IDENTIFICATION OF PESTICIDES AND USE OF HOUSEHOLD METHODS TO ERADICATE THE PESTICIDES FROM VEGETABLES AND FRUITS

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***ABSTRACT*:** Vegetables and fruits are integral part of daily diet of man. It is a known fact that commercially available vegetables and fruits are usually sprayed with pesticides. If these fruits and vegetables are consumed without proper processing, they may lead to bioaccumulation. The current study aims to identify the presence of pesticides like Cypermethrin and Carbendazim on commonly consumed vegetables and fruits. An attempt was also made to find out some household methods which can be implemented to eradicate these pesticides from the vegetables and fruits.

A comparative study was designed to identify Cypermethrin and Carbendazim from two vegetables viz. marketed and organic varieties of ridge guard (*Luffa acutangula*) and smooth guard (*Luffa aegyptiaca*). In fruits, grapes were selected as they are known to be sprayed with these pesticides. The extracts of the peels and flesh of these vegetables and fruits were analyzed by TLC method for the presence Cypermethrin and Carbendazim and their presence was confirmed by IR spectra. In another study, salad vegetables were treated with different concentrations of Cypermethrin and Carbendazim. They were then washed with house hold methods like RO water, vinegar water and alum water. These washing were analyzed for the presence pesticides by TLC method. It was observed that house hold methods like RO water, vinegar water and alum water are effective in the removal traces of pesticides from the surface of the vegetables and fruits.

***Index Trems* - Pesticides, Cypermethrin, Carbendazim, vegetables, fruit, TLC, IR spectra, RO water, vinegar water, alum water**

I. INTRODUCTION

Essential nutrients which are necessary for major biochemical reactions occurring in the body are derived from daily diet consisting of vegetables and fruits. For the prevention of vitamin deficiency and to reduce the risk of diseases like cancer, cardiovascular diseases, diabetes and obesity, high intake of vegetables and fruits i.e. five or more servings per day is recommended. The United Nations Population Division estimates that, by the year 2050, there will be 9.7 billion people on Earth. Nearly all of this population growth will occur in developing countries [1]. Increase in the yield of fruits and vegetables from limited agricultural land is the only solution to meet the need of increasing population. Pesticides can prevent large crop losses and will therefore continue to play an important role in agriculture. However, the effects of these pesticides on humans and the environment is an issue of continuing concern [2]. The use of pesticides have increased because they have rapid action and are effective in decrease in toxins produced by food infecting organisms like bacteria, fungi and viruses[3][4]. Application of common pesticides is less labour intensive than other pest control methods. However, the use of pesticides during agricultural practices, often leads to the presence of pesticide residues in fruits and vegetables after harvest [5]. Exposure to pesticides on regular intervals and in large quantities may lead to acute poisoning or long-term health effects, including cancer and adverse effects on reproduction [6].

In contrast to these facts, organic food has higher nutritional quality. It is an overall system of farm management and food production that aims at sustainable agriculture. Organic farming ensures high –quality products and the use of processes that do not harm the environment or humans, plant or animals' health and welfare. The overall number of studies analyzing the safety of organic vs. conventional foods is growing rapidly. It may be surprising to know that only a small number of scientific studies have addressed the question whether organic food is more or equally or less healthy compared to conventional food [7][10].

Therefore it is essential to confirm the presence of common pesticides on vegetables and fruits of organic and marketed varieties. The current study aims to identify the presence of pesticides like Cypermethrin and Carbendazim on commonly consumed vegetables and fruits. An attempt was also made to investigate easy methods for removal of these pesticide residues from the surface of the vegetables and fruits at the level of every household so as to reduce the constant risk of exposure to pesticides.

II. MATERIAL

In the first part of study two vegetables viz. marketed and organic varieties of ridge guard (*Luffa acutangula*) and smooth guard (*Luffa aegyptiaca*) and grapes were used. The vegetables and fruits were procured from local market. Organic vegetables were procured from a local organic farmer.

For the second part of study, salad vegetables like Cucumber, cabbage, carrot and beetroot were procured from the local market.

The Cypermethrin and Carbendazim which are commonly used pesticide and fungicide respectively, were procured from a local nursery. Chemicals for extractions and TLC were procured from local dealer.

III. RESEARCH METHODOLOGY

The current study was divided into two parts viz.
2. 1 Extraction and identification of pesticides from peel and flesh of ridge guard and smooth guard and grapes
2.2 Eradication of pesticides from salad vegetables by household methods

2. 1 Extraction and identification of pesticides from peel and flesh of vegetables and fruit

A comparative study was designed to identify Cypermethrin and Carbendazim from two vegetables viz. marketed and organic varieties of ridge guard (*Luffa acutangula*) and smooth guard (*Luffa aegyptiaca*) and market variety of grapes. The vegetables and grapes were washed with water and dried with cloth. They were peeled and the skin and flesh was extracted on rotary shaker using distilled water and absolute alcohol in three concentrations namely 25%, 50% and 100%. Cypermethrin and Carbendazim were diluted to 25% and 50% respectively. Extracts were analyzed by common analytical method like thin layer chromatography (TLC). The solvent system used for determination of Cypermetrin was n - Hexane: Chloroform in (1:1) ratio and for Carbendazim it was Methanol: Water (95:5) ratio [8][9][13]. The extracts which showed the presence of Cypermethrin and Carbendazim by TLC, were analyzed on FT-IR 4100 type A to confirm the presence of these pesticides [11][12]. The results were compared with that of standard IR spectrum of Cypermethrin and Carbendazim.

