THE ROLE OF ADJUVANTS ON THE EFFICIENCY AND PERFORMANCE OF CERTAIN LOCALLY FORMULATED PESTICIDES

By

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B. Sc. Agric. Sc. (pesticides), Ain Shams University, 2003
M. Sc. Agric. Sc. (pesticides), Ain Shams University, 2009

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ABSTRACT

Zakia Kamal Lotfey Saber El-Khiat: The Role of Adjuvants on the Efficiency and Performance of Certain Locally Formulated Pesticides. Unpublished Ph.D. Thesis, Department of Plant Protection, Faculty of Agriculture, Ain Shams University, 2017.

This study aimed to preparation new trend of locally lambda cyhalothrin (Emulsion Oil in Water and Oil Dispersion) pesticides formulations compared with conventional one (Emulsifiable Concentrate), with evaluating the effect of commonly used agricultural adjuvants (Argal and Techno oil) upon addition to these formulations. Adjuvants are considered to be safer and more friendly to the (eco-system) as they decrease the application rate of pesticides. Data demonstrated that the results of the physical and chemical properties for the three types of formulations pass in all parameters for these formulations, spray solutions and the active ingredient content were within the acceptable limit. Adding adjuvants to formulated pesticides caused some changes in the physical and chemical properties of the spray solutions. These changes increased the effectiveness of these formulations aganist cotton leaf worm and decreased the residue on cotton crop. Using Argal adjuvant decrased surface tension and enhanced spray solution which lead to increasing the deposit in the treated surface of the plant. Results showed that M3 gave most increase in average residual effect than the pesticide alone (M1). The highest effectiveness was that of EW M3 with improvement insecticidal efficiency of lambda-cyhalothrin against 4^{th} instar larvae of cotton leafworm. LC50 for EW , OD and EC were (10.57 , 5.46 and 5.1 ppm) respectively ,with the half recommended dose. These results indicated that adjuvants increased the effectiveness of lambda-cyhalothrin formulations. Therefore, adjuvants may be used to reduce the number of applications per season and the application rates of insecticides.

Key words: Adjuvant, Physico-chemical properties, lambda cyhalothrin, emulsion oil in water, oil dispersion, emulsifiable concentrate, insecticidal effectiveness, cotton leaf worm, residues.

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INTRODUCTION

Since the dawn of time mankind has had two primary goals - obtaining enough food to survive and improving the quality of life. The single most important task facing a society is the production of food to feed its population. A country or society has to feed its people before it can devote resources to education, arts, technology or recreation. In some areas of the world this remains the primary focus of the entire population, producing or accessing food to feed its people. In these countries food can account for over 60% of annual income needs. Today, more than 60% of our population is involved in agriculture, producing enough food for not only our population, but for others around the world. A basic reason for our ability to increase our productivity is our ability to control pests, weeds, insects and pathogens using crop protection products **(Anjan *et al.*, 2009).**

Pesticides are still going to be used for many years to ensure food supply for the ever growing world population. Great potential still exists to improve their efficiency and reduce their input into the environmental and food chain **(Gasic *et al.*, 2011)**.

Pesticides, as a key component of Integrated Pest Management (IPM), help out an important role in increasing agricultural production, but their abuse has led to the environmental problems including health hazards to humans **(Akbar *et al.*, 2010)**.

Pesticide formulation is the process of transforming a pesticidal chemical (active ingredient) into a product, which can be applied by practical methods to permit its effective, safe, and economical use **(De *et al.*, 2013).**

Recently the pesticide industry has made a good progress in terms of development and production of low risk environmental friendly pesticide formulations, although pesticides are still mainly available in conventional formulations such as dustable powders, wettable powders, emulsifiable concentrates, solutions, etc. Such conventional formulations could cause problems related to environmental protection, leaving residues in ecosystem, food, final products, etc. Hence, there is a growing

demand for use of environmental friendly water based formulations as oil-in-water emulsions, aqueous suspension concentrates, oil dispersion, aqueous capsule suspensions and so on instead of conventional pesticide formulations. Thus, formulation scientists now are facing the challenge to explore novel green or environmental friendly agrochemical formulation to improve the biological efficacy and develop technique that can be employed to reduce pesticide use while maintaining plant protection (**Kumar *et al.*, 2016).**

Emulsifiable agricultural chemical formulations have been conveniently and widely used for a very long time. However, emulsifiable solutions need large amounts of organic solvents such as toluene, dimethyl benzene, etc. which are harmful to man and his environment. Hence, there is a demand for water-based, granular or control-release new pesticide formulations, which are clean and safe and have minimal impact on the environment **(Feng *et al* ., 2009) .**

Oil-in-water emulsions are now receiving considerable attention as they have reduced or eliminated volatile organic compounds (VOCs) for safer handling. Water based, oil-in-water emulsions can have significant advantages over emulsifiable concentrates in terms of cost and safety in manufacture, transportation and use. The active ingredient must have very low water solubility to avoid crystallization issues. One of the latest formulation types is oil dispersions (ODs) this technology allows very efficient and environmentally friendly agrochemical formulations. In ODs the solid active ingredient is dispersed in the oil phase such as mineral oils, vegetable oils or esters of vegetable oils, making it especially suitable for water-sensitive or non-soluble active ingredients and give a stable emulsion after dilution with water **(Hazra, 2015).**

Within the range of currently available agro-chemical products, there exists a unique group of products called adjuvants. These products have the ability to greatly influence the performance of pesticidal materials by working through means of both physical and chemical processes. Clearly, the expansion of world agriculture production will be