ABSTRACT

Jaypal (Croton tiglium) is a plant used in the Ayurved medicines from ancient time. Jaypal seed has intense power of purgation. It acts like rechak. It is agnideepaka, teekshna. In Ayurved, It is used to cure udara, shoola, kandu, kushta, rakthvika, pleeha, ashmaree and krumi. Active principle of croton tiglium is Crotin, a toxalbumin, which is an irritant & vesicant. A less poisonous glycoside, crotonoside is also present. The activity of croton is a vesicant externally and as a purgative internally. For any new research regarding Jaypal, researcher requires its literature review, so this article provides the detail information regarding Jaypal. This review article deals with vernacular names, synonyms, classification, geographical distribution, external morphology, chemical constituents, ayurvedic properties with pharmacological action of Jaypal.

Keywords: Jaypal, Croton tiglium, Purgative, Crotin.

INTRODUCTION

Jaypal (Croton tiglium) is a plant used in the Ayurved medicines from ancient time. In Ayurved Samhitas, there are different formulations in which Jaypal plays role as important ingredients. According to Aacharya Yogratnakar, Jaypal is guru, tikta & having Ushna Guna. Due to this property it acts like a vantikar. Jay-
**Jaypal (Croton tiglium)** helps to cure *jwara* and *kushta*. It acts like *rechak*. It reduces *kapha*, *kandu* and *krumi*. According to Bhavprakash Nighantu, if Jaypal is taken in excessive quantity then signs and symptoms occurs like *Daha*, *Udarshool*, *sarakta dravamal pravruti*.

According to Modern science Jaypal i.e. *Croton tiglium* is included as an Irritant organic vegetable poison. *Croton oil plant* is an erect, evergreen shrub or small tree growing up to 7 meter tall. The plant has a very long history of herbal use, being employed as a powerful laxative and as oil to treat a wide range of skin problems. It has been grown for these uses for more than 2,000 years and is still cultivated nowadays. *Croton tiglium* causes blistering externally and on ingestion causes severe gastrointestinal irritation with burning pain in the abdomen, vomiting, powerful purging, and frequently a burning pain in the anus. In substantial dosage, collapse precedes death. These signs and symptoms will find by consuming Jaypal.

The review of Jaypal (*Croton tiglium*) deals with vernacular names, synonyms, classification, geographical distribution, external morphology, chemical constituents, and its Ayurved properties with pharmacological action.

**Aim & Objective:** Available Ayurvedic *samhitas*, various texts, journals and modern literature will be reviewed with special reference to Jaypal(*Croton tiglium*).

**Materials & Methods:** Various Ayurved samhitas with their commentaries by different authors, web search, various textbooks and peer reviewed journals were studied to get more information about Jaypal.

**Vernacular names:** Jaypal has been mentioned by different names in different regions. Below are given regional names according to region.


**Synonyms:** Jaypal, Dantibeej, Rechaka, Saraka, Tittirfal, Maladravi, Beejrechani, Kuntinibeej, Kumbhibeej, Shodhani, Ghantabeej, Chakradanti, Dantinibijak, Nikumbhabej, Nikumbha, Jamalgota, Japolota, Nepalo.

**Classification:**

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<tr>
<th>Samhitas</th>
<th>Classification</th>
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<tr>
<td>Bhavaprakasha nighantu</td>
<td>Guduchyadi varga</td>
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<td>Dhanwantara nighantu</td>
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<td>Rasa Tarangini</td>
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**According to Modern Science (Botanical classification):**

- **Kingdom:** Plantae
- **Subkingdom:** tracheobionata
- **Superdivision:** Spermatophyta
- **Division:** Magnoliophyta
- **Class:** Magnoliopsida
- **Subclass:** Rosidae
- **Order:** Euphorbiales
- **Family:** Euphorbiaceae
- **Genus:** Croton
- **Species:** tiglium

**Geographical distributions:**

Jaypal is found in the countries like America, Bangladesh, Myanmar, Srilanka, Malaysia, Vietnam. In India it is found in Assam, West Bengal, Southern part of India.

