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COMPARATIVE PHARMACOLOGICAL EVALUATION OF *SHYONAKA* (*Oroxylum indicum* Vent.) AND *ARALU* (*Ailanthus excelsa* Roxb.)" W.S.R.TO ITS *DEEPANA PACHANA* ACTIVITY

Makwana A J[1], Patel B R[2], Nariya MB[3], Parmar N A[4]

[1,4]PhD Scholar, [2]Assistant professor; Department of Dravyaguna, [3]Head, Pharmacological laboratory IPGT & RA, Gujarat Ayurved University, Jamnagar, Gujarat, India

ABSTRACT

In Ayurvedic literature, *Aralu* (*Ailanthus excelsa*) is a synonym (*Paryaya*), a type (*Prakara*) and also a substitute of *Shyonaka (Oroxylum indicum)*. Both drugs *Shyonaka* and *Aralu* posses *Grahi* and *Atisaraghna* properties and also indicated in *Shwaas*, *kaas* under *Dashmoola* group. According to Ayurveda principles, *atisaraghna* (Antidiarrhoeal) and *shwaasaghna* (Anti asthamatic/ Anti histaminic) drugs primarily act on *annavaha srotas* (Gastrointestinal system) and posses *Deepana pachana* (Carminative and digestive/ stomachachic) properties. Hence, the present pharmacological study is taken to evaluate and compare the properties of both the drugs in *kwath* (Decoction) form at 7.2ml per kg animal dose through *Deepan –pachana* activity in Charles Foster strain albino rats by the method of U.D**.** Dixit et al (1995) in 18 animals kept in metabolic cages as per CPSCEA guidelines. Both *Shyonaka* and *Aralu* treated groups showed stastically insignificant improvement in parameters like weight gain, increase in food intake, food conversion ratio and decrease in fecal output. *Shyonaka* group showed increase while *Aralu* group showed stastically insignificant decrease in water intake. Both groups showed marked improvement in *Deepana pachana* activity with *Shyonaka* treated group having stastically insignificant higher values than *Aralu* treated group.

Key words: *Shyonaka, Aralu, Deepana, pachana.*

INTRODUCTION

Dashmoola is an important group of ten plants whose roots are used for a variety of purposes. *Shyonaka* (*Oroxylum indicum*) of Bignoniaceae family is one of the important ingredients of *dashamoola* which is now a days, one of the 70 species in High Trade obtained from Tropical forests of India and has become vulnerable due to its over exploitation. *Katvanga-Aralu* is identified as *Ailanthus excelsa* Roxb., which is considered rather mistaken as synonymous to *Shyonaka*.[1] There are two distinct drugs *Aralu* and *Shyonaka* in classical texts of Ayurveda. In Gujarat state, *Aralu* is being substituted for *Shyonaka* as mentioned by Shri Jaykrishna Indraji Thakar [2].Thus, *Aralu* is a synonym (*Paryaya*), a type (*Prakara*) and also a substitute of *Shyonaka*. Both drugs *Shyonaka* and *Aralu* posses *Grahi* and *Atisaraghna* properties and also indicated in *Shwaas*, *kaas* under *dashmoola* group. According to Ayurveda principles, *atisaraghna* and *shwaasaghna* drugs primarily act on *annavaha srotas* and posses *Deepana pachana*

properties. Hence, the present study is taken to analyze and compare the properties of both the drugs through *Deepan–pachana* activity. The experiment was originally designed by Dwivedi RR and Ravishankar B (1995) to assess the effect of test drug on status of *Agni*[3] in Charles Foster strain albino rats**.**

AIM AND OBJECTIVES:

To study the test drugs *shyonaka* and *Aralu* for *Deepana Pachana* effect in albino rats.

MATERIALS AND METHODS:

Animal species: Charles Forster albino rats weighing between 230 ± 20 g

Source: Animal house attached to IPGT & RA, Gujarat Ayurved University, and Jamnagar.

