To evaluate toxicological residues of pesticide on Brassica oleracea before and after Dhavana by Vishaghna Dravya Albizzia Lebbek

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Abstract---Ayurveda is classified into 8 branches Agadantantra is one of important branch of Astanga ayurved which deals with study of poisons origin their properties harmful effects fatal doses their management prevention of poisoning method of detection and estimation of poison. Poisons may be from herbs, mineral or animal origin. In modern science parallel branch known as Toxicology. Today the scope of toxicology continues to grow rapidly and the subject is to profound importance to human and animal life too. Evaluation of residues of pesticides on Cauliflower (Brassica oleracea) before and after Dhavana by Vishaghna Dravya Shirish (Albizzia Lebbek). Cauliflower (Brassica oleracea) and Shirish panchanga (Albizzia Lebbek). Identification and authentication was done in department of Dravyaguna. The percentage of Cypermethrin residue was found to be decreased more by shirish kwatha(73.86%) than hot water(67.33) and tap water(51.56%). The percentage of Chlorpyrifos residue was found to be decreased more by shirish kwatha(48.83%) than hot water(42.93%) and tap water(35.71%). The percentage of Imidaclopride residue was found to be decreased by tap water(86.54%) than that of hot water(72.44%) and shirish kwatha(78.84%). Dhavana with shirish kwatha was found more efficient method for reduction of pesticidal residue in cauliflower. (chlorpyrifos and cypermethrin), which is cost effective and easily practiced. Prove the vishaghna property of shirish.
Introduction

In ayurveda shirish (Albizzia lebbeck) is describe as the medicine curing all type of toxicity. All references prove that shirish is best vishaghnadraya. Its bark used in skin diseases and all part are recommended by acharya charaka and acharya sushruta for treatment of snake bite. Pesticidal residue is one of the weak and slow poison. Usually pesticides are not water soluble. However commonly used method for cleaning these vegetable are washing them with tap water, warm water or salt water (Dhavan) but washing removes externally adhered pesticides and boiling vaporizes some pesticides. Deep seated and non-degradable pesticides will be retained in vegetable even after boiling. So for such a type of study has not been conducted in the field of Ayurveda. This is trial to study the effect of tap water, hot water and shirish kwatha as dhavana dravya to reduce the pesticidal residues of cauliflower and to assess the best dhavan dravya, that were selected according to their easy availability.

Aim and Objective

Evaluation of residues of pesticides on Cauliflower (Brassica oleracea) before and after Dhavana by Vishaghna Dravya Shirish (Albizzia Lebbek).

Material and Methods

Drug material

Cauliflower (Brassica oleracea) and Shirish panchanga (Albizzia Lebbek).(Fig. 1)

Authentication

The identification and authentication of cauliflower (Brassica oleracea) and shirish panchanga (Albizzia Lebbek) was done in department of Dravyaguna. (Fig. 2)

Pharmaceutical

Firstly 16 liter tap water was taken by measuring jar in steel vessel. Then 200 gm of each part of shirish panchanga was added in that water. Then heated on mandagni until 1/8th part was remaining. Kwatha was filtered through cotton cloth. About 2 litre kwatha was prepared. Same kwatha procedure was repeated for 4 times. During experiment fresh kwatha was prepared for each batch. (Fig. 3)

Sampling Method

For batch 1, from 20 cauliflower only 4 cauliflower sample randomly selected taken for experimental study. Each sample of cauliflower weighing 800-1000gm was divided into four parts. Pieces of first cauliflower coded as a1, a2, a3, a4. Second cauliflower coded as b1,b2,b3,b4. Third cauliflower coded as c1,c2,c3,c4
and for fourth cauliflower coded as $d_1, d_2, d_3, d_4$. Each part from each cauliflower sample was taken for four experimental groups. Same procedure was repeated for cauliflower samples of other batches.

**Experimental study**

The whole study was carried out in following method 1. Extraction of pesticides residues 2- Analysis of residual pesticides, These 2 steps were carried out for all the samples of cauliflower, The experiment was first conducted on cauliflower group 1 which was taken as control group was analysed for pesticide residues, The same procedure was then carried out on the samples of each group after washing separately in tap water, hot water, and shirisha kwath, The same procedure was carried out for another batches.

**Method of experimental study**

The experiment was done by “QuEChERS” method. QuEChERS (pronounced) an acronym for Quick, Easy, Cheap, Effective, Rugged, and Safe, covers a variety of sample preparation and clean-up techniques for the analysis of multiple pesticides residues. QuEChERS was developed using an extraction method for pesticides in fruits and vegetables, with clean up method that removes sugar, lipids, organic acids, steroid, sterols, proteins, pigments and excess water. QuEChERS method involves three steps. Liquid micro extraction, Solid phase clean up, GC/MS analysis

**Result and Discussion**

There is maximum reduction in concentration of imiadcloprid (86.54%) and moderate reduction in concentration of cypermethrin (51.56%), chlorpyrifos (37.71%) was observed by following traditional procedure i.e. Dhavana with tap water. Dhavana with hot water significantly reduce imidaclopride (72.44 %). There is moderate reduction in residues of cypermethrin(67.33%) and chlorpyrifos (42.93%). The group after Dhavana with shirish kwatha has significantly reduce (78.84%) of concentration of imidaclopride, (73.86%) cypermethrin, (48.83 %) chlorpyrifos. Tap water considerably reduced residues of imidaclopride 86.54 % than that of hot water (72.44%) and shirish kwatha(78.84%). (Table 1 and 2) Hence effective method to reduce residues of imidaclopride residue was Dhavana with tap water. It can be noted that all the methods of Dhavana have reduce the pesticidal residues more than 50% for all the pesticides except chlorpyrifos. Mean difference between the group has revealed that sample without Dhavana and shirish kwatha has highest difference among all, which indicates significant reduction in concentration of chlorpyrifos and cypermethrin pesticides after Dhavana with shirish kwatha. The difference of reduction between samples without Dhavana and samples after Dhavana by Shirish kwatha for chlorpyrifos and cypermethrin residue was found to be maximum.

So all the result are statistically significant. It was observed in study that mean residue level of chlorpyrifos on cauliflower before Dhavana i.e. 80.254 mg/kg was reduce in shirish kwatha Dhavana i.e.41.062 mg/kg than that of cauliflower Dhavana in hot water and tap water. It was observed in study that mean residue
level of cypermethrin on cauliflower before Dhavana i.e. 14.234 mg/kg was reduce in shirish kwatha Dhavana i.e. 3.748 mg/kg than that of cauliflower Dhavana in hot water and tap water. Highlighting additional feature of this study imidacloprid was the pesticide does not included in the study but its mean residue level on cauliflower before Dhavana i.e. 0.312 mg/kg was reduce in tap water Dhavana i.e. 0.042 mg/kg than that of cauliflower Dhavana in hot water and shirish kwatha. The percentage of Cypermethrin residue was found to be decreased more by shirish kwatha(73.86%) than hot water(67.33) and tap water(51.56%). The percentage of Chlorpyrifos residue was found to be decreased more by shirish kwatha(48.83%) than hot water(42.93%) and tap water(35.71%). The percentage of Imidaclopride residue was found to be decreased by tap water (86.54%) than that of hot water(72.44%) and shirish kwatha. Washing the sample with the tap water has washed off superficially adhered residue. Most of the Imidaclopride residue was reduced in tap water i.e. 86.54% than hot water and shirish kwatha.

Cypermethrin and chlorpyrifos which is quite stable have showed moderate reduction. Tap water might have penetration in to deeper tissue of cauliflower hence only 51.56% and 37.71% of reduction was observed after washing with tap water. Due to solubility of imidaclopride i.e. 0.61 g/l in water it’s maximum reduction occurred by simply washing with tap water. Hot water has higher temperature than the normal tap water which might be responsible for hydrolysis of residues and thus more reduction was observed in it than tap water. Cypermethrin has 67.33% and chlorpyrifos has 42.93 % reduction of pesticide in hot water which might be greater than tap water but imidaclopride has 72.44% reduction in hot water which might be lesser than tap water. Shirish kwatha has reduced concentration of chlorpyrifos and cypermethrin residue significantly than tap water and hot water. Possibly, it is due to the temperature of liquid which has caused oxidation and hydrolysis. The chemical constituent of shirish kwatha which might have caused the chemical degradation by chemical reaction with the residues, and might have formed a stable compound which was washed off easily by shirish kwatha. Shirish kwatha being an organic substance, which perhaps may be responsible for binding of the cypermethrin and chlorpyrifos. As cypermethrin is synthetic pyrethroid insecticide that has high insecticidal activity and adequate stability in air and light. The water solubility of cypermethrin is very low 0.009mg/l. cypermethrin hydrolyzed slowly in water at pH 7 and below. Solubility in organic solvent is high than that of water. Chlorpyrifos has solubility in water is 0.0014 g/l, due to very low solubility it does not wash easily by tap water. Ayurveda mentioned various drugs having multifaceted activity, utilized as medicine, food etc.

In shirish due to laghu guna this drug help to reduce heaviness and increase lightness in kwatha which help to move it freely in all direction in cauliflower. In shirish, pradhan rasa is tikta having function of shodhana(to detoxify or purify) residue. Katu rasa has a function of stravana (to expel out) residue from cauliflower. Kashaya rasa has karma of parishoshan (to drain out). Hence in shirish katu rasa with stravana karma expel out the residues and kashaya rasa with parishoshan karma (to absorb or drain out) the residues from cauliflower. Tikta rasa of shirish with shodhana karma (to detoxify or to purify) to remove residues present in cauliflower. The some constituents of shirish part has best
vishaghna (anti toxic) property which may bind or denature the pesticidal residue which are markedly reduced. Several studies have been found that surface residue are remove to simple washing operation process, here as systemic residue present in tissue little affected. The different house hold preparation such as washing, cooking, washing plus cooking, salt water washing play a role in reduction of pesticidal reduces. Among the household processes washing process reduce the pesticidal residues moderately. While plan tap water washing have not shown any promising effect in removal of residues. Due to the faulty washing techniques, we swallow small quantity of poison in our body in day to day life. This concept can be correlated with dushivisha explained in classical texts of ayurveda. Dushivisha an ayurvedic concept, refers to the substance which have tendency to accumulate in the body when consumed in smaller quantity, and projects the hazardous effect. Pesticidal residue has also similar action as that of Dushivisha, when consumed as a part of daily diet though in a small quantity. Cauliflower is consumed daily by most of the people as vegetable, salad, chinese food, fast food, in burger, pizza etc.

Definitely it had sprayed with pesticides for it’s good yeild by farmers. These pesticidal residue if not degraded before consumption they will turn deleterious. It leads to ingestion of pesticides directly into our body, which is very hazardous for each and every system of our body. Pesticidal residues in cauliflower or other vegetables constitute dushivisha. Dushivisha produces many diseases and syndromes after the accumulation of the quantity being capable to produce illness. Shirish kwatha reduces most of pesticide residues than that of tap water and hot water dhavana. When cauliflower deep in shirish kwatha, kwatha enters into the cauliflower due to which taste and colour of cauliflower changes. Also it is very difficult to prepared kwatha daily for Dhavana process duing cooking food. Hence, instead of shirisha kwatha; use shirish extract for Dhavana process is quiet beneficial. Also the extract can be stored for long use by adding with preservatives. Also the amount of kwatha required for Dhavana process is definitely more than that of amount of extract required. Thus, Dhavana process to reduce pesticidal residues could be more efficient with shirisha extract than that of shirisha kwatha. And there is further scope for upcoming researchers.

Conclusion

The cauliflower growers have been using the pesticides frequently to have higher and insect free yield. But over doses of pesticides make the residue problem, which might pollute our food and environment. Shirish kwatha was appreciated to been efficient method of dhavana in which significant reduction (48.83% chlorpyrifos, 73.66% cypermethrin) in their residual concentration. Imidacloropride another pesticide seen in pesticide residue was significant result in dhavana with tap water than hot water and shirish kwatha. Hence it could be concluded that Dhavana with shirish kwatha was found more efficient method for reduction of pesticidal residue in cauliflower. (chlorpyrifos and cypermethrin), which is cost effective and easily practiced. Prove the vishaghna property of shirish.
### Table 1
Pesticide residues

<table>
<thead>
<tr>
<th>Sample</th>
<th>Chlorpyrifos (mg/kg)</th>
<th>Cypermethrin (mg/kg)</th>
<th>Imidacloprid (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Dhavana</td>
<td>80.254</td>
<td>14.234</td>
<td>0.312</td>
</tr>
<tr>
<td>Tap water</td>
<td>51.598</td>
<td>6.894</td>
<td>0.042</td>
</tr>
<tr>
<td>Hot water</td>
<td>45.8</td>
<td>4.65</td>
<td>0.086</td>
</tr>
<tr>
<td>Shirish Kwatha</td>
<td>41.062</td>
<td>3.748</td>
<td>0.066</td>
</tr>
</tbody>
</table>

### Table 2
Percentage of reduction of pesticide residues after Dhavana are as follows

<table>
<thead>
<tr>
<th>Sample using different dhavana method</th>
<th>Reduction in percentage of chlorpyrifos</th>
<th>Reduction in percentage of cypermethrin</th>
<th>Reduction in percentage of imidaclopride</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water</td>
<td>35.71 %</td>
<td>51.56 %</td>
<td>86.54 %</td>
</tr>
<tr>
<td>Hot water</td>
<td>42.93 %</td>
<td>67.33 %</td>
<td>72.44 %</td>
</tr>
<tr>
<td>Shirish Kwatha</td>
<td>48.83 %</td>
<td>73.66 %</td>
<td>78.84 %</td>
</tr>
</tbody>
</table>
Fig 1. Collection of cauliflower
Fig 2. Identification of shirish panchanga
Fig 3. Kwatha preparation

References


Souza AJ, Oliveira PS, Fernandes KV, Xavier-Filho J, Oliveira AE. Toxicity of the Albizia lebbeck seed coat to insects.