WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 13, Issue 18, 98-120. Review Article ISSN 2277–7105

A CRITICAL REVIEW ON ETHNOBOTANICAL USES OF EUPHORBIA NERIIFOLIA Linn [INDIAN SPURGE TREE]

Dr. Monika Gondane*, Dr. Om Prakash Rout, Mr. Arun Kumar Singh Parihar and Dr. Keerti

Md Scholar, Kanchanganga Phase-2, Near Sabri Kanya Ashram Raipur Chhattisgarh, India.

Article Received on
23 July 2024,

Revised on 13 Aug. 2024,
Accepted on 03 Sept. 2024

DOI: 10.20959/wjpr202418-33707

***Corresponding Author**
Dr. Monika Gondane
Md Scholar, Kanchanganga Phase-2, Near Sabri Kanya Ashram Raipur Chhattisgarh, India.

ABSTRACT

Euphorbia neriifolia plants are highly valuable medicinal plants with many health benefits that have long been utilized in China, Europe, America, Turkey, India, Africa, Iran, and Pakistan. Many medical conditions can be treated with its stems, leaves, roots, and latex, including respiratory infections, inflammatory infections, digestive problems, skin irritations, bodily discomfort, snake or scorpion bites, pregnancy, sensory disturbances, microbiological infections, and anticancer diseases. Euphorbia neriifolia[snuhi]. Belong from Upavisha i.e. the class of less toxic medications used in the treatment of various illnesses. According to acharya Charaka when poison is taken as prescribed, it might even be a very effective drug: it posses Kaphavatahara, Vedanasthapana, Lekhana, Tikshnavirechaka, Raktashodhaka, Shothahara, Kaphanissaraka, Twakadoshahara Karma, Katu rasa, Katu vipaka, Ushna virya, and Laghu- Tikshna guna. Due to this gunas, are responsible for its pharmacological property. This review examines the literature on Snuhi, including its common names, synonyms, classification, geographic distribution, external morphology, phytochemistry, ayurvedic properties, pharmacological action, toxicological aspect, management, medico-legal aspect, and therapeutic uses from various Ayurvedic Samitas, Nighantus, as well as current books and peer-reviewed journals in the modern sciences.

KEYWORD: Euphorbia neriifolia, snuhi, pharmacology, phytochemical, nighantu, samhita.

INTRODUCTION

Medicinal plant mixtures have become widely used in alternative medicine, especially for conditions that are resistant to conventional therapy. Latex of EN has been thoroughly tested and appears to have magical qualities. Numerous significant active components, including flavonoids, phenolic compounds, vitamins, and amino acids, have been found in Sehund according to chemical and phytochemical study.[1] This plant exhibits great promise and a wide range of therapeutic effects on many conditions. The tribal people of India use this plant safely for an extended period of time as an inexpensive source of active medicines to alleviate common diseases.

Several plant species from around the globe have been suggested for use in medicine because they contain a variety of chemical components, including secondary metabolites with distinct biochemical activity.[1] Nearly 80% of people on the planet still rely on the traditional medical system (Ayurvedic, Sidha, Tibetan, Unani, Rigpa, Sowa, Folk, Homeopathic, and Chinese) for their health and well-being, The majority of therapies use both active ingredients and extracts from this plant as per WHO.[2]

The use of medicinal plants for therapeutic purposes is older than human history. There are more than 45,000 different kinds of medicinal plants in India. Samhitas, Vedas, and other sacred books mention the successful usage of a number of medicinal plants as medicines. Snuhi is one important medicinal herb that is described in Rasatarangini's Upavisha i.e Euphorbia neriifolia Linn.[3] It is extensively found in the dry, rocky, and hilly regions of central, north, and south India. Based on its morphology and pharmacological characteristics, snuhi has been given a lot of synonyms. Almost every component of the Snuhi plant has a therapeutic use. Snuhi is an ingredient in over 462 formulations that address roughly 62 distinct condition. The 20 Virechana formulations given by Acharya Charaka are contained in the Sudha kalpa Adhyaya of Kalpasthana.[4] It has historically been mostly used in the Shotha, Pandu, Gulma, Dushivisha, Visha, Udara, and Kushtha chikitsas. The analgesic, anesthetic, anti-anxiety, anti-convulsant, anti-psychotic, anti-arthritis, anti-diabetic, anti-inflammatory, anti-diarrheal, anti-microbial, antioxidant, anti-ulcer, diuretic, hemolytic, immunomodulatory, radioprotective, wound healing property, cytotoxic, and anticarcinogenic properties of Snuhi (Euphorbia neriifolia Linn.) extracts and isolates have been studied using a range of in vitro and in vivo techniques.

This plant is an inexpensive source of active medicines that can be used safely for an extended period of time to treat common diseases.

METHODOLOGY

All of the Nighantus, Samhitas, modern toxicology textbooks, and research publications were used to gather data.

SYNOMYMS[6]

Euphorbia ligularia Roxb

Euphorbia antiquorum Linn. (Tridhara sehunda)

Euphorbia nivulia Buch. (Ham),

Euphorbia royleana Boiss (Thuhara),

Euphorbia tirucalli Linn. (Kanda snuhi)

Euphorbia caducifolia Haines.

Euphorbia trigona Haw (Tridhana sehunda bheda)

DISTRIBUTION[5]

E. neriifolia is usually found in rocky ground and the rock crevices in hills. The plants of E. neriifolia are cultivated for fencing purposes in Sri Lanka, Ceylon, Burma, Baluchistan, and Malaysian island and for hedges in Bengal and other nearby villages.[5]

MORPHOLOGY[6]

-A olive green coloured plant with abundance of milk like sap Succulent broad leaved (Other than grass) shrub (not woody plant) that well developed in dry, rocky and hilly area, Leaves alternately clustered, persistent, fleshy, stipules prickle like, Arranged in five vertical nearly spiral lines Leaf blade obovate or obovate oblong to spoon shaped or tongue like, tip blunt apiculate, veins inprominent, dry dehiscent fruits known as capsule.