Approval: The experimental protocol was submitted to the animal ethics committee of the institute, and approval was obtained for conducting the experiment **(**Approval number **– IAEC/10/2012/03).**

Selection: A total 18 adult and healthy male and female rats of 12-16 weeks age were selected and divided into three groups of six animals in each group as follows:

Group I Normal Control (NC)

Group II *shyonaka kwath* treated group (7.2ml/kg, p.o.) (SH)

Group III *Aralu kwath* treated group (7.2ml/kg, p.o.) (AR)

Housing: Each rat was housed in each metabolic cage.

Environment: The animals were exposed to 12 hour light and 12 hour dark cycle with the relative humidity of 50 to 70% and the ambient temperature during the period of experimentation was 22 ± 03ºC

Diet: Amrut brand rat pellet feed supplied by Pranav Agro Ltd. was provided throughout the study period. The drinking water was given *ad libitum* in polypropylene bottles with stainless steel sipper tube.

Source of test drug: Barks of *Shyonaka* and *Aralu* were collected by scholar himself from its natural habitat (Dangs and Jamnagar).It was coarsely powdered and *kwatha* (decoction) prepared was utilized for the present study**.**

Administration: Fresh test drug was administered per oral as per the calculated dosages with the help of suitable sized steel catheter sleeved onto a syringe.

Statistical analysis: Results were presented as Mean ± SEM, difference between the groups was statistically determined by paired and unpaired student's t test for paired and unpaired data respectively with the level of significance set at $P<0.05$. The level of significance was noted and interpreted accordingly by using sigmastat software.

Methods:

Study was performed in two phases:

Phase I: Preliminary study: Duration – 4 days.

Phase II: Experimental study: Duration - 7 days.

Phase –I: Preliminary study (Duration- 4 days) was carried out prior to the experimental study to understand and obtain base line data about the normal amount of food intake, water intake and fecal output of the experimental animals in metabolic cages.

Phase –II: Therapeutic study (Experimental phase, duration - 7 days):

In this phase, test drugs were administered to respective groups as per the calculated doses. During this phase, food (30g/day) and water (100ml/day) was provided to each and every animal. All the parameters mentioned above were recorded for 7 consecutive days.

Drug Dose calculation:

The dose for experimental study was calculated by extrapolating the human dose to animal dose based on the body surface area ratio using the table of Paget and Barnes (1964)[4] as follows:

= Therapeutic human dose × Body surface area ratio (convertibility factor) for rat

Dose for Rats = Human dose × 0.018 as convertible factor for rat weighing 200g

ASSESSMENT OF PARAMETERS:

1. **Method of estimation of change in body weight**

The difference between the body weight of animal on 1st day and 11th day of the study indicates the actual weight change as a result of metabolic activity.

2. **Method of estimation of food intake**

Each rat was provided 60g dry food pellets/day to ensure maximum food consumption according to its capacity. The residual food was collected on the next day and it was weighted again. The total amount of food consumed by animal in 24h was obtained by deduction of the remaining food from the allotted 60g; this was the absolute value of food consumed in g. This value was then calculated with the body weight of the animal by the rule of 3 and food consumed in g% of the body weight per day was obtained. This is relative value of food consumption.

3. **Method of estimation of water intake**

100ml of tap water was provided to each rat in a labeled bottle every day. Water remaining in each bottle was noted down on the next day. Total amount of water intake in animal was calculated by the deduction of the remaining water in the feeding bottle from 100ml. Method similar to the one described above was adopted to calculate the water intake in ml % of the body weight per day. This is relative value of water intake.

4. **Method of estimation of fecal output**

The total amount of fecal matter passed by individual rat was collected separately and kept in oven at 80^0C for 6h. Weight of dry fecal matter was then calculated in the electronic balance. Stool passed in g% of body weight per day was obtained by applying rule of 3. This is defined as relative weight of the fecal matter.

