DDT was detected. In the case of the more resistant Malir strain, the minimum amount of DDT in its original form was detected, while the maximum amount of DDT was degraded. Isomers of DDT were also recorded in the form of peaks, but these were not identified because the standards of these isomers were not available.

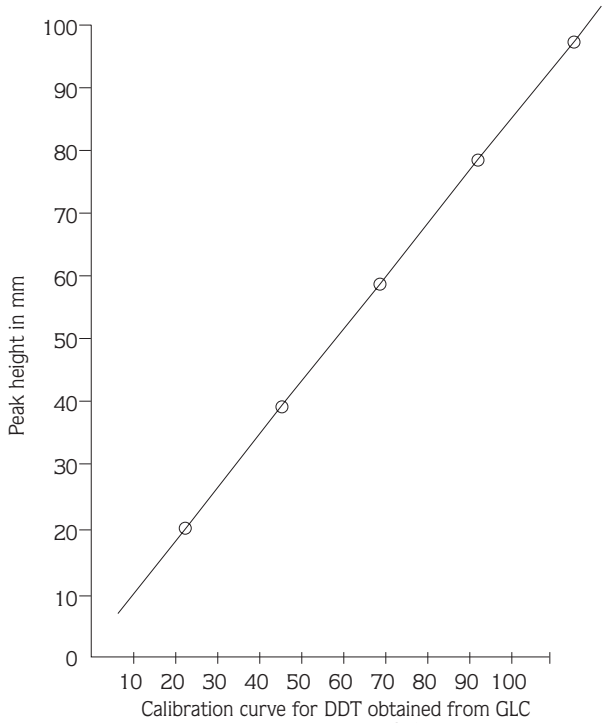


Figure 1. Calibration curve for DDT obtained from GLC.

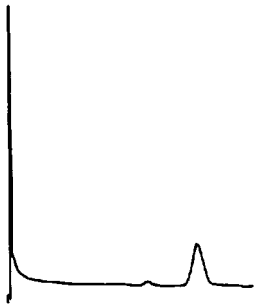

Figure 2. Chromatograph showing amount of standard DDT after the injection of 20 ng/ml to GLC.

Figure 3. Chromatograph showing amount of standard DDT after the injection of 40 ng/ml to GLC.

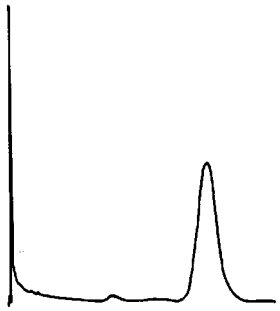

Figure 4. Chromatograph showing amount of standard DDT after the injection of 60 ng/ml to GLC.

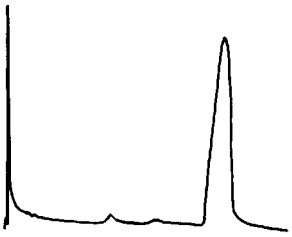

Figure 5. Chromatograph showing amount of standard DDT after the injection of 80 ng/ml to GLC.

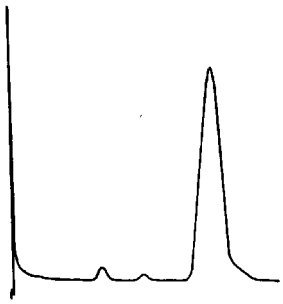

Figure 6. Chromatograph chowing amount of standard DDT after the injection of 100 ng/ml to GLC.

Figure 7. Chromatograph showing amount of DDT nondegraded by GLC in hexane after the treatment of *Musca domestica* (L.) (PCSIR strain).

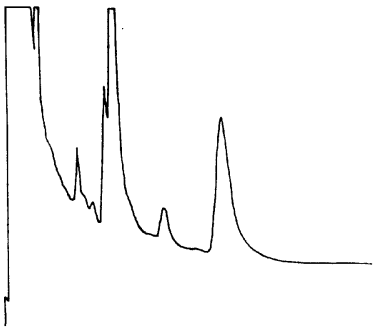

Figure 8. Chromatograph showing amount of DDT nondegraded by GLC in diethyl ether after the treatment of *Musca domestica* (L.) (PCSIR strain).