SCIENTIFIC CLASSIFICATION OF Euphorbia neriifolia Linn[7]

Kingdom Plantae— plant
Subkingdom Tracheobionta—Vascular plants
Super-division Spermatophyta—Seed plants
Division Magnoliophyta—Flowering plants
Class Magnoliopsida—Dicotyledons
Subclass Rosidae
Order Malpighiales
Sub-order Euphorbiales
Family Euphorbiaceae
Sub-Family Euphorbioideae

Tribe Euphorbieae
Sub-Tribe Euphorbiinae
Genus Euphorbia
Species neriifolia Linn

VERNACULAR NAMES[8,9]

Euphorbia neriifolia is known with variable names in different regions and languages, which are as follows. For example:

In Sanskrit, the meaning of its name is as follows:

(i) Sudha—has white coloured latex;

(ii) Samanth dugdha—has milk all over the body;

(iii) Vajradruma, Vajrakantaka, Kulisha druma, Vajravruksha, Vajratunda, Vajri—it has strong action similar to diamond, edges are diamond shaped in cross section;

(iv) Nistrisha patra—the structure is sharp, similar to sword;

(v) Mahavriksha—the shrub grows to a good height;

(vi) Vatari—balances vata dosha;

(vii) Ksheerakanda, Bahushrava— a rich source of latex;

(viii) Bahushakha— having many branches,

(ix) Dabdavruksha—branches are similar to log of woods

VARIABLE NAMES IN DIFFERENT REGION[8,9]

English- Hedge Euphorbia, Oleander Spurge, Milk hedge, Dog's tongue, and Indian Spurge Tree

Goa- Nevulkanta

Gujarati -Thor, Tuaria, Kantaluthohar, Kantalo

Hindi- Thuhar, Sij, Sehund, Patton-ki-send, Danda-thuar, Danda-thor, Gangi-chhu

Ilocano- Carambuaya

Telugu- Akujemudu, Kadajemudu

Thailand- Som chao

Indochinese- Xuong rong, Xuong rong ta

Kannada- Muru Kanina Kalli, Yelekalli, Aelaegalli, Elekalli, Gootagalli, Irekalli, Yellegulla

Punjabi- Gangichu, Thor

Rajputana- Thor, Patton ki send

Vajravrksa, Vujri, Ilai-kalli, Aranciruku, Caciyami, Camattuttaccam, Catakkai, Cinittam, Cunkatam, Katutittacam, Kunakki, Manar, Manca

Sinhalese Paluk, Patuk

Kashmiri Kath

Konkani- Nivalkantem, Nivelkanti

Maharashtra- Vayinivadunga

Malaya- Sesudu

Malayalam- Kalli, Elakkalli, Ilakkalli

Marathi- Mingut, Newarang, Neya-dungra

Oriya- Siju, Kantalothor

Pampangan -Bait, Sosoro

Philippines- Lengua de perro, Carambuaya, Karimbuaya, Sobog-sobog, Sobo-soro

Sanskrit-Snuhi, Sudha, Vijri, Snuk, Svarasana, Patrosnuhi, Sudhi, Nistrinsapatra, Pratrasnuk, Puttakarie, Sakhakanda, Samantadugdhaka, Seej, Vajra,

Tamil-Ilaikkalli, Kalli, Manjevi, Nadangi, Naynakki, Perumbukalli, Mucarcevi, Mutakapani, Mayurpelakkalli, Nakanay, Nalainkalli, Natanki, Nattanki, Naynakku, Payaca, Mulaittaci, Picakavayakkalli, Pilavaillolli, Punakam, Sadurakalli, Talaikkalli, Tapilika, Terravacceti, Ulokapantani, Vattampam, Vaccirakanta, Vannikaram

Tibetan- Snu-ha

Urdu- Zaqqum, Sendh, Send, Thuhar

CLASSICAL CATEGORIZATION[9,10,11]

Sr.no.	Samhita	Classification
1	Modern	Irritant organic vegetative poison
2	ayurveda	Sthavara upvisha varga
3	Charaka	Shodhanarthaprayukta vriksha tikshnaVirechana dravya,
4	Shushruta	Shyamadi gana, adhobhagahara dravya
5	Vagbhata	Nikumbhadi (virechana) dravya, mushakadi gana

NIGHANTU CATEGORIZATION[910,11]

S.No	Nighantu	Gana/varga
1	Bhavprakash nighantu	Guduchyadi varga, dhatuupdhatu rasauprasa ratnaupratnavishaupvisha varga
2	Raj nighantu	Shyamadi varga
3	Shaligram nighantu	Guduchyadi varga
4	Saraswati nighantu	Kshup varga
5	Nighantu adarsh	Amlakyadi varga
6	Abhidhan ratnamala	Tikta skandhas
7	amarkosh	Vanaushadhi varga

8	Ashtang nighantu	Mushkadi varga
9	Dhanvantari nighantu	Guduchyadi varga
10	Shodhala nighantu	Guduchyadi varga, anekartha varga
11	Madanpala nighantu	Abhyadi varga
12	Madhava dravyaguna	Vividhaushadhi varga
13	Kaiyadeva nighatu	Aushadhi varga
14	Shabda chandrika	Vrikshadi varga
15	Saushrut nighantu	Mushkadi gana, shyamadi gana
16	Madanadi nighantu	Dvitiya gana
17	Hridyadipika nighantu	Dvipada

RASAPANCHAK OF SNUHI BY DIFFERENT ACHARYA[9,10,11]

Acharaya	Rasa	Guna	Virya	Vipaka	Dosha karma
Dh. Ni	tikta	guru	ushna	katu	Kapha vata shamak
m.ni	katu	Tikshna, guru		katu	-
r.ni	-	-	ushna	katu	Pitta vata shamak Kshira- vata shamak
k.ni	Katu, tikta, kshira-katu	Tikshna,guru Khira-snigdha guru	Ushna Kshira- ushna	katu	Kapha vata shamak
Bha.ni	Katu Kshira-katu	Tikshna, guru, kshira-snigdha, laghu	Kshira-ushna	katu	Kapha vata shamak
Sha.ni	Katu Kshira-katu, patra-katu,tikta	Tikshna guru Kshira-snigdha laghu, patra-tikshna, sara, guru	Kshira-ushna Patra-ushna	katu	Kapha vata shamak Patra-kapha vata shamak
Ni. A	Tikta,katu	-	ushna	katu	Kapha vata shamak

KARMA BY DIFFERENT ACHARYA[9,10,11]

Karma	**Cha.s**	**Dh.ni**	**s.ni**	**m.ni**	**k.ni**	**r.ni**	**Bha.ni**	**Sha.ni**
Tikshna virechan	+							
deepana			+	+	+		+	+
shodhana		+						
shothhar		+						
Vrana shodhan		+						
vishahar	+	+	+	+	+		+	+
Shul hara				+	+		+	

