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Detection of Alfabaz10EC Residue (Alphacypermethrin) in Some Vegetables and Fruits in Khartoum, Sudan

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Abstract

The study was carried out during 2017 and aimed to detect alfabaz10EC residue (alphacypermethrin) in some vegetables and fruits. The pesticide was prepared according to the manufactured instructions. *Eruca sativa* was planted in Nuba village (Khartoum State). Twelve days later after planting *Eruca sativa* sprayed with alfabaz10EC. *Cucumis sativus, Cucumis melo, Punica deranatum* and *Capsicum annum* were collected randomly from Khartoum markets. Samples from *Eruca sativa* were taken for analysis after 1, 24, 72 and 96 hours later after spraying with the pesticide. The analysis of the pesticide and the samples were carried out by gas chromatography/mass spectrometry (GC-MS) at criminal evidence laboratory (Khartoum). The mass spectra for the pesticide (alphacypermethrin) showed a base Peak at 163.00 and the chromatogram gave a peak with a retention time (20.80) for the active material in the pesticide. The analysis of the different samples of *Eruca sativa* by GC-MS showed peaks with retention time 20.80 and base peak at 163.00 for the samples collected after 1, 24, and 72 hours and no peak appeared for the samples collected after 96 hours. Analysis of the samples collected randomly by GC-MS showed a base peak at 163.00 and a peak with a retention time 20.80 only for *Cucumis melo.* The results obtained indicate that the *Cucumis Sativus, Punica deranatum, Capsicum annum* and *Eruca sativa* (after 96 hours) are safe for human consumption as far as alphacypermethrin pesticide residue is concerned. The study recommends that there be continuous survey and monitoring program for pesticides in vegetables and fruits in order to protect the consumer from exposure to pesticides.

Keywords: *Eruca sativa; Cucumis melo;* Alphacypermethrin; Human consumption

Abbreviations: WHO: World health organization; UNPE: United Nations Environment Program; FAO: Food and Agriculture Organization; GC/MS: Gas Chromatography/Mass Spectrometry; NIST: National Institute of Standards and Technology

Introduction

Pesticide is any substance or mixture of substances that is intended to prevent, eliminate or control any pest, including disease carriers for humans, animals and unwanted plant species that cause damage or interference in any form during the production of food or agricultural products and feeds, or during their manufacture- transportation and marketing and considered to be the most important and the most complex chemical pollutants to be exposed to humans and environment together. The world health organization estimated that about three million cases of poisoning occurred most of them are located during the period associated with pesticide use [1]. This expression includes substances used to regulate the growth of plants or to prevent the fall of fruit prematurely, as well as materials used in crops either before harvest or after to prevent the crop from deterioration or transportation [2]. It is one of the most important elements of agricultural production as it is an effective means can be used correctly to contribute to the protection of crops [3]. They are used to kill pests because of the similarity of vital processes in humans [4]. With their counterparts in pests, pesticides may cause harm to humans and the environment, especially if it is not used properly. Citric acid was used as an insecticide during the 18th century in China and hence the world witnessed the beginnings of arsenic development and expansion of pesticide use [5]. In the year 1821 copper sulfate was used as the first chemical to fight weeds.

In 1855 sulfuric acid was used in Germany to control weeds in grain crops and onions [6]. Routine and pyrethrum have been used as common insecticides in year 1882. The protective and therapeutic effect of the bordeaux mixture known as Milardet (Copper and sulfur mixture with lime and water) against white diseases [5]. In 1896, the copper sulphate solution was proven to be an option in killing mustard plants in grain crops. Heavy metal salts were used to combat broad leaf in grain crops in America in 1914. Oils were used to kill weeds in irrigation channels and roads, and this is still the method used in some areas [6]. The

actual expansion of pesticide use began from the years after 1930 when it was introduced the synthesis and manufacture of organic pesticides [5]. The first organic chemical pesticide made in 1932 in France is optional to control large grasses in grain crops 2- methyl 4,6-dinitro phenol. It was also used to control weeds in legume crops (large grains) and the detection and synthesis of dithiocarbamate pesticides, which were used as fungicides in 1935, and DDT in 1939 [6].

