



Research Article

THE EFFECT OF SHODHAN PROCESS ON TOXICITY OF *UPAVISHA KUPEELU BEEJA (STRYCHNOS NUXVOMICA)*: A CRITICAL STUDY

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KEYWORDS: *Shodhana* process, *Kupeelu beeja*, *Strychnos nuxvomica*, Toxicity.

ABSTRACT

The principle objectives of Ayurveda are to promote perfect health and to prolong life and to completely eradicate the disease and dysfunction of the body. *Charaka* opined that a deadly poison can become a very good medicine if it is administered in a proper way and with proper technique. Various processes of purification, especially for *Visha and Upvisha*, are mentioned in Ayurvedic texts. They are called as *Shodhan sanskar* (detoxification procedure). *Shodhana* is the process which involves the conversion of any poisonous drug into a medicinally useful and harmless drug. *Kupeelu beeja (Strychnos nuxvomica)*, a *Sthavara vanaspatij visha* contains spinal neurotoxic poison, strychnine. But pure *Kupeelu beeja* has many therapeutic properties as well. So, it is necessary to subject *Kupeelu beeja* to detoxification (*Shodhana*) process before using it as medicine. To prove the authenticity and safety of the use of purified and *Shodhit Vishadravya* (detoxified poisonous drugs), it must be subjected to modern parameters. In this article, attempt has been made to study the changes in phyto-chemical properties and LD50 values of *Kupeelu beeja churna (Strychnos nuxvomica seed powder)* due to *Shodhan sanskar*. The detoxification of *Strychnos nuxvomica* seeds was done by boiling it in cow's milk for 3 hrs. Then the seeds coverings were scrapped and embryo was removed and dried. Thereafter, a fine powder was prepared and stored. This detoxified powder (*Shodhit Kupeelu beeja churna*) was used in studying phytochemical properties and animal experiment in comparison with the powder of non detoxified *Strychnos nuxvomica* seeds (*Ashodhit Kupeelu beeja churna*). The study revealed that the detoxification process of *Strychnos nux vomica* seed powder affects its physico-chemical properties. *Shodhana* process increases the value of LD50 of *Kupeelu beeja churna*. i.e. it reduces the toxicity of *Kupeelu beeja churna*. Thus the safety of the detoxified drug can be established.

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INTRODUCTION

Ayurveda is a science of longevity. The principle objectives of Ayurveda are to promote perfect health and to prolong life and to completely eradicate the disease and dysfunction of the body. It is a fundamental science of life which is evolved primarily for maintenance of the health and to alleviate the sufferings of sick individuals.^[1] *Charaka* opined that a deadly poison can become a very good medicine if it is administered in a proper way and with proper technique. On the other hand even a medicine can prove fatal if it is not prepared

properly or if not administered properly.^[2] It is said that not a single substance in the universe is devoid of therapeutic potential provided it is used judiciously in proper form, in proper dosage and at appropriate indications. Bhavmishra states that a poisonous substance if used tactfully, after adequate purification and in proper dosage, can be used as medicine in many diseases, as after purification it can empower us vitality, energy, immunity by creating total balance of *Doshas* in the body.^[3] Various processes of purification, especially

for *Visha and Upvisha* are mentioned in Ayurvedic texts. They are called as *Shodhan sanskar* (detoxification procedure). *Shodhana* is the process which involves the conversion of any poisonous drug into a beneficial one.^[4] All Poisonous drugs should be purified before their therapeutic use. Rasatarangini has classified poisons as *Stavara* and *Jangam vishas*.^[5] Further the *Stavar visha* is classified into *Visha and Upavisha* on the basis of their toxicity and potency.^[6] *Kupeelu beeja* (*Strychnos nuxvomica*) is one among the 11 *Upavishas* mentioned by Rasatarangini. It is described as *Sthavara vanaspatij visha*. It contains strychnine as an active principal, which is a spinal neurotoxic poison which produces many harmful effects on human body, if consumed in crude form. But pure *Kupeelu beeja* has many therapeutic properties. So, it is necessary to subject *Kupeelu beeja* to detoxification (*Shodhana*) process before using it as medicine. When we are talking about Ayurvedic formulation to modern physicians who have got tendency to observe each and every drug through certain parameters, we have to prove it by some definite criterion to give authenticity to our word.

This study aimed to study experimentally whether *Shodhana* process reduces toxicity of *Kupeelu beej*, or not and to what extent. Hence the present topic to study the effect of *Shodhana*/detoxification on LD50 of *Kupeelu beeja* was selected. The dose amount of poisonous or toxic substance required to kill 50% of tested population is the LD50 of drug. LD50 Figure is frequently used as a general indication of substance acute toxicity. The LD50 is usually expressed as the mass of substance administered per unit mass of test subject, such as mg or grams of substance per kg of body mass. As the signs and symptoms of toxicity of strychnine are seen immediately after consumption, acute toxicity study has been chosen. The detoxified powder of *Strychnos nuxvomica* (*Shodhit Kupeelu beeja churna*) was used to study phytochemical properties and animal experiment in comparison with the powder of non detoxicated *Strychnos nuxvomica* seeds (*Ashodhit Kupeelu beeja churna*).

