Chronopharmacological Influence of *Operculina turpethum* in Pylorus Ligated Albino rats

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ABSTRACT
The present study was undertaken to validate the concept of chronopharmacology and assess the influence of different seasons on gastric secretions by *operculina turpethum* in pylorus ligated rats. The Ayurvedic drug is widely used by the practitioners of the system for managing GI disorders. The antulcer effect of *O. turpethum* 100 mg/kg given orally was compared with reference drug lansoprazole 30mg/kg. The studies spanned for all the 6 seasons (‘Ritus’) of the year viz., Vasant ritu, Grishma ritu etc. Adult albino rats of either sex weighing between 180–220 g were used for investigation. Various biochemical parameters like volume of HCl, pH, free acidity, total acidity and ulcer index were recorded in comparison with standard lansoprazole. The studies indicated statistically significant difference by Dunnet-t test between standard and test. The acid secretion for different “Ritus” varied significantly and similarly the gastro protection of *O. turpethum* and lansoprazole also varied over different seasons. The studies reveal management of hyperacidity and ulcers can be done more effectively with variation of doses in different seasons. Thus, minimizing drugging and optimizing cost effectiveness and imparting a safe and efficacious treatment with less of unwanted effects.

Keywords: *Operculina. turpethum*, Trivrit, St. Thomas Lidpod, Pylorus ligation, Lansoprazole.

INTRODUCTION
The Ayurvedic concept of drug treatment is based on the “Ritu charya” i.e. seasonal influence on body physiology besides age, sex, pregnancy, etc. The year is divided into six “Ritus” from January - December. Each “Ritu” lasts for two months and they correspond to English months approximately as shown in the Figure 1 and the body behaves in accordance with balance/imbalance of “Vata” (air), “Pitta” (bile) and “Kapha” (phlegm). Ayurveda’s “science of life,” because ancient Indian system of health care focused views of man and his illness.1 Ayurveda considers the human body as a miniature form of universe. There is considerable importance given to seasonal changes. The *Tridosha*, *Vata*, *Pitta* and *Kapha* also vary considerably as per the variations in the seasons. As per Ayurveda, *Pitta dosha* is prominent in Sharat (Sept/Oct) and starts aggravating from *Varsha ritu* (July/Aug).2 *Operculina. Turpethum* is a perennial herb with milky juice belonging to the family *Convolvulaceae*. Its roots are incorporated in *Avipattikara churna*.3 It is commonly referred to as Trivrit or St. Thomas Lidpod. *O. turpethum* is the source of the drug known as Turpeth or Indian Jalap, it is widely grown throughout India and is occasionally cultivated in gardens as an ornament.1,9 It is used as a traditional medicine in many countries since centuries. The roots are bitter, acrid, sweet, thermogenic, purgative, carminative, anthelmintic, expectorant, antipyretic, hepatic stimulant and hydragogue.1,9 Trivrit (*Operculina turpethum* syn. *Ipomea turpethum*) is commonly used since centuries in Ayurvedic system of Medicine to treat fevers, edema, ascites, anorexia, constipation, hepatosplenomegaly, intoxication,
haemorrhoids, fistula, anemia, obesity, abdominal tumors, ulcers/wounds, worm infestation, pruritus and other skin disorders. The root of *Operculina turpethum* is the chief ingredient in the Ayurvedic formulation viz. *Avipattikara churna* used for the treatment of gastric ulcer and related gastrointestinal disturbances. This *churna* is useful in the treatment of *Amla Pitta* (Hyperacidity), *malabandha* (Constipation) (Ayurvedic formulary of India, 1976).

In Ayurveda, *Trivrit* has been included in the group of ‘ten purgative herbs’ (*Bhedaniya Mahakashaya*), group of ‘ten antidote herbs’ (*Visbaghina Mahakashaya*), group of ‘ten herbs supportive for therapeutic enema’ (*Ashibapanpag Mahakashaya*), group of ‘colon cleanser, antitumor and antidote herbs’ (*Shyamadi Gana*), and in the group of ‘herbs eliminating the toxins (vitiated Doshas)*. *Kaishore guggulu* is one of the most famous Ayurvedic formulation that is used traditionally to support healthy joints, muscles and connective tissue. *Kaishore guggulu* is used in the treatment of pitta aggravated patients and muscle pain. One of the chief ingredient of *Kaishore Guggulu* tablet is *Trivrit* (*Operculina turpethum*) included for its Anti-ulcer, anti-inflammatory, anti diarrheal, and antihaemorrhoidal effect.