**External Morphology:**

The Plant is a small evergreen tree of almost 5-10 m in height. Leaves are oblong to ovate- 5-10cm long, lanceolate, obtuse or rounded at the two gland bases, minutely toothed. Flowers are small, 5-7 cm long, unisexual, Greenish yellow in color. Fruits are ovoid or oblong, 3 gonous capsules. Seeds are smooth, rectan-
regular in shape, enclosing reddish brown oily endosperm, looks like as seeds of *Ricinus communis*. \(^{[11,7]}\)

**Description of Seed:**\(^{[12]}\)

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

**Microscopic:** Seeds show a hard testa, which consist an epidermal layer, covered externally with a thick cuticle and composed of oval and tangentially elongated cells, filled with brownish content. Epidermis followed by a layer of radially elongated cells, slightly bent at middle, upper half portion filled with reddish brown & lower half filled with yellow contents. Innermost zone consists of tangentially elongated, thin walled cells. Endosperm consists of polygonal parenchymatous cells filled with oil globules. Few cells having rosette crystals of calcium oxalate; central region of endosperm shows a dicotyledonous embryo consisting of thin-walled parenchymatous cells. Powder- Whitish with black particles of testa; under microscope shows elongated cells containing reddish brown and yellow contents, oil globules and a few rosette crystals of calcium oxalate.

**Chemical constituents:**
Active principle of croton tiglium is Crotin, a toxalbumin, which is an irritant & vescicant. A less poisonous glycoside, crotonoside is also present. \(^{[5]}\)Crotonoside (glycoside), oil contain powerful vesicating resin composed of crotonoleic acid, methyl crotonic acid, and several other fatty acids. \(^{[13]}\)

**Ayurvedic Properties and Pharmacological Actions:**\(^{[7,11]}\)

**Praroyjya Aanga (Useful Part):**
Jaypal Beej and Taila

**Rasa Pamchaka (Properties):**
1. Rasa - Katu
2. Veerya - Ushna
3. Vipaaka - Katu
4. Guna – Guru, Ruksha, Tikshna. \(^{[2]}\)
5. Prabhaava - No specific prabhaava

**Karma (Action on Tridosha):**
**Vaata- Vaatagghna**
**Kapha - Kaphagghna**

**Pharmacological Actions:** In different Ayurvedic texts Jaypal is described as having followed pharmacological actions: udaraghna, shoolghna, kandughnha, kushtagghna, raktvakaraghna, pleehagghna, ashmareegghna and krumighna. On the basis of above-mentioned pharmacological actions, it is used in many medicinal preparations.

**Indication:** In classical Ayurvedic texts, Jaypal is indicated in following diseases mentioned according to Srotasa.

**Srotasa- Indicated Diseases**
**Annavaaha- Parinamshul, Krimi, Agnimandya, Aruchi**
**Udakavaha- Jalodar**
**Raktavaha- Kushtha, Raktashodhaka, Pleehagghna**
**Shukravaha- Dhvajbhanga**
**Mutravaha- Ashmarighna**

**Matraa/Dose:**
a) Beejkalka: 25-50 mg
b) Beejataila: 0.5-1 drop.

**Description of Jaypal according to Samhitaa:**

1. **Charaka Samhitaa:**
a) In first chapter of *Sutrasthana* i.e. *Dirghanjivi*tiiyaadhyaa, Jaypal mentioned as Dravanti in 16 Mulini dravyas. \(^{[14]}\)
b) In the second chapter of *Sutrasthana* i.e. *Apamargatandu*tiiyaadhyaa, Dravnti is mentioned in virechak dravyas. \(^{[15]}\)
c) In fourth chapter of *Sutrasthana* i.e. *Shadavi*rechanashhatashriyayadhyaa, Jaypal mentioned as Dravanti. And it is said that there are 48 yogas of Danti & Dravanti. \(^{[16]}\)
d) Detailed description of these 48 yogas of Danti & Dravanti is in twelfth chapter of *Kalpasthana* which is named as Danti-Dravanti Kalpadhyaya. \(^{[17]}\)
c) References of Dravanti are also found in 7th & 8th chapter of Vimana sthana and in 7th 13th, 27th, 33rd chapters of chikitsa sthana. In Kalpa sthana, Dravanti is described in 1st, 11th, and 12th chapters and in Siddhi sthaneanit is in 11th chapter.

2. Sushruta Samhita:
   a) In 11th chapter of Sutrasthana, Dravanti is used as Prativap to prepare Tiksha kshara.[18]
   b) Jaypal is included in Adhobhagahara Gana in 39th Chapter of Sutrasthana.[19]
   c) In 42nd chapter of Sutrasthana i.e. Rasavisheshvidnyanamadya, Dravanti comes under Tikta Rasatmak Dravya.[20]
   d) In 44th chapter of Sutrasthana i.e. Viechandravyavikalpa vidnyanamadya there is preparation of Dantyadi Ghruta which is useful in Visarpa, Daha, Kaksha, Alaji. Dantyadi tailam is useful in Prameha, Gulma, Vata & Kapasajanya Malavarodha.[21]
   e) In 2nd chapter of Chikitsasthana i.e. Sadyovrana-chikitsatamadhyaya, Dravanti is the main ingredient of Shodhana tail.[22]
   f) In 18th chapter of Chikitsasthana i.e. Granti-Apachi-Ardhuda-Gandachikitsatamadhyaya, Dravanti is in the preparation of Ghruta which is very useful in treatment of Apachi.[23]
   g) In 31st chapter of Chikitsasthana i.e. Snehopyougika chikitsatamadhyaya, Dravanti sneha is described under Virechana sneha.[24]

