Summary

The present work was conducted to investigate the role of chemical additives to increase the insecticidal efficiency and reduced the dosage rate of recommended concentrations to about 75% of candidate insecticides against the cotton leafworm, Spodoptera littorals in order to reduce the hazards and costs. Insecticides used: Dursban 44.5% EC, Curacron 72% EC, Axone 5% EC and Super alpha 10% EC. Additive materials included lipophilic agents (kerosene, xylene and CAPL1), acidifying agents (citric acid, sulphonic acid, oxalic acid and tartaric acid), Surfactant agents poly ethylene glycol 600 dilurate (DL600), poly ethylene glycol 600 monolurate (ML600) and Sisi6, sticking agents (glue and Arabic gum) and thickening agents (polyacryl amid and HMC).

The following principle points were considered throughout the present study.

1- The effect of adding local chemical additive materials on the physico-chemical properties of candidate insecticides.

The physico-chemical properties of additive materials were studied. Solubility in both water and insecticides was considered as a limiting factor for mixing technique i.e direct or indirect method. The free acidity or alkalinity were studied for those materials, also HLB and CMC were studied for surfactants. The physical compatibility between different additive materials and candidate insecticides was then investigated.

Emulsion stability test was consider as a limiting factor for the successful combination and would be an important guide for the physical compatibility of the mixed materials. Also the physico-chemical properties:

free acidity or alkalinity, cold test and accelerated storage were carried out in case of direct-mix method.

The effect of physically compatible materials on the physico-chemical properties of insecticidal spray solution in tap water under field dilution rate was studied. Surface tension, viscosity, electrical conductivity and pH value were measured.

2- Physico-chemical properties of tested additive materials alone.

Data indicated that all tested oils were miscible with Dursban, Curacron, Axone and super alpha, but they were not soluble in water. Therefore oils were added to insecticides using direct mix technique. On the other hand citric acid, sulphonic acid, oxalic acid, tartaric acid, glue, Arabic gum, polyacryl amid, HMC and surfactant Sisi6 were soluble in water, therefore, they could be mixed with insecticides using tank-mix method. Acidity modifiers, sulphonic acid, surfactants: Poly ethylene glycol 600 dilurate (DL600) and poly ethylene glycol 600 mono lurate (ML600) were soluble with all insecticides and water, therefore they added to insecticides using direct mix technique and water using indirect mix technique. Data obtained indicated that all tested additives decrease pH value, Surface tension and increase viscosity, electrical conductivity; therefore they gave a prediction of increasing the efficiency and residual activity of insecticides spray solution.

1.2. Physical compatibility of tested additive materials and candidate insecticides under field dilution rate.

In case of direct mixing method, data indicated that all tested oils were compatible with all insecticides at ratio 10%. Also most of surfactants

poly ethylene glycol 600 dilurate (DL600), poly ethylene glycol 600 mono lurate (ML600) and sulphonic acid were compatible at ratio 10% in emulsion stability, free acidity or alkalinity, cold test and heat storage tests. In case of tank-mix method, most of chemical additives used which soluble in water were compatible with tested insecticides.

1.3. Effect of compatible additive materials on the physico-chemical properties of candidate insecticides under field dilution rate.

The results indicated that most additive materials showed improvement in the physico-chemical properties of candidate insecticidal spray solution. Such improvement gave a prediction of increasing in their retention and deposit on treated plant surface. In case of direct mix technique, data indicated that, the tested oils (kerosene, xylene and CAPL1), poly ethylene glycol 600 dilurate (DL600), poly ethylene glycol 600 mono lurate (ML600) and sulphonic acid gave slight decrease in surface and pH values. On the other hand they gave decrease in viscosity and increase in electrical conductivity.

In case of indirect mix technique, data indicated that, all tested surfactants (DL600, ML600 and Sisi6), sulphonic acid and HMC decreased the surface tension of candidate insecticide spray solution. Polyacryl amid and HMC increased the viscosity of candidate insecticide spray solution. The increase in viscosity gave a prediction of decreasing the drift and increasing retention of insecticides. All acids showed high increase in the electrical conductivity. Also most additive materials decreased the pH values of insecticide spray solution. This decrease in pH value indicated increase in

positive charge of insecticide spray solution and therefore increased the attraction between the spray solution and the treated plant leaves which have negative charge.

3- Evaluation the insecticidal efficiency of candidate insecticides and their combination with chemical additives against the 4th instar larvae of cotton leafworm.

The tested insecticides at their full and 3/4 recommended rate of application alone and with chemical additives at 3/4 recommended rate were applied on cotton plants. Insecticidal efficiency was determined according to Ministry of Agriculture Protocol (Field – Laboratory Experiment). It could be concluded that the dosage rate of candidate insecticides could be reduced to about 3/4 of the recommended dose when mixed with chemical additives as a result of increasing their insecticidal efficiency to be the same as complete rate. In case of direct mix technique, the dosage rate of Dursban could be reduced to about 3/4 of the recommended rate when used in combination with Kerosene, Xylene and CAPL1. Also the dosage rate of Axone could be reduced to about ¾ rate when combined with Kerosene, Xylene, CAPL1 and. On the other hand, Kerosene, Xylene, CAPL1, poly ethylene glycol 600 dilurate (DL600) and Sulphonic acid when combined with Super alpha reduced the dosage rate to be about 3/4 the recommended rate. In case of tank- mix technique, the dosage rate of Dursban could be reduced to about ¾ rate when combined with citric acid, oxalic acid, tartaric acid, poly ethylene glycol 600 dilurate (DL600), poly ethylene glycol 600 mono lurate (ML600), Sisi6, Glue, Arabic gum and HMC. On the other hand all the above additives reduced the dosage rate of Curacron to about ¾ rate except ML600, Glue and HMC. Also the dosage rate of Axone could be reduced to about ¾ rate when combined with citric acid, oxalic acid and poly

eyhylene glycol 600 dilurate (DL600). The dosage rate of Super alpha could be reduced to about ¾ rate when combined with citric acid, oxalic acid, tartaric acid, poly ethylene glycol 600 dilurate (DL600), Glue, Arabic gum, polyacryl amid and HMC.

4- Persistence of Dursban and Axone on cotton leaves.

for determination the persistence of pesticides alone and pesticide – additive mixture on cotton plants, 3 leaves samples of treated cotton plant were taken at 0.0 time and after 6 days of treatment and kept at deep freezer at less than 0.0 C^0 up to determination the chemical stability as the following method of extraction and cleaning up.

A- Persistence of Dursban

Results showed that the remaining quantity of pesticide Dursban after one hour from cotton leaves treatment with recommended rate, ¾ recommended rate, 3/4 recommended rate plus poly ethylene glycol 600 dilurate (DL600) were 96.04, 51.43 and 65.49 respectively. This amount decreased after 6 days of treatment to 9.65, 4.14 and 5.36.

B- Persistence of Axone.

Obtained results showed that the amount of pesticide residue after one hour from cotton leaves treatment with recommended rate, 3/4 recommended rate, and 3/4 recommended rate plus CAPL1 were 24.95, 7.18 and 7.63 respectively. This amount decreased after 6 days of treatment to 6.19, 3.44 and 5.23.