

RISK ASSESSMENT OF PESTICIDES ON APPLICATORS AND FARM WORKERS USING DIFFERENT SPRAYERS IN COTTON SEASON

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Abstract

Fakous province in Sharkia Governorate constitutes one of the largest agricultural areas in Egypt. The majority of people in this province rely on agricultural activities for subsistence. In cotton cultivation season continuous application of pesticides are commonly used according to Schedule of pest management. In this study the health effects of pesticides on some biochemical criteria were assessed among a cohort of 210 intensive agricultural pesticides applicators and farm workers from Sawada and Akyad Elkeppia villages in Fakous province according to the type of spraying equipments they used. Conventional motor (300 L / Feddan) and knapsack motor sprayer (20 L / Feddan) were commonly used. Contamination on head, body (thorax / abdomen) and legs was detected among 85 applicators (knapsack motor sprayers) and among 75 applicators (conventional motor sprayers) agricultural workers compared with an age and sex matched control group (60 subjects) selected from the general population. The recorded results revealed that contamination with pesticides due to knapsack motor sprayers was 0.76 % on head, 4.8 % on body and 5.8 % on legs. However, conventional motor sprayer induces higher contamination than knapsack with 3.6 % on head, 23.7 % on body and 29.1 % on legs. Several criteria for estimating pesticide contamination by the previous expressed machines were used. The most important one being serum cholinesterase (AChE) as a reference biomarker was depression with two types of sprayers. Applicators expressed changes in serum glucose level with two types of sprayers presented as well as, reduced glutathione level (GSH) in erythrocytes. However, an increase in each of total serum protein and albumin was recorded also, elevation in lipid peroxidation biomarker malondialdehyde (MDA) was recorded. Changes in serum biochemistry namely enzymes reflecting cytotoxicity were recorded, an inhibition in alanine aminotransferase (ALT) and glutathione-s-transferase (GST). An increase in aspartate aminotransferase (AST) and glutathione reductase (GR) was observed. The most pronounced results were observed in conventional motor sprayers. Changes in enzymes activities found in this study are linked to the adverse health effects related to chronic pesticide toxicity that may led to pathophysiological diseases, cancer or neurodegenerative

disorders, are attractive hypothesis that warrants further investigations.

Key Words: Risk Assessment, Spraying Equipments, Applicators, Biochemical Changes.

INTRODUCTION

Cotton played an important and vital role in the political and economic history of Egypt. Egyptians have pride in their cotton because it affects their everyday life and is considered a pillar in their culture. It is because of that they seek its uniqueness and quality. Cotton plantations are highly important in Egypt, covering between 400 000 and 500 000 ha, 1/6 of all cultivated land (Nassar, 1994). In 2007 Fakous province in Sharkia Governorate in Egypt cultivated more than 2000 feddan with cotton. This crop is a vital source of foreign currency revenue through exports, and their state of health is therefore permanently under close surveillance. Egyptian cotton is vulnerable to dozens of insect pests and diseases especially Egyptian cotton worm (*Spodoptera littoralis* Boisd – Lepidoptera, Noctuidae (Moritz Schanz, 1913), making it the most pesticide-intensive crop grown on the planet. Today cotton farmers from as far apart as Egypt, India, Peru and Australia spend a total of US\$ 2 billion on agricultural pesticides every year, of these chemical applications at least US\$ 819 million are toxic enough to be classified as hazardous by the World Health Organization (WHO) such as deltamethrin and endosulfan, which are the two most widely used insecticides on cotton (WHO, 2005). Pesticides action is affected by several interfering factors, e.g spray quality and the contact between deposited droplets and the target pest these factors depends upon the type of spraying equipments. Different types of spraying equipments were used in pesticides application for example: Knapsack motor sprayer (Kubota) at 35,55,85, 105 and 120 L / Fadden and conventional motor sprayer at 600 L / Fadden (Megahed *et al.*, 2004). In the field operations smaller droplets drifting away from application area, In many cases pesticides not only affect the physiology of the pest species they are intended to control, but also impact upon the well-being of human adults and children. This phenomenon is particularly associated with insecticides, many of which are designed to interfere with biological systems common throughout much of the animal kingdom, such as the nervous and reproductive systems (Zahm 1997).

Nearly 99 % of the world's cotton farmers live and work in the developing world where low levels of safety awareness, lack of access to protective apparatus, illiteracy, poor labelling of pesticides, inadequate safeguards, and chronic poverty each exacerbate the damage caused by cotton pesticides to low income communities. Developing world farmers are responsible for producing 75 % of global cotton