PRAYOGA OF SNUHI BY DIFFERENT ACHARYA[9,10,11]

Roga	**Dh.ni**	**Sha.ni**	**M.ni**	**K.ni**	**Bha.ni**	**R.ni**	**Dg.v.jn**
vatavyadhi	+	+	+	+	+	+	+
gulma	+	+	+	+	+	+	+
udara	+	+	+	+	+	+	+
sotha	-	+	+	+	+	-	+
arsha	-	+		+	+	-	+
kushtha	-	+	+	+	+	+	+

medoroga	-	+		+	+	-	+
prameha	-	-	-	+	-	+	-
adhyaman	+	+	+	+	+	+	-
daha	-	-	-	-	-	+	-

FORMULATIONS OF SNUHI[12]

S.NO	Formulation	Uses	Reference
1	Abhaya lavana	Spleen disorder	bhaisajyaratnawali
2	Ayaskirti	Weight loss, dermal skin disease, syndrome of irritable bowel, and anemia	bhaisajyaratnawali
3	Shanka dravaka	Disease of spleen and liver, ascites, and indigestion	bhaisajyaratnawali
4	Vishatinduka taila	Dermal skin diseases (discoloration), gout, and numbness.	bhaisajyaratnawali
5	Agnivara Taila	Taila Treatment of blisters and burns	bhaisajyaratnawali
6	Jalodarari rasa	Hepatic disorders and ascites, female disorder	bhaisajyaratnawali
7	Ardraka ghrita	Gastritis treatment, indigestion treatment, and treatment of chronic diarrhea	Sahasryayoga ghrit prakran-40
8	Arsha kuthara rasa	Hemorrhoid treatmen	Yogaratnakar
9	Chitrakadi taila	fistula	Shushruta samhita
10	Vajrakshara	Gulma rogadhikara	bhaisajyaratnawali
11	Abhya vati	Udara rogadhikar	bhaisajyaratnawali
12	Mahamarichyadi taila	Gout treatment	yogaratnakar
13	Dhanvantara ghrita	Diabetis, skin, anemia, edema, Hemorrhoid	Ashtanga hridya
14	Kasisadi taila	Hemorrhoid treatment	Bhaisajyaratnawali
15	Avittoladi bhasma(kshara)	Liver and spleen disorder	Sahasrayoga, kasayaprakrana
16	Vajra ksara	Gulma rogadhikar	bhaisajyaratnawali
17	Abhraka bhasma	cough asthama sinusitis TB	Rasatarangini, ayurveda prakash
18	Lauha rasayana	medoroga	bhaisajyaratnawali
19	Kshara sutra	Piles, fistula treatment	Chakradutta, shushrut samhita
20	Dantimuladi lepa	Galagandadi roga	bhaisajyaratnawali
21			
22	Dantyadi gutika	Gulma chikitsa	yogaratnakar
23	Jwarakalaketu rasa	Jwara chikitsa	bhaisajyaratnawali
24	Pasupata rasa	Ajirna chikitsa	yogaratnakar
25	Sarvangasundar rasa	Vatavyadhi chikitsa	Bhaisajyaratnawali

26	Agnimukha lauha	Asraroga chikitsa	bhaisajyaratnawali
27	Narach rasa	Udar roga	Yogaratnawali

SEASONAL COLLECTION OF CRUDE DRUG[13]

S.No	Prayojyanga	Charak	Shushrut	Ra.ni
1	Mula	Grishma-shishira	pravruta	Shishira
2	Patra	Varsha-vasanta	varsha	Varsha
3	Pushpa	yatharitu		Vasanta
4	Twaka	sharada	sharada	
5	Kshira	End of shishir	End of Hemant	
6	Kanda	Sharad		

COLLECTION[13]

The Charak Samhita indicates that Snuhikshir should be harvested from the stem of the plant after it has matured for 2-3 years, with the optimal time for tapping being at the conclusion of the Shishir Ritu (late winter), which aligns with mid-January. Observations have shown that the highest yield of Snuhikshir occurs during dawn. Research conducted by Paardekooper & Sookmark in 1969 suggests that the diminished latex production when trees are tapped later in the morning is attributable to diurnal fluctuations in turgor pressure, likely influenced by variations in atmospheric water vapor deficit. Consequently, upon tapping, the pressure within the vessel tips equalizes with atmospheric pressure, resulting in the expulsion of latex from the lacticifers. As previously mentioned, both Snuhi (Euphorbia neriifolia Linn.) and the Rubber plant (Hevea brasiliensis) are members of the Euphorbiaceae family and exhibit similar properties. Therefore, it is advisable to collect the latex from Snuhi before dawn, as recommended in the Charak Samhita.

PRESERVATION OF LATEX[13]

Snuhikshir must be preserved because it coagulates when exposed to air, as is observed in practice. Therefore, it is essential that fresh latex be collected each time before its use as coagulated latex renders it useless for clinical utility. Snuhi ksshir should ideally be collected in a sterile, airtight container. Few professionals, however, move the collected latex into a jar containing diethyl ether (CH3-0-CH2CH3), an inert material that has good organic molecule-solvent characteristics. Additionally, ethers are very combustible and utilized as a solvent for oils, fats, resins, and other substances. They are also employed as a general anesthetic and as a refrigerant, which generates cooling upon evaporation.

It is observed that, ether prevents from coagulating of latex and hence, latex can be preserved bit longer for further clinical uses.

SNUHI KSHIRA SHODHANA (Purifiction method)[16,17]

Yogaratnakar mentioned that snuhi itself is pure, not required for any purification where as Rasatangaini described 2 pala (96ml) of Snuhi kshira is taken along with 2 tola (24ml) of filtered cinca patra swarasa in a clean wide mouthed container. The vessel is placed under sun and dried. When the liquid part dries up, the dry powder obtained is stored in a suitable airtight container as Suddha suska snuhi ksira for further therapeutic uses.

PRECAUTION WHILE COLLECTING SNUHI KSHIRA[13]

the scientific methods for the collection of Snuhikshir is essential to recognize the necessary precautions during the collection process. Reports indicate that latex can cause inflammation and blistering when applied to the skin. Furthermore, it has been documented that latex into the eyes can lead to severe conjunctivitis and potential loss of vision. Therefore, individuals who handle are advised to wear gloves and protective eyewear to ensure their safety.

Toxic part – Latex[14]

Fatal dose– 25-30ml

Fatal period- 3 days27

TOXIC SYMPTOM

External Application

• When applied to the skin, produces vesication.

