WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 11, 1927-1937. Review Article ISSN 2277–7105

A REVIEW ON *KRISHNAJEERAKADI CHURNA*: AN AYURVEDIC FORMULATION FOR STOMATITIS

[1*]Dr. Shreya Sahu, [2]Dr. Urmila Shukla, [3]Dr. Sharad Rathi, [4]Dr. Sunita Rajput and [5]Dr. Anshu Malviya

[1]M.D. Scholar, Department of Agad Tantra Evum Vidhi Vaidyaka.
Pt. Khushilal Sharma Government Ayurveda College and Hospital, Bhopal (M.P).
[2]Professor M.D. Ph.D and HOD, Department of Agad Tantra Evum Vidhi Vaidyaka,
Pt. Khushilal Sharma Government Ayurveda College and Hospital, Bhopal (M.P).
[3]Lecturer M.D. Department of Agad Tantra Evum Vidhi Vaidyaka,
Pt. Khushilal Sharma Government Ayurveda College and Hospital, Bhopal (M.P).
[4]Lecturer M.D. Department of Agad Tantra Evum Vidhi Vaidyaka, Pt. Khushilal Sharma Government Ayurveda College and Hospital, Bhopal (M.P).
[5]Lecturer M.D. Department of Agad Tantra Evum Vidhi Vaidyaka, Pt. Khushilal Sharma Government Ayurveda College and Hospital, Bhopal (M.P).

Article Received on
18 April 2024,
Revised on 08 May 2024,
Accepted on 28 May 2024
DOI: 10.20959/wjpr202411-32682

***Corresponding Author**
Dr. Shreya Sahu
M.D. Scholar, Department of Agad Tantra Evum Vidhi Vaidyaka. Pt. Khushilal Sharma Government Ayurveda College and Hospital, Bhopal (M.P).

ABSTRACT

Background: *Mukhpaka* (mouth ulcer) is the most common disease of oral cavity and can occur anywhere in the mouth, i.e the inside of the cheeks, gums, lips, palate and tongue. *Mukhapaka* (mouth ulcer) is *Pitaja Nanatmaja* and *Rakta Pradoshaja Vikara*. It can be caused by poor oral hygiene, excessive intake of spicy and pungent food, Tobacco- gutkha chewing, hormonal imbalance, dietary deficiency and stress. The aggravated *doshas* move through the oral cavity and produce the *Paka* which is characterized by *Vedanayukta Vrana* (painful wound) in mouth. It is also called as *Sarvsara Mukharoga*. The symptoms of *Mukhapak* can be correlated with Aphthous ulcer which is characterized by painful superficial ulcer in the movable mucosa of the mouth. **Objective:** The objective is to explore the pharmacological properties of the individual components of *Krishnajeerakadi churna* and evaluate their collective impact on Stomatitis. **Method:** Various databases, including PubMed, Google

Scholar, and Ayurvedic journals, were searched using relevant keywords. Studies reporting on the anti-inflammatory, anti-ulcerogenic, antioxidant, and antibacterial activities of the individual components of *Krishnajeerakadi churna* were included. *Ayurvedic Samhita* and *Nighantu* with commentaries are used for relevant content. Data were synthesized to elucidate the potential mechanisms of action and therapeutic efficacy of *Krishnajeerakadi churna* in managing *Mukhapaka* (mouth ulcer). **Conclusion:** *Krishnajeerakadi churna* useful in treating *Mukhapaka* (mouth ulcer), *Vrana* (wound), *Kleda* (excessive moisture), *Mukhadaurygandha* (halitosis). The individual constituents of this *Churna* exhibit anti-inflammatory, anti-ulcerogenic, antioxidant, and antibacterial activities, which may collectively contribute to its efficacy in treating *Mukhapaka*.

KEYWORDS: Oral diseases, *krishnajeerakadhi churna, ukhapaka,* Aphthous ulcer.

INTRODUCTION

Oral cavity is gateway of alimentary canal and important part of upper respiratory tract. Mouth ulcer is common oral mucosal disease. Oral cavity infections are strongly associated with systemic chronic diseases such as cardiovascular disease, diabetes mellitus and pneumonia. Maintenance of good oral hygiene is very crucial in the prevention of oral cavity diseases. For these *Acharaya Charak* and *Vaghabhatta* have mentioned the guideline for daily oral health care under the heading of *Dincharaya* (daily routine).

