

Pharmacological and Evidence-based Review of *Euphorbia neriifolia* Linn. (*Snuhi*): An *Upavisha*; A Strong Purgative; Exigencies to Verify its Potential to Act as an Anthelmintic Drug Especially in Paediatric Age Group in Local Regions of India Specifically in Chhattisgarh

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ABSTRACT

Euphorbia neriifolia Linn. (*Snuhi*) (Euphorbiaceae family) is a traditional medicine which is included under multiple categories such as *Upavisha*, Purgatives and Anthelmintic drugs. Preferably, an anthelmintic agent should have comprehensive deed, high fraction of rehabilitation with a single analeptic hit, denuded noxiousness to the host and should be economical. Even the intricacy like retching, wobbliness and bowel interruption have been shown by the prevalent drugs like piperazine particles. High consequence of the existing drugs and hostility of the parasites to their action sanction the hunt for revived anthelmintic molecules. In the ritualistic remedy implementation, the genesis of many worthwhile drugs is found and to evaluate denizenlore healing herb for their proclaimed anthelmintic virtue, several researchers have undertaken studies. Reinforced governance integrated with Chemical command of helminthes has been the important world-wide worm constraint tactics. Still, global multiplying resistance of gastrointestinal trichostronglides of household petty ruminants hostile to accustomed antihelminthes.^[1,2] The expertise of molding employ of even a solitary Drug with their sorting and amalgam to escort a concluding upgraded outcome is *Yukti*. Not forgetting the safety and fruitfulness of the medicament, it is the fundamental notion of empirical drug lay out. This review describes the key information related to botanical description of *E. neriifolia*, phytochemistry, pharmacological actions, its purification, clinical studies and better utilization as anthelmintic-purgative package. The author emphasizes the need for evidence-based clinical studies to expand *Snuhi* pharmacological activities, clinical efficacy and safety.

Keywords: Anthelmintic, *Krimi*, *Snuhi*, Worms.

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INTRODUCTION

Gent, the overseer of entire genus is always in thrust and hunt of one top-notch Target: "The paramount state of well-being". To execute the same, all the researches have been governed by the distinguished authority, from the Sacred text (*Vedic* span) to this epoch. The essence of the tenacity of our archaic oracle is the cherish of *Ayurveda* that has been lies in the literary texts. Greatest extent of these commentary is found only in fragments while some others are yet to be explored. *Kashyapa Samhita*

has a lot to put under the hammer instead of being available as a *Astamit Tantra* (Obsolate literature). *Ayurveda* leaflets are tremendous fund of various drug articulation. Before the advent of calligraphy, the bygone sagacity of curing, precaution and eternity was a part of the non-secular ethic of a global faith. Along with the more spiritual insights of morality, grace, and self-exploration, *Veda Vyasa* the glorious mentor, preserved the complete insight of *Ayurveda* in written form. For assuring the restorative efficacy and safety of the formulations pertaining to its mode of action, the investigative study and survey are important areas. *Krimi roga* is being a typical presentation in pediatric age group. Despite the fact that, worm infestation is not mortal, sometimes on the growth and intellectual development of the little ones, they have greater influence. It may prove fetal if it involves other system. By robbing them of food, causing blood



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deficit, damaging organs, intestinal or lymphatic obstruction and by secreting toxins,^[3] they impair the host. Apathy to avert them by immunization is the major handicap in the battle against such parasite. Considering the *aparipakwavastha* of minor, the proposed action of medicament is further pertinent. As among all treatment criteria of *Krimi*, *Samshamana* is easier to be managed in children, so anthelmintic drugs are preferred to be administered. In the World Health Assembly, for sufferers inhabiting in tribal zone who are markedly susceptible to attack of several contagion due to awareness scarcity about convenient asepsis, the need to utilize especially natural products with therapeutically approved efficacy has been highlighted by numerous settlements. Therefore it remains a budding area of investigation^[4] to explore anthelmintic factors in plants.

Upavisha

In *Ayurvedic* point of view, the group of drugs which are less virulent in nature and not so baneful, but on intake.^[5] Produces certain noxious symptoms are named as *upavisha*. *Rasa Ratna Samucchaya* described eleven number of *upvisha*.^[6] *Snuhi* is one among *upvisha*. According to *Acharya Charaka*, even an acute poison become an exemplary medicament if delivered precisely and likewise in case that a drug not dispensed duly becomes an acute poison. A strong poison if used after proper *shodhana*, could be the best medicine in an acceptable remedial portion and formulation. Conversely, an authentic pill if not used for proper person with proper dose^[7] may affect adversely.

