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

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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 possess Grahi and Atisaraghna properties and also indicated in Shwaas, kaas under Dashmoolu group. According to Ayurveda principles, atisaraghna (Antidiarrhoeal) and shwaasaghna (Anti asthmatic/ 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 Indrajthakar.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 dashmoolu 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 Deepana–pachana activity. The experiment was originally designed by Dwivedi RR and Ravishankar B (1995) to assess the effect of test drug on status of Agni³ 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 ± 03°C

**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) as follows:

\[ \text{Dose for Rats} = \text{Human dose} \times 0.018 \text{ as convertible factor for rat weighing 200g} \]

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°C 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

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

Data: Mean ± SEM, ↑- Increase * P<0.05, ** P<0.01 when 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**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Food intake (g %)</th>
<th>Preliminary phase</th>
<th>Experimental phase</th>
<th>Actual change</th>
<th>% change in comparison to prelim. phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>8.162±1.337</td>
<td>8.626±0.960</td>
<td>0.464±0.78†</td>
<td>5.68 †</td>
</tr>
<tr>
<td>Shyonaka</td>
<td></td>
<td>5.470 ±0.764</td>
<td>6.791±1.029</td>
<td>1.321±1.31†</td>
<td>24.14 †</td>
</tr>
<tr>
<td>Aralu</td>
<td></td>
<td>7.516±0.250</td>
<td>7.288±0.412</td>
<td>0.228±0.53†</td>
<td>3.03 †</td>
</tr>
</tbody>
</table>

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**

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

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**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Dry fecal output (g%)</th>
<th>Preliminary phase(g)</th>
<th>Experimental phase(g)</th>
<th>Actual change(g)</th>
<th>% change in comparison to prelim. phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td>3.375±0.216</td>
<td>2.385±0.216</td>
<td>0.045±0.270↑</td>
<td>1.3</td>
</tr>
<tr>
<td>Shyonaka</td>
<td></td>
<td>1.963±0.209</td>
<td>1.984±0.169</td>
<td>0.002±0.290↑</td>
<td>--</td>
</tr>
</tbody>
</table>
Aru 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

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

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

<table>
<thead>
<tr>
<th>Groups</th>
<th>Preliminary phase (ml %)</th>
<th>Experimental phase (ml %)</th>
<th>Actual change(ml %)</th>
<th>% change in comparison to prelim. phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>10.736±1.92</td>
<td>10.656±1.277</td>
<td>0.080±2.825↓</td>
<td>0.75↓</td>
</tr>
<tr>
<td>Shyonaka</td>
<td>8.200±1.791</td>
<td>8.692±1.614</td>
<td>0.493±2.181↑</td>
<td>6.01↑</td>
</tr>
<tr>
<td>Aralu</td>
<td>11.42±0.88</td>
<td>9.685±0.874</td>
<td>1.580±1.140↓</td>
<td>13.83↓</td>
</tr>
</tbody>
</table>

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 vimuntrata (difficulty in excretion) causes Baddha vimuntrata (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.* 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 multi-dimensional attribute which is influenced by different factors unless most of these factors are taken into 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 *Deepana-pachana* 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>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Shyonaka</th>
<th>Aralu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body weight</td>
<td>NSI</td>
<td>SI</td>
<td>SI</td>
</tr>
<tr>
<td>Food intake</td>
<td>NSI</td>
<td>NSI</td>
<td>NSI</td>
</tr>
<tr>
<td>Wet Fecal output</td>
<td>NSI</td>
<td>NSD</td>
<td>NSD</td>
</tr>
<tr>
<td>Dry Fecal output</td>
<td>NSI</td>
<td>NSE</td>
<td>NSD</td>
</tr>
<tr>
<td>Water intake</td>
<td>NSE</td>
<td>NSI</td>
<td>NSD</td>
</tr>
<tr>
<td>Food conversion ratio</td>
<td>NSI</td>
<td>NSI</td>
<td>NSD</td>
</tr>
</tbody>
</table>

*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.

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 Shyonaka 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 Sheetaveerya and tikta with Kashaya murasa, 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.

REFERENCES
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