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Effect of Shodhana (Purification) on Convulsive Property of Kupeelu (Strychnous Nuxvomica) Toxicity: An Experimental Study

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Abstract

Kupeelu (Strychnousnuxvomica Linn)is a spinal poison of vegetable origin which comes under Upavisha (semi-poisonous group).[1,2,3,4] Even though it is a poisonous drug; it possesses abundant therapeutic values, it's seeds are highly toxic but after adopting proper shodhana (purificatory) procedures it attains medicinal values and can be used in the treatment of many diseases.[5] Accidentally or homicidal or because of misuse of drugs during medication, may lead into so many complications like convulsions, coma etc. and eventually death occurs.[6] In the present study kupeelu seeds were subjected to shodhana using Gomutra, Godugda and Goghrita and to evaluate its effect of shodhana on convulsive property of kupeelu by comparing the toxic effects produced by ashodhita (unpurified) kupeelu seeds with shodhita (purified) kupeelu seeds in wistar rats. Animals were grouped and one group received ashodhita kupeelu seed powder and another group received shodhita kupeelu seed powder. And they were dosed in a single oral dose of 666 mg/kg body weight, following by 24 hrs observations for toxic signs and symptoms pertaining to convulsions. An observation reveals that all the animals of ashodhita group got convulsions followed by death of all animals, whereas there is no occurrence of convulsions in all the animals of shodhita group. So shodhita group shows 100% protection against convulsions in albino rats. Hence the present study concludes that by adopting proper shodhana procedure, it reduced the effect of toxicity when compared with ashodhita group.

Keywords: Gomutra; Godugda; Goghrita; Ashodhita; Shodhita; Convulsions.

Introduction

Kupeelu (Strychnousnux vomica. Linn) is a well known toxic drug in both *ayurveda* and in contemporary science because of its convulsive property. It is considered under *Upavisha*. The categorization of this drug under *Upavisha* is to make the physician cautious about the unexpected ill effects. Accidental usage like miss identification, self-medication, over dose and improper purification of this poisonous herb may produce adverse reactions. It may lead into poisonous signs and symptoms such as convulsions, twitching of muscles of face, Cyanosis, Dilated pupils, Frothy salivation, epigastric pain and death may occur.[6]

Kupeelu seeds contains various alkaloids such as Strychnine, Brucine, vomicine, Kajine, Novocain (N-methyl pseudobrucine), isostrychnine; Cuchiloside, loganic acid etc. Strychnine and Brucine are the two main toxic alkaloids responsible for the tetanic convulsions.[7] So before medication, seeds are to be subjected to proper purification processes known as *shodhana*. Here *shodhana* process, converts a poisonous drug into a potent medicine by reducing the toxic alkaloids or converting them into a less toxic or by adding some special qualities to the drug.[8]

In contemporary sciences they have conducted several studies, where they show the dreadful effects of the alkaloids, mainly the alkaloid Strychnine. But in our classics acharyas have made the best use of these

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poisonous drugs in the treatment of various diseases by subjecting them to the process of *shodhana* (purification). One of the best example for use of such potent poison as an excellent medicine in the treatment is *Kupeelu*. In classics mentioned the actions of *Kupeelu* as *Shothahara, vedanasthapana, uttejaka, nadibalya, deepana, pachana, jwaraghna, arshogghna* and therapeutically can be used in *Alarkavisha, Vrana, Mushika visha*[9], in *vata vikaras* like *ardita, kampa, badirya, shayyamutra, napumsakata*.[10]

There are more than 60 formulations containing kupeelu beeja as one of the ingredient, which are used successfully in day today practice in the treatment of many disorders. For shodhana various medias are mentioned in classics like Gomutra, Godugda, Goghrita, Dhanyamla etc.In the present study kupeelu shodhana was done using Gomutra, Godugda and Goghrita as described in the classics and to evaluate its effect of shodhana on the convulsive property of kupeelu toxicity in wistar rats.

Materials and Methods

Collection and Authentication of Plant material

The seeds of Strychnous nuxvomica were collected from its natural habitat and they were authenticated in AYUSH approved drug testing laboratory, Shree B.M.K. Ayurved mahavidyalaya, Belgaum,Karnataka.

