

A REVIEW ARTICLE ON JAYPAL-CROTON TIGLIUM

Jadhav Pradeep Uttam¹, Pachkawade Shubhangi Tukaram²

¹Associate Professor & HOD, Agadtantra, Sai Ayurved College, Hospital & Research Centre, Sasure- Vairag, Taluka Barshi, Dist Solapur, Maharashtra, India

²Assistant Professor, Agadtantra Dept, Sai Ayurved College, Hospital & Research Centre, Sasure- Vairag, Taluka Barshi, Dist Solapur, Maharashtra, India

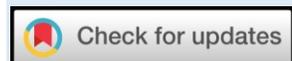
Email: piyush_jadhav84@yahoo.com<https://doi.org/10.46607/iamj08062020>

(Published online: June 2020)

Open Access

© International Ayurvedic Medical Journal, India 2020

Article Received: 04/05/2020 - Peer Reviewed: 14/05/2020 - Accepted for Publication: 01/06/2020



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*, *kushtha*, *raktvikara*, *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 crotin 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-*

pal helps to cure *jwara* and *kushta*. It acts like *rechak*. It reduces *kapha*, *kandu* and *krumi*.^[1] According to Bhavprakash Nighantu, if *Jaypal* is taken in excessive quantity then signs and symptoms occurs like *Daha*, *Udarshool*, *sarakta dravamal pravrutti*.^[2]

According to Modern science *Jaypal* i.e. *Croton tiglium* is included as an Irritant organic vegetable poison.^[3] *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 often cultivated nowadays.^[4] *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*.^[5]

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.

Latin: *Croton tiglium*, English: Kroton, Sanskrit: Jaypala, Danti, Jaipala, Hindi: Jamalgot, Bengali: Jaipal, Marathi: Jamalgot, Gujarati: Jepalo, Karnataki: Jepal, Arabi: Dand, Batu, Habusasalatin, Pharsee: Tukhmebande Jirakhtai. Burma: Kanako, Chinese: Pa Teou Pa Tou, French: Bois desmolusques, Italian: Grana tiglio, Java: Cheraken, Malyalam: Dantibijam, Nepal: Lapchebis, Persian: Bedanjirekhatai, Dund,

Habbekhatai, Portuguese: croton tiglio, Sinhalese: Jayapala, Tamil: Kattukkatai, Naganam, Nagandi, Telugu: Nepalamu^[6]

Synonyms: *Jaypal*, *Dantibeej*, *Rechaka*, *Saraka*, *Titirfal*, *Maladravi*, *Beejrechani*, *Kuntinibeej*, *Kumbhibeej*, *Shodhani*, *Ghantabeej*, *Chakradanti*, *Dantinibijak*, *Nikumbhabeej*, *Nikumbha*, *Jamalgota*, *Japolota*, *Nepalo*.^[7]

Classification:

According to Ayurveda^[8]

<i>Samhitas</i>	Classification
<i>Bhavaprakasha nighantu</i> <i>Dhanwantara nighantu</i>	<i>Guduchyadi varga</i>
<i>Kaiyyadeva nighantu</i>	<i>Oushadi varga</i>
<i>RajaNighantu</i>	<i>Pippalyadi varga</i>
<i>Sharngadhara samhita</i> <i>Rasendra chudamani</i> <i>Rasa sara sangraha</i> <i>Ayurveda prakasha</i> <i>Rasa Tarangini</i>	<i>Upavisha</i>

According to Modern Science (Botanical classification):^[9]

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.^[10] In India it is found in Assam, West Bengal, Southern part of India.^[11]

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-

gular 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 quadrangular, convex on dorsal and somewhat 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, caruncle 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 acidity.

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 Croton, a toxalbumin, which is an irritant & vesicant. 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]

Prayojya Amga (Useful Part):

Jaypal Beej and Taila

Rasa Pamchaka (Properties):

1. Rasa - Katu
2. Veerya - Ushna
3. Vipaka - Katu
4. Guna – Guru, Ruksha, Tikshna.^[2]
5. Prabhaava - No specific prabhaava

Karma (Action on Tridosha):

Vaata- Vaataghna

Kapha - Kaphaghna

Pharmacological Actions: In different Ayurvedic texts Jaypal is described as having followed pharmacological actions: *udaraghna, shooghna, kandughna, kushthaghna, raktvikaraghna, pleehaghna, ashmareeghna 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

Annavaha- Parinamshul, Krimi, Agnimandya, Aruchi

Udakavaha- Jalodar

Raktavaha- Kushtha, Raktashodhaka, Pleehaghna

Shukravaha- Dhvajbhanga

Mutravaha- Ashmarighna

Matraa/Dose:

- | | |
|------------------------|----------------|
| a) Beejkalka: 25-50 mg | b) Beejataila: |
| 0.5-1 drop. | |

Description of Jaypal according to Samhitaas-

1. Charaka Samhita:

- a) In first chapter of *Sutrasthana* i.e. *Dirghanjivitiyaadhyaya*, Jaypal mentioned as *Dravanti* in 16 *Mulini dravyas*.^[14]
- b) In the second chapter of *Sutrasthana* i.e. *Apa-margatanduliyaadhyaya*, *Dravnti* is mentioned in *virechak dravyas*.^[15]
- c) In fourth chapter of *Sutrasthana* i.e. *Shadavirechanashatashriyayadhyaya*, 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 & Drvanti* is in twelfth chapter of *Kalpasthan* which is named as *Danti-Dravanti Kalpadhyaya*.^[17]

e) 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 sthanait* is in 11th chapter.

2. *Sushruta Samhitaa*:

a) In 11th chapter of *Sutrasthana*, *Dravanti* is used as *Prativap* to prepare *Tikshna kshara*.^[18]

b) Jaypal is included in *Adhobhagahara Gana* in 39th Chapter of *Sutrasthana*.^[19]

c) In 42nd chapter of *Sutrasthana* i.e. *Rasavishesh-vidnyaniyamadhyaya*, *Dravanti* comes under *Tikta Rasatmak Dravya*.^[20]

d) In 44th chapter of *Sutrasthana* i.e. *Viechandra-vyavikalpa vidnyaniyamadhyaya* there is preparation of *Dantyadi Ghruta* which is useful in *Visarpa, Daha, Kaksha, Alaji*. *Dantyadi tailam* is useful in *Prameha, Gulma, Vata & Kaphajanya Malavarodha*.^[21]

e) In 2nd chapter of *Chikitsasthana* i.e. *Sadyovruna-chikitsitamadhyaya*, *Dravanti* is the main ingredient of *Shodhana tail*.^[22]

f) In 18th chapter of *Chikitsasthana* i.e. *Granti-Apachi-Arbuda-Gandachikitsitamadhyaya*, *Dravanti* is used in the preparation of *Ghruta* which is very useful in treatment of *Apachi*.^[23]

g) In 31st chapter of *Chikitsasthana* i.e. *Snehopyougika chikitsitamadhyaya*, *Dravanti sneha* is described under *Virechana sneha*.^[24]

3. *Ashtaamga Hridaya*:

a. Jaypalis described as *Nikumbha* in 19th chapter of *Chikitsasthana* i.e. *Kushthachikitsitamadhyaya*. 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 *Shaaramgadharasamhita*, 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, Malavishtambha, Udavarta*.

b) *Ichhabhedi Rasa*: Jaypal is the main content of the *Ichhabhedi rasa* which is used in *Vishtambha & Aadhmana*.

5. *Yogaratraakara*:

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 this 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, Udaymartanda rasa*.

1) According to *Rasendra sar samgrah*:^[28]

Kalpa	Vyadhi/Adhikara
<i>Ichhabhedi rasa</i>	<i>Virekoadhikara(Shloka no.3)</i>
<i>Ichhabhedi rasa</i>	<i>Virekoadhikara(Shloka no.4-5)</i>
<i>Ichhabhedi gudica</i>	<i>Virekoadhikara(Shloka no.14)</i>
<i>Jalodarari rasa</i>	<i>Udarrog chikitsa (Shloka no.10-11)</i>
<i>Ichhabhedi rasa</i>	<i>Udarrog chikitsa (Shloka no.21-22)</i>

2) According to *Bhaishyajya ratnawali*:^[29]

Kalpa	Vyadhi/Adhikara	
Narach rasa	Udavrtanaharogadhikara	(Shloka no.39-42)
Udyamarttanda rasa	Udavrtanaharogadhikara	(Shloka no.48)
Vaidyanath vati	Udavrtanaharogadhikara	(Shloka no.43-44)
Ichhabhedi rasa	Udavrtanaharogadhikara	(Shloka no.46)

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 (IC₁₀₀) values of 7.6 ng/ml and 7.81 µg/ml, and minimum cytotoxic concentration (CC₀) 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 (IC₁₀₀ 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 phytoconstituents 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 Hepatoxins. 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 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.

REFERENCES

1. Indradeva Tripathi, Dayashankar Tripathi, Yogaratnakar, 1st ed., Varanasi, Krishnadas Academy, 1998, P. 132.
2. Krushnachandra Chunekar, Gangasahay Pande, Bhavaprakashnighantu, Reprint, Varanasi, Choukhamba Bharati Akadamy, 2013, P. 388.
3. Dr.Parikh C.K, Parikh's textbook of Medicinal Jurisprudence, forensic Medicine and Toxicology, Reprint, New Delhi, CBS Publishers & Distributors, 2000, P. 9.29.
4. <http://tropical.theferns.info/viewtropical.php?id=Croton+tiglium> Accessed on 29/04/2020.
5. Dr. C. K. Parikh, Parikh's textbook of Medicinal Jurisprudence, forensic Medicine and Toxicology, Reprint, New Delhi, CBS Publishers & Distributors, 2000, P. 9.30
6. Kirtikar KR, Basu BD. Indian Medicinal Plants. 2nd ed. Vol. III, Allahabad, Lalit Mohan Basu, 1934; P.2257.
7. Vishnu Mahadev Gogate, Dravyagunavidnyana, 1st ed., Pune, Vaidyamitra Prakashan, 2008, P. 403.
8. <https://www.easyayurveda.com/2017/05/09/jamalgota-purging-croton-croton-tiglium/> Accessed on 28/04/2020.
9. <https://plants.usda.gov/java/ClassificationServlet?source=display&classid=CRTI3> Accessed on 27/04/2020.
10. <https://indiabiodiversity.org/species/show/266494> Accessed on 29/04/2020.
11. AP Deshpande, RR Jawalgekar, Subhash Ranade, Dravyagunavidnyana, 5thed. Reprint, Pune, Anmol Prakshan, 2003.P 942.
12. The Ayurvedic Pharmacopodia of India, Government of India, Ministry of health and family welfare, Department of India systems of medicine and Homeopathy, New Delhi, Part -1, vol.2, P.58.
13. Jaising P Modi, Modi's textbook of Medical Jurisprudence And Toxicology, 24th ed., Gurgaon, Lexis Nexis, 2011, P.137-138.
14. Kashinath Pandey, Gorakhnath Chaturvedi, Charaka Samhita Part I, Reprint, Varanasi, Choukhamba Bharati Aakadamy, 2005, P.43.