Anthelmintics

Snuhi is mainly recommended for preferred cure in *Krimi* due to its *Samshamana* as well as *Prakritivighata* effect, as it is halting the circumstances liable to cause *krimi* by the inherent peculiarities of *Snuhi* that are further preverse to *Pureesha* and *Kapha*.

Purgative

An ideal anthelmintic medication is expected to wield its impact counter to the worm's excluding absorption. Portion is needed to be considerable that can ambush the worm instead of the host besides inducing any baneful reaction on victim. Safe doses of vermicides only depress or narcotize the parasites but do not kill them and these would recuperate if left in the intestine. For that reason, it is accustomed to ensure the use of vermicide with a purgative. This also abated the toxicity by precluding any drug absorption. As *Snuhi* itself is a strong purgative as given in *Charaka samhita*, *kalpa sthana*, and 10th chapter so we can consider it as a single drug with package of anthelmintic (as having its chemical composition) and purgative effects if given in proper way. So, it can be considered as one among anthelmintic drugs with best results.

METHODOLOGY

Classification of Snuhi^[8-23]

In different texts, the classification of *Snuhi* is given in Table 1.

Species^[24]

The species of *Euphorbia neriifolia* are given in Table 2.

Species Distribution^[25]

Habitually, the plant crops up in rugged landscape all over the Deccan, Peninsula, and in villages, it is frequently cultivated for barricade all over India.

Brief Botanical Description of Snuhi^[9,26,27]

It is considered as a little tree or an extensive luscious bush which extend up to 6-20ft high, with interconnected cylindrical or undistinguished 5-angled branches bearing short stippular thorns, more or less merging in vertical or slightly spiral lines. Fleshy and ephemeral leaves are prolonged 6-12 inch. The tinge of blooms is greenish yellow or yellowish green and emerge in springs with minute oil rich seeds. At the cold time, it turns into leafless vegetation. In due course, plant bear tricolous fruits which comprises three arising radiating follicles. All over India, it is available. The other important points about botanical description are summarized in Table 3.

Therapeutic Uses of Snuhi^[23]

Common Therapeutic Uses of *Snuhi* are given in Table 4.

Dosage, Toxic symptoms and Shodhana of Latex (Snuhi Ksheera)^[19,23,28,29]

(Figure 1).

Rasa Panchaka^[30]

The description about *Rasa Panchaka* is shown in Table 5.

Chemical Constituents in Parts of the Plant and their Mode of Action^[31,32]

Chemical Constituents in different parts of the plant and their mode of action are given in (Figure 2).

Major Phytoconstituents of *Euphorbia neriifolia* Linn. (Snuhi)

The major Phytoconstituents of *Euphorbia neriifolia* Linn. (*Snuhi*) with their structure and antihelmintic pharmacological values are summarized in Table 6.

Pharmacological Properties of *Euphorbia neriifolia* Linn. (Snuhi)^[33-41]

Several investigations have revealed that the drug *Snuhi* embraces multifold pharmacological peculiarities as shown in Table 7.

Table 1: Classification of Snuhi in different texts.^[8-23]

Ayurvedic Texts	Varga	References
Ayurvedic	Sthavara Upavisha varga ^[8]	Naga. A et al. July-2016
Charaka-Samhita	Shodhanarthaprayukta Vruksha Tikshanavirechana dravya ^[9]	(Shastri. D. 2012),
Sushruta-Samhita	Shyamadi gana ^[10] Adhobhagahara dravya	(Shastri. A. Reprint 2017)
Ashtanga-Hrudaya	Virechanakaraka dravya Mushakadi gana ^[11]	(Murthy. K. R. reprinted.2010)
Raja –Nighantu	Shalmalyadi varga ^[12]	(Sankhyadhar. S. Cetal. 2012)
Shodhala-Nighantu	Guduchyadi varga ^[13]	(Pandey. G. 2009)
Madanpala-Nighantu	Abhayadi varga ^[14]	(Shastry. J. L. N. 2012)
Kaiyadeva-Nighantu	Aushadhi varga ^[15]	(Sharma P. 2006)
Dhanvantari-Nighantu	Guduchyadi varga ^[16]	(Sharma P et al.1998)
Bhavaprakasha-Nighantu	Guduchyadi varga ^[17]	(Singh Amritpal. 2007)
Rasaratnasamucchaya	Dughada-varga ^[18]	(Tripathi I. 2006)
Yogaratanakara	Upavisha ^[19]	(Shastri. B. 2008)
Nighantu Adarsha	Aamalkyadi varga ^[20]	(Vaidya. B. Reprint 2005)
Priya Nighantu	Shatapushpadi varga ^[21]	(Sharma P. 2004)
Shaligram-Nighantu	Guduchyadi varga ^[22]	(Khemraj Shrikrushnadas. March 2007)
Modern	Irritant organic vegetative poison ^[23]	Naga. A et al. July-2016)