• When dropped into the eyes, it produces inflammation involving eyesight.

Internal Administration

• It's causing irritants, vomiting, diarrhoea.

• Convulsions and coma.

• It is used for procuring criminal abortion.

TREATMENT

Wash contact part with running water.

Symptomatic treatment –

On ingestion: Gastric lavage with normal saline, Activated charcoal.

On contact: Skin - Topical corticosteroids

Eye- Antibiotic eye drops, Tears substitute, IOP (Intra ocular pressure) lowering medications.

POST MARTUM APPEARANCE

Signs of inflammation of contact part, gangrenous patches in the stomach and rotten spleen. Medico legal importance.

Commonly accidental poisoning, Homicidal and suicidal purposes are very rare and used for procuring criminal abortions.

CHEMICAL CONSTITUENT[20,21]

Numerous investigation were conducted in different part of e. neriifolia reveals the presence of many alkaloid, glycosides, saponin, flavonoid, resin, gum, and majorly terpenoids etc.

Powdered plant, stem and leaves	Several triterpenoids like Glut-5-en-3$-ol, Glut 5(10)-en1-one, taraxerol and $-amyrin
Latex	Triterpene – nerifoliene, euphol, neriifoliol, neriifolene, euphorbon, resin, gum, caoutchouc, malate of calcium, euphol, monohydroxy triterpene, neriifoliol, taraxerol, beta- amyrion, glut-5-(10)-en-1-one, neriifolione, cycloartenol
Leaf	Friedelan-3, D: B- friedolan-5-(10)-en-1-one, taraxerol
Bark	Euphol, Euphorbol, hexacosanoate, n- hexacosanol, 12- deoxy 4-β-hydroxyphorbol-13-dodecanoate-20-acetate, pelargonin – 3, 5-diglucoside, 24-methylene cycloartenol, tulipanin-3, 5- diglucoside
Stem	Euphol, friedelan-3, D: B friedoolan-5(10)-en-1-one, glut-5(10)-en-1-one, taraxerol
Ethanolic extract of fresh root	Antiquorin
root	Alnus-5(10)-ene-1-one, anthocyanins, euphol, pururate dikinase, terpenes, 24-methylene cycloartenol, tulipanin-3, 5- diglucoside

CULTIVATION AND PROPAGATION[22]

Although Euphorbia neriifolia plants may tolerate some shade, they prefer full sunlight for optimal growth. Additionally, it is discovered that they grow in arid regions atop rocky terrain in well-drained soil in several Indian communities. In three to five years, they quickly mature into massive trees that require little care. During the growing season (March to September), they must be regularly watered; however, during the winter, they must be kept entirely dry and water should not be allowed to pool near the root area.

PHARMACOLOGICAL ACTIVITY

Different in-vivo and in-vitro study done in different part of Euphorbia neriifolia that posses the property of antiarthritis, antioxidant, anti diabetic, anti inflammatory, anti cancerous, wound healing, antimicrobial etc.

Pharmacological activity	plant part	Mode of action	dosage	Reference
Anti-arthritis activity	Leaf	Pre-treatment of this fraction significantly reduced the cytokine TNF_ ($p < 0.05$) and paw edema ($p < 0.001$) in CFA-induced arthritic model after treatment for 28 days	-	[17]
Anti oxidant activity	Leaf	Saponin showed better in vitro antioxidant activities compared to silymarin with a high bitterness index	10 mg/mL	[18]
	Leaf	Observed a good correlation among the antioxidant activity and physiochemical analysis and reported the maximum scavenging potential	1 mg/mL	[19]
	Leaf	FRAP method determined the reducing capability of ferric ions with 149.2} 0.05 µmol concentration. At 1 mg/mL of extract concentration, superoxide scavenging activity was determined to be 50.06% and it was 76.15% in the DPPH assay. The capacities for metal chelation of the standard and extract were 85.37% and 73.24%, respectively. The percentages of hydrogen peroxide scavenging potential of BHT, ascorbic acid, and extract were determined to be 44.7%, 12.7%, and 69.015%, respectively	1 mg/mL	[20]
	leaf	In terms of metal chelation, reducing power, and scavenging activity, it was determined that the methanolic extract from different parts of *E. neriifolia* (leaves, stem, latex, and bark) possessed potential antioxidant activity	1 mg/mL	21
	leaf	Showed effective DPPH scavenging activity	1 mg/mL	[22]
	leaf	EN extract reduced the profile of serum lipid as well as of glucose by establishing its catabolic activity. It further raised the level of kidney and liver SOD along with catalase and decreased the lipid peroxidase in the liver. This represented that the *E. neriifolia* was considered to be safe and could be applied for the treatment of various ailments	400 mg/kg bw	[23]
Anti-diabetic activity	stem	After administration of extract, there were decreases in fasting blood glucose level and in the oral glucose tolerance	400 mg/kg bw	[24]

		test after the time period of 60 min. The maximum reduction in the level of fasting blood glucose was found after 15 days of treatment at 400 mg/kg dosage. The profile of serum lipids was also found to be reduced compared to the control rat group		
	Stem bark	It was found to suppress the levels of elevated blood lipids and glucose in diabetic rats. The results were determined to be comparable to the standard drug glibenclamide at 400 mg/kg of dosage. Thus, this study indicated the anti-diabetic and anti-hyperlipidemic activity of EN	100, 200, and 400 mg/kg bw	[25]
	stem	The serum triglyceride, cholesterol, and blood glucose content were significantly ($p < 0.05$) decreased in treated group, whereas there was elevation in the serum HDL cholesterol levels in response to the methanolic extract of the *E. neriifolia* stem.	200 and 400 mg/kg bw	[25]
	leaf	The ethanolic extract of *E. neriifolia* leaf with controlproduced 99.6} 2.540 mg/dl glucose drop at 400 mg/kg dosage after 60 min, whereas control resulted in 110.2} 3.01 mg/dl of glucose drop in streptozotocin-directed, high-fat diet type-2 diabetic animal model	400 mg/kg bw	[26]
	leaf	The effect of ethanolic extract of *E. neriifolia* on glucose oxidase model was found to be 43.23} 3.58 mg/dl at 400 mg/kg, whereas control group has shown 112.63} 4.68 mg/dl of effectiveness	400 mg/kg bw	[27
Immunomodulatory activity	leaf	Significantly raised the phagocytic index, differential leucocyte count, and total leucocyte count to provide protection against abdominal sepsis. It increased the cell-mediated immunity and hemagglutination antibody titer by facilitating the footpad thickness response in betamethasone-induced and normal immunosuppressed rats. Therefore, it can be stated that *E. neriifolia* can be utilized as a complementary therapeutic agent for the treatment of immunomodulatory diseases	400 mg/kg bw	[28]
anti-inflammatory	Latex	Determined to have potent anti-	750 and	[29]

