ABSTRACT
Jayapala is commonly known as Jamalgota. It is described in Upavisha Varga in Ayurved. It’s botanical name is Croton tiglium Linn. It is used in Ayurveda in various diseases. Its seeds are used in many formulations. The seed oil is purgative. It produces severe symptoms of toxicity when taken internally or applied externally to the skin. Seeds are having poisonous properties so it should be used carefully after proper shodhana according to Ayurvedic text. Pharmaceutical study of various steps of shodhana process of Jayapala seeds are described here along with its introduction.

Key Words: Jayapala Seed, Shodhana, Godugdha, Svedana, Nimbu Svarasa, Bhawana

INTRODUCTION
JAYAPALA (Seed) Jayapala consists of dried seed of Croton tiglium Linn. (Fam. Euphorbiaceae); a small evergreen tree, 5-7 m high, found throughout tropical India.

(A) Jayapala (Croton tiglium Linn.)
(B) Seed before Shodhana

Synonyms
Sanskrit: Mukula, Tintidiphala, Jepala, Rechaka, Saraka, Vibhedani and Maladravi
English: Croton
Hindi: Jamalgota

Description
a) Macroscopic: Seed albuminous, ovate, oblong, slightly quadrangular, convex on dorsal and somewhat flattened on ventral surface, about 12 mm in length and resemble castor seed in shape, dull cinnamon-brown, often mottled with black due to abrasion in testa, caruncle easily detached and usually absent, hilum on ventral side less distinct than that of castor seed, raphe runs along ventral surface of seed, terminating in a dark chalaza at opposite extremity, kernel yellowish and oily, consisting of a large endosperm, enclosing papery
cotyledons and a small radicle, no marked odour; kernel gives at first oily taste followed by an unpleasant acridity.

b) Flowering and fruiting time: Summer to winters¹

Identity, Purity and Strength²

Foreign matter : Not more than 2 per cent,
Total ash : Not more than 3 per cent,
Acid-insoluble ash : Not more than 0.5 per cent,
Alcohol-soluble extractive: Not less than 15 per cent,
Water-soluble extractive: Not less than 7 per cent,

T.L.C.: T.L.C. of alcoholic extract of the drug on Silica gel 'G' plate using n-Butanol: Acetic acid: Water (4:1:5) shows under U.V. (366 nm) three spots at Rf. 0.34, 0.54 and 0.84 (all violet). On exposure to iodine vapour six spots appear at Rf. 0.10, 0.29, 0.39, 0.49, 0.63 and 0.90 (all yellow). On spraying with 5% Methanolic-Sulphuric acid reagent and heating the plate at 105°C for ten minutes. Three spots appear at Rf. 0.34 (grey), 0.54 (yellow), 0.84 (brown).

Chemical Compositions³: Seeds kernel contain 55-57% croton oil. The poison occurs to the extent of 2-5% in the fatty acids, purgative effect may also follow the applications of oil on the skin: oil contains a toxic resin. In addition to the vesicant and purgative principle which pass into the oil, the seed kernels contain 2 toxic proteins, croton-globuline and croton albumin, sucrrose-glycoside and a glyco-side-crotonoside. Seeds yield a fixed oil, tiglic acid, crotanic or tiglinic acid, crotanic or quarterly acid and croton oil.

Major contents of croton oil include croton – oleic acid, mainly activating principle; tiglic acid or methyle crotonic acid; crotonol, non purgative but corrosive for skin; some volatile oil and fatty acids.

Properties and Action -

<table>
<thead>
<tr>
<th>Rasa</th>
<th>Madhura</th>
</tr>
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<tbody>
<tr>
<td>Guna</td>
<td>Guru, Snigdha</td>
</tr>
<tr>
<td>Virya</td>
<td>Sheeta</td>
</tr>
<tr>
<td>Vipaka</td>
<td>Madhura</td>
</tr>
<tr>
<td>Karma</td>
<td>Pittahara, Kaphahara, Rechana</td>
</tr>
</tbody>
</table>

Part Used⁴
Seeds, Seeds oil

Important Formulations
Icchabhedi Rasa, Ashvakanchuki Rasa, Jalodarari Rasa, Jwarari Rasa, Anjanbharav Rasa, Vrashchik Vishar Pralepa⁵

Therapeutic Uses: Udara roga (Diseases of Abdomen), Vibandha (Constipation), Jvara (Fever).

Dose: 6-12 mg. of the drug in powder form.⁶
1/8 to 1/4 Gunja⁷

Anupana⁸ Cold Water

Groups (Gana) Guduchyadi (Bhavapraka-sha)⁹, Triphaladi (R.S.S.)¹⁰

Adverse Effect of Impure Croton Seed: Croton seed is a strong purgative. If used without appropriate purification, it might cause excessive purging leading to dehydration, cramps, burning sensation and excessive thirst.

Precautions: If there is excessive purgation then cold water should never be used to stop it. On the other hand, warm water will stop motions. Borax is an antidote of croton seed poisoning¹¹.

Importance of Shodhana: Some drugs are required to be used after shodhana. The literal meaning of the word “Shodhana” is “Purification”. But this is often misinterpreted to mean that the substance is rendered physically and chemically pure. Shodhana, no doubt, brings about physical and chemical purity to some extent. But at times, more impurities are added to the substance during certain stages of the processing. By such addition, the drug be-
comes less toxic and therapeutically more effective.