AIMS AND OBJECTIVES

- To thoroughly study *Kupeelu beeja* and its properties as per Ayurveda and modern science.
- To verify the effects of *Shodhana process* i.e. detoxification process on toxicity level of body.
- To compare mentioned samples with the help of chemical studies.
- To test the hypothesis that detoxification process reduces toxicity of *Kupeelu beeja*.

MATERIALS AND METHODS

Shodhana/Detoxification process of Kupeelu beeja

After detailed literature review it was found that – Most of Ayurveda *Acharyas* have mentioned the same process which was selected in this study. Properties of *Godugdha* (Cow's milk) were also described as detoxifying agent. Further, in previous work it has been stated that the toxicity of *kupeelu beeja* is remarkably reduced by this method compared to other methods. Similarly, the process is standard, very easy, materials are easily available and less time consuming. Hence I had selected the mentioned *Shodhana* process in the context.

Detoxification / Shodhan process

Ingredients – *Ashudhdha kupeelu beeja* (crude *Nux Vomica*), *Godugdha* (cow's milk), Hot water

Equipments – *Dolayantra*, cotton cloth, *Tulayantra*, *Kharal yantra*, Gas cylinder, earthen pot, steel pots.

Procedure:- Impure seeds of *Nuxvomica* were boiled in cow's milk by *Dolayantra* process for 1 *Yaama* i.e. 3 hrs. Then the seeds were washed with hot water. Thereafter the covering and embryo was removed from each seed. Then the purified seeds were dried and powdered in a *Kharal yantra* and stored.^[7]

Toxicity study

Acute toxicity study of both samples (before and after *Shodhana*) of *Kupeelu beeja churna* was carried out in authorized centre.^[8, 9]

Materials

Animal species used - Albino mice

No. of animals - 1 for each dose for preliminary range finding study.

- 4 for each sample for main LD50 study

Avg. wt of animals - 25gm

Sex of animals - female

Period of fasting - overnight

Dosing - oral route

Samples - 2, in fine powder form

a) Before *Shodhana*

b) After *Shodhana*

Procedure for experimental studies: OECD guidelines for testing chemicals were followed.

- *Kupeelu beeja churna* samples were converted into suspensions by thorough mixing of very fine powder of the seeds in water separately.
- Samples were freshly prepared for each group (before and after *Shodhana*) in different concentrations (increasing order) and then were administered.

- Doses were given to animals by gavages according to their body weight.

Animals were deprived of feed overnight, before and 2 hrs after administration of the sample water was allowed ad libitum.

- First of all preliminary range finding study was done.

a) Preliminary range finding study

One female albino mice per dose was assigned to the treatment with before *Shodhana* sample of *Kupeelu beeja churna* as follows:

Table 1: Showing albino mice per dose, assigned to the treatment with before *Shodhana* sample

Group	No. of Mice	Dose (mg/kg)
I	1	5
II	1	50
III	1	300
IV	1	2000

Same data was applied for treatment with after *Shodhana* sample of *nuv vomica*. Mice were observed for toxic signs and mortality for 7 days after dosing. Toxic signs or mortality for both samples were observed upto 2000mg / kg of body weight dose.

b) LD50 in albino mice

From the data obtained in the preliminary range finding study, mice were assigned to the treatment as follows:

Table 2: Showing albino mice per dose assigned to the treatment of LD50 in albino mice

Group	No. of Mice	Dose (mg/kg)
I (vehicle control group)	4	0.00
II (before detoxification)	4	300
IV (after detoxification)	4	2000

Mice were observed for toxic signs and mortality for 14 days after dosing.

OBSERVATIONS

Observations of the entitled study were divided into two main parts as follows:

- Physicochemical analytical observations
- Median lethal dose observations

a) Observations of physicochemical analysis:

Following Table shows physicochemical analytical data of before and after *Shodhana* samples of *Kupeelu beeja churna*.

Table 3: Showing physicochemical analytical data of before and after *Shodhana* samples of *Kupeelu beeja churna*

Tests	<i>Kupeelu beeja churna</i>	
	Before <i>Shodhana</i>	After <i>Shodhana</i>
1. Moisture content on drying	3.2%	4.0%
2. Total Ash	0.88%	0.51%
3. Acid Insoluble Ash	0.16%	0.04%
4. Alcohol Soluble extractives	6.22%	6.55%
5. Water Soluble extractives	14.22%	8.42%
6. Qty. of Alcoholic Strychnine	1.26%	0.24%

Observation of medium lethal dose study:

- Preliminary range finding study for before and after *Shodhan* samples.