Krimi Utpatti and Krimighna Effect of Snuhi according to Ayurvedic Concept

Samprapti^[42]

Samprapti of diseases consists of indulgence in causes of the diseases, resulting in *Khavaigunya* at any point in *Srotas*, vitiation of *Doshas* accompanied by *Agnimandya* and production of *Ama* and *sthanasamshraya* of *Doshas* at the point of *khavaigunya* producing the diseases. The improperly digested food item will have different effects. Firstly, the tissues of the body will be denied of nutrition. Secondly, more or less, unwanted material in the body will get accumulated results in putrefaction and fermentation. This increased *Amavisha* induces more manufacture of *Kapha* and *Purisha* which are also considered as *Krimikara nidana* inturn forms *Kaphaja* and *Purishaja krimi*. The different types of *Pakwa–Apakwa ahara* which is moving downwards is digested by *Jatharagni*. Then the question was asked by *Acharya Harita*-Why this *agni* is not capable to burn *Krimi*. The answer given by *Maharshi Atreya-Rakta* gets vitiated in the body due to *virudhanna* and *rasa*. then these *Krimi* remained *kaphavrita* for one day, after that they gets their existence with *shukra*. They become *chaitanya* at the time when man becomes *panchabhutatmaka* and will not be burnt by *Jatharagni*.^[43]

Mode of action of Snuhi on Krimi^[44]

Snuhi is better option of drug for *Samshamana* as well as *Prakritivighata* line of treatment of *Krimi*, as it opposes the circumstances liable to cause *Krimi* by the inherent peculiarities of *Snuhi* that are further preverse to *Pureesha* and *Kapha*.



The fundamental nature (prakriti) of *Krimi* subsists *Kapha* and *Pureesha*.



The attributes of *Kapha*^[44] (*snigdha, guru, manda, slakshna, Sandra, madhura* and *pichila*) after inducing *agnimandya*, yields *ama* which may favour the *krimi* genesis.



By virtue of inappropriate doing of *agni*, *kitta bhaga* deposited in *pakwasaya*, it can generate *kotha* alongwith *Pureeshaja Krimi* genesis responsible for *pureesha prakriti* of *krimi*.



Table 2: The species of *Euphorbia nerifolia*.^[24]

Species	
<i>E. tirualli</i>	Kanda snuhi
<i>E. nerifolia</i> Linn.	Patra Snuhi
<i>E. antiquorum</i> Linn.	Tridhara sehunda
<i>E. trigona</i> haw	Tridhara sehunda bheda
<i>E. nivulia</i> buch	Ham
<i>E. royleana</i> boiss	Thuhara

Table 3: Botanical Description of Snuhi.^[9,26,27]

Family	Euphorbiaceae
Botanical name	<i>Euphorbia nerifolia</i> Linn.
English name	Common milk hage
Sanskrit name	Snuhi
Hindi name	Thuhara
Telugu name	Akujemudu
Tamil	Ilaikalli
Bengali	Manasa sija
Arabic	Jakum



Parts used^[29] -Latex, root, stem, leaf.

Toxic part -Latex

Dosage and Toxic symptoms of Latex^[28] -

Lethal Dose^[23]

- *Moola churna*: 0.5-1 gm
- *Kanda rasa*: 5-10ml
- *Kshira* :125-500mg

Lethal Period^[23]: 12 hrs

Symptoms on consumption of Latex-causes *chardi, atisara, udara daha, ainathan* and *murchha*.

Symptoms on contact

Eye- *Akshi shotha* and *asthayanidhatva*
Skin- *Twak daha* and *putika*.