**Methods of Purification (Shodhana):** So many methods of Jayapala shodhana are available in the texts. Four types of purification methods are described into the *Vrihada Rasa Raja Sundara*¹² and three types of methods into the *Rasa Tarangini*¹³ according to them the seeds is treated with Godugdha (Cow’s Milk) by Svedana into Dola Yantra for 3 Hours or other Svedana method is also described, 1/8 borax powder – mixed into Jayapala seed is treated with cow’s milk into Dola Yantra for 6 Hours or kept with them buffalow’s dung for 3 days, then washed with warm water and dried it. Residual oil is removed by pressed through two blotting papers or through earthen pot or through triturated with lime juice.

**General Method of Jayapala Shodhana:** According to *Rasa Tarangini* croton seed are Soaked in water for one night, after that its outer coating are removed. From inside the kernel, leaf like cotyledons is to be removed. Then these are to be tied in a piece of cloth in the form of pottali for Svedana in Dola Yantra by adding cow’s milk. Thereafter, these kernels are to be removed from the pottali, washed with warm water and dried in the sun. To remove the residual oil, these kernels are to be pressed through two blotting papers and stored in a dry and new earthen jar¹⁴.

**Jayapala Seed Shodhana**¹⁵ Process

<table>
<thead>
<tr>
<th>Process</th>
<th>: Svedana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparatus</td>
<td>: Steel container, Cotton Cloth and Dola Yantra, Earthen pot, Mortar &amp; Pestle, Knife etc.</td>
</tr>
<tr>
<td>Materials</td>
<td></td>
</tr>
<tr>
<td>1. Jayapala seed</td>
<td>: 1 Kg</td>
</tr>
<tr>
<td>2. Godugdha (Cow’s Milk)</td>
<td>: 5 Lit.</td>
</tr>
<tr>
<td>3. Hot water</td>
<td>: Q.S. for Prakshalana (Washing)</td>
</tr>
<tr>
<td>4. Bloating papers</td>
<td>: Q.S. for drying</td>
</tr>
<tr>
<td>5. Nimbu Svarasa</td>
<td>: Q.S. for 3 Bhavana</td>
</tr>
</tbody>
</table>

**Procedure**

- Required quantity of *Ashuddha Jayapala* seed is weighed. The testa of Jayapala seed is removed.
- A piece of cotton cloth is taken, dried Ashuddha Jayapala seed is kept in it and pottali is prepared.
- An Iron rod is introduced at the tip of the pottali and it was hanged in steel vessel, sufficient amount of Godugdha is added to imerse the pottali completely.
- The vessel is kept on gas burner.
- Madhayamagni is given for 3 Hours and then pottali is taken out and washed with hot water.
- Then the embryo (Jihva) of the seeds are removed with the help of knife and made paste in mortar and pestle.
- Then the paste of Jayapala is kept on earthen pot for reduce the oil. After drying the paste it was kept on bloating paper to minimize the quantity of the oil content.
- Then 3 Bhawana of Nimbu Svarasa are given.
- Then dried well and stored it.

**Observation**

- Before Svedana, the colour of Jayapala seed is Blackish Red. After Svedana it is changed to Brownish Red.
- After the Bhawana with Nimbu Rasa the paste became less sticky.
Results (Quantitative measurements)

- Wt. of Ashodhita Jayapala seed : 1 Kg
- Weight of Testa : 58 gm
- Weight of Embryo (Jihva) : 3 gm
- Weight of Shudha Jayapala seed (dried) after Svedana: 747 gm

Note: Here probability of 192 gm. weight loss is due to the loss of oil content and handling loss.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Weight of Jayapala seed before Bhawana (gm.)</th>
<th>No. of Bhawana</th>
<th>Quantity of Nimbu Svarasa used in Bhawana (ml.)</th>
<th>Weight after Bhawana (In gm)</th>
<th>Weight gain (In gm)</th>
<th>Weight gain (In %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>747</td>
<td>1st</td>
<td>950</td>
<td>820</td>
<td>73</td>
<td>9.77</td>
</tr>
<tr>
<td>2.</td>
<td>820</td>
<td>2nd</td>
<td>325</td>
<td>845</td>
<td>25</td>
<td>3.05</td>
</tr>
<tr>
<td>3.</td>
<td>845</td>
<td>3rd</td>
<td>225</td>
<td>861</td>
<td>16</td>
<td>1.89</td>
</tr>
</tbody>
</table>

Table: showing the final results of Jayapala seed

<table>
<thead>
<tr>
<th>Total weight of purified Jayapala seed after 3 Bhawana</th>
<th>861 gm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Weight Loss</td>
<td>139 gm</td>
</tr>
<tr>
<td>% of Weight Loss</td>
<td>13.9 %</td>
</tr>
</tbody>
</table>

Precautions

- Embryo (Jihva – poisonous parts) of the Jayapala seed must be removed by the help of knife.
- The pottali should be hanged just to avoid it to touching the bottom end inside of vessel.

CONCLUSION

In conclusion, we found in this study that Jayapala seed has 13.9 % weight loss after proper Shodhana and Bhawana of Nimbu Svarasa. The cause of weight loss is found here due to outer hard cover called as Testa 5.8 %, Embryo (Jihva) 0.3 % (tongue shaped thin layer present in between seed) and oil content which present in seeds. The main aim of Shodhana of Jayapala seed is to reduce the oil content which has very purgative and harmful effect. Total 1.5 liter of Nimbu Svarasa was consumed in three bhawanas and Jayapal seeds becomes less sticky.

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