Collection of Media for Purification

Fresh *Gomutra* and Godugda were collected from the local cowshed daily and Goghrita was procured from the local market of Aditya ghee Pvt. limited.

Shodhana (Purification) of Kupeelu

Equipments for the Shodhana (Purification): Glass beaker, measuring cylinder, weighing machine, earthen pot, iron rod, cotton cloth, Gas stove, aluminium frying pan, steel spatula etc.[11]

Procedure

Properly washed and well dried raw *kupeelu* seeds were taken in a clean glass beaker and *Gomutra* (cow urine) was added till the complete immersion of seeds. Andit was kept undisturbed for 24 hrs.On the next day (after 24 hrs) fresh *Gomutra* was added by replacing the previously added gomutra. The same procedure was followed seven consecutive days. On the eighth day, the seeds were taken out from the *Gomutra* and properly washed shade dried and they were subjected for next shodhana procedure i.e. swedana in godugda.

In swedana procedure Kupeelu seeds were taken in a three folded cotton cloth and pottali was prepared and it was tied to aniron rod and kept freely over the mouth of the earthen pot. Then the pot was filled with Godugda till the neck or knot of the pottali. The earthen pot with pottali was kept on a gas stove, and then gas stove was started. The swedana was carried out for three hours on mandagni (low medium flame). Finally the seeds were taken out, properly washed, shade dried and used for the further purification process i.e. Bharjana with Goghrita.

In Bharjana process the aluminium frying pan was kept on a gas stove for frying at mandagni (low medium flame),then the Goghrita was added to this pan and left for boiling of Goghrita. When the Goghrita was started to boil the Kupeelu seeds were added to the pan. Then the seeds were stirred gently and continuously with a steel spatula till the seeds attain Kapilavarna (Brownish colour). Exactly after attaining the Brown colour the heating was stopped, then after cooling the seeds were taken out shade dried and collected in air tight container. Finally the seeds were equally separated into three parts, one part is taken, stored in air tight container and given the name as S1 (1st time shodhita). The remaining two parts of seeds were used for 2nd time shodhana, finally after 2nd time shodhana the seeds were equally separated into two parts and one part is taken, stored and given the name as S2 (2nd time shodhita). The remaining one part is used for the third

time shodhana and finally after 3rd shodhana seeds were stored in air tight container and given the name as S3 (3rd time shodhita).

Note: The same procedure was adopted in all the three times shodhana

Experimental Study

Female Albino rats weighing 180±220gms were procured from licensed breeder and all animals were acclimatized in the laboratory about a week before commencement of the study as per CPCSEA Guidelines. Animals were grouped and provided food and water ad libitum. The experiment protocol has been approved by the Institutional Animal Ethics Committee (IAEC Reg. No.1017/C/06/ CPCSEA dated: 19.6.2011).

Experimental Design

Grouping: 30 animals were taken for the whole study and were broadly divided into five groups. In each group six animals were selected

Duration of study: 30 days.

Selection of Dose **:** Animal convulsive dose of rat-orally is 666mg/kg body weight is available in previous works of Kupeelu and that itself was taken as standard convulsive dose and administered to the animals in a single oral dose. Both the Ashodhita and all shodhita groups received the same dose.[12]

Table 1: Showing the Groups of Experimental Study

Groups	Treatment
Group I (Control)	Receives vehicle (normal saline)
Group II	Receives *Ashodhita Kupeelu beeja churna*
Group III	Receives 1st time *shodhita Kupeelu beeja churna*
Group IV	Receives 2nd time *shodhita Kupeelu beeja churna*
Group V	Receives 3rd time *shodhita Kupeelu beeja churna*

Preparation of Doses

The suspension is prepared by triturating Kupeelu beeja churna with Gum acacia and distilled water.

Route of Drug Administration

The test substance is orally administered in a single oral dose by using a stomach tube. Feeding needle No 15 was used for administration of doses.

Parameters for Observation

Occurrence and duration of the following phases are measured in terms of the time spent by the animal in each phase and the same was repeated for all groups.