Postmortem appearance

Sign of inflamed contact part, decayed spleen and gangrenous patches in stomach

Medicolegal Importance-

Typically it is intended for very limited purposes of homicidal and accidental poisoning and suicidal intent and for procuring criminal abortions, it is mainly used.

Shodhana of Snuhi- Ksheera- *Snuhi-Ksheera* doesn't require further purification according to *Yogaratanakara*, as it is a purified one. But *Rasa-tarangini* describes its *Shodhana* process in which mixing 2 Pala *Snuhi ksheera* to 2 Palas of *Amlikaapatra rasa* and the mixture is sundried to the *churna rupa* and in formulations, this *Snuhi Ksheera shushka churna* can be used.^[30,31]

Figure 1: Description about Latex (*Snuhi Ksheera*).^[19,23,28,29]



Plant, stem and leaves - Several triterpenoids like Glut-5-en-3 β -ol, Glut 5(10)-en-1-one, taraxerol and β -amyrin .



Latex- euphol, euphorbon, neriifoliol, neriifolene, neriifolione, cycloartenol , Triterpene – neriifolene, beta- amyron, resin, gum, caoutchouc, malate of calcium, monohydroxy triterpene, taraxerol, glut-5-(10)-en-1-one,.



Stem -Euphol, anthocyanins, pururate dikinase, terpenes friedelan-3, D: B friedolan-5(10)-en-1-one, taraxerol Root Alnus-5(10)-ene-1-one, 24- methylene cycloartenol, glut-5(10)-en-1-one ,tulipanin-3, 5- diglucoside Ethanolic extract of fresh root Antiquorin.



Bark-Euphobol,Hexacosanoate,n-hexacosanol ,12-deoxy-4 β -hydroxyphorbol-13-dodecanoate-20acetate and 24-methylene cycloartenol isolated from bark.(*Indian J.Pharm,Sci.*1980,42,66;*Indian J.Chem.*1980,19B,717);



Roots- Euphorbol ,cycloartenol, delphinidin-3,5-diglucoside,24-methylene cycloartenol, 12-deoxy euphorbol-13,20-diacetate, ingenol triacetate, and tulipanin-3,5-diglucoside. (*Indian J.Chem.*1980,19B, 717).



Leaf - Euphorbol, taraxerol Bark Euphol ,Friedelan-3, D: B- friedolan-5-(10)-en-1-one, hexacosanoate, n- hexacosanol, tulipanin-3, 5- diglucoside, 12- deoxy 4- β - hydroxyphorbol13-dodecanoate-20-acetate, pelargonin – 3, 5- diglucoside, 24-methylene cycloartenol,.

Figure 2: Chemical Constituents in Parts of the Plant and their Mode of Action.^[31,32]

Table 4: Therapeutic Uses of Snuhi.

Therapeutic Uses ^[23]	
Vrana	By applying the streamed leaves of <i>Snuhi</i> for 5-6 days, gashes are healed.
Arsha	<i>Snuhi kshira</i> blended with <i>Haridra churna</i> is applied superficially.
Krimidanta	Chewing <i>Snuhi moola</i> .
In <i>Vrscika and Sarpa dansha</i>	Both externally and internally ^[23] <i>Snuhi mula churna</i> stirred with <i>marica</i> is given.
Kshara Sutra	The preparation of <i>Kshara Sutra</i> by using <i>Snuhi Kshira</i> and <i>Haridra</i> was recited by <i>Cakradatta</i> .

Table 5: Rasa Panchaka of Snuhi.^[30]

Rasa	Katu
Guna	Laghu, Tikshna, Snigdha
Virya	Ushna
Vipaka	Katu
Karma	Kaphavatahara, Dipana, Rechana
Indications	Vatavyadhi, gulma, udara, sula, sotha, arsha, kustha, medoroga

As per *Acharya Charaka*, the dravyas like *Snuhi* are principled for *prakriti vighata* regimen due to its constitution opposite to *kapha* and *pureesha*.

Krimighna effect of Snuhi according to Rasa Panchaka- According to *Rasa Panchaka*, *Krimighna* effects of *Snuhi* are summarized in Table 8.