5. **Method of obtaining the food conversion ratio (FCR)**

The food consumed by a rat in g% was divided by fecal matter in g% passed on the same day by that particular rat.

OBSERVATIONS AND RESULTS:

Table.1: -- Effects of test drugs on body weight of rats during *Deepana Pachana* activity in albino rats

Groups	Body weight (g)			
	Preliminary phase	Experimental phase	Actual change	% change in comparison to prelim. phase
Control (NC)	213.00±14.32	223.25±14.16	10.25±6.86	4.81↑
Shyonaka (SH)	227.42±18.551	244.67±20.30 *	17.25±7.25	7.58↑
Aralu (AR)	212.33±11.78	251.33±12.74 **	39.00±6.69	18.36↑

Data: Mean ± SEM, ↑- Increase

* P<0.05, ** P<0.01when compared to preliminary phase (Paired't' test)

Data pertaining to effect of test drugs on body weight during *Deepana Pācana* activity has been presented in Table – 1. Normal progressive body weight gain was observed in all groups when the final body weight was compared with their respective initial values. Both SH and AR treated groups showed statistically significant increase in weight as compared to control group with pronounced effect in AR group.

Table: 2-- Effects of test drugs on food intake in *Deepana Pachana* activity in albino rats

Groups	Food intake (g %)			
	Preliminary phase	Experimental phase	Actual change	% change in comparison to prelim. phase
Control	8.162±1.337	8.626±0.960	0.464±0.78↑	5.68 ↑
Shyonaka	5.470 ±0.764	6.791±1.029	1.321±1.31↑	24.14 ↑
Aralu	7.516±0.250	7.288±0.412	0.228±0.53↑	3.03 ↑

Data: Mean ± SEM ↓- Decrease, ↑- Increase

Data related to effect of test drugs on food intake during the *Deepana Pachana* activity has been presented in Table –2. Though all the groups showed increase in food intake, but it was statistically non significant as compared to control group with SH group having pronounced effect than AR group.

Table 3: —Effects of test drugs on wet fecal output in *Deepana Pachaan* activity in albino rats

Groups	Wet fecal output (g%)			
	Preliminary phase	Experimental phase	Actual change	% change in comparison to prelim. phase
Control	3.901±0.834	4.092±0.337	0.191±0.678↑	4.8↑
Shyonaka	3.492 ± 0.684	3.380 ±0.439	0.424 ±0.427↓	9.1↓
Aralu	3.971±0.160	3.804±0.280	0.167±0.272↓	4.2↓

Data: Mean ± SEM ↓- Decrease, ↑- Increase

Data related to effect of test drugs on wet faecal output during the *Dipana Pachana* activity has been presented in Table –3. There was increase in wet fecal output in control group while comparative decrease in .output as compared with initial values. This decrease in output was not statistically significant as compared to control group.

Table 4: -- Effects of test drug on dried fecal output in *Deepana Pachana* activity in albino rats

Groups	Dry fecal output (g%)			
	Preliminary phase(g)	Experimental phase(g)	Actual change(g)	% change in comparison to prelim. phase
Control	3.375490196	2.385±0.216	0.045±0.270↑	1.3
Shyonaka	1.963±0.209	1.984±0.169	0.002±0.290↑	--

Aralu	2.485±0.0653	2.099±0.0944	0.386±0.084↓	15.0

Data: Mean ± SEM ↓- Decrease, ↑- Increase

Data related to effect of test drugs on dry fecal output during the *Deepana Pachana* activity has been presented in Table –4. There was decrease in dry fecal output in AR group while no change in output in SH group. This decrease in output was not statistically significant as compared to control group.