activity		inflammatory activity in comparison to standard diclofenac sodium at 100 mg/mL dosage	500 mg/kg bw	
	Latex	Determined to have anti-inflammatory activity	400 mg/kg bw	[30]
	leaf	EN caused inhibition in the inflammation of (1%) carrageenan-induced paw edema in rats	400 mg/kg bw	[31]
	Stem bark	These compounds result in the inhibition of pro-inflammatory mediators in cases of LPS-directed RAW264.7 macrophages. Studies on the cellular signaling pathway showed that these compounds prevent IkB_ degradation and NF-kB/p65 subunit translocation. Furthermore, the amounts of COX-2, TNF-_, and PGE2 increased dramatically under the impact of these compounds, which was closely associated to the activation of the mitogen activated protein kinase (MAPKs) signaling pathway or by the phosphorylation of protein kinase C _ (PKC_). Thus, these compounds have shown multidirectional regulation in the immune function of macrophages and cytokines, along with better anti-inflammatory activity with the close regulation of NF-kB and PKC_/MAPKs signaling pathway	2.5 to 8 µM	[32]
Wound healing activity	Leaf	Enhanced the epithelization. The content of protein and hydroxyproline was found to be increased along with the catalase activity, and the superoxide dismutase activity was determined in granular tissues.	200 and 400 mg/kg bw	
	leaf	Showed efficacy of 100% and 85% in response to extract and control at 18th day in the excision wound model of rat	500 mg/kg bw	[33
	latex	Cutaneous wounds produced by surgery were treated tropically. Thus, the extract helped the healing process by increasing the angiogenesis, epithelization, DNA content, and tensile strength, respectively	1% and 0.5%	34]
Anti-atherosclerosis	Latex	Modulated the pathway related to inflammation in order to relieve atherosclerosis	-	[35]
Radio-protective activity	Leaf	This compound exhibited moderate antioxidant	173.78 µg/mL	[36]

		activity with great reduction in the gamma-directed chromosomal abnormalities compared to gamma radiation alone. It also showed cytotoxic activity with an IC50 value of 173.78 µg/mL in a melanoma cell line. Thus, this compound can provide a scientific basis for the claim of radioprotective activity in EN		
Anti-anxiety, anti-convulsant, anti-psychotic activity		Significant reduction in the apomorphine-induced stereotype in rats and mice and absence of cataleptic effect that suggested the modulated activity of specific dopaminergic receptors	100, 200, and 400 mg/kg bw	[37]
Anti-thrombotic activity	Whole plant	The damage of the caudal vein was observed at 2 mg/kg dosage of carrageenan, whereas the ethanolic extract of *E. neriifolia* significantly ($p < 0.01$) reduced the thrombosis and increased the clotting and bleeding time of the animal	400 mg/kg	[38]
Dermal irritation	Latex	Dermal irritation Latex Inhibited the paw edema, which was induced by carrageenan	500 and 700 mg/kg bw	[29]
	Latex	Showed thrombolytic activity		[40]
Hemolytic activity	Leaf	Reported to have hemolytic activity at varied concentrations such as silymarin at 100 µg/mL of concentration, triton at 100 g/mL of concentration, and saponin at 300 µg/mL	300 µg/mL	[37]
Death receptor expression enhancing activity	leaf	A novel ingol diterpene, 3-O-acetyl-8-O-tigloylingol (8), euphonerins A–G (1–7), and seven new cycloartane triterpenes were isolated from the methanolic fraction of *E. neriifolia* leaves, along with three known flavonols (11–13), (24R)-cycloartane-3_,24,25-triol (10), and 3,12-di-O-acetyl-8-O-tigloylingol. The structure of 1–8 compounds was made with the help of spectroscopic analysis. Among all compounds, 1–11 compounds have shown the death receptor expression enhancing activity		[42]
Analgesic activity	leaf	The increase in reaction time in response to the *E. neriifolia* extract showed the better analgesic activity against thermal, chemical, and mechanical stimuli	100, 200, and 400 mg/kg bw	[44]

	Leaf	Showed analgesic activity against acetic-acid-induced abdominal constriction in mice	150, 300, and 400 mg/kg bw	[45]
Anti-diuretic activity	leaf	Indicated in the increase in urine volume up to three times in response to the extract as an effective hypernatremic and hyperchloremic diuretic compared to control with 6.65 mL urine in model of rat	400 mg/kg bw	[46]
Anti-ulcer activity	leaf	Showed anti-ulcer activity against ethanol-induced ulceration and pyloric-ligated ulceration	400 mg/kg bw	[47]
Anesthetic activity	stem	Possessed good anesthetic activity in the case of the intradermal wheal in guinea pig and in the case of foot-withdrawal in frog	-	[48]
Anti-bacterial and Anti-fungal activity	Leaf	Exhibited greater anti-microbial activity against *Proteus vulgaris* with an 8 mm zone of inhibition	50 mg/mL	[49]
	leaf	Showed anti-fungal activity against *Fusarium oxysporum* and *Candida albicans* with inhibition in their mycelial growth	50 mg/mL	[49]
	Stem	Found to be effective against *P. aeruginosa* at 400 mg/mL dosage, whereas it showed more effectiveness against *Staphylococcus aureus*	400 mg/mL	[49]
	Leaf	Inhibited the growth of *K. pneumonia* and *P. vulgaris*	50 µg/mL	[49]
	Latex	Found to be effective against *Klebsiella pneumoni* and *Salmonella typhi* with an 8 mm inhibition zone. It showed a 7 mm inhibition zone at 50 µL concentration against *P. aeruginosa*. MIC showed more effectiveness against *P. aeruginosa*, *K. pneumonia*, and *S. typhi* high concentration	60 and 50 µL	[50]
Anti-viral activity	Stem bark	Showed moderate anti-HIV-1 activities	24 and 34 mM	[51]
	Whole plant	Exhibited better anti-HIV-1 activity	6.4 and 6.6 µg/mL	[52]
	Whole plant	Exhibited moderate anti-HIV activity in comparison to standard azidothymidine	3.58 and 7.40 µM	[53]
	Leaf	Determined that the 3_-Friedelanol exhibited better anti-viral activity in comparison to actinomycin D (control) against HCoVs	-	[54]
Anti-asthmatic activity	Whole plant	EN ethanolic extract caused no toxicity, whereas ethyl acetate extract has shown the most significant anti-asthmatic property in all models	2000 mg/kg bw	[55]