Worm Infestation and Anthelmintic Effect of *Euphorbia nerifolia* according to Modern Concept

Etiology and Epidimiology of Round worm^[45]

Within the lumen of the small intestine, mature worms of *Safaris lumbricoids* lodges having a life cycle of 10-24 months. *Safaris* has vast reproductive potential; a gravid female worm produces 200,000eggs/day. The prolific ova with oval contour and a thick mammillated sheath measure 45-70 μ m lengthily and 35-50 μ m in broadness. The eggs embryonate after transit in the feces, and under supportive circumstances, turn infective in 5-10 days. The lifespan of adult worms is 12-18 months. In hot regions of the nature, *Safaris* is extremely prevalent where suitable climate is existing for ova maturation in the soil. Poor social class, utilizing human feces as fertilizer and geophagia are the higher prevalences of infection. Transmission is intensified by the high output of eggs by prolific female worms and resisting ova to the outside habitat. *Safaris* eggs can endure viable at 5-10°C for as long as 2 yr.

Table 6: Major Phytoconstituents of *Euphorbia neriifolia* Linn. (Snuhi).

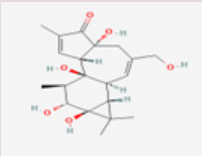
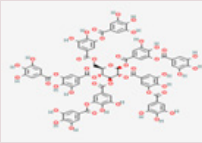
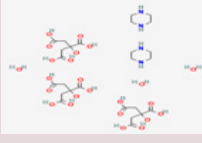
Phytoconstituent Name	Structure	Pharmacological Value
Esters of Phorbol	 (PubChem CID 442070)	Tumour promoting activity is owned by esters of phorbol (basically found in croton oil) and trigger the process allied with cell growth. A range of these chemicals adopted as protein kinase catalyst.
Tannin	 (PubChem CID 16129778)	By uncoupling oxidative phosphorylation, polyphenolic compounds hinder energy genesis in helminth worm. Tannin in juice of snuhi can cohere with free proteins in the gastrointestinal tract of host animal or glycoprotein on the cuticle of parasite and causes death.
Piperazine citrate	 (PubChem CID 131801040)	By escalating chloride ion conductance of worm muscle membrane and creating hyperpolarization and diminishing excitability that elicit muscle leisure and flaccid apathy.

Table 7: Pharmacological Properties of *Euphorbia neriifolia* Linn. (Snuhi).^[33-41]

Sl. No	Pharmacological properties	References of study done
1.	Analgesic activity and Anti-inflammatory ^[33]	Gaur Kalpesh <i>et al.</i> January March, 2009.
2.	Anti- parasitic activity ^[34]	Bauri R. K., Tigga M. N and Kullu S. S. (2015).
3.	Wound healing activity ^[35]	Rasik. A.M, <i>et al.</i> Accepted for publication: March 15, 1996.
4.	Antimicrobial activity ^[36]	Kumara swami M <i>et al.</i> 30 October, 2011.
5.	Anticancer activity ^[37]	Veena Sharma and Pracheta; Dec 2013.
6.	Antipsychotic activity ^[38]	Bigoniya P, Rana AC; 2005.
7.	Antidiabetic activity and Antihyperlipidemic activity ^[39]	Mansuri MI, Patel VM; 2013.
8.	Hepatoprotective activity ^[40]	Bigoniya. P <i>et al.</i> Accepted 13 August, 2010.
9.	Immunomodulatory Activity ^[41]	Kalpesh Gaur, Rana AC <i>et al.</i> September-November 2009.

Pathogenesis^[46]

Following ingestion by the human host, *Safaris* ova contrive in the small intestine. After release, Larvae penetrate the intestinal wall and migrate to the lungs via venous circulation. The parasites cause pulmonary ascariasis while enter into the alveoli and migrate through the bronchi and trachea. Later on, they are swallowed and return to the intestines, where they mature into adult worms. Female *Safaris* begin depositing eggs in 8-10 wk.

Mechanism of Action of *Euphorbia neriifolia* as Anthelmintic

A Kind of drugs thrusting out parasitic worms and other immanent parasites from the body are specified as anthelmintics. Besides instigating remarkable harm to the host, such drugs acted by either stunning (**vermifuges**) or killing (**vermicides**) parasites. To warrant their competence, anthelmintic drugs require efficient concentrations to be attained at parasitic site for a concluded duration. Drug concentration and length of its withdrawal time is influenced by the processes of absorption, dispersal, integration and elimination (pharmacokinetic aspect) promptly accomplished at the activity site and the pharmacological consequences.

After consumption, anthelmintic drugs like *Euphorbia neriifolia* are frequently taken into the blood flow, then deported to body different parts, including the liver, where they feasibly metabolized and subsequently evacuated in the poop and pee.