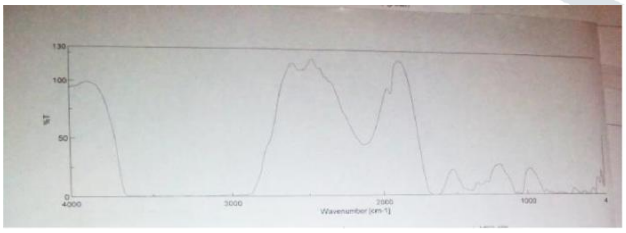
2.2 Eradication of pesticides from salad vegetables by household methods

Another study was designed with salad vegetables like cucumber, cabbage, carrot and beetroot which are generally consumed raw. They were washed with known quantity of normal tap water. This washing water was then analyzed by TLC to determine the presence of Cypermethrin and Carbendazim. The solvent system used for determination of Cypermetrin was n - Hexane: Chloroform in (1:1) ratio and for Carbendazim was Chloroform: Acetone in (6:4) ratio [8][9]. Further, these vegetables were sprayed with 0.5ppm of Cypermethrin and Carbendazim. After 10 mins, they were soaked in 10% vinegar, 10% alum water and RO water respectively for 1hour. The washing water thus acquired was also analyzed by TLC.

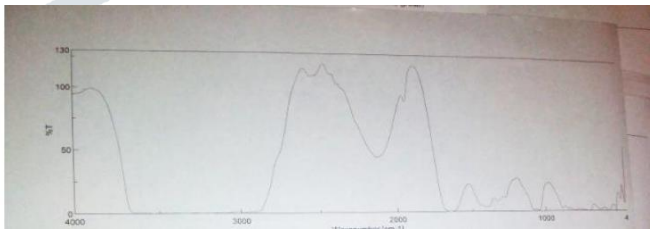
IV. RESULTS AND DISCUSSION

After extraction, pesticides were identified from peel and flesh of ridge guard and smooth gaurd (market and organic) and grapes by TLC. The results revealed the presence of Carbendazim from peels of market variety in water and alcohol extracts. The same results were obtained from the skin of grapes. Cypermethrin was not detected by TLC analysis from any of these extracts. However, flesh extracts of market and organic vegetables and grapes did not show presence of both the pesticides under investigation.
The peel extracts of market variety of vegetables and grapes were then analyzed by FT-IR 4100type A. The results were compared with standard IR spectrum of Carbendazim.

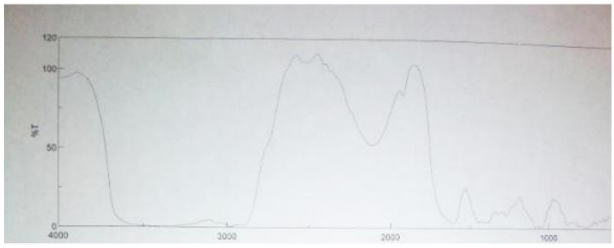
IR Spectra of Standard Carbendazim



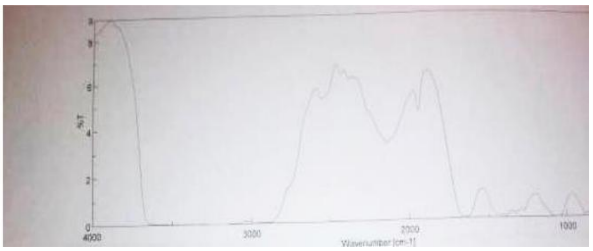
IR Spectra of EtOH Ext. of Ridge Guard



IR Spectra of EtOH Ext. of Smooth



IR Spectra of EtOH Ext. of Grapes



To investigate the efficacy of household means such as 10% vinegar water, 10% alum water and RO water in eradication of pesticides from salad vegetables; washings of these vegetables were analyzed by TLC. The results revealed the presence of Cypermethrin and Carbendazim at Rf value of 0.33 and 0.86 respectively.

To sum up, TLC analysis of peels of Ridge Guard (*Luffa acutangula*), smooth Guard (*Luffa aegyptiaca*) and skin of grapes revealed the presence of Carbendazim in both aqueous and ethanolic extracts, but only in marketed varieties. The organic varieties did not show presence of both the pesticides. The FT-IR spectra also confirmed the presence of Carbendazim in these extracts. However, presence of Cypermethrin was not detected in all these extracts.

It was also observed that common household ingredients like RO water, Vinegar and Alum water are useful in removal of traces of pesticides from the surface of salad vegetables than normal tap water. In this study, TLC analysis of washing solutions revealed presence of Cypermethrin and Carbendazim.

Therefore, it can be concluded that fungicides like Carbendazim are used extensively on marketed varieties of vegetables as compared to organic vegetables. It is therefore advisable to peel the vegetables and deskin the fruits before use. It can be also added that thorough washing of these vegetables and fruits with household ingredients like RO water, Vinegar and Alum water help in eradication of traces of pesticides.

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