Table.5: - Effects of test drug on food conversion ratio in *Deepana Pachana* activity in albino rats

Groups	Preliminary phase (g %)	Experimental phase (g %)	Actual change (g %)	% change in comparison to prelim. phase
Control	3.155±0.122	3.603±0.922	0.448±0.433 ↑	14.19 ↑
Shyonaka	2.842±0.198	3.368±0.29	0.526±0.417↑	21.19↑
Aralu	3.028±0.076	3.499±0.214	0.471±0.267↑	15.55↑

Data: Mean ± SEM ↑- Increase

Data related to effect of test drugs on food conversion ratio during the *Deepana Pachana* activity has been presented in Table –5. Though all groups showed increase in food conversion ratio, it was not statistically significant as compared to control group.

Table .6:—Effects of test drugs on water intake in *Deepana Pachana* activity in albino rats

Groups	Preliminary phase (ml %)	Experimental phase (ml %)	Actual change(ml %)	% change in comparison to prelim. phase
Control	10.736±1.92	10.656±1.277	0.0803±2.825↓	0.75↓
Shyonaka	8.200±1.791	8.692±1.614	0.493±2.181↑	6.01↑
Aralu	11.42±0.88	9.685±0.874	1.580±1.140↓	13.83↓

Data: Mean ± SEM ↓- Decrease ↑- Increase

Data related to effect of test drugs on water intake during the *Deepana Pachana* activity has been presented in Table –6. Control and AR group showed decrease while SH group showed increase in water intake which was not statistically significant as compared to control group.

DISCUSSION

When any substance is ingested, it is digested and metabolized by the action of different *Agni* (digestive power) i.e. *JatharAgni, BhutAgni* and *DhatwAgni*. During this whole process it decomposes and resynthesizes several times in form of breakdown and reformation of bonds between *Panchamahabhutas* (penta-elements)[5] It is well known that *Rasa, Veerya, Vipaka* shows its effect on *Dosha, Dhatu* (tissues) and *Malas* (excretory products) in the body.[6] The present animal study was designed to assess the effect of drugs on *Agni* and *Koshtha* related parameters. According to Ayurvedic concepts, *Katu rasa and Vipaka* (pungent post digestive effect) causes *Baddha vinmutrata* (difficulty in excretion) i.e. decrease in quantity and frequency of stool and urine, elevates *Vata dosha.* Same is the process

with *tikta rasa and ushnaveerya.*[7] Experiments are to be carried out to find out evidential data which can support the assumed hypothesis; the aim of the present study is same. Though the experiments were done on the line of modern pharmacology, the focus was always on the basic concepts of Ayurveda.

Rasapanchaka plays an important role in pharmacokinetics and pharmacodynamics. The parameters through which they can be assessed are always based upon modern parameters; many attempts have been made to correlate them with the help of modern pharmacology and the success achieved so far is very much limited. The main reason for this is the fact *Rasapanchaka* is a multidimensional attribute which is influenced by different factors unless most of these factors are taken in to consideration and design appropriate experimental protocol it would be quite difficult to obtain consistent results. The present study is an attempt to find out the possibility of employing certain simple experimental parameters to assess *Deepanapachana* properties in a drug. *Shyonaka,* having *Tikta,katu rasa* (bitter and pungent taste) *and katu Vipaka* (pungent post digestive effect), *Sheeta veerya, laghu- ruksha-guna (light and dry property) ;* while *Aralu* possessing *Tikta kashay rasa*, *katu vipaka* and *sheeta veerya*, they both cause decrease in stool and urine output. As the stool and urine output are directly related to food consumption and water intake, parameters related to metabolic activity like weight change, food consumption, water intake and fecal output were also measured in the present study.

The outcome of test drugs administration to rats in the present study has been provided in the form of consolidated tables as follows for easy comparison and discussion.