Cytotoxic study	Leaf	Exhibited better cytotoxic activity against esophageal squamous cancer cells (KYSE-450 and KYSE-410 cells) and inhibited their proliferation	-	[56]
	Leaf	Showed in vitro cytotoxicity against the murine F1B16 melanoma cell line with 50% inhibition	173.38 µg/mL	58]
	latex	Inhibition against EAC cells and DLA cells	82 and 51 µg/mL	[59]
	Leaves and bark dried powder	In vitro anti-tumor activity with >50% inhibition rate in HepG2 cell line	89.25%	[59]
	Whole plant	Induced differentiation in megakaryocytic cells, inhibited growth, and caused apoptosis to some extent in HEL and K562 human leukemia cell lines		[59,57]
	Leaf	All compounds showed better cytotoxicity against the MCF-7 cell line	13.14, 7.12, and 9.50 µM	[59,57]

TRADITIONAL USES OF SNUHI

Disease	Traditional background	Reference
Whole plant		
Deep cracks in feet soles	Used with castor oil by locals of ChhattisgChhattisgarh region of Indiaarh	[60]
Vata-dosha disorders such as constipation, neuroglia, bloating, paralysis, induction of severe purgation, and for improving the strength of digestion	Whole plant juice	[61]
Anorexia, fatigue, vomiting, weakness, spree syndrome, arthritis, and digestive tract disorder	Whole plant as one of the components of Dashmoolarishtam	[61]
Insecticide	Used as a spray by local farmers in India	[60
As a fence full of spines	Used by local farmers in India	60]
Allelopathic effect in weed control	Used by local farmers in India	[60]
Latex		
Used in aphrodisiac mixture	Chhattisgarh region of India	[62]
Earache	Malay	
Obstinate skin disease, urinary disorders, and diabetes	Shusruta	
Coughs, skin problems	Used in Rajputana	[63]
Piles	Used with turmeric in Indian medicine	[26]
Ophthalmic use	Indian Medicine	[64]
Cathartic, earache	Used by Indian Vaidya	[40]
Whooping cough, leprosy, dyspepsia, jaundice, dropsy, colic, enlarged liver, and spleen	Used with salt by Indian Vaidya	[40]

Removes warts	Used by Indian Vaidya	[40]
External application for rheumatic limbs	Used with margosa oil or neem oil by Indian Vaidya	[40]
Prevents the attack of red weevils in palms	Gujarat	[40
Anal fistulae	Indian medicine	[40]
Asthma	Ayurveda	[40]
Syphilis, visceral obstruction, spleen, and liver enlargement	Used with ghee in Rural area in India	[40]
Leaves		
Ear problems	Sarawak	[62]
Wound healing, CNS problems, and immunomodulatory effects	Used in Malaya	[64]
Bronchitis, bleeding piles	Indian traditional medicine	65]
Earache	Used in Malaya and Philippines	[66
Wound-healing	The steamed leaves used in Indian medicine	[29]
Respiratory trouble in children	Used with common salt an honey in localised areas in India	[60]
Stem		
Deroots skin warts	Indian traditional medicine	67]
Coughs and colds	Used with honey in Indian traditional medicine	67
Chronic respiratory problems	Used with black pepper locally in India	60
Promotes the expectoration of phlegm	Used with honey and borax by Indian Vaidya	40
Hydrophobia	Used with fresh ginger by Indian Vaidya	40
Bark		
Semen passing with urine	Mixture of bark and leaves of *Piper betle* L.	68
Roots		
Antispasmodic activity	Used in Indian medicine	40
Snake bites, scorpion stings	Used with black pepper in Indian medicine	31
Dropsy	Used after boiling with rice water by Indian Vaidya	40

CONCLUSION

The traditional and ethno-botanical uses of natural chemicals, particularly those derived from plants, have garnered significant attention in recent years due to their well-established efficacy and overall perceived safety for human consumption Utilization of plants for medicinal purposes in India has been documented long back in ancient literature because they are essential for human survival. Traditional medicinal system is widely distributed in India. A major proportion of population mostly belonging to rural areas is still dependent on traditional system of medicines for their various health needs. Therefore, traditional and

cultural medical knowledge has a catalyzing effect in meeting health care demands. From the available literature survey, it should clearly show that Euphorbia neriifolia L. serve as an important source of many therapeutic efficient chemicals. It is extensively used in an Indian medicine system in combination with other plants and natural products.

Due to the presence of various natural products like euphol, monohydroxy triterpenes, nerifoliol, taraxerol, flavonoids, steroidal saponins, sugar, tannins, alkaloids, β-amyrion, proteins, glycosides, alkaloids, and phenolics in significant, moderate, and trace amounts, this plant is beneficial for treating abdominal problems, bronchitis, tumors, loss of consciousness, asthma, leucoderma, piles, inflammation, enlargement of the spleen, anemia, dyspepsia, pain, flatulence, intermittent fever, fever, and chronic respiratory problems. For an extended period, this particular plant has been effectively utilized to treat a wide range of medical conditions. It is possible to create novel medication molecules or mixtures that can treat numerous ailments by just altering the dosage can be a good scope for pharmaceutical on investigating leads from the conventional medical system in order to design and produce new, innovative, indigenous plant-based medications like snuhi.

REFERENCES

1. Petrovska, B.B. Historical review of medicinal plants0 usage. Pharmacogn. Rev., 2012; 6: 1–5.
2. WHO. Available online: http://www.who.int/mediacentre/factsheets/fs297/en/index.html
3. Agnivesa, Charaka Samhita with Vaidyamanorama hindi commentary, Ed. Acharya Shukla V, Tripath R, Chaukhambha Sanskrit Pratishthan, Delhi, (Reprint), Kalpasthana. 10/5-8; 2015.p. 847.
4. Ahmed, S.A.; Nazim, S.; Siraj, S.; Siddik, P.M.; Wahid, A.C. Euphorbia neriifolia Linn.: A phytopharmacological review. Int. Res. J.Pharm., 2011; 2: 41.
5. Sultana, A.; Hossain, J.; Kuddus, R.; Rashid, M.A.; Zahan, M.S.; Mitra, S.; Roy, A.; Alam, S.; Sarker, M.R.; Mohamed, I.N. Ethnobotanical Uses, Phytochemistry, Toxicology, and Pharmacological Properties of Euphorbia neriifolia Linn. against Infectious Diseases: A Comprehensive Review. Molecules, 2022; 27: 4374.
6. Mali, P.Y.; Panchal, S.S. Euphorbia neriifolia L.: Review on botany, ethnomedicinal uses, phytochemistry and biological activities. Asian Pac. J. Trop. Med., 2017; 10: 430–438.

