# GENOTOXIC EFFECT OF THE INSECTICIDE CHLORPYRIFOS AND THE ROLE OF LETTUCE LEAVE AS ANTIMUTAGEN IN MALE MICE

BY

**AHMED MOHAMED MOHAMED DARWISH**
B. Sc. Agric. Sc. (Genetics), Ain Shams University, 2003

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# السمية الوراثية لمبيد الكلوربيريفوس ودور ورق الخس كمضاد للطفور في ذكور الفئران

رساله مقدمه من

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**للحصول على**

**درجة الماجستير في العلوم الزراعية**
**(وراثه)**

**قسم الوراثة**
**كلية الزراعة**
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**صفحة الموافقة على الرساله**

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# ABSTRACT

**Ahmed Mohamed Mohamed Darwish: Genotoxic Effect of the insecticide Chlorpyrifos and the role of Lettuce Leave as Antimutagen in Male Mice. Unpublished M. Sc. Dissertation, Department of Genetics, Faculty of Agriculture, Ain Shams University, 2009.**

Chlorpyrifos [O, O-diethyl-O-(3, 5, 6-trichloro-2-pyridyl)-phosphorothioate] is one of the most widely used organophosphate insecticides. Previous studies proved that chlorpyrifos at different doses induced genotoxicity. Since, the residual levels of pesticides in Egyptian foods often higher than those found in developed countries, the aim of the present work is to evaluate the mutagenicity of the insecticide chlorpyrifos at the doses that equal to its maximum residue limit (MRL) in the leafy vegetables, its double and triple (0.5, 1 & 2 mg/kg body weight) in somatic and germ cells of male mice. In addition, to evaluate the role of lettuce leaves as antimutagen in reducing the genotoxic effect of chlorpyrifos tested doses when concurrently administrated to animals with the insecticide. The study of this effect is conducted on adult male laboratory mice at three levels: Bone marrow cells as model for mitotic chromosome, spermatocytes as a model for meiotic chromosomes and sperm count and morphology. The results of the present study indicated that the treatment of male mice with chlorpyrifos three doses by oral gavages for three month induced significant increase in the frequencies of total chromosomal aberrations in both somatic, and germ cells over than the control groups. Results of the sperm analysis indicated that chlorpyrifos induced significant decrease in the sperm count as compared to negative control. In addition, it induced significant increase in head and tail sperm abnormalities and the coiled tail is

considered the more obvious sperm abnormality induced by chlorpyrifos. Meanwhile, the present study indicated that administration of lettuce leaves at tested dose concurrently with chlorpyrifos different doses could not protect cells from damage.

**Key word:** Genotoxic, Mutation, Chlorpyrifos, Insecticides, Lettuce, Anti mutagen, Chromosomal aberration, Mice Male

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# I- INTRODUCTION

Chlorpyrifos [*O, O*-diethyl-*O*-(3, 5, 6-trichloro-2-pyridyl)-phosphorothioate] is one of the most widely used organophosphate insecticides ***(Donaldson et al., 2002)***. According to the U.S. Environmental Protection Agency, approximately 800 registered products on the market contain chlorpyrifos, and these products are used for a number of purposes, including pest control for a variety of food crops, turf and ornamental plants, green houses, and sod; indoor pest control; structural pest control; and pet collars ***(Smegal, 2002)***.

The primary mechanism of action of chlorpyrifos involves the inhibition of acetylcholinestrase resulting in a wide range of neurotoxic effects in humans, such as sensory and motor neuropathy with permanent paralysis (***Meggs, 2003)***.

Some experimental studies proved that chlorpyrifos-induced genotoxicity ***(Patnaik and Tripathy, 1992; Rahman et al., 2002)***, sister-chromatid exchanges ***(Amer and Aly, 1992; Sobti et al., 1982)***, and chromosomal loss ***(Woodruff et al., 1983)***. In rats, chlorpyrifos has been found to induce mitotic abnormalities and cytotoxicity ***(Roy et al., 1998)***; immunologic abnormalities, such as increased expression of the CD5 and CD8 surface markers ***(Blakley et al., 1999)***; and generation of reactive oxygen species, DNA damage, and lactate acid dehydrogenase leakage ***(Bagchi et al., 1995***). Also, ***De Saliva and Samayawardhena,(2005)*** demonstrated that chlorpyrifos affects mating behavior, number of offspring and offspring survival in guppy. But Recent work on organophsphate pesticide illustrate that exposure to neurotoxic compounds, such as chlorpyrifos, at levels considered safe for adults could lead to permanent loss of brain function in early childhood exposure and that these concerns were relevant to the average child's exposure to pesticide residues in their diet (***Slotkin, 2004)*.**