Stomatits refers to inflammation that occur in any tissue in the oral cavity.[1] It is considered as one of the prevalent oral diseases. Aphthous ulcer characterized by recurrent small round and ovoid ulcer with circumscribed margins, erythematous halos and yellow or grey floor. Its symptoms range from presence of mouth ulcer, redness and erosion of buccal mucosa, salvation, burning sensation, difficulty in chewing pungent and hot things. Most ulcer occur on the non- keratinizing epithelial surface of the mouth like buccal and labial mucosa and tongue. According to *Acharya Sushruta* there are 65 kinds of *Mukhroga* (mouth disease) which occur at seven locations such as lips, teeth, gums, tongue, palate, throat and entire oral cavity.[2] The one that occur in mucus membrane of the mouth is called as *Mukhapaka* or *Sarvsara roga*, it is a disease of oral cavity characterized as the *paka-avastha* (inflammation) of oral mucosa and produce ulcer in oral cavity. *Pitta dosha*, *Rasa*, *Rakta* (blood) and *Mamsa* (muscles) are the main *Dushya* in *Mukhpaka*. The fundamental goal of the treatment to shorten the duration of ulcer, relief from pain, lessen the frequency and severity of recurrences. Topical therapy may be sufficient for occasional episodes of minor ulcers while

systemic intervention is used in patient who are unresponsive to topical agent.[3] There are many topical and systemic drugs described in ayurveda literature to cure *Mukhpaka*. In these review *Krishnajeerakadi Churne* is taken to explore its efficacy in *Mukhpaka.*

DRUG REVIEW

Krishnajeerkadi Churna

Krishnajeerkadi Churna is polyherbal formulation used in *Mukhroga* (oral diseases). In *Ayurveda Chakradatta.*[4] first mentioned this formulation and then *Yogratnakar.*[5] and *Bhaishajayratnavali.*[6] followed the same preparation for the same indication (oral disease). It contains of equal quantity of *Krishnajeeraka (Carum carvi Linn.), Kushtha (saussarea lappa c.b clarke)* and *Indrayava (holarrhena antidysenterica (linn.) Wall.)* Use in treatment of *Mukhapaka* (mouth ulcer), *Vrana*(wound), *Kleda, Mukhadaurygandha* (halitosis).

Krishnajeerak (*Carum carvi Linn)*.

Ayurvedic Pharmacological Properties and Action

The drug is *Katu* (pungent) in *Rasa, Laghu* (light) in *Guna, Ushna* (hot) in *Virya* and *Katu* (pungent) *Vipak*. Hence pacifying *Kaphavata dosha*.[7]

Table No. 1: Properties of *Krishnajeerak* As Per Various *Nighantu.*

S.No.	Nighantu	Rasa	Virya	Gana
1	*Nighantu Adarsa*[8]	*Katu*	*Ushna*	*Jirakadi Varga*
2	*Dhanwantri Nighantu*[9]	*Katu*	*Ushna*	*Shatpushpadhi Dwitiya Varga*
3	*Raj Nighantu*[10]	*Katu*	*Ushna*	*Pippalyadi varga*
4	*Kaiyadeva Nighantu*[11]	*Katu, Tikta*	*Ushna*	*Aushdhi Varsga*
5	*Bhavaprakasa Nighantu*[12]	*Katu*	*Ushna*	*Haritkyadi Varga*

Chemical composition: the seed and root of caraway showed the presence of polyacetylenic compounds.[13] in a recent study, a nonspecific lipid transfer protein has been isolated from the cumin seed.[14]

Table No. 2: Phytochemical in *(carum carvi Linn.)*[15]

Name compound	Percentage	Name compound	Percentage
A-pinene	5.17%	A –terpinene	0.37%
B-pinene	3.54%	Limonene	15.82%
Myrcene	2.27%	Crithmene; moslene	31.12%
4,8-epoxy-p-menth-1-ene	0.10%	Limonene oxide	0.12%
1-(3-isopropenyl-2,2-dimethylcyclopropyl)-2-methyl-propan-1- one	0.14%	1,4-dimethyl-.delta.-3 tetrahydroacetophenone	0.08%
Cis-para-menth-2-en-1-ol	0.08%	Para-menth-3-en-7-al	5.19%

(1)-1-(isopropyl)-4-methylcyclohex	1.80%	4-isopropyl-1-methyl-2-cyclohexen-1-ol	0.06%