7. Hooker, J.D. The Flora of British India; Chenopodiaceae to Orchideae. London, L. Reeve; 1890; Volume 5, p. 914. Available online: https://www.biodiversitylibrary.org/item/13818
8. Gupta, S.; Acharya, R. A critical review on snuhi (Euphorbia neriifolia linn.) with special reference to ayurvedic nighantus (lexicons). Int. J. Res. Ayurveda Pharm., 2017; 8: 98–103.
9. 20. Burkill, I.H. A Dictionary of the Economic Products of the Malay Peninsula; Crown Agents for the Colonies: London, UK, 1936; 1–2.
10. 25. Chaudhary, P.; Janmeda, P. Sehund: Poison or medicine. Agric. Food E-Newsl, 2021; 3: 254–256.
11. Formulation. Prashanth, B.K. Anuhi Sehund: Euphorbia neriifolia Uses, Side Effect, Research. 2017. Available online: https://www.easyayurveda. com/2017/04/16/snuhi-euphorbia-neriifolia-uses/
12. Dundappa, C.P.; Amarprakash, D. A comprehensive review on snuhikshir (latex of Euphorbia nerifolia Linn.). Int. Ayurvedic Med. J., 2017; 5: 2936–2945.
13. Shastri. L. commentrator-Shastri.B., Editor, Yogaratnakara, Hinditranslation, Athoupavisha, sholoka no:01, Chaukhambha Sanskrit Sansthan Varanasi, edi-reprinted, 2008; 167.
14. Sharma. S, Rasatarangini, 24th chapter, vishopvishaniya Adhyaya, Snuhikshirasyashodhanam, Shloka no: 517-518, Chaukhambha sanskrit Sansthana Varanasi, edi: 11th 1979; 744.
15. Upadhyay C, Sathish S. A Review on Euphorbia neriifolia Plant. International Journal of Pharm and Chemical Research, 2017; 3(2): 15.
16. Bigoniya, P.; Siddique, F. Anti-inflammatory and anti-arthritic effect of triterpene fraction isolated from Euphorbia neriifolia L. Leaf. Photon., 2015; 124: 1007–1017.
17. Bigoniya, P.; Shukla, A.; Singh, C.S. Dermal irritation and sensitization study of Euphorbia neriifolia latex and its anti-inflammatory efficacy. Int. J. Phytomed, 2010; 2: 240–254.
18. Pracheta, S.V.; Paliwal, R.; Sharma, S. In vitro free radical scavenging and antioxidant potential of ethanolic extract of Euphorbia neriifolia Linn. Int. J. Pharm. Pharm. Sci., 2011; 3: 238–242.
19. Pracheta, S.V.; Paliwal, R.; Sharma, S. Preliminary phytochemical screening and in vitro antioxidant potential of hydro-ethanolic extract of Euphorbia neriifolia Linn. Int. J. Pharm. Tech. Res., 2011; 3: 124–132.

20. Priya, C.; Pracheta, J. Quantification of phytochemicals and in vitro antioxidant activities from various parts of Euphorbia neriifolia Lin. J. Appl. Biol. Biotechnol, 2022; 10: 1–4.
21. Sawale, J.A.; Patel, J.A.; Kori, M.L. Antioxidant properties of cycloartenol isolated from Euphorbia neriifolia leaves. Indian J. Nat. Prod., 2019; 33: 60–64.
22. Bigoniya, P.; Rana, A. Subacute effect of Euphorbia neriifolia on hematological, biochemical and antioxidant enzyme parameters of rat. Acad. J. Plant Sci., 2009; 2: 252–259.
23. Mushir, I.M.; Patel, V.M. Anti-diabetic potential of Euphorbia neriifolia Linn. in alloxan induced diabetic rats. J. Pharm. Res., 2012; 5: 2571–2573.
24. Datta, S.; Kar, B.; Mishra, G.; Nayak, S.S. Antidiabetic and hypolipidemic activity of Euphorbia neriifolia in streptozotocin induced diabetic rats. J. Nat. Prod. Plant Resour, 2015; 5: 12–17.
25. Mansuri, M.I.; Patel, V.M. Evaluation of antidiabetic and antihyperlipidemic activity of Euphorbia in high fat diet-streptozotocin induced type-2 diabetic model. IJPRS, 2013; 2: 83–89.
26. Gaur, K.; Rana, A.C.; Chauhan, L.S.; Sharma, C.S.; Nema, R.K.; Kori, M.L. Investigation of immunomodulatory potential of Euphorbia neriifolia Linn. Against Betamethasone induced immunosuppression. Int. J. Pharmacog. Phytochem. Res., 2009; 1: 8–11.
27. Ilyas, M.; Perveen, M.; Muhaisen, M.M.H.; Basudan, O.A. A novel triterpene (Neriifolione) a potent anti-inflammatory and antiarthritic agent from Euphorbia neriifolia. Hamdard Med., 2003; XLIV: 97–102.
28. Shamim, S.A.; Fatima, L. Pharmacological actions and therapeutic benefits of thuhar (Euphorbia neriifolia): A review. Pharma Innov. Int. J., 2018; 7: 221–222.
29. Jiang, M.; Xue, Y.; Li, J.; Rao, K.; Yan, S.; Li, H.; Chen, X.; Li, R.; Liu, D. PKC_/MAPKs and NF-_B Pathways are Involved in the Regulation of Ingenane-Type Diterpenoids from Euphorbia neriifolia on Macrophage Function. J. Inflamm. Res., 2021; 14: 2681–2696.
30. Pattanaik, S.; Si, S.C.; Pal, A.; Panda, J.; Nayak, S.S. Wound healing activity of methanolic extract of the leaves of Crataeva magna and Euphorbia neriifolia in rats. J. Appl. Pharma Sci., 2014; 4: 46–49.
31. Rasik, A.M.; Shukla, A.; Patnaik, G.K.; Dhawan, B.N.; Kulshrestha, D.K.; Srivastava, S. Wound healing activity of latex of Euphorbia neriifolia Linn. Indian J. Pharma, 1996; 28: 107–109.

