Summary

This study was conducted to investigate the effect of storage at different intervals temperature and time on the following:

1- Stability of three commercial chlorpyrifos 48% EC (manufactured from various companies) and the formation of its impurity sulfotep.

2- Stability of three commercial malathion 57% EC (manufactured from various companies) and the formation of its impurities isomalathion, malaoxon, MeOOSPS-triester, and MeOOOPS-triester.

3- Physical properties such as emulsion stability and re-emulsification test, pH values, and free acidity for pesticides under investigation.

The results of the present study can be summarized as follows:

1. Chlorpyrifos.

1.1. **Effect of storage stability on chlorpyrifos 48% EC content**

Chlorpyrifos content was stable after storage at 54± 2 °C for 21 days. The content of chlorpyrifos was 45.21, 44.99, and 45.43%, and it has percentage of loss 3.85, 4.46, and 3.75% for source I, II, and III respectively.

However chlorpyrifos was more stable after storage at room temperature for 12 weeks. The content of chlorpyrifos was 46.025, 45.69 and 46.11%, and it has percentage of loss 2.12, 2.97, and 2.31% for source I, II, and III respectively. Whereas the stability of chlorpyrifos after storage at 72± 2 °C for 5 days was less stable than storage at room temperature and 54± 2 °C, The chlorpyrifos content was 41.79, 41.30, and 41.35% and it has percentage of loss 11.12, 12.30, and 12.39% for source I, II, and III respectively. The rate of degradation of the three chlorpyrifos formulations under investigation was influenced by change

in temperature degrees and long period of storage, and there was no difference in the content of chlorpyrifos from the three sources.

1.2. Effect of storage stability on the formation of sulfotep

The amount of sulfotep didn't affect by long period of storage and storage at high temperature, and also the amount of sulfotep from source I and III was in the allowed limits according to [1], but the amount of sulfotep from source II was more than the allowed limits and that was found before and after storage at room temperature, 54± 2 °C, and 72± 2 °C.

1.3. Effect of storage stability on the emulsion stability and re-emulsification for chlorpyrifos 48% EC

Chlorpyrifos from source I, II and III passed successfully through emulsion stability and re-emulsification test before and after storage at 54± 2 °C for 21 days, and at 72± 2 °C for 5 days when formulation diluted with CIPAC standard water A and D, but the emulsion stability and re-emulsification for chlorpyrifos from source II was not comply with specification after storage at 72± 2 °C for 5 days when the formulation diluted with CIPAC standard water D.

Chlorpyrifos from source I, II, and III passed successfully through emulsion stability and re-emulsification test before and after storage at room temperature for 12 weeks when formulation diluted with CIPAC standard water A. Also when using CIPAC standard water D with source I and III the emulsion stability and re-emulsification test passed successfully after 12 weeks, but for chlorpyrifos from source II the emulsion stability and re-emulsification test was not comply with the specification of chlorpyrifos.

1.4. Effect of storage stability on PH values for chlorpyrifos 48% EC.

pH range for chlorpyrifos under investigation was stable through the storage at room temperature for 12 weeks, at 54± 2 °C for 21 days and at 72± 2 °C for 5 days. pH values of chlorpyrifos from source III were agreement with the range of pH values [1], but the results of pH values from source I, and II were in agreement with [1].

2. Malathion

2.1. Effect of storage stability on malathion 57% EC content

The content of malathion after storage at 54± 2 °C for 21 days was 55.03, 52.5, and 44.02%, and it has percentage of loss 2.65, 7.1, and 21.89% for source I, II and III respectively. The content of malathion after storage at 72± 2 for 5 days was 48.49, 47.47, and 38.18%, and it has percentage of loss 14.22, 15.99, and 32.26% for source I, II, and III respectively. The content of malathion after storage at room temperature for 12 weeks was 55.59, 54.65, and 52.33% and it has percentage of loss 1.67, 3.45, and 7.15% for source I, II, and III respectively.

The previously mentionded results showed that there is a difference in the rate of degradation of the three malathion formulations under investigation, the rate of degradation of malathion from source III was more than the rate of degradation of malathion from source I, and II because of change in temperature degrees and long period of storage, also manufacturing process and sources of starting materials. Malathion was influenced by increasing temperature degrees and became less stable after storage at high temperature than storage at room temperature.

2.2. Effect of storage stability on the formation of malathion impurities

2.2.1. Impurities of malathion from source I

The amount of isomalathion, malaoxon, MeOOSPS-triester, and MeOOOPS-triester in malathion formulation after storage at 54± 2 °C, 72± 2 °C, and at room temperature were more than the maximum allowed level of impurities according to [2] except MeOOSPS-triester was less than the maximum allowed level, and all impurities increased by storage.

2.2.2. impurities of malathion from source II

The amount of isomalathion, malaoxon, MeOOSPS-triester, and MeOOOPS-triester in malathion formulation after storage at 54± 2 °C, 72± 2 °C, and at room temperature were more than the maximum allowed level of impurities [2], and all impurities increased by storage.

2.2.3. Impurities of malathion from source III

The amount of isomalathion, malaoxon, MeOOSPS-triester, and MeOOOPS-triester in malathion formulation after storage at 54± 2 °C, 72± 2 °C, and at room temperature were more than the maximum allowed level of impurities [2], and all impurities increased by storage.

2.3. Effect of storage stability on the emulsion stability and re-emulsification for malathion 57% EC

Malathion from source I, II, and III passed successfully through the emulsion stability and re-emulsification test before and after storage at 54± 2 °C for 21 days, at 72± 2 °C for 5 days, and at room temperature for 12 weeks when formulation diluted with CIPAC standard water A, and also malathion from source I passed successfully through the emulsion stability and re-emulsification test after storage at 54± 2 °C for 21 days, at

72± 2 °C for 5 days, and at room temperature when formulation diluted with CIPAC standard water D. Whereas malathion formulation from source II, and III was not comply with specification before and after storage at 54± 2 °C, 72± 2 °C, and at room temperature when formulation diluted with CIPAC standard water D.

2.4. Effect of storage stability on acidity for malathion 57% EC

The free acidity calculated as H_2SO_4 of three malathion formulation after storage at 54± 2 °C, 72± 2 °C, and room temperature increased with increasing in time and temperature.