Pharmacological Activity *(carum carvi linn.)*

antimicrobial Effect, Antibacterial and Antifungal Effects

carum carvi volatile oil showed weak antimicrobial activity against *pseudomonas aeruginosa* and *candida albicans* at 2% concentration. 1% concentration of the volatile oil was the minimum inhibitory concentration against *escherichia coli* and 0.5% concentration against *pseudomonas aeruginosa*. Against *candida albicans*, caraway volatile oil exhibited antimicrobial activity at all tested dilution (0.5, 1 and 2%).[16]

Anticancer Effects

Four different derivatives of carvone were prepared in order to evaluate the anticancer potential. Only (1e)-1-[2-methyl-5-(prop-1-en-2-yl) cyclohex-2-en-1- ylidene]-2-phenyl hydrazine showed anticancer activity on mcf7 (breast), hela (cervix) and sk-ov3 (ovary) cell lines. Other derivatives were shown to have poor anticancer activity.[17]

Antiulcerogenic Activity

Based on the gastric emptying in fasted rats, animals were pretreated with aqueous extract of *carum carvi* (250 and 500 mg/kg p.o.). Pretreatment with *carum carvi* (500 mg/kg, body weight) was also found to completely protect the different histopathological changes (hemorrhage, inflammatory, erosions and ulceration) caused in the gastric mucosa of ethanol treated rats.[18]

Kushtha (Saussarea lappa c.b Clarke)

Ayurvedic pharmacological properties and action: the drug is *Katu* (pungent) and *Tikta* (bitter) in *Rasa, Laghu* (light) in *Guna, Ushna* (hot) in *Virya* and *Katu* (pungent) *Vipak*. Hence pacifying *Kaphavata Dosha*.[19]

Table No. 3: Properties of *Kushtha* as Per Various *Nighantu.*

S.No.	*Nighantu*	*Rasa*	*Virya*	*Vipaka*	*Gana*
1	*Adarsha Nighantu*[20]	*Katu, tikta*	*Ushna*	*Katu*	*Sahdevyadi varga*
2	*Dhanwantri Nighantu*[21]	*Katu,tikta*	*Ushna*	-	
3	*Madanpal Nighantu*[22]	*Katu,Madhur,tikta*	-	-	*Abhayadi varga*
4	*Kaiyadeva Nighantu*[23]	*Katu,Madhur,tikta*	*Ushna*	-	*Aushadhi Varga*
5	*Bhavaprakas Nighantu*[24]	*Katu,Madhur, Tikta*	*Ushna*	-	*Haritkyadi varga*

Phytochemical in *(Saussarea lappa c.b clarke):* From the roots of *Saussurea lappa* (sl), a wide array of biologically active constituents has been isolated however sesquiterpenes, flavonoids are the main active constituents which are mainly responsible for various pharmacological activities.[25]

Pharmacological activity *(saussarea lappa c.b clarke)*

Anti-ulcer and cholagogic activity

Ul-409, polyherbal formulation consists of a total of six medicinal plants. SL is also one of the medicinal plants present in the formulation. A significant increase in gastric mucus secretions in all different cases such as normal, stress, drug and alcohol induced ulcerations in rats and guinea pigs. All these observations, reveal that ul-409 possess the anti-ulcer activity.[26]

The mechanism appears to be due to the promotion of mucosal protection by augmenting gastrin mucin activity respectively.[27,28]

Anti-inflammatory activity

The ethanolic extract of the *saussurea lappa* (sl) was evaluated for inflammation for both acute and chronic cases in mice as well as in rats with dose varying from 50-200 mg/kg, p.o. The extract inhibits the inflammation significantly in paw edema was induced by carrageenan at a dose of 50-200mg/kg. Moreover, it also prevents the accumulation of inflammatory cells in carrageenan-Induced peritonitis.[29,30]

Anti-hepatotoxic activity

Traditionally the plant of sl was used for liver disease, in order to investigate that aqueous and methanolic extract of sl was used against d galactosamine (d-gain) and lipopolysaccharide (lps) induced hepatitis in rats. Posttreatment improvement in plasma levels was further confirmed by histopathology of the liver, in which improved architecture, the absence of parenchyma congestion, decreased cellular swelling and apoptotic cells in treatment groups as compared to the toxin group of animals.[31]

Anti-microbial

The ethanolic extracts of sl along with 29 other chinese herbal medicines were evaluated for antibacterial activity against five different strains of *helicobacter pylori.* The study shows that

the plant possesses anti-bacterial activity which is mainly due to the presence of volatile oils present.[32,33]

Indrayava (Holarrhena antidysenterica (linn.) Wall.)