3. Ashtaamga Hridaya:
   a) Jaypalis described as Nikumbha in 19th chapter of Chikitsasthana i.e. Kushthachikitsatamadhyaya. It is one of the main ingredients of Mahavajraka Ghruta which is used in the Kushtha chikitsa.[25]
   b) In 30th chapter of Uttarsthana, Dravanti is one of the main ingredients of Dantyadi Ghruta which is useful in treatment of Apachi.[26]

4. ShaaramgadharaSamhita[27]
   In Shaaramgadhara Samhita, there are many medicinal preparations in which Jaypal was used as key ingredient.
   a) Narach Rasa: Jaypal is the main ingredient and is used in Aadhmana, Malavishthambha, Udavarta.
   b) Icchabhedi Rasa: Jaypal is the main content of the Icchabhedi rasa which is used in Vishtambha & Aadhatman.

5. Yogaratnakara:
   In Upavisha Prakaranam, Jaypal is described under Upavisha. In this, Jaypal is described as having properties like Tikta rasa and Guna like Guru, Ushna, Sara. It is useful in Vruna, Kaphavikara, Krumivikara, Jwara, Kushtha. With this, Shodhana process of Jaypal is also described in detail.[1]

**Shodhan padhati (Purification):[1]**

1) Remove skin and cotyledon from seed of Jaypal. Soak this seed in buffalo’s dung for three days and then clean this seed with warm water. Make a pest of these seeds with the help of Khala. And then spread this pest on mud’s spot for removing oil from seed. After this, give a Bhavana of lemon juice. This shodhana method will help to make seed purified and its properties may be enhanced.

2) Remove outer cover and cotyledon from the seed and soak it with milk in Dolayantra. After doing this process, Jaypal is used as content in formulations.

3) Wrap seeds of Jaypal in cotton cloth. Immerse this pottali in cow’s dung. After this, jaypal seed is ready for use as medicine.

**Aushadhi Kalpa’s of Jaypal:**

After purification of Jaypal seeds are used in many formulations like, Ashwakanchuki, Ichhabhedi, Narachrasa, Jalodarari, Jwaramurar, Udymartanda rasa.

1) According to Rasendra sar samgrah,[28]

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<tr>
<th>Kalpa</th>
<th>Vyadhi/Adhikara</th>
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<tr>
<td>Icchabhedi rasa</td>
<td>Virekoadhikara(Shloka no.3)</td>
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<tr>
<td>Icchabhedi rasa</td>
<td>Virekoadhikara(Shloka no.4-5)</td>
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<tr>
<td>Icchabhedi gudica</td>
<td>Virekoadhikara(Shloka no.14)</td>
</tr>
<tr>
<td>Jalodarari rasa</td>
<td>Udarrog chikitsa (Shloka no.10-11)</td>
</tr>
<tr>
<td>Icchabhedi rasa</td>
<td>Udarrog chikitsa (Shloka no.21-22)</td>
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</table>
According to *Bhaishyajya ratnavali*:[29]

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<th>Kalpa</th>
<th>Vyadhi/Adhikara</th>
<th>(Shloka no.)</th>
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<tbody>
<tr>
<td>Narach rasa</td>
<td>Udavrtanaharogadhikara</td>
<td>39-42</td>
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<tr>
<td>Udyamartanda rasa</td>
<td>Udavrtanaharogadhikara</td>
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<td>Vaidyanath vati</td>
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<td>43-44</td>
</tr>
<tr>
<td>Ichhabhedi rasa</td>
<td>Udavrtanaharogadhikara</td>
<td>46</td>
</tr>
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**Poisoning of Jaypal:**
If *Jaypal* is ingested in impure form or in excess, it will show symptoms and signs in the individual. It causes severe gastrointestinal irritation with burning pain in the abdomen, vomiting, powerful purging and frequently a burning pain at the anus. In substantial dosage, collapse precedes death. The oil of *Jaypal* causes blistering externally.[5]

**Fatal Dose:** 20 drops of oil or 4 seeds.[5]

**Fatal Period:** Death may occur in about 4 to 6 hours or may be delayed for 3 to 6 days.[5]

**Treatment:**[13]
- Stomach wash
- Administration of demulcent drinks like milk, or egg white
- Morphine with atropine to allay pain and reduce intestinal secretions.
- Glucose and saline are given IV to compact collapse and dehydration.
- Borax is an antidote of croton seed poisoning.