Table.7 Consolidated statement of effect of test drugs on various parameters during *Deepana pachana* activity on albino rats :(paired t test)

Parameters	Control	Shyonaka	Aralu
Body weight	NSI	SI	SI
Food intake	NSI	NSI	NSI
Wet Fecal output	NSI	NSD	NSD
Dry Fecal output	NSI	NSE	NSD
Water intake	NSE	NSI	NSD
Food conversion ratio	NSI	NSI	NSI

***** Compared with preliminary phase;

NSE-No significant effect; **NSD**-Non-significant decrease; **NSI-** Non significant increase; **SI-** significant increase

As per above table, there was gradual increase in body weights of rats in all the groups. As there was significant increase in body weight in experimental groups as compared to control group, it could be attributed to its *tikta rasa* and *katu vipaka* and which have *Deepana* properties[8].

There was insignificant increase in food intake in all the groups. The increase in food intake is attributed to *deepana* effects of both the drugs. *Shyonaka* treated group showed higher percentage (24.14%) than *Aralu* treated group (3.03%) (Table 2). This difference may be due to difference in conjugation of *mahabhuta* (Penta elements).

Adhamalla has labeled such category of drugs into *Sheetagrahi*.

Both the drugs showed insignificant decrease in wet fecal output as compared to preliminary phase and control group. Decrease in fecal output may be attributed to *grahi karma* of the drugs due to absorption of water contents in stool by their *Ruksha* and *Laghu* gunas. *Shyonaka* showed higher percentage (9.1%) decrease than *Aralu* treated group (4.2%) can again be due to the difference in intensity of laghu ruksha *guna* of both the drugs. In dry fecal output, *Aralu* showed higher insignificant decrease (15%) as compared to *Shyonaka* treated group which didn't have any significant effect. Dry fecal output was weighed after subjecting fecal matter to heat in oven. As *Aralu* group had more water content in its stool hence showed higher loss of water in drying as compared to *Shyonka* treated group in which already there was low water content before placing in oven at same temperature conditions. Also difference in consistency of stool was observed on both the groups. *Shyonaka* treated group passed more bound stool than *Aralu* treated one. This suggests that *Tikta rasa* and *Katu vipaka* of *Shyonaka* makes it more *Graahi* than *Aralu* having *Sheeta-veerya* and *tikta* with *Kashaya nurasa*, which being more prone to *Sthambhana karma*. Also *Katu Vipaka* (pungent post digestive effect) causes *Baddha vinmutrata* (difficulty in excretion) i.e. decrease in quantity and frequency of stool and urine, elevates *Vata dosha.*[9]

Food conversion ratio is related to the *Pachana* property of drug. It is calculated as the food consumed by a rat in g% by dividing fecal matter in g% passed on the same day by that particular rat. As the status of *Agni* improves, the *Sarakitta vibhajana* take place properly leading to increase in *Sara bhaga* and decrease in *Kitta bhaga*. So less is the *Kitta bhaga*, higher will be food conversion ratio. In this experiment, insignificant increase in food conversion ratio was seen in all the groups as compared to preliminary phase with *Shyonaka* showed higher values than *Aralu*. This again may be attributed to *grahi karma* and *laghu ruksha guna* involving in *pachana* process more pronounced in *Shyonaka* than *Aralu*, though *Pachana* done by both.

Because of the uncertainty of *Karma* (action) at various levels it is said that, some substances act in accordance with their *rasa* (taste), others in accordance with their *Vipaka* (post digestive effect), and yet others in accordance with their *Guna* (property) or *Veerya* (potency) or *Prabhava* (cause for specific action)[10]

CONCLUSION:

From above study, it can be concluded that both the drugs *Shyonaka* and *Aralu* posses *Deepana pachana* effect with *Shyonaka* more effective than *Aralu*. It can be also concluded that *Aralu* can be used in the place of *Shyonaka* in its unavailability; of course more supportive clinical study is needed in this context.

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CORRESPONDING AUTHOR

Dr. Makwana Amit Jayendra

PhD Scholar, Department of Dravyaguna, IPGT & RA, Gujarat Ayurved University, Jamnagar, Gujarat, India.

Email: ayu.amit@gmail.com

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