Ayurvedic pharmacological properties and action:

The drug is *Tikta* (bitter) and *Kashaya* (astringent) in *Rasa, Laghu* (light) and *Ruksha* (dry) in *Guna Shit* (cold) in *Virya* and *Katu* (pungent) *Vipak*. Hence pacifying *tridosha*.[34]

Table No. 4: Properties of *Indrayava* as per various *Nighantu.*

S.No.	*Nighantu*	*Rasa*	*Virya*	*Vipaka*	*Gana*
1	*Adarsha Nighantu*[35]	*Katu,tikta*	*Shita*	*Katu*	*Kutajadi Varga*
2	*Dhanwantri Nighantu*[36]	*Tikta*	*Ushna*	*Katu*	*Shatpushpadi Varga*
3	*Madanpal Nighantu*[37]	-	*Shita*	*Katu*	*Abhyadi Varga*
4	*Kaiyadeva Nighantu*[38]	*Katu,tikta*	*Ushna*	-	*Aushadhi Varga*
5	*Bhavaprakasa Nighantu*[39]	*Katu*	*Shita*		*Guduchiyadi Varga*

Phytochemical in *(holarrhena antidysenterica (linn.) Wall.):* The *Inderjao* plant is reported to contain the presence of glycoflavones-iso-orientin, flavanoid, and phenolic acids. From the various parts of the plant there are various chemical constituents are isolated, these are reported as 3,4-seco-lup-20 (29)-en-3-oic acid, stigmasterol, lupeol, and campetosterol, indirubin, indigotin, tryptanthrin, anthranillate, isatin, and rutin triacontanol, cycloeucalenol, wrightial, cycloartenone, alpha-amyrin, β-amyrin, and β-sitosterol, 14α-methylzymosterol. The four uncommon sterols, clerosterol, desmosterol, 24-methylene-25-methylcholesterol, and 24-dehydropollinastanol, are isolated and they are identified in the addition to several more common phytosterols.[40]

Pharmacological activity *(holarrhena antidysenterica (linn.) Wall.)*

Anti-inflammatory and analgesic activity- ethanolic plant extract showed an analgesic effect by suppressing writhing response in albino mice.[41,42] *h. Antidysenterica* treatment also prevented rupture of goblet cells, inflammatory cellular infiltration and inflammation in mucosal layer.[43]

Hepatoprotective effect

A study revealed that treatment of plant likely to reduce the severity of liver damage, the formation of fibrous septa and also restricts liver weight loss induced by pcm. Therefore, the plant is considered as prevailing hepatoprotective agent.[44]

Anti-bacterial activity

Bark, seeds, callus extracts of the plant possess promising antibacterial activity over *staphylococcus, salmonella* and *e. Coli*. the plant also inhibited adhesion of enteropathogenic *e.coli* on host epithelial cells.[45]

DISCUSSION

Mukhapaka, also known as stomatitis, is a prevalent oral mucosal disease. This condition is characterized by the inflammation and ulceration of the oral mucosa, leading to symptoms such as mouth ulcers, redness, erosion of the buccal mucosa, salivation, and a burning sensation in the mouth. The etiological factor of *Mukhapaka* is capable of vitiating *Kapha Dosha*. That vitiated *Kapha Dosha* gets into *Chayavastha* in its *sthana* and leads to *Anubandha* of vitiated *pitta* and further interact with vitiated *Vata dosha* that produce *Utkles*h of Kapha, vitiates the *Annavahasrotas* that leads to *Aam* formation. These *Aam* instantly creates *Yugapat Prakopa* of all *Dosha* and *Dhatu*. These vitiated *Dosha* along with *Dushya Rasa, Rakta, Mamsa* get *Sammurchhya* and produces *Mukhapaka.* To break this *Samprapti Kapha, Pitta Doshahar, Rakta Prasadak, Vranropak* and *Shothahar Chikitsa* is necessary.

Krishnajeerakadi churna is compose of *Krishnajeeraka, Kushtha and Indrayava* in equal quantity.