Table 8: Anthelmintic Effect of Snuhi according to Rasa Panchaka.

Rasa	Katu rasa	<i>Rasa</i> of a substance can be scientifically used to presume its pharmacological behavior which in drug research will reduce the time and cost and it can provide lead optimization. For safer and effective drugs, <i>rasa</i> can help focused and intentional search. <i>Katu rasa</i> dilates the body channels, allays <i>kapha</i> humor and acts as an anthelmintic. It is an art of a writer to express the action of drug more precisely and correctly. <i>Haret, ghna, hanti</i> are the <i>upsarga</i> used by <i>Bhavprakash Nighantu</i> which attracts a special attention which requires to be understood by physician and research. All these <i>upsarga</i> are a part of <i>Amashamsha Vikalpna</i> subject to the <i>karma</i> mentioned by <i>Nighantu</i> and also indicates a special action.
Guna	<i>Laghu, Tikshna</i> and <i>snigdha guna</i>	It is surprisingly observed that there are 132 <i>krimighna</i> drugs out of 426 drugs. From <i>Ayurveda</i> to microbiology, It can be a novel contribution for screening the herbs. Among them for <i>krimighna karma</i> , <i>Laghu</i> and <i>Tikshna guna pradhana dravyas</i> are maximum. <i>Laghu guna dravyas</i> are easy to digest and very less nutrient is made available for microbes for growth (static effect) while <i>Tikshna guna</i> opens the microchannels, irritating actions pressurize the microbes to excrete/kill (cidal effect). So, <i>tikshna guna</i> can have better actions in the <i>apakarshana</i> treatment in which the unwanted components i.e; <i>Krimi</i> and <i>dosha</i> are removed or eliminated from body, <i>Tiksna</i> and <i>snigdha guna</i> of <i>Snuhi</i> also promotes <i>Panchakarma</i> therapies to expel out <i>doshas</i> , also <i>Krimi</i> .
Virya-	Ushna Virya	<i>Kapha</i> and <i>vata dosha</i> are the basic promoters of <i>Krimi</i> in the body and pacified by <i>ushna virya</i> of <i>Snuhi</i> . The <i>ushna virya</i> also promotes to release various hormones to destroy <i>Krimi</i> .
Vipaka	Katu vipaka	<i>Katu vipaka</i> have direct action on <i>Krimi</i> . As it is <i>kapha shamaka</i> , it restricts the nutrient value (End digestive material) for <i>Krimi</i> growth.
Doshaghnta	Kaphavatahara	The <i>doshaghnta</i> of <i>Snuhi</i> is <i>Kaphavatahara</i> . As <i>kapha</i> is enriched with favourable atmosphere for progress of flora for <i>Krimi</i> which is <i>kleda, jala, drava, sneha</i> . The destruction of <i>kapha</i> will exert a static as well as cidal effect on all <i>Krimi</i> .

The temperament of the drug is more intricately all through the body than can be depicted by a set of pharmacokinetic criterions in the circumferential circulation. Upgraded drug execution requisite expertise drug aspects comprising the convoluted interactivity amidst formulation and course of administration, physicochemical aspects of the compound, and physiology of the compartment into which the drug is disseminated. For combating these worms, absorption of drug from the GI tract, injection site, or skin is mandatory by reason of lodging of worms in the lumen or close to the mucosa, others reside at locations of the liver and lungs. Not only with the unabsorbed drug going across the GI tract, intestinal parasites approach furthermore along the absorbed fraction in the blood as they sustain on the intestinal mucosa, and with some other that is recycled into the gut. To the parasite, anthelmintics ought to be specifically virulent by its inherent pharmacokinetic features that cause parasite to be in special mode of action or this is also executed by hindering metabolic processes that are only vital to the parasite but not vital to or absent in the host. Along with that, their site of action and biochemical mechanisms are needed to be understood properly. For nurturing, an appropriate site needs to be perpetuated by parasitic helminthes. Despite host immune reactions, parasite also required to be maintained homeostasis.

The pharmacologic premise of anthelmintic aid basically includes,

Defensive mechanism against host immunity which prompt starvation, paralysis, expulsion or digestion of the parasite.

Inference with integrity of parasitic cells and neuromuscular collaboration.

