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Research Article

A COMPARATIVE ANALYTICAL STUDY ON MEDICATED VEGETABLE WASHES WITH DISTILLED WATER WASH W.S.R TO CYPERMETHRIN AND CHLORPYRIFORM PESTICIDE RESIDUE IN *COCCINIA GRANDIS*

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ABSTRACT

Fresh vegetables and fruits are the main sources of micro-nutrients and macro nutrients for health. Pesticides are mainly used to increase the yield. Pesticides are potentially toxic to humans and can have both acute and chronic health effects, depending on the nature of exposure and duration exposure and the quantity of exposure. This study was done to evaluate the efficacy of medicated vegetable wash comparison. Two samples of Medicated water were prepared according to the *Kshara* preparation of Ayurveda classics. In Samhitas various decontamination have been explained for various types of pollution. Two commonly used pesticides, Cypermethrin and chlorpyrofos were taken in this study. For this study organic vegetable ivy gourd (*Coccinia grandis*) were selected and treated with the pesticides as per QuEChERs method (quick, easy, cheap, effective, rugged and safe) method. The analysis was done GCMS/MS. The results depicted reduction of pesticide residue by medicated water decontamination process with distilled water. Although it varied in different in the two samples, overall medicated water 2 is having more effect on both pesticide residues over medicated water 1 and distilled water.

INTRODUCTION

Vegetables and fruits are important part of a healthy diet. A meta-analysis of cohort studies following 469,551 participants found that a higher intake of fruits and vegetables is associated with a reduced risk of death from cardio vascular diseases, with an average reduction in risk of 4%for each additional serving per day of fruits and vegetables [1]. Nowadays worldwide consumption of pesticides is about 2 million tonnes per year [2]. Pesticides are used to reduce damage to crops from weeds, rodents, insects and germs which increases the yield of crops. But for, many years the use of pesticides was largely unregulated. However pesticides are not perfect, and their use can have health and environmental issues[3]. Another criticism is that some of the more subtle, chronic health effects, chronic health effects of pesticides may not be detectable by the types of studies used to establish the safe limits [4]. The commonly used pesticides includes a large number of organic and inorganic compounds that are classified according to the target organisms in herbicides, acaricides, nematicides, fungicides insecticides rodenticides etc. Most of the pesticides are non-selective, killing natural enemies and other organisms and other organisms that are useful to the ecosystems [5]. Chlorpyrifos and Cypermethrin are insecticides which are widely used in farms. Breathing or ingesting of Chlorpyrifos may result in a variety of nervous system effects ranging from headache, blurred vision, and salivation to seizures, coma and death depending upon the amount and length of exposure[6]. Cypermethrin is a synthetic Pyrethroid, its effects ranges from mild local symptoms like paraesthesia following dermal contamination to neurological symptoms like seizures, fasciculation, tremors coma and GIT symptoms. Studies described the toxicity of Cypermethrin in white male rabbits, following its long term administration which resulted in chronic inflammation of the liver and kidney and induced toxicity[7]. *Agadatanta* is one among *Ashtangas* of Ayurveda deals with various animate and inanimate poisons. Which also describes various *Sodhana*

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(decontamination) methods including water purification, soil purification, air purification[8,9]. Using medicine in the form of medicated water helps to remove impurities without losing the nutritional value.

MATERIALS AND METHOD

Preparation of Medicated water - two samples

Here the medicated water preparation is in accordance with the *Kshara Kalpana* Vidhi by Acharya Vagbhata. [10]