Krishnajeerak has *Katu* in *Rasa* and *Ushna* in *Vipak* to pacifiy *Kaphavata Dosha* and *Kaiyadev* also mention its *Tikta Rasatamak* property hence it also pacifiy *Pitta Dosha*. It works as *Pachak, Deepan* and *Shothhar*. It shows anti-microbial, anti- bacterial and anti-fungal activity against Pseudomonas aeruginosa, Escherichia coli, Candida albican and anti-ulcerogenic activity. In that way *krishnajeerak* is helpful in treating stomatitis. *Kustha* has *Katu* and *Tikta Rasa* to pacify *Kapha Dosha* and *Ushna Virya* for *Ama Pachan*. *Adarsha Nighantu* and *Dhanwantri Nighantu* also mention *Madhur Rasa* of *Kushtha* to pacify *pitta dosha.* It has anti- ulcer, anti- inflammatory and hepatoprotective activity help to reduce swelling, prevent accumulation of inflammatory cell. Due to above property *Kustha* will be useful in treating stomatitis. *Indrayav* is *Tikta, Kashaya* in *Rasa, Shit* in *virya* and *Katu* in *vipaka* thus pacify *Tridosha. Indrayav* have antibacterial activity over *staphylococcus, salmonella* and *e. Coli* and also have Anti-inflammatory, analgesic, hepatoprotective activity help to relief from pain and inflammation. Hence *Indrayav* has effective in managing stomatitis. Combination of these drugs pacify *Kapha* and *Vata dosha* due to its *Doshahar Prabhav* and *Pitta dosha* by *Tikta rasa*. *Krishnajeerak* have *Deepan, Pachan* property, it will

increase *Jatharagni* that leads to *Pachan* of *Aam dosha*. *Pachan* of *Aam* alleviate all aggravated *Dosha* and *Dhatu*.

In that way the synergistic action of the individual components in this *Churna* have ability to combat inflammation, promote wound healing, and inhibit microbial growth.

CONCLUSION

Krishnajeerkadi churna is *tridosha shamak, Ama panchak, Agni deepanak and shothahara* property hence it can be used for treating *Mukhapaka*. Further research and clinical studies are needed to validate its efficacy and safety for therapeutic use.

REFERENCES

1. E. S. B. A. Raber-Durlacher JE, "Oral mucositis," *Oral Oncol*, 2010; *46:* 452-456.
2. K. A. shastri, "nidansthana chapter No. 16," in *sushruta samhita*, varanasi, chaukhamba sanskrit sansthan, 303.
3. G. G. E. Tarakji B, "Guideline for the diagnosis and treatment of recurrent aphthous stomatitis for dental practitioners.," *Journal of International Oral Health*, 2015; 7(5): 74-80.
4. D. I. Tripathi, "Mukharoga chikitsa 56 in Kantharoga chikitsaprakaran sholka No. 30," in *chakradatta*, Varanasi, Chaukhambha Sanskrit Sansthan, 333.
5. D. A. k. &. D. P. Tewari, "Diagnosis and treatment of the oral diseases sholk no. 182," in *yogratnakar*, varanasi, chaukhamba visvabharati, 1025.
6. K. S. A. shastri, "mukharoga chikitsa (Kantharoga chikitsa)," in *Bhaisajyaratnavali*, varanasi, Chaukhamba sanskrit sansthan, 2004; 676.
7. "The Ayurvedic Pharmacopeia of India Part 1 Vol. 1," Delhi; the controller of publications, second Edition, 130.
8. B. G. Vaidya, Nighantu Adarsha vol. 1 page No. 669-670, varanasi: Chaukhambha Bharati Academy.
9. D. J. Ojha, Dhanwantri Nighntu Page No.111-112, varanasi: Chaukhamba bharati prakashk.
10. D. S. C. S. A. D. d. Sankhyadhar, Raj Nighantu page no. 211, varanasi: Chaukhambha Orientalia.
11. P. P. S. A. D. G. P. sharma, Kaiyadeva Nighantu page no.216, varanasi: Chaukhambha Orientalia.