15. Kashinath Pandey, Gorakhnath Chaturvedi, Charaka Samhita Part I, Reprint, Varanasi, Choukhambha Bharati Aakadamy, 2005, P.53.
16. Kashinath Pandey, Gorakhnath Chaturvedi, Charaka Samhita Part I, Reprint, Varanasi, Choukhambha Bharati Aakadamy, 2005, P.66.
17. Brahmanand Tripathi, Charaka Samhita Volume II, Reprint, Varanasi, Choukhamba Surbharati Prakashan, 2004, P. 1132.
18. Kaviraj Ambikadatta Shastri, Sushrura samhita Part I, 14th ed., Varanasi, Choukhambha Sanskrit Sansthan, 2003, P.36.
19. Kaviraj Ambikadatta Shastri, Sushrura samhita Part I, 14th ed., Varanasi, Choukhambha Sanskrit Sansthan, 2003, P.147.
20. Kaviraj Ambikadatta Shastri, Sushrura samhita Part I, 14th ed., Varanasi, Choukhambha Sanskrit Sansthan, 2003, P.159.
21. Kaviraj Ambikadatta Shastri, Sushrura samhita Part I, 14th ed., Varanasi, Choukhambha Sanskrit Sansthan, 2003, P.164.
22. Kaviraj Ambikadatta Shastri, Sushrura samhita Part I, Chikitsasthana, 14th ed., Varanasi, Choukhambha Sanskrit Sansthan, 2003, P.20.
23. Kaviraj Ambikadatta Shastri, Sushrura samhita Part I, Chikitsasthana, 14th ed., Varanasi, Choukhambha Sanskrit Sansthan, 2003, P.85.
24. Kaviraj Ambikadatta Shastri, Sushrura Samhita Part I, Chikitsasthana, 14th ed., Varanasi, Choukhambha Sanskrit Sansthan, 2003, P.133.
25. Kaviraj Atridev Gupta, Ashtanghridaya, Reprint, Varanasi, Chaukhambha Publications, 2005, P.406.
26. Kaviraj Atridev Gupta, Ashtanghridaya, Reprint, Varanasi, Chaukhambha Publications, 2005, P.559.
27. Brahmanand Tripathi, Sharangdhar samhita, Reprint, Varanasi, Choukhamba Surbharati Prakashan, 2006, P.301.
28. Dr. Parimi Suresh, Dr. Dhannapunei Vinaya Kumari, Rasendra Sara Sangrah of Sri Bhatt Gopal Krishna, 1st ed., Varanasi, Chaukhambha Sanskrit Sansthan, 2007.
29. Prof. Siddhi Nandan Mishra, Bhaisajyaratnawali of Kaviraj Govind Das Sen, 1st ed., Varanasi, Chaukhamba Surbharati prakashana; 2005.
30. Han Chien Lin, Yu-Liang Kuo, et al., Antidermatophytic Activity of Ethanolic Extract from Croton tiglium, BioMed Research International, 2016. P.1-6.
31. Sahar El-Mekkawy, Meselhy R. Meselhy et al., Anti-HIV-1 phorbol esters from the seeds of *Croton tiglium*, Phytochemistry, 9 February 2000, Volume 53, Issue 4, P. 457-464
32. Wael Mahmoud Aboulthanal, Ahmed M. Youssef et al., Evaluation of Antioxidant Efficiency of Croton tiglium L. Seeds Extracts after Incorporating Silver Nano particles, Egyptian Journal of Chemistry, Feb 2019, Volume 62, Issue 2, P. 181-200.
33. Yadav A., Mishra A.et.al., Preliminary evaluation of hepatoprotective potential of the polyherbal formulation, CRJPAS, July-Sept 2019, Volume 3, Issue 3, P. 1-6.
34. Mudium R., Kolasani B., Anticonvulsant Effect of Hydroalcoholic Seed Extract of Croton Tiglium in Rats and Mice, JCDR, Mar 14, Voume 8, Issue 3, P.24-26.
35. Iraqui P., Prof.R.N.S Yadav, Evaluation of Antibacterial and Antifungal Activities of Leaf and Seed Extracts of Croton Tiglium Plant against Skin Disease Causing Microbes, IJRSB, May 2015, Volume 3, Issue 5, P. 139-144.
36. Changyou Li, Xiao Wu et. Al, Croton Tiglium Extract Induces Apoptosis via Bax/Bcl-2 Pathways in Human Lung Cancer A549 Cells, APJCP, Nov. 2016, Volume 16, Issue 11, P. 4893-4898.

Source of Support: Nil

Conflict of Interest: None Declared

How to cite this URL: Jadhav Pradeep Uttam & Pachkawade Shubhangi Tukaram: A Review Article On Jaypal-Croton Tiglium. International Ayurvedic Medical Journal {online} 2020 {cited June, 2020} Available from: http://www.iamj.in/posts/images/upload/3714_3720.pdf