*O. turpethum* is native to Asia (India, Nepal, Bangladesh, Pakistan, Sri Lanka, China, Taiwan, Myanmar, Thailand, Indonesia, Malaysia, Papua New Guinea, and Philippines), Africa (Kenya, Tanzania, Mozambique, Zimbabwe, Madagascar, Mauritius and Reunion) and Australia while is naturalised in West Indies. The plant material (i.e. roots) was purchased from authorized Ayurvedic crude drug dealer, Gulbarga, Karnataka. The roots were authenticated by pharmacog-
continued further till the solution regains pink colour. This volume of NaOH corresponds to total acidity. Acidity was expressed as mEq/l/100g.

\[
\text{Acidity} = \text{Vol. of NaOH} \times \text{Normality} \times \frac{100}{0.1 \text{ mEq/l/100g}}.
\]

The stomach was opened along the greater curvature and washed slowly under running tap water. The stomach was fixed on glass slide and was observed under 10X magnification for ulcers and scoring was done as described by Kulkarni SK.

- 0 – Normal coloured stomach.
- 0.5 – Red colouration.
- 1.0 – Spot ulcers.
- 1.5 – Haemorrhagic streaks.
- 2 – ulcers ≥ 3 but ≤ 5
- 3 – ulcers > 5

Mean ulcer score for each animal was expressed as ulcer index.

RESULTS

As per the Ayurvedic concept of physiological functioning of body, the acid secretion was found to be high during Varsha and Sharat ritu (June-Oct) which was evident from the gastric juice volume and pH which was low. The free acidity and total acidity values were also high in these seasons. The percentage ulcer protection was lowest in this seasons i.e. Varsha – Sharat ritu (June–Oct). The ulcer protection was found to be highly significant during Vasanta ritu and Hemanth ritu. The results were calculated using Dunnet-t test and indicated statistical difference in their ulcer protection in different seasons. The P< 0.001 indicating significant difference in controlling the acid secretion and ulcer protection. The results were in comparison with standard drug lanzoprazole and the details are shown in Table 1.

DISCUSSION

Ayurvedic literature has well established theories of treating diseases which are based on factors like “Pancha maha bhuta tatva” and “Ritu charya”. These factors are taken into consideration for treatment according to seasonal changes, wherein the medicine may remain the same but vehicles may change. This is because particular factor may be dominant in a particular season causing a disease or disorders in the body (i.e. ‘vata’, ‘pitta’ or ‘kapha’). The variations in the environmental conditions and their corresponding therapeutic actions are well established in Ayurvedic literature.

![Figure 1: Effect of various seasons on Gastric acid Secretion.](image)
Table 1: Chronopharmacological influence of *O. turpethum* on various gastrointestinal biochemical parameters in pylorus ligated rats. *n*=6, Mean.

<table>
<thead>
<tr>
<th>Seasons</th>
<th>Groups</th>
<th>Volume (ml)</th>
<th>pH</th>
<th>Free acidity (meq/l)</th>
<th>Total acidity (meq/l)</th>
<th>Ulcer Index</th>
<th>% Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan/Feb</td>
<td>Control</td>
<td>2.5</td>
<td>1.6</td>
<td>28</td>
<td>44</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>* (Shishir “ritu”)</td>
<td>Standard</td>
<td>2.3</td>
<td>6.5</td>
<td>22</td>
<td>42</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Test</td>
<td>1.25</td>
<td>5.5</td>
<td>24</td>
<td>40.5</td>
<td>0.63</td>
<td>68.5</td>
</tr>
<tr>
<td>Mar/April</td>
<td>Control</td>
<td>2.5</td>
<td>1.6</td>
<td>30</td>
<td>45</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>* (Vasant “ritu”)</td>
<td>Standard</td>
<td>1.5</td>
<td>8.5</td>
<td>25.5</td>
<td>33</td>
<td>0.5</td>
<td>83.3</td>
</tr>
<tr>
<td></td>
<td>Test</td>
<td>1.5</td>
<td>6.3</td>
<td>26.3</td>
<td>40.6</td>
<td>0.8</td>
<td>72</td>
</tr>
<tr>
<td>May/June</td>
<td>Control</td>
<td>3.7</td>
<td>1.7</td>
<td>30</td>
<td>55.5</td>
<td>1.25</td>
<td>–</td>
</tr>
<tr>
<td>* (Grishm “ritu”)</td>
<td>Standard</td>
<td>3.4</td>
<td>6.2</td>
<td>18</td>
<td>32.2</td>
<td>0.9</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Test</td>
<td>3.7</td>
<td>3.13</td>
<td>21.7</td>
<td>27.5</td>
<td>1.9</td>
<td>12.5</td>
</tr>
<tr>
<td>July/Aug</td>
<td>Control</td>
<td>3.1</td>
<td>1.8</td>
<td>30</td>
<td>57.6</td>
<td>2.3</td>
<td>–</td>
</tr>
<tr>
<td>* (Varsha “ritu”)</td>
<td>Standard</td>
<td>2</td>
<td>6.3</td>
<td>13</td>
<td>29.5</td>
<td>1</td>
<td>56.5</td>
</tr>
<tr>
<td></td>
<td>Test</td>
<td>2</td>
<td>6.1</td>
<td>20.3</td>
<td>27.5</td>
<td>3</td>
<td>34.8</td>
</tr>
<tr>
<td>Sept/Oct</td>
<td>Control</td>
<td>2.7</td>
<td>1.8</td>
<td>36.9</td>
<td>56.3</td>
<td>2.5</td>
<td>–</td>
</tr>
<tr>
<td>* (Sharat “ritu”)</td>
<td>Standard</td>
<td>2.1</td>
<td>8.6</td>
<td>20</td>
<td>54.5</td>
<td>0</td>
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<tr>
<td></td>
<td>Test</td>
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<td>6.5</td>
<td>20</td>
<td>51</td>
<td>1.62</td>
<td>40</td>
</tr>
<tr>
<td>Nov/Dec</td>
<td>Control</td>
<td>1.8</td>
<td>1.8</td>
<td>33.9</td>
<td>50</td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>* (Hemanth “ritu”)</td>
<td>Standard</td>
<td>1.7</td>
<td>4.3</td>
<td>22</td>
<td>53.5</td>
<td>0.5</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Test</td>
<td>1.7</td>
<td>4.61</td>
<td>24.9</td>
<td>42.16</td>
<td>1.5</td>
<td>25</td>
</tr>
</tbody>
</table>

The study showed significant variation in its activity all through the seasons in a year. The histogram in Figure 1 shows various phases of acid secretion throughout the year due to environmental influence. The ‘*sanyavastha*’ indicates a well-balanced secretion of acid and hence during this season the GI related disorders are less common. The ‘*chaya*’ phase indicates ascending period of acid secretion leading to increased GI disorders like temperature, sunlight, humidity, diurnal cycle influence the physiological functions of the body. So as to say in Ayurvedicians language in a particular season particular “*dosha*” is dominant. Similarly the recommended diet and vehicle for the drug also changes with the seasons. The energy levels are also said to vary in descending and ascending order viz Jan – June descending energy levels and July – August ascending energy levels.

Figure 2: Seasonal Variations of *Operculina turpethum* on Ulcer protection in Pylorus ligation induced ulcer model in rats.
Figure 3: Influence of *Operculina turpethum* and Lansoprazole on Ulcer index of rats during Vasant ritu. $P < 0.0001$.

Figure 4: Influence of *Operculina turpethum* and Lansoprazole on Ulcer index of rats during Grishma ritu. $P=NS$. 
burning sensation, belching, ulcers etc. The ‘Prakopa’ indicates an intense phase of acid secretion resulting in chronic GI disorders. The ‘Prasham’ indicates the lowest secretion of GI acid and less GI disturbances. Besides these factors the host defense, dietary habits, alcohol, stress levels are additional factors that aggravate the condition.

*O.turpethum* showed significant antiulcer activity in the *Shishir ritu* (Jan/Feb), *Vasant ritu* (Mar/Apr) because of natural body cycle that tends to secrete less of acid, but the effect reduced in the *Grishma ritu* (May/June), *Varsha ritu* (July/Aug), *Sharat ritu* (Sep/Oct) due to the natural predisposing factors of aggravation that causes excess acid secretions as shown in Figure 2. Hence the same dose (i.e. 100mg/kg b.w.) did not produce the required and the desired antular effect in the latter seasons (i.e. *Grishma* (May/June), *Varsha* (July/Aug), *Sharat* (Sep/Oct).

The above study helps in adjusting the dosage regimens in accordance with the seasons throughout the year in order to achieve the desired therapeutic effect. Thus, the dosage can be reduced in natural conducive season in relation to acid secretions and can be increased in seasons that are prone to aggravate the natural factors. The proton pump inhibitors are available in various dosage ranges (10 mg, 20 mg etc.) and during favorable season 10 mg would give the desired effect instead of excessively drugging with 20mg. The above results were statistically significant by Dunnet t-test that was calculated for ulcer index and depicted graphically in figure: 3, 4 and 5.

**CONCLUSION**

These studies indicate that the dosage of the drugs can be adjusted according to the seasonal variations in order to achieve the maximum therapeutic effect. The influence of seasons holds good both for Ayurvedic formulations like *O.turpethum* and proton pump inhibitors like lansoprazole.

**REFERENCES**