Sl.No	Ingredient	Botanical name	Family
1.	*Ajasringi*	*Gymnea sylvestre*	Apocynaceae
2.	*Indravaruni*	*Citrullus colocynthis*	Cucurnitaceae
3.	*Guduchi*	*Tinospora cordifolia*	Menisperaceae
4.	*Uttamarini*	*Pengularia daemia*	Apocynaceae
5.	*Ativisha*	*Aconitum heterophyllum*	Ranunculaceae
6.	*Phanijjaka*	*Ocimum gratissimum*	lamiaceae
7.	*Sarala*	*Pinus roxburghi*	Pinaceae
8.	*Haridra*	*Curcuma longa*	Zingiberaceae
9.	*Daruharidra*	*Berberis aristata*	Berberidaceae
10.	*Brihat Ela*	*Amomum sabulatum*	Zingiberaceae
11.	*Manjishta*	*Rubia cordifolia*	Rubiaceae
12.	*Rasna*	*Pluchea lanceolata*	Asteraceae
13.	*Ushira*	*Vetiveria zizanoides*	Graminae
14.	*Tintrini*	*Tamarindus indicus*	Fabaceae
15.	*Bilimbi*	*Averrhoa bilimbi*	Oxalidaceae

Plant materials

Ajasringi (*Gymnea sylvestre*), *Indravaruni* (*Citrullus colocynthis*), *Guduchi* (*Tinospora cordifolia*) *Utamarini* (*Pengularia daemia*) *Ativisha* (*Aconitum heterophyllum*) are used for ignition and made into Ash form.

Phanijjaka (*Ocimum gratissimum*) *Sarala,* (*Pinus roxburghi*) *Haridra* (*Curcuma longa*), *Daruharidra* (*Berberis aristata*), *Brihat Ela* (*Amomum sabulatum*), *Manjishta* (*Rubia cordifolia*), *Rasna* (*Pluchea lanceolata*) *and Ushira* (*Vetiveria zizanoides*) were made into fine powder. These were used as *Prativaapa dravyas.* Added in the form of *Kalka*.

Bilimbi (*Averrhoa bilimbi*) juice and Tamarind (*Tamarindus indicus*) juice are added into sample 1 & sample 2 of medicated water respectively.

The ingredients were procured in 500 Gms quantity from a Govt. authorized shop and was obtained drug authentification certificate from Department of Dravya Guna Vijnana Parul Institute of Ayurveda. A big metal kadayi was taken, among the thirteen ingredients, five ingredients *Ajasringi, Indravaruni, Guduchi Utamarini Ativisha* were ignited and made into ash form using a flame gun. The ash formed was collected. 200 gms of ash was taken and added with 1600 ml of distilled water, stirred it well, covered it with a cloth, and kept overnight. Next day morning this solution filtered and supernatant solution separated and collected. Filtration repeated seven times using a four folded thick cotton cloth. The filtered solution of 1400 ml kept in a big steel vessel, boiled and reduced to half.

To this boiling solution 8 ingredients *Phanijjaka, Sarala, Haridra, Daruharidra, Brihat Ela, Manjishta, Rasna and Ushira* were taken in 6 Gms each and made into a *Kalka* form by mixing it with water. This *Prativapa dravyaas* were added to the boiling solution and boiled again and reduced to half. Likewise 2 samples of medicated water were prepared. After cooling, 200 ml of *Bilimbi* juice was added to Sample 1 of medicated water and 200ml of tamarind juice was added to sample 2 of medicated water. Both Medicated water 1&2 prepared and weighed about 500ml.

Ratio for ingredients for Medicated water

Quantities mentioned for making *Kshara* preparation was Ash: Water: *Prativapa Dravya* = 1:8:1/30

Ingredients	Ash (1Gm)	Water (8Gms)	*Prativapa dravya* (1/30 Gms)
Quantity	200Gms	1600ml	6Gms