Before Shodhana sample**Table 4: Showing Preliminary range finding study for before Shodhan samples.**

Group	Dose (mg/kg)	No. of Animals Dosed	Effect on Animals
I	5	1	-
II	50	1	-
III	300	1	Died
IV	2000	1	Died

After Shodhana sample**Table 5: Showing Preliminary range finding study for after Shodhan samples**

Group	Dose (mg/kg)	No. of Animals Dosed	Effect on Animals
I	5	1	-
II	50	1	-
III	300	1	-
IV	2000	1	-

2) LD₅₀ in albino mice**Table 6: Showing LD₅₀ in albino mice in before and after Shodhan samples.**

Group	Dose (mg/kg)	No. of animals died	Mortality%
		No. of animals dosed	
I (Control)	0.00	0/4	0%
II (Before Shodhana)	300	3/4	75%
III (After Shodhana)	2000	0/4	0%

**Kupeelu beeja****Kupeelu beeja Shodhan in cow's milk****RESULTS**

LD₅₀ values of *Kupeelu beeja churna* before *Shodhana* (detoxication) and after *Shodhana* (detoxication) were as follows:

Before *Shodhana* process – LD₅₀ value was less than 300 mg/kg and more than 50 mg/kg body weight in albino mice by oral route.

After *Shodhana* process – LD₅₀ value was greater than 2000 mg/kg body weight in albino mice by oral route.

DISCUSSION

Poisons are those substances, that immediately after entering the body vitiates the normal *Dosha-dushyas* resulting in mild to severe

effects. They have their toxic effects due to their harmful contents. But when purified or detoxified, they possess many properties which are useful to treat many diseases. *Shodhana Sanskar* mentioned in Ayurveda is a process for detoxification and modification of therapeutic properties of drugs especially poisonous drugs. *Shodhana* causes magical changes in the drug and removes the harmful effects of the poisons whereby it can be used as medicines. These *Shodhan* processes are described in detail in Ayurvedic texts. But all of them are not proven on the modern parameters. To prove the authenticity and safety of the use of

purified and detoxified poisons (*Shodhit vishadravya*) as medicines, the detoxified poisonous drugs must be subjected to modern parameters. All drugs should be standardized to avoid its use in unexpected manner. In today's modern world the efficacy and safety of Ayurvedic drugs especially detoxified poisons should be well established with the help of modern methods.

Toxicity of the substance can be tested experimentally by acute, sub acute and chronic toxicity study according to poison. LD50 is the method to test the acute toxicity. LD50 is the dose, amount of a poisonous substance required to kill 50% of tested population. It is useful to decide extent of toxicity of poisonous substance. The acute toxicity aims at establishing the therapeutic index i.e. the ratio between pharmacologically effective dose and lethal dose on the same strain and species (LD50/ED50). Greater the index, safer the compound and vice versa. This research work aimed to study the effect of *Shodhana sanskara*. i.e. detoxification process on *Kupeelu beeja* with the help of modern parameters like chemical tests and experimental method i.e. LD50 studies.^[10,11,12]

In present work, attempts were made to study

- *Shodhana process of Kupeelu beeja* described by Rasatarangini
- Effect of *Shodhana* on LD50 of *Kupeelu beeja*.

During the course of *Shodhana* process, it was observed that the fumes evaporating from *Dolayantra* had a typical nauseating odour and caused mild irritation in the eyes. These mild adverse reactions can be avoided by performing the *Shodhana* procedure in an open area. It was observed that before *Shodhana* and after *Shodhan* samples differed in their physicochemical properties. Before starting the *Shodhana* process moisture content (3.2%), total ash value (0.88%) acid insoluble ash (0.16%) quantity of strychnine alkaloid is (1.26%) were ruled out for *Kupeelu beeja churna*. After *Shodhana* the values were ruled out. Total ash value was decreased by 0.37%. Acid insoluble ash was decreased by 0.12%. The alkaloid strychnine was decreased by 1.02%. From all observations, it can be concluded that the reduction in toxicity was due to loss in quantity of chemical constituents during *Shodhana* process. The toxic contents could be extracted in cow's milk. The poisonous content of the drug was removed due to the heat given in the *Shodhan* process, through a specific procedure. Also the covering and embryo were removed during *Shodhana*. It may be possible that they contain maximum part of poisonous content.

For oral LD50, study samples were prepared by mixing the powder of seeds with water. The LD50 value for before *Shodhana* sample of *Kupeelu beeja churna* was found to be greater than 50 mg/kg and lesser than 300 mg/kg of body weight by oral route in albino mice. While LD50 value for after *Shodhana* sample of *Kupeelu beeja churna* was found to be greater than 2000 mg/kg of body weight by oral route in albino mice. i.e. The LD50 value was found to be increased due to *Shodhana* process.

Further studies can be done for the target organ toxicity. The effect of *Kupeelu beeja churna* after *Shodhana* on spinal cord and brain by histopathological studies can be evaluated through further detailed studies. Hence further studies with many more perspectives are needed to establish the complete safety of this detoxified drug.

CONCLUSION

This study shows that the detoxification process of *Strychnos nux vomica* seed powder affects its physico-chemical properties. Some proportion of organic materials was extracted by cow's milk during *Shodhana sanskara* of *Kupeelu beeja*. It was found that at the end of the detoxification process the quantity of main elements, strychnine and brucine present in the seeds of *Nux vomica* was reduced. *Shodhana* process increases the value of LD50 of *Kupeelu beeja churna*. i.e. it reduces the toxicity of *Kupeelu beeja churna*. Thus the safety of the detoxified drug can be established.

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