How to Cite:
Khapre, P. W., Mohurle, P. S., & Lambat, R. (2022). To evaluate toxicological residues of pesticide on Brassica oleracea before and after Dhavana by Vishaghna Dravya Albizzia Lebbek. *International Journal of Health Sciences*, *6*(S3), 3246–3255.
https://doi.org/10.53730/ijhs.v6nS3.6338

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

Dr. Prashant W. Khapre
Medical Officer, Primary Health Care center, Sahur, Tq-Ashti, Dist-Wardha, Maharashtra, 442202

Dr. Pradip S. Mohurle
Lecturer, Department of Agadatantra Evum Vidhivaidyaka, North Eastern Institute of Ayurveda & Homeopathy (NEIAH), Shillong, Meghalaya
Correspondence author email: Pradipsm21@gmail.com

Dr. Rajendra Lambat
Associate Professor, Department of Agadtantra, Government Ayurved College, Nagpur

Abstract*---Ayurveda*** is classified into 8 branches *Agadtantra* 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*.

***Keywords*---**dhavana, residues, pesticides, cauliflower, vishaghna, shirish.

Introduction

In *ayurveda shirish* (*Albizzia lebbeck*) is describe as the medicine curing all type of toxicity. All references prove that *shirish* is best *vishaghnadravya*. 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 $1/8^{th}$ 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. T**hird cauliflower coded as **c1,c2,c3,c4**

and for fourth cauliflower coded as **d1,d2,d3,d4**. 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 group1 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 mehod 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. Highliting 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* (78.84%). 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 oxidization 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, chineese 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 illeness. *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 benefial. 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. Imidaclopride 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

Sample	Chlorpyrifo s (mg/kg)	Cypermethri n (mg/kg)	Imidaclopr id (mg/kg)
With out Dhavana	80.254	14.234	0.312
Tap water	51.598	6.894	0.042
Hot water	45.8	4.65	0.086
Shirish kwatha	41.062	3.748	0.066

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

Sample using different dhavan a method	Reduction in percentage of chlorpyrifos	Reduction in percentage of cypermethr in	Reduction in percentage of imidaclopri de
Tap water	35.71 %	51.56 %	86.54 %
Hot water	42.93 %	67.33 %	72.44 %
Shirish Kwatha	48.83 %	73.66 %	78.84 %