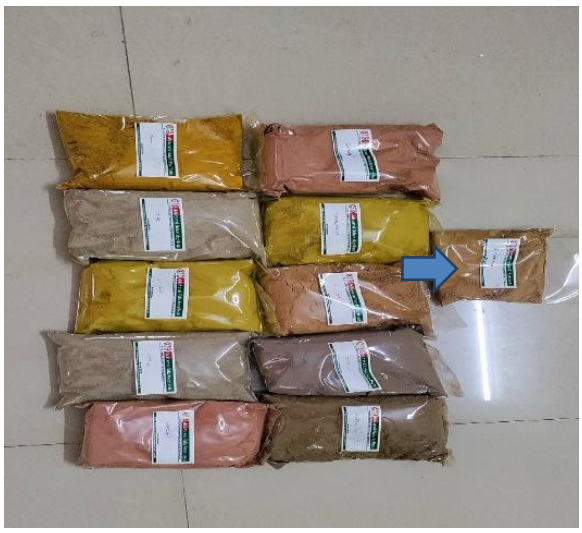

Figure 1: Drugs

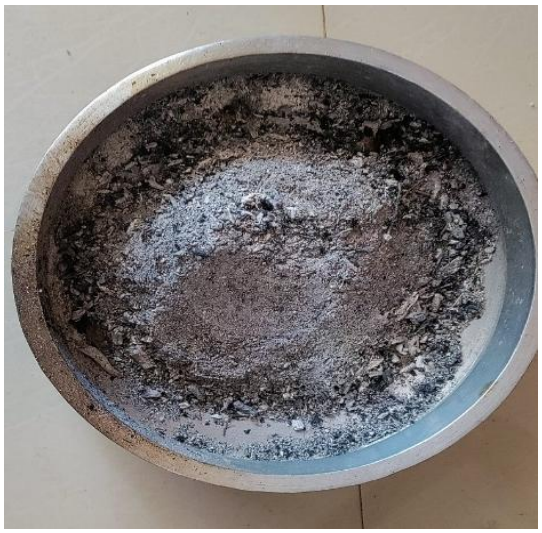

Figure 2: Ash

Figure 3: Medicated water-1

Figure 4: Medicated water-4

Collection of Vegetables and Treatment with the pesticides

The vegetable used for this study was organic ivy gourd (*Coccinia grandis*). It was taken 3.2 kg of Ivy gourd which is organic and natural. This sample collected and brought to the Kerala Agricultural University, Pesticide Residue Analysis Lab, Thrissur. The sample identified and the weight was confirmed and 200 Gms separated as control sample again 3kg ivy gourd is segregated into two of 1.5 kg each for cypermthrin and chlorpyriforms tests.

The Pesticides used for the treatment were purchased from a local pesticide shop, Thrissur. Challenger brand is selected for cypermethrin and Banest is selected for chlorpyrifos. These are the common brands used by the farmers. The dilution also fixed according to the common agricultural practices. The dilution of cypermethrin (Challenger) 1ml/1litre of water that is 5 ml is taken and diluted with 5 litre of water. Dilution of chlorpyrifom (Banest) was 2.5ml/1litre that is 12.5ml/5litre of water.

Pesticide Treatment

The SOP followed for this analysis was done by commonly using analytical method of QuEChERs (Quick, Easy, Cheap, Effective Rugged and safe), here the sample is taken that is organic ivygourd of 3 kg was segregated into two of 1.5kg each. Sample 1 is treated with chlorpyrifom (Banest) of 12.5ml/5litre and Sample 2 is treated with cypermethrin 5ml/5litre of water. The two samples kept or dipped in the pesticides respectively for 10 minutes and and taken out and air dried. After air drying subsampling was done for both the samples, into 4 sub-groups each weights about 370Gms. One sample each from the four subgroups was kept aside without decontamination for the comparison of pesticide residue.

The two samples (chlorpyrifos and cypermethrin) of ivy gourd is divided into sub samples of 370 Gms, each sample is washed with Distiled water, Medicated water 1, and Medicated water 2. Again 3 replicates were prepared. The samples were dipped in the respective wash and kept it for 10 minutes. Taken it out and air dried. GCMS/MS analysis was done.

The samples were evaluated then it is concentrated with Rota vapor. The samples were centrifuged on centrifugation machine on 5 minutes. Then 10ml supernatant solution was collected in the test tube. Now the sample was ready to put in GC Mass Spectrometry (MS) machine.