- Tonic flexion
- Tonic extension
- Clonic convulsions
- Stupor
- Recovery or death.

Results

The frequency, intervals and severity were measured in terms of the time spent by the each animal in each phase is noted and the same was repeated for all groups. The video recording of each animal was done during the observational period and that video was played on the windows movie maker software and the time spent by the animal in each phase was recorded in seconds.

Discussion

Ashodhita Group

All the six animals of ashodhita group got convulsions at the average time of 15 min. after dosing followed by death of all the six animals

Table 2: Shows Results of Ashodhita Group

Number of occurrence & Average time spent by animal in each phase of convulsion						
Animal	No. of Occurrence	Tonic Flexion	Tonic Extension	Clonic convulsions	Stupor	Recovery or death
1	1	0.07	0.11	24.55	0.63	Death
2	7	0.3143	0.4229	11.211	39.494	Death
3	4	0.0575	5.535	16.033	22.973	Death
4	17	0.065	0.0086	9.8543	8.7743	Death
5	24	1.0657	1.8143	7.9329	4.49	Death
6	30	0	0	7.65	14.03	Death

All the six animals got convulsions at the average time of 15 min.after dosing fallowed by death of all the six animals at the average time of 30 min. after dosing

Table 3: Shows the Result of 1st, 2nd and 3rd Time Shodhita Groups

Number of occurrence & time spent by animal in each phase of convulsion						
Animal	No. of Occurrence	Tonic Flexion	Tonic Extension	Clonic convulsions	Stupor	Recovery or death
1	0	0	0	0	0	Recovery
2	0	0	0	0	0	Recovery
3	0	0	0	0	0	Recovery
4	0	0	0	0	0	Recovery
5	0	0	0	0	0	Recovery
6	0	0	0	0	0	Recovery

There is no occurrence of convulsions in all the animals of shodhita groups and all the animals are said to be healthy after the observational period

Table 3: Results of Strychnine and Brucine percentage of Unpurified and Purified *Kupeelu* Seeds by HPTLC

Kupeelu samples	Strychnine %	Brucine %
Ashodhita	1.552%	0.659%
1st time shodhita	0.405%	0.314%
2nd time shodhita	0.213%	0.201%
3rd time shodhita	0.104%	0.079%

There is a gradual reduction in the % of strychnine and Brucine in all the shodhita Kupeelu samples when compared to ashodhita Kupeelu sample

at the average time of 30min. after dosing; it is due to the high percentage of the Strychnine and Brucine in the Ashodhita kupeelu seeds as determined by the HPTLC.

The strychnine is a selective competitive antagonist of Glycine receptors, these receptors found mostly in the spinal cord and brainstem. Glycine is a neuroinhibitory neuron, which acts on the glycine receptors and causes neuroinhibition. So by blocking these receptors by strychnine the glycine will not act on these receptors, so there is no inhibition the person will have constant contractions of muscles. The Diaphragm, chest and abdominal muscles are in a sustained stage of contraction which leads to difficulty in breathing, finally hypoxia followed by death.[13]

Shodhita Groups - Third, Fourth, and Fifth Groups

There is no occurrence of convulsions in all the animals of 1st, 2nd and 3rd time shodhita groups, it is because of the reduced percentage of Strychnine and Brucine in the shodhita Kupeelu seeds as determined by the HPTLC. And it is also evident that there is no occurrence of convulsions in all the animals of shodhita groups even by administering at the same dose as administered to the ashodhita group.

Jackson & Marsh, 1997 has reported larger doses of Strychnine are known to be deadly poisonous, but in lower doses it gives subjective feeling of stimulation and Cai. *et. al*, 1990 has

reported that after boiling the Kupeelu seeds in Godugda converted the Strychnine into its less toxic form isostrychnine. In the same way the chemical bonds of Strychnine, Brucine etc. chemical constituents might have been broken and they may be converted into their less toxic derivatives during the process of boiling the Kupeelu seeds in Godugda like strychnine into isostrychnine, Brucine into isobrucine, Brucine N-oxide etc. and so on. These are all the regions for the absence of convulsions in all the animals of shodhita groups.

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