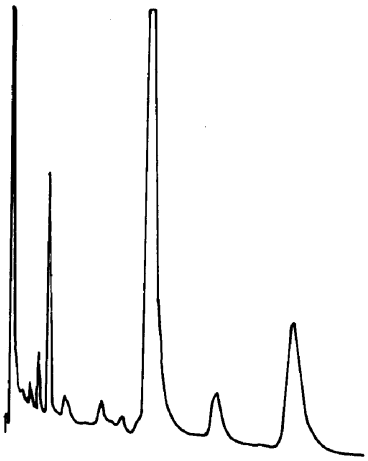

Figure 9. Chromatograph showing amount of DDT nondegraded by GLC in hexane after the treatment of *Musca domestica* (L.) (Holland strain).

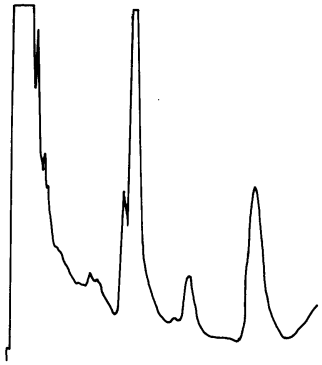

Figure 10. Chromatograph showing amount of DDT nondegraded by GLC in diethyl ether after the treatment of *Musca domestica* (L.) (Holland strain).

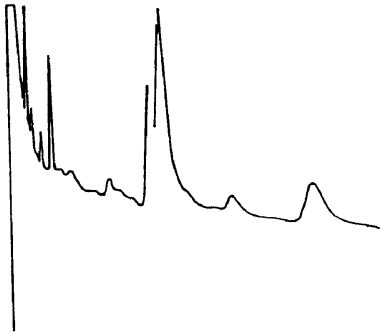

Figure 11. Chromatograph showing amount of DDT nondegraded by GLC in hexane after the treatment of *Musca domestica* (L.) (Malir strain).

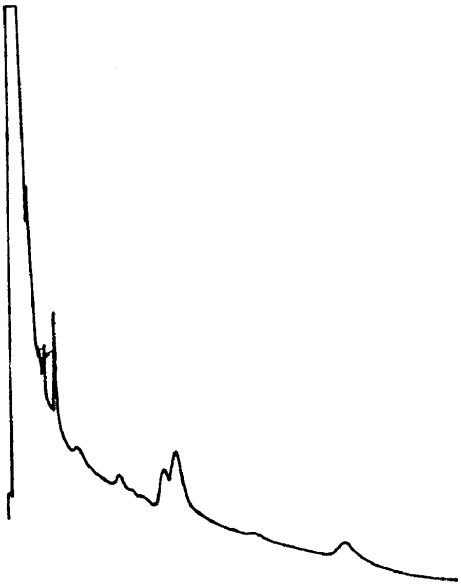

Figure 12. Chromatograph showing amount of DDT nondegraded by GLC in diethyl ether after the treatment of *Musca domestica* (L.) (Malir strain).

Table Showing the Reproducibility of DDT by GLC.

| Solvents | Reproducibility of DDT and its percentage in | | | Amount of DDT injected to insects |
|---|---|---|---|---|
| | Susceptible (PCSIR) | Resistant (Holland) | Resistant (Malir) | |
| *n*-Hexane | 59.68 ng | 18.3 ng | 4.35 ng | 2.0 µg/fly (PCSIR) |
| Diethyl ether | 55.74 ng | 17.1 ng | 1.29 ng | 8.8 µg/fly (Holland) |
| % | 0.3 % | 0.02 % | 0.022 % | 19.0 µg/fly (Malir) |

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