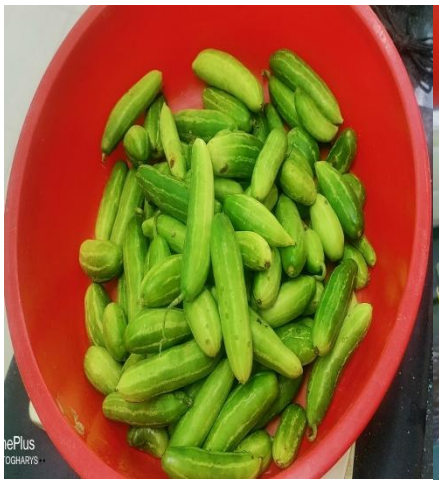

Figure 5: vegetable organic ivy gourd

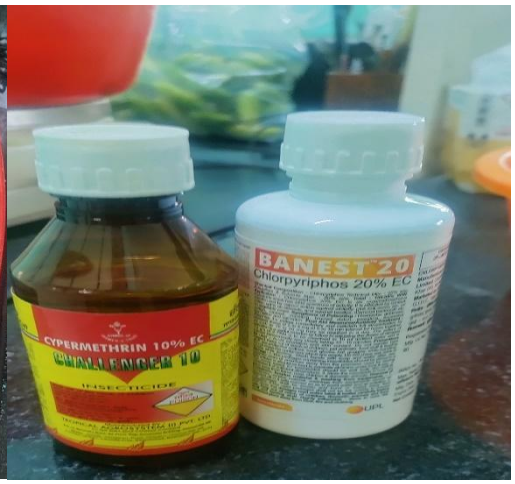

Figure 6: pesticides used for treatment

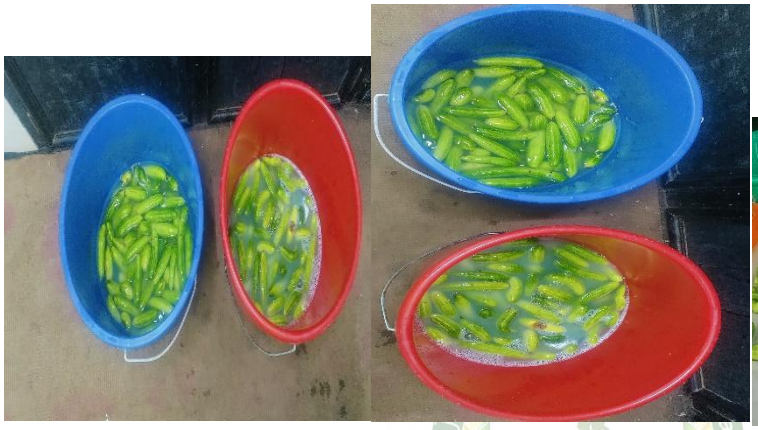

Figure 7: dipped in pesticides

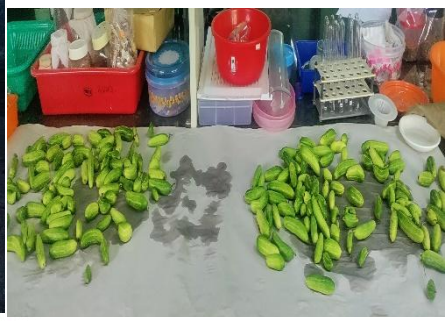

Figure 8: air drying

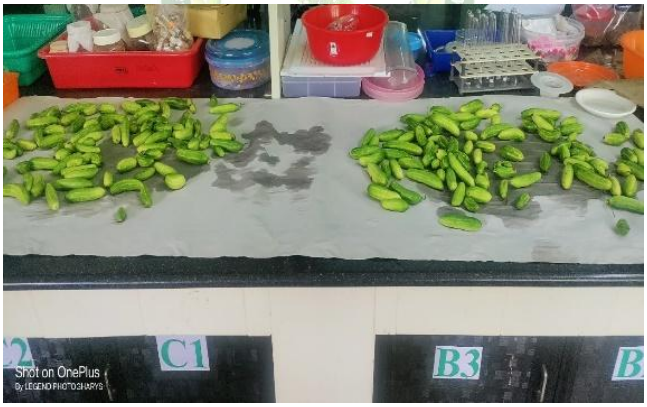

Figure 9: replicates for analysis

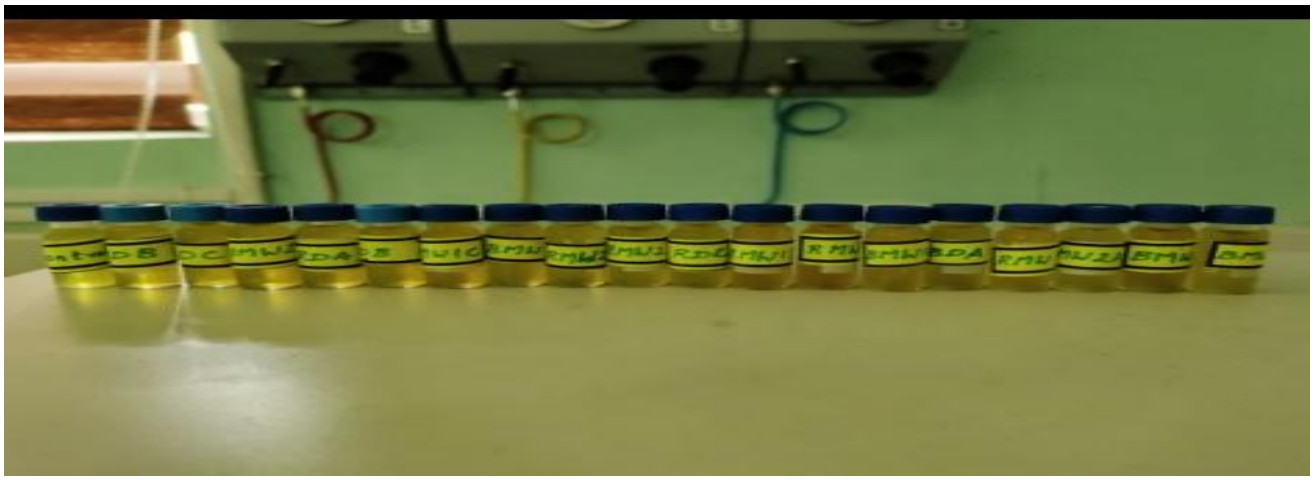

Figure 10: Samples for analysis

RESULTS

After the samples were introduced in GC-MS. The results were seen like this.

Residues of Chlorpyriphos in Ivy gourd after various decontamination treatments

Treatment	Residue (ppm)	Average (ppm)	Degradation (%)
Distilled water	1.38	1.43	71.95
	1.52		
	1.38		
Medicated water 1	1.24	1.15	77.50
	1.19		
	1.01		
Medicated water 2	1.27	1.31	74.27
	1.40		
	1.26		
Untreated (Control)	4.77	5.09	
	5.21		
	5.30		

Treating ivy gourd samples dipped in Chlorpyriphos with medicated water 1 resulted in 77.50% degradation of Chlorpyriphos and with medicated water 2 resulted in 74.27% degradation of Chlorpyriphos over the untreated samples. Dipping the ivy gourd samples resulted in 71.95% degradation of Chlorpyriphos.

Residues of Cypermethrin in Ivy gourd after various decontamination treatments

Treatment	Residue (ppm)	Average (ppm)	Degradation (%)
Distilled water	0.0345	0.0321	37.24
	0.0288		
	0.0331		
Medicated water 1	0.0343	0.0301	41.15
	0.0294		
	0.0267		
Medicated water 2	0.0251	0.0256	50.07
	0.028		
	0.0236		
Untreated (Control)	0.0475	0.0512	
	0.0522		
	0.0539		

Treating ivy gourd samples dipped in Cypermethrin with medicated water 1 resulted in 41.15% degradation of Cypermethrin and with medicated water 2 resulted in 50.07% degradation of Cypermethrin over the untreated samples. Dipping the ivy gourd samples in distilled water resulted in 37.24% degradation of Cypermethrin.