Fig 1.Collection of cauliflower

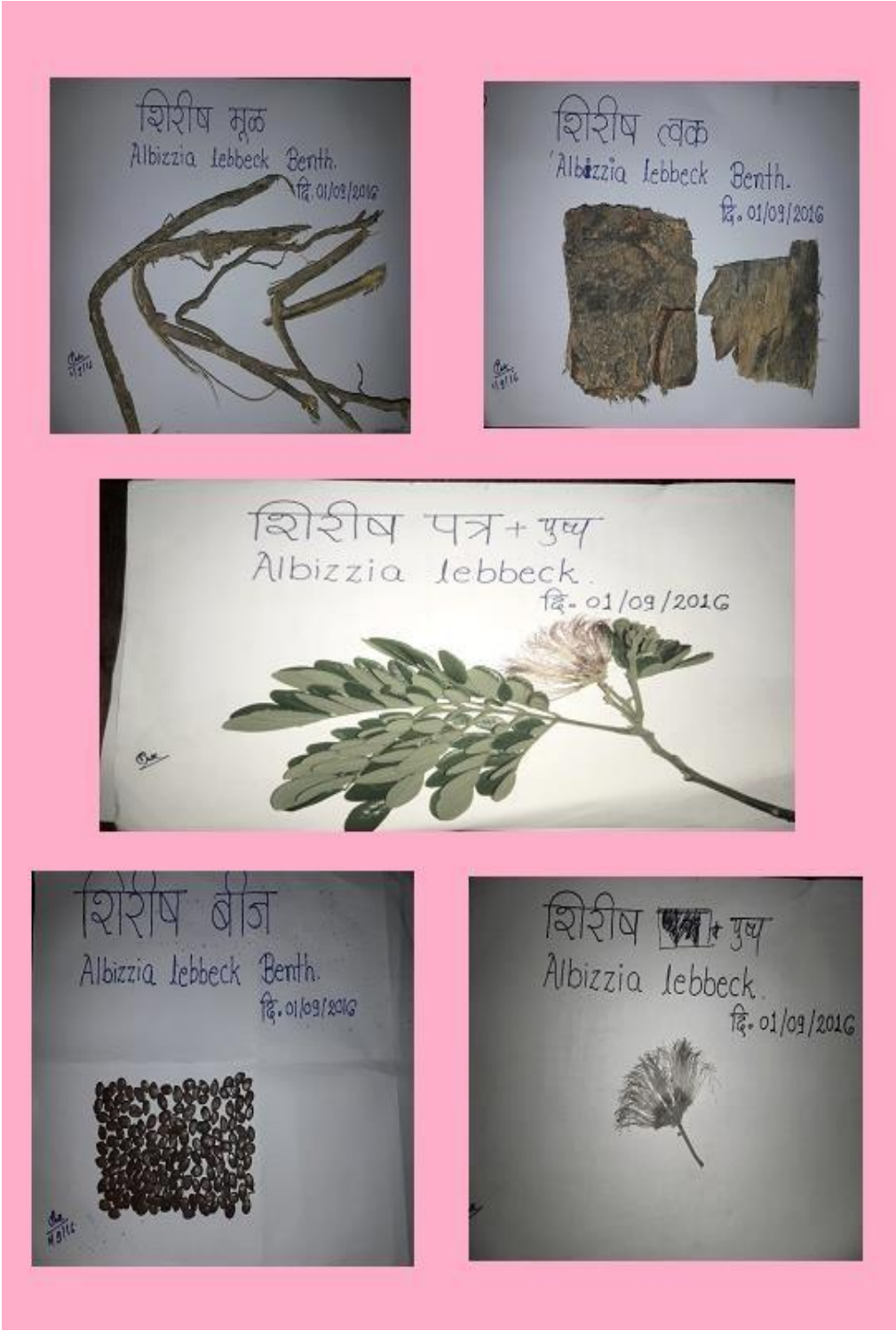

Fig 2. Identification of shirish panchanga

Fig 3. Kwatha preparation

References

Mishra SS, Gothecha VK, Sharma A. Albizia lebbeck: a short review. Journal of herbal medicine and toxicology. 2010;4(2):9-15.

Seyydnejad SM, Niknejad M, Darabpoor I, Motamedi H. Antibacterial activity of hydroalcoholic extract of Callistemon citrinus and Albizia lebbeck. American Journal of Applied Sciences. 2010;7(1):13.

Iqbal MZ, Rahmati K. Tolerance of Albizia lebbeck to Cu and Fe application. Ekológia, ČSFR. 1992;11(4):427-30.

Seyyednejad SM, Niknejad M, Yusefi M. Study of air pollution effects on some physiology and morphology factors of Albizia lebbeck in high temperature condition in Khuzestan. Journal of Plant Sciences. 2009;4(4):122-6.

Farag M, El Gamal A, Kalil A, Al-Rehaily A, El Mirghany O, El Tahir K. Evaluation of some biological activities of Albizia lebbeck flowers. Pharmacology & Pharmacy. 2013 Sep 1;4(6):473.

Farooqi ZR, Iqbal MZ, Kabir M, Shafiq M. Toxic effects of lead and cadmium on germination and seedling growth of Albizia lebbeck (L.) Benth. Pak. J. Bot. 2009 Feb 1;41(1):27-33.

Hegde NG, Relwani LL. Psyllids attack Albizia lebbeck (Linn.) Benth. In India. Nitrogen Fixing Tree Research Reports. 1988;6:43-4.

Marc M, Moïse BF, Joël TN, Lebel TJ. Evaluation of the insecticidal activity of the methanol extracts of Calotropis procera (Asclepiadaceae) and Albizia lebbeck (Mimosaceae) on larvae of Culex quinquefasciatus Say, 1823. The Journal of Basic and Applied Zoology. 2021 Dec;82(1):1-8.

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