Role of *Euphorbia neriifolia* as Purgative as well as Anthelmintic drug

The anthelmintic type used is the basis to select a preliminary aperient. Since oil helps drug absorption, on that account, purgatives oil has to be evaded for drugs like male fern, thymol, carbon tetrachloride except castor oil which can be used with oil of chenopodium having the vantage of thwarting the paralyzing act of chenopodium oil on the intestine. In large doses, most anthelmintics acts as gastrointestinal irritants. In that instance of tapeworm or hook worm infection, anthelmintic intake is typically preceded by food abstinence with the intention that parasite will not be secured by intestinal constituents and also helping drug absorption. In spite of all these facts, patient debility is the drawback, thus, in any case, Fast should not be severe like starving. Succeeding light supper, purgative hit is supplied, also anthelmintic is taken. Primarily in the next

Table 9: The Prevalence of STH in different agro-climatic zones of Chhattisgarh,^[50] 2015–2016.

Agro-climatic zones of Chhattisgarh	No. examined	<i>Ascaris lumbricoides</i>		<i>Trichuris trichiura</i>		Hookworm		Any STH ^(a)	
		No. positive	% (95% CI) ^(b)	No. positive	% (95% CI)	No. positive	% (95% CI)	No. positive	% (95% CI)
Bastar plateau	465	289	62.2 (48.9–73.8)	2	0.43 (0.057–3.2)	162	34.8 (20.6–52.4)	371	79.8 (72.2–85.7)
Chhattisgarh plains	482	324	67.2 (51.8–79.7)	0	–	22	4.6 (1.7–11.8)	333	69.1 (54.3–80.8)
Hilly areas	495	448	90.5 (86.4–93.5)	0	–	108	21.8 (12.4–35.6)	453	91.5 (87.5–94.3)
Overall	1,442	1,061	73.6 (65.4–80.4)	2	0.14 (0.02–1.1)	292	20.3 (13.3–29.6)	1,157	80.2 (73.3–85.7)

(a): STH (Soil Transmitted Helminthes). (b): CI (confidence interval).

AM, either in one dose or in 2 or 3 splitted doses prescribed per hour, to be followed 2 hr after last dose by another laxative shot. A preliminary saline purgative usually facilitates expulsion of intestinal mucus which aids worms' exposure to anthelmintic action. For that, Magnesium sulphate or sodium sulphate or both are practiced feasibly. Owing to its reaction on retina, Santonin is chiefly granted at sleep time. As we know, for safe doses of any anthelmintic drug, a purgative is must. Etymological derivation of drug Snuhi reflects it secretes milky white latex which is used as drastic purgative.^[47]

Clinical Trials on *Euphorbia neriifolia* and its obligation in most Prevalent Areas like Chhattisgarh

In vitro Study^[48]

Anatomical and physiological similitude between Human intestinal round worm parasite and Adult Indian Earthworm, *Pheretima posthuma* is the base of the study performed on anthelmintic activity. By escalating chloride ion conductance of worm muscle membrane, Piperazine citrate initiate hyperpolarization and diminished the excitability that trigger muscle relaxation and flaccid paralysis. *Euphorbia neriifolia* juice manifested paralysis and also caused death of worms specifically at great concentration of 100mg/mL, in short while as compared to reference drug Piperazine citrate. Presence of tannin as one of the main components is disclosed by phytochemical investigation of the crude extracts. Tannins are poly phenolic compounds shown to produce anthelmintic activity by interfering with energy generation in helminth parasites via uncoupling oxidative phosphorylation. They also can stick to free polypeptides in the gastrointestinal passage of host animal or glycoprotein on the cuticle of the parasite and cause loss of life.

In a Survey Study^[49]

Around the time of November 2015 and January 2016, in the Indian States of Chhattisgarh, Telangana, and Tripura, amid the children of government schools learning in 1st to 5th standard, school-based surveys were conducted to assess the ubiquity and severity of STH (Soil Transmitted Helminthes) infections. As per the 2011 census, the total population of Chhattisgarh was 25,540,196. Based on soil type, average annual rainfall, and temperature, Chhattisgarh is divided into three agro-climatic zones: the Bastar plateau consisting of six districts, Chhattisgarh plains consisting of 16 districts, and hilly areas consisting of five districts.^[50] Stool samples from 3,313 students (Chhattisgarh: 1,442, Telangana: 1,443, and Tripura: 428) were investigated. In Chhattisgarh, 1,157 of the 1,442 children whose stool samples were examined had one or more STH infections, all in all prevalence of any STH infection was 80.2% (95% confidence interval [CI]: 73.3–85.7) in Chhattisgarh (The Prevalence of STH in different agro-climatic zones of Chhattisgarh are shown in Table 9), 60.7% (95% CI: 53.8–67.2) in Telangana, and 59.8% (95% CI: 49.0–69.7) in Tripura. In all three states, *Ascaris lumbricoides* was the most prevalent STH infection. The survey data revealed that STH infections were extremely predominant among the students in Chhattisgarh, Telangana, and Tripura, suggesting the need for reinforcing STH control program in these states. For documenting the impact of the National Deworming Day programs in these states, the prevalence rate from the inspection would act as a standard.