Statistical Analysis

Standard deviation (SD) and relative SD were calculated to determine the reliability of data. The decontamination of insecticides was calculated in percent and expressed as mean percent removal. The data on decontamination studies were analysed in a completely randomized design, and test of significance was carried out by F test. The critical difference values were computed at $P<0.05$

DISCUSSION

Pesticides are designed to kill "pests" but some pesticides can also cause serious health effects in people.[11] Pesticides affects different people differently, children may be more sensitive to some pesticides than adults. [12] Unsafe use of pesticides in agriculture increases the presence of their residues in produce such as vegetables after harvest. Intake of foods contaminated with pesticide residues exposes consumers to pesticides with potential long term health risks. [13] Organophosphates (Chlorpyrifos) and Pyrethroides (Cypermethrin) are the commonly used pesticides globally [14]. Most of the pesticides can be decontaminated by washing the vegetables. Sometimes residues like cypermethrin and deltamethrin could not be removed by washing and cooking in stored grains suggesting that residues penetrated the interior of grains. Commonly used and more effective and convenient alternative could be washing with chlorine water, or with dilute solution of other chemicals depending upon the food commodity. [15]

In Ayurveda the science of life there are so many references regarding decontamination methods. In Susruta Samhita Kalpasthana third chapter Ashtanga sangraha Suthrasthana 8 th chapter *Ahara vidhi viseshayathana* (Guidelines for the food preparation and intake) it has been clearly explained [16,17]. These *Samskaras* (refining) or purifactory procedures either intend to change the specialities of the particular drug or detoxify the chemicals. *Shodhana* in Ayurveda texts meant to remove the toxic principles or to detoxify them by means of washing or treating with antitoxic herbs. [18]

Here two medicated water against double distilled water decontamination on Cypermethrin and Chlorpyrifos pesticide residue was studied. Decontamination effect of Medicated Water 2 in removing Cypermethrin is 50.07%, while the degradation with Medicated water 1 is 41.15% while with double distilled water is 37.24%. As Cypermethrin is in Pyrethroid adhers strongly to soil particles and poses minimal leaching concerns. Cypermethrin hydrolyses slowly under acidic or neutral but more rapidly under alkaline solutions [19] Here the medicated water 1 & 2 were prepared according the *Kshara paka vidhi* and most of the ingredients are anti-toxic anti-bacterial anti-inflammatory. [20] Cypermethrin is having tendency to hydrolyzes slowly in water at pH 7 and below, with hydrolysis is more rapid at pH 9.Under normal environmental temperatures and pH. Cypermethrin is very stable to hydrolysis with a half life of >50 days. It is also stable to autolysis with a half life of >100 days. If we see in sterile solution and under sunlight, cypermethrin photo-degrades with <10% lost in slowly. [21] (Walker and Keith 1992). By analysing all these, medicated water shows significance in reducing Cypermethrin.

Regarding the decontamination of Chlorpyrifos, distilled water made a degradation of 71.95% while medicated water 2 posed 74.27% whereas medicated water 1 posed 77.50% reduction of pesticide residue rate. This shows considerably significant pesticide residue degradation rate.

Decontaminating pesticide residue with medicated water was found to be more effective compared to washing with double distilled water. It is obtained mainly through its Anti-toxic effects of majority of drugs. [22]

CONCLUSION

Food safety is a current burning issue worldwide in the current scenario. Pesticide residue is a major threat food safety. All farmers use pesticides, even organic farmers use natural pesticides to increase their yield. The poisonous pesticides build up and its contamination through food causing various health issues. Before using the vegetables as food it is important to wash it properly for health benefits. There are many vegetable washing methods followed by people. In this study two different medicated water for pesticide decontamination has been used and its effects have been proved. Agadatantra describes various decontamination methods for different poisoning. The formulations described are very effective and safe also. This is an attempt to overcome the major issue that people are suffering in connection with food safety.

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