The production of pesticides has been expanded globally after the end of the Second World War in particular in the late 1940s and early 1950s, with the emergence of many commercial preparations such as organic phosphorus compounds, which were used as insecticides and phenoxy acetate, which act as herbicides. The development and manufacture of new types of pesticides continued during the 1960s and 1970s such as chlorpyrifos (phosphoric insecticide), glyphosate (herbicide) and pyrimethrin (insecticide from the pyrethroid group). The pesticide contains active ingredient that responsible for killing the pests, while the rest of the materials that are included in the composition are inactive materials [7]. Additive substances are known as substances that have no effect to add to the pesticide to increase the efficiency of the pesticide but can improve the properties of spray solution [8,9]. Farmers are aware of the seriousness of the pesticide they use, but still continue to use them above the required quantity [10]. The World health organization (WHO) defined the pesticide residue as any substance or mixture of substances in food for human or animal resulting from the use of a pesticide and includes any specified derivatives, such as degradation and conversion products, metabolites, reaction products, and impurities that are considered to be of toxicological significance [11]. In general, guidelines for the study of the amount to be addressed with chemical pollutants are prepared through the joint efforts of the United Nations Environment Program (UNPE), the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) [12]. The damage of pesticides is a subject of great importance to most of the World Health Organization to protect people from the indirect danger to health including pesticides damage to human health are directly by touching or inhaling the pesticide or through the mouth or eye [13].

Materials and Methods

Materials

Vegetables and fruits samples: Watercress (Eruca sativa) was planted in Nuba village (Khartoum State). Twelve days later after planting, the watercress was sprayed by alfabaz10EC. Different samples collected for analysis from watercress after one, twenty-four, seventy-two and ninety-six hours later after spraying the plant with the pesticide. Cantaloupe, pomegranate, cucumber and pepper collected randomly from Khartoum and Omdurman markets.

Methods

Preparation of the pesticide solution: 5ml of the pesticide (Alfabaz10EC) was added to one liter of water according to the manufactured company description.

Preparation of fruits and vegetables samples for analysis: 20mg of each sample were added to 10ml of distilled water, stirred well until smooth. 3ml of a combination of isopropanal and dichloromethane (95.5%) were added to the sample solution. The mixture was centrifuged for 5 minutes. The organic phase was separated from the aqueous phase by extraction method. The organic layer was dried with nitrogen and 100 microliters of methanol was added to the dried layer. The analysis was carried out by gas chromatography/ mass spectrometry (GC/MS).

GC/MS analysis conditions: The qualitative analyses of the samples were carried out by GC/MS technique model (GC/MS-QP2010-Ultra) from Japan, Simadzu Company, with serial number 205251015650SA and capillary column (Rtx-5ms-30mx0.25mmx0.25µm). The sample was injected by using split mode, helium as the carrier gas passed with flow rate 1.69ml/min, the temperature program was started from 80 °C with rate 15 °C/min to 200 °C then the rate was changed to 10 °C/min reaching 260 °C and the rate was changed to 10 °C/min reaching 290 °C as final temperature degree with 2 minutes as hold time, the injection port temperature was 290 °C, the ion source temperature was 200 °C and the interface temperature was 250 °C. The sample was analyzed by using scan mode in the range of m/z 35-400 charge to mass ratio and the total run time was 22 minutes. Identification of components of the samples were achieved by comparing their retention times and mass fragmentation patents with those available in the library, the National Institute of Standards and Technology (NIST).

Results and Discussion

The results depend on the retention time (20.80) and the base peak that appeared at 163.0 for the active material in the pesticide (alphacypermethrin). The appearance of a peak at 20.80 in any sample tested of fruits or vegetables means the presence of alphacypermethrin. The results obtained indicated that watercress collected after 1, 24, 72 hours and Cucumis melo were affected by the pesticide residue and not safe for human consummation. 100% of watercress is safe for human consumption after 96 hours of the spray of the vegetable. 75% of fruits and vegetables collected randomly are safe for human consumption.

Conclusion

From the results obtained fruits and vegetables are safe for human consumption after 96 hours later from spraying with the pesticide as far as the investigated residue is concerned. However, they should be cleaned and washed properly before use.

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