In another Study^[51]

In the Department of Microbiology, CMMC, Bhili, Durg Dist., Chhattisgarh; India, the present survey was organized to evaluate prevalence of parasitic infection and their affiliation with environmental, socio-demographic and behavioral habits of school children. Out of total, 250 stool samples were picked up from students, 160 were male and 90 were female. A total of 78

were positive for one or more parasite. Out of total positive 53.9% were protozoan, 38.5% were helminthes and 7.7% were mixed type. *Entamoeba histolytica* 38.5% and *Safaris lumbricoides* 19.2% were the commonest protozoan and helminthes respectively. The other parasite found were *Giardia lamblia* 19.2%, Hookworm 10.3%, *Taenia* spp 5.1%. Multiple parasitism's were found in 7.7% children. The present study shows 31.2% parasitic infection which is still important health issue in our zone. Health alertness agenda, individualized sanitation, hand cleaning as well as uses of sanitary latrine and food treatment to minimize the occurrence of parasitic infection should be executed in these societies.

DISCUSSION

Krimi cannot be produced in our intestines unless their eggs are ingested, but to get totally sterile food in our country is improbable, so contaminated food articles and unclean water as by *Maharshi Kashyapa* serve as vehicle for the eggs to get into the gut, in turn, provides optimal conditions for *Krimi* growth in intestine. The parasite twists the foundation of the health of child mainly at developmental stage. Infections of man and animals with different varieties of worms is a common occurrence and drugs which are used to kill or throw out these worms are known as anthelmintics. Either they live in the tissues or in the intestinal canal of the victim responsible for somatic infections. Medicament which expels the worms besides certainly destroying them are named as Vermifuges while Vermicides are remedies which kill them. Along with other intestinal contents, intestinal parasites are cleared away by active peristalsis. Therefore, in an effort to dislodge the worms, harsh laxatives are rarely used with imperfect profit. Considering the fact that the worms anchor themselves with the aid of their hooks, suckers or serrated margins, they must be weakened or narcotized or destroyed prior to their expulsion effectively. *Snuhi* is referred by *Brahat Trayi* texts along with all the *Nighantus*.^[52] As *Snuhi* itself is mentioned as strong purgative by *Charaka samhita* and also by other texts. So, we can consider it as a solitary medication wrap up with anthelmintic (as having its chemical composition) and purgative effects if given in proper way. So, it can be considered as one among anthelmintic drugs with best results.

CONCLUSION

This review compiles the different aspects about *Upavisha Snuhi*, its anthelmintic and purgative potential, its botanical description, therapeutic contribution, purification of its toxic but useful part (latex), its pharmacological actions, chemical constituents with structure and anthelmintic properties and different clinical studies. The above attempt is for concluding the classical and modern concept of anthelmintic enterprise of *Euphorbia nerifolia*. The preclinical studies discovered that *Euphorbia nerifolia* holds Analgesic, Anti-inflammatory, Anti-parasitic, Wound healing, Antimicrobial, Anticancer,

Antipsychotic, Antidiabetic, Antihyperlipidemic, Hepatoprotective and Immunomodulatory attributes.

These vast ranges of pharmacological activities may be ascribed due to phytoconstituents present in its different parts like stem, root, leaves, bark, latex, etc. and the anthelmintic act is shown by major phytoconstituents of *Euphorbia nerifolia* like *Esters of Phorbol*, *Tannin*, *Piperazine citrate*. Worm infestation in Chhattisgarh has been a concern, so to promote awareness about deworming and sanitation, the clinical trials has been conducted in most prevalent areas, the facts about those trials are summarized by the author to reveal the anthelmintic potential of *Euphorbia nerifolia* and also the call of time and context to amplify its more use considering its clinical efficacy and safety.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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