**PM Findings:**[13]
- The mucous membrane of the stomach and intestines is usually found red, inflamed and excoriated at places.
- Fragments of the seeds may be found in stomach and intestine.
- The spleen and liver get congested.
- The kidneys may show cloudy swelling and congestion.
- Occasionally the postmortem findings are negative.

**Medico legal importance:**[13]
- Accidental poisoning results from swallowing croton oil by mistake, or when taken in large doses as a purgative or by inhaling their dust
- Suicide and Homicide is rare
- Root and oil are taken internally as an abortifacient.
- Oil is used as arrow poison.

**Research:**
- **Antidermatophytic activities:**[30]
The ethanolic extracts of stem or seed extracts of *C. tiglium* exhibited strong antidermatophytic activities. A topical application of the ethanolic extracts of *C. tiglium* on treating skin fungal infection and formulation of the extracts into shampoo or soap may be practical and scientifically sounding.
- **Anti HIV:**[31]

Five phorbol diesters, together with three known ones, were isolated from a MeOH extract of the seeds of *Croton tiglium*, and their structures were determined by spectroscopic methods and selective hydrolysis of acyl groups. These compounds were assessed for their abilities to inhibit an HIV-induced cytopathic effect (CPE) on MT-4 cells and to activate protein kinase C (PKC) associated with tumor-promoting action. 12-O-Acetylphorbol-13-decanoate and 12-O-decanoylphorbol-13-(2-methylbutyrate) effectively inhibited the cytopathic effect of HIV-1 [complete inhibitory concentration (IC$_{100}$) values of 7.6 ng/ml and 7.81 μg/ml, and minimum cytotoxic concentration (CC$_{0}$) value of 62.5 and 31.3 μg/ml, respectively]; however, 12-O-acetylphorbol-13-decanoate showed no activation of PKC at concentrations of 10 and 100 ng/ml. 12-O-Tetradecanoylphorbol-13-acetate (TPA) was found to be not only the most potent inhibitor of HIV-1-induced CPE (IC$_{100}$ value of 0.48 ng/ml), but also the most potent activator of PKC (100% activation at 10 ng/ml).
- **Antioxidant capacity:**[32]

In this study, it was concluded that *C. tiglium* seeds contain various active phytococonstituents such as carbohydrates (glycosides), flavonoids, sterols (triterpenes), alkaloids (nitrogenous compounds) and proteins. Incorporation of Ag-NPs into the different extracts (ethanolic, petroleum ether and aqueous seeds
extracts) enhanced the antioxidant properties through increasing the total antioxidant capacity, total reducing power and free radical scavenging activity in comparison with the crude extracts.

- **Hepato protective Activity:**[33]
  The finding of the liver biochemical markers and histopathological changes in the present study reveals that the *Shodhita Croton tiglium* seed might be able to protect liver from acute damages caused by Hepatotoxins. This preliminary screening may help to understand the scientific basis of use of *Shodhita Croton tiglium* seed in liver disorders and in future development of new drug from the plant.

- **Anticonvulsant effect:**[34]
  *Croton tiglium* had shown dose dependant anticonvulsant effect in electrically induced seizure, however it was inferior to sodium valproate. In pentylenetetrazole induced seizures, the anticonvulsant effect of croton tiglium was much lower when compared to sodium valproate, and there was higher percentage of mortality in croton tiglium treated groups.

- **Antimicrobial Activity:**[35]
  This study confirmed that the leaf and seed extracts of *Croton tiglium* possesses antimicrobial activities against skin disease causing microbes. The antimicrobial activity of the plant may be attributed to various phytochemical constituents present in the crude extracts. It can be concluded that antimicrobial activity and its active components would be helpful in nitrating skin disease.

- **Anti-Cancer Activity:**[36]
  Result of this study demonstrates that the *Croton tiglium* extract could inhibit the proliferation of A549 cells by regulating apoptosis related genes expression in vitro. It has potential to provide biologically active compounds for treating NSCLC (Non-small cell lung cancer) and deserves additional evaluation criteria as a new plant-derived anticancer agent.

**CONCLUSION**

Thus, from this review, we can say that Jaypal (*Croton tiglium*) can act as Antidermatophytic, Anti-HIV drug, Antioxidant, Hepatoprotective, Anticonvulsant, Antimicrobial, Anti-Cancerous drug. Thus Jaypal (*Croton tiglium*) has immense practical applicability in biomedicine but more clinical trials should be conducted to support its therapeutic uses. This article will provide all the information regarding Jaypal (*Croton tiglium*) which will be beneficial to Researchers who wants to study on it.

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