12. D. K. C. A. D. G. pandey, Bhavaprakasa Nighantu Page no. 32, varanasi: Chaukhambha Bharti Academy.
13. Y. Nakano, H. Matsunaga, T. Saita, M. Mori and M. Katano, *Biol Pharm Bull*, 257-61, 1998.
14. A. A. U Zaman, *phytochemistry,* 2009; 979-987.
15. G. R. M. S. M. H. G. R. kumar M, "protective effect of carum carvi fruit against paracetamol and thioacetamide induce hepatic injury in rat," *The journal of Ethnobiology and traditional medicine,* No. 2013; 118: 355-365.
16. C.-M. S. E. Grigore C, "chemical analysis and antimicrobial activity of indigenous medicinal species volatile oils," *Romanian biotechnological letters,* 2012; 17(5): 7620-7627.
17. Deepak and shashikant, "Extraction and pharmacological screeing of carvone and its derivatives," *International Journal of pharmaceutical archive,* 2014; 3(1): 273-284.
18. A.-M. E. Alhaider, "Effect of carum carvion experimentally induced gastric mucosal damage in wistar rats," *International journal of pharmacology,* 2006; 2(3): 309-315.
19. "The Ayurdevic Pharmacopiea of India Part 1 vol 1," delhi, The controller of publication, 134.
20. B. G. Vaidya, Nighantu Adarsa Vol 1 Page No. 743, Varanasi: Chaukhambha Bharati Academy.
21. D. J. Ojha, Dhanwantri Nighantu page no. 134, varanasi: Chaukhabhma Bharati Prakashan.
22. D. J. Sastry, Madanapala Nighantu page 159, varansi: Chaukhambha orientalia.
23. P. P. S. A. D. G. P. sharma, Kaiyadeva Nighantu Page no. 244, varanasi: Chaukhambha Orientalia.
24. D. K. C. Chunekar, Bhavaprakasa Nighantu page no. 61-64, varanasi: Chaukhambha Bharati academy.
25. H. M. hassan Reyaz, "Saussurea lappa; a comprehensive review on its pharmacological Activity and phytochemistry," *current traditional medicine,* 2019: 5(0).
26. M. S. G. et.al, "Protective effect of UL-409, a herbal Formulation against physcial and chemical factor induce gastric and duodenal ulcers in experimental animal," *J enthopharmacol,* 1996; 52(3): 165-9.
27. V. M. et.al, "Evalution of possible mechanism of anti-ulcergenic activity of UL-409, a herbal preparation," *J ethnopharmacol,* 1998; 63(3): 187-92.

28. [Online]. Available: http://dx.doi.org/10.1016/s0378-8741(98)00089-0] [pmid: 10030722].
29. G. A. et.al, "Preliminary evalution of anti-inflammatory and Antiarthritic Activity of S.lappa, a Speciosa and a.Aspera," *Phytomedicine*, 2002; 9(5): 433-7.
30. [Online]. Available: http://dx.doi.org/10.1078/09447110260571689 pmid: 12222664.
31. J. Q. E. Yaeesh s, "Antihepatotoxic activity of Saussurea lappa extract on dgalactosamine and lipopolysaccharid- induced hepatitis," *Phytother res.* suppl., 2010; 2.
32. X. C. E. LI Y, "In vitro anti helicobacter pylori action of 30 chinese herbal medicine used to treat ulcer diseases," *J ethnopharmacol*, 2005; 98(3): 329-33.
33. [Online]. Available: http://dx.doi.org/10.1016/j.jep.2005.01.020 pmid:15814268.
34. The Ayurvedic Pharmacopiea of India vol 1 part 1 page 138, Delhi: The controller of publication.
35. B. G. vaidya, Nighantu Adarsa vol 1 page no. 847-848, varanasi: Chaukhambha Bharati Acadmey.
36. D. J. ojha, Dhanwantri Nighantu page no. 98, varanasi: Chaukhamba Bharati prakashan.
37. D. J. L. N. sastry, Madanapala Nighantu page no. 108-110, varanasi: Chaukhambha orientalia.
38. P. P. S. a. D. g. P. Sharma, Kaiyadeva Nighantu page no.166, varanasi: Chaukhambha Orientalia.
39. D. K. Chunekar, Bhavaprakasa Nighantu page no. 347, varanasi: Chaukhambha Bharati Academy.
40. [Online]. Available: https://www.chandigarhayurvedcentre.com/blog/indrajao-holarrhena-antidysenterica/.
41. I. K. Shwetha C, "Study on analgesic activity of Holarrhena antidysenterica leaves," *International Journal of Herbal Medicine*, 2014; 2(3): 14-16.
42. H. K. Manpreet Kaur, "Analgesic Activity of Roots of Aralia racemosa," *Research J. Pharm. and Tech*, 2011; 4(12): 1896-1897.
43. C. S. S. Umashanker KPD, "Antidiabetic Efficacy of Ethanolic Extract of Holarrhena antidysenterica Seeds in Streptozotocin – Induced Diabetic Rats and Its influence on certain Biochemical Parameters," *Journal of Drug Delivery and Therapeutics*, June 2012; 2(4): 159-162.
44. S. S. Pritt verma, "Hepatoprotective effect of ethanolic extract of holarrhena tidysenterica against paracetamol induced toxicity in wistar rats.," *Research j. Pharma and tech*, 2018; 11(4): 1633-1639.

45. N. S. kavitha d, "Inhibition of entropathogenic escherichia coli adhesion on host epithelial cells by holarrhena antidysenterica," *wall. phytotherapy research*, 2009; 23: 1229-1236.