32. Kimata, M.; Shichijo, M.; Miura, T.; Serizawa, I.; Inagaki, N.; Nagai, H. Effects of luteolin, quercetin, and baicalein on immunoglobulin E-mediated mediator release from human cultured mast cells. Clin. Exp. Allergy, 2000; 30: 501–508. [CrossRef] [PubMed]
33. Bigoniya, P.; Rana, A. Radioprotective and In-Vitro Cytotoxic Sapogenin from Euphorbia neriifolia (Euphorbiaceae) Leaf. Trop. J. Pharm. Res., 2010, 8: 521–530. [CrossRef]
34. Bigoniya, P.; Rana, A.C. Psychopharmacological profile of hydro-alcoholic extract of Euphorbia neriifolia leaves in mice and rats. J. Pharmacol. Exp. Ther., 2005; 43: 859–862.
35. Bekemeier, H.; Hirschelmann, R.; Giessler, A.J. Carrageenan-induced thrombosis in rats and mice: A model for testing antithrombotic substances? Agents Actions, 1985; 16: 446–551.
36. Bigoniya, P.; Shukla, A.; Singh, C.S. Dermal irritation and sensitization study of Euphorbia neriifolia latex and its anti-inflammatory efficacy. Int. J. Phytomed, 2010; 2: 240–254.
37. Mali, P.Y.; Panchal, S.S. Pharmacognostical and Physico-chemical Standardization of Euphorbia neriifolia Leaves. Pharmacogn. J., 2017; 9: 696–705.
38. Toume, K.; Nakazawa, T.; Hoque, T.; Ohtsuki, T.; Arai, M.; Koyano, T.; Kowithayakorn, M.; Ishibashi, T. Cycloartane triterpenes and ingol diterpenes isolated from Euphorbia neriifolia in a screening program for death-receptor expression-enhancing activity.
39. Gaur, K.; Rana, A.C.; Nema, R.K.; Kori, M.I.; Sharma, C.S. Anti-inflammatory and analgesic activity of hydro-alcoholic leaves extract of Euphorbia neriifolia Linn. Asian J. Pharm. Clin Res., 2009; 2: 26–29.
40. Sharma, V.P.; Paliwal, R.; Singh, L.; Sharma, C.; Sharma, S. Elucidation of analgesic activity of hydroethanolic extract of Euphorbia neriifolia leaves in swiss albino mice. J. Plant Develop Sci., 2012; 4: 183–189.
41. Pracheta, S.V.; Paliwal, R.; Sharma, S.; Singh, L.; Janmeda, B.S.; Panwar, S.; Yadav, S.; Sharma, S. Chemoprotective activity of hydro-ethanolic extract of Euphorbia neriifolia Linn. leaves against DENA-induced liver carcinogenesis in mice. Biol. Med., 2011; 3: 36–44.
42. Bigoniya, P.; Rana, A. Pharmacological Screening of Euphorbia neriifolia Leaf Hydroalcoholic Extract. J. Appl. Pharm., 2010; 2: 1–17. [CrossRef]
43. L.C.; Lhanikor, H.N.; Ahmed, N. The preliminary study of local anaesthetic activity of Euphorbia neriifolia Linn. In Pharm., 1979; 11: 239–240.

44. Kumara Swamy, M.; Pokharen, N.; Dahal, S.; Anuradha, M. Phytochemical and antimicrobial studies of leaf extract of Euphorbia neriifolia. J. Med. Plants Res., 2011; 5: 5785–5788.
45. Sumathi, S.; Hamsa, D.; Dharani, B.; Sivaprabha, J.; Malathy, N.; Radha, P.; Padma, P.R. Isolation and characterization of chitin from prawn shell waste and incorporation into medical textiles. Int. J. Recent Sci. Res., 2012; 3: 676–680.
46. Yan, S.-L.; Li, Y.-H.; Chen, X.-Q.; Liu, D.; Chen, C.-H.; Li, R.-T. Diterpenes from the stem bark of Euphorbia neriifolia and their in vitro anti-HIV activity. Phytochemistry, 2018; 145: 40–47.
47. Li, J.; Feng, X.; Liu, D.; Zhang, Z.; Chen, X.; Li, R.; Li, H. Diterpenoids from Euphorbia neriifolia and Their Related Anti-HIV and Cytotoxic Activity. Chem. Biodivers, 2019; 16: e1900495.
48. Sultana, A.; Hossain, J.; Kuddus, R.; Rashid, M.A.; Zahan, M.S.; Mitra, S.; Roy, A.; Alam, S.; Sarker, M.R.; Mohamed, I.N. Ethnobotanical Uses, Phytochemistry, Toxicology, and Pharmacological Properties of Euphorbia neriifolia Linn. against Infectious Diseases: A Comprehensive Review. Molecules, 2022; 27: 4374.
49. Chang, F.R.; Yen, C.T.; Ei-Shazly, M.; Lin, W.H.; Yen, M.H.; Lin, K.H.; Wu, Y.C. Anti-human coronavirus (anti-HCoV) triterpenoids from the leaves of Euphorbia neriifolia. Nat. Prod. Commun, 2012; 7: 1415–1417.
50. Sawale, J.A.; Patel, J.R.; Kori, M.L. Evaluation of anti-asthmatic property of Euphorbia neriifolia. Asian J. Biomat. Res., 2017; 3: 39–48.
51. Qi, W.; Xia, C.; An, R.; Gao, X.; Li, D.; Xu, H. Suppressive effects of lignans from Euphorbia neriifolia L. on esophageal dquamous cancer cell. J. China Pharm. Univ. 2022; 6: 93–98. Sustainability, 2023; 15: 1225 68 of 68.
52. Bigoniya, P.; Rana, A.C. Protective effect of Euphorbia neriifolia saponin fraction on CCl4- induced acute heapatotoxicity. Afr. J. Biotechnol, 2010; 9: 7148–7156.
53. Padala, S.A.; Barsouk, A.; Thandra, K.C.; Saginala, K.; Mohammed, A.; Vakiti, A.; Rawla, P.; Barsouk, A. Epidemiology of Renal Cell Carcinoma. World J. Oncol, 2020; 11: 79–87.
54. Govindrao, A.G.; Vithalrao, N.A.; VenkatRao, P.U.; Pramