

Summary of the Candidate (Ph.D.) Dissertation Thesis

**Effect of food technological processing on residues of
some plant foods**

by

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Scientific background and study objectives.

In recent years, the use of many agrochemicals in the field of plant production and animal production took place. Pesticides, as agrochemicals for plant protection are widely used throughout the world for pest control. The use of pesticides in agriculture has provided numerous benefits in terms of increased production and quality of the product. At the same time, pesticides are toxic chemicals or in fact are poisons and their residues in foods can pose a potential health risk to consumers. Residues of pesticides and their metabolic products can find their way into the food chain from several sources; the purposeful application of pesticides on crops to control various pest species is the most common. Another is the indirect contamination of food with pesticides that persist in the environment.

To protect the health of consumers and to avoid any hazardous effects, most countries have introduced laws governing not only the use of pesticides, but also setting up limits for pesticide residues which may be tolerated in food stuff (Maybury, 1989). Regulatory agencies, both national and international seeking to limit the human intake of pesticide residues throughout the consumption of food, have established systems of "tolerances" or Maximum Residue Limits (MRLs) in foods (Polen, 1971).

In spite of this, careful attention should be given to assure that desired residue levels are achieved in the food supply without the costs associated with excessive final

product monitoring (Trichilo and Schmitt, 1989). It is of great importance to make sure tAX, at the time of food consumption, the residue levels of any agrochemicals should be within or below the established MRLs to avoid their hazardous effects on human beings and domestic animals (Elkins, 1989).

The objectives of the present studies

1. Influence of some commercial home preparations on residue levels of Lindane, Mancozeb and Zineb on apple and tomato fruits.
2. Effect of some preservation methods on residue levels of Lindane, Mancozeb and Zineb in some products of apple and tomato.
3. Impact of storage period on residue levels of the same above mentioned pesticides in some preserved products of apple and tomato.
4. Incidence of safety waiting period post-treatment and before consumption on the residue levels of the above mentioned compounds.
5. Decomposition of Lindane during processing and preservation of apple and tomato, and during the safety waiting interval.

The methods of investigations and experiments.

1. Materials

1.1 Tested pesticides

1.1.1 Chlorinated hydrocarbon compound

a/ Gamma-Hexachlorocyclohexane (Lindane)

1.1.2 Dithiocarbamate fungicides

a/ Dithane M-45 (Mancozeb)

b/ Dithane Z-78 (Zineb)

1.2 Plantfoods

1.2.1 Tomato

1.2.2 Apple

2. Methods

2.1 Treatment of plantfoods

All treatments with Lindane, Mancozeb and Zineb were carried out according to the recommendation of Hungarian Ministry of Agriculture (Agrochemicals, pesticides, 1987).

2.2 Commercial home preparations.

Before processing, treated fruits of tomato or of apple were mainly washed with water (normal washing) and minor portion of fruits was washed with detergent (adequate washing) to compare the effect of adequate washing with the effect of normal washing on the residue levels of Lindane, Mancozeb and Zineb.

2.3 Technological processes

Treated fruits of apple and tomato were washed with water, then processed to various products using different technological process, as described by Giaman and Sherrington (1977) as follows:

2.3.1 Tomato products

- a/ Pasteurized juice.
- b/ Sterilized juice.
- c/ Concentrated juice.
- d/ Tomato puree (paste).

2.3.2 Apple products

- a/ Pasteurized juice.
- b/ Sterilized juice.
- c/ Apple jam.

2.4 Storage of preserved products

All products of tomato or of apple were divided into two equal parts, where one of them was stored for three months in sealed clean bottles at room temperature to elucidate the effect of storage on residue levels of Lindane, Mancozeb and Zineb.

2.5 Analytical methods for residue determination.

- 2.5.1 Günther Becker's method (1979) was used for extraction, clean-up and determination of Lindane residues on apple and tomato fruits and in their products. Determination of Lindane residues was carried out using gas liquid chromatographic analysis with electron capture detector (ECD).

2.5.2 Steinwandter method (1984) was used for determination of Mancozeb and Zineb residues on apple and tomato fruits and in their products. Gas-chromatographic analysis with ECD was used for residue determination.

2.5.3 Recovery of pesticide residues

The efficiency of the gas-liquid chromatographic method and gas-chromatographic method were evaluated. The average recovery values of Lindane, Mancozeb and Zineb in apple and tomato were used to correct all obtained residue values.

Summary of the new scientific results

The main obtained results can be summarized as follows:

1. Removal of Lindane, Mancozeb and Zineb residues from apple and tomato fruits was higher by adequate washing than normal washing directly after treatment and after the safety interval for 15 days post-treatment.
2. Preservation of apple as an apple jam, as sterilized apple juice and as pasteurized apple juice reduced a big portion of residue levels of Lindane, Mancozeb and Zineb in comparison with unprocessed products immediately after treatment and after 15 days of treatment. Preservation of tomato juice by sterilization, concentration and pasteurization declined significantly the residue levels of Lindane, Mancozeb and Zineb in comparison with unprocessed fresh juice directly after treatment and after 15 days of treatment. Manufacturing of tomato juice to tomato puree (paste) occurred a high reduction in residue levels of the same above mentioned pesticides at

the same mentioned intervals. Residue Levels of Lindane, Mancozeb and Zineb significantly lowered by these preservation methods to be below the established MRLs for these pesticides.

3. In spite of the reference point of residues before storage was below the MRLs, storage of preserved products of apple and tomato for three months caused reductions in residue levels of Lindane, Mancozeb and Zineb in the preserved products of apple and tomato to be mere traces of their established MRLs.
4. Waiting safety period for 15 days post-treatment and before harvest time occurred various reductions in residues levels of Lindane, Mancozeb and Zineb on unwashed apple and tomato fruits to be after water washing within the MRLs except in case of Lindane on tomato fruits, where careful washing with water for several times is required to decline Lindane residues to be within the MRL for Lindane.
5. Decomposition of Lindane to various metabolic products during the safety waiting interval, during the processings and during the storage period was investigated. Monochlorobenzene, Dichlorobenzene and trichlorobenzene were the common detected metabolic products during the safety interval on apple and tomato fruits, and during processing and storage of apple and tomato products.

The practical importance of investigations

In continuation to the scientific efforts for answering the problems of food pollution, the present work was designed, to investigate some processes and methods which play a key role in minimizing the residue levels of some pesticides and other agrochemicals on some vegetables and fruits to avoid their hazardous side effects on human beings.

In the present study, when Lindane, Mancozeb and Zineb were applied with the widely used field rates on apples and tomatoes, it was found that

- (1) Washing of apple and tomato fruits with water after 15 days post-treatment was enough to lower the residue levels to be within their established MRL_s and to be valid for human consumption except in case of Lindane on tomatoes and therefore washing for several times may lower residue level to be safe for human consumption.
- (2) Processing of apple and tomato fruits to various products reduced the residue levels of Lindane, Mancozeb and Zineb below their established MRL_s and to be safe for human consumption without any hazardous side effects.
- (3) Storage of the preserved products of apple and tomato for three months minimized the residue levels which were significantly smaller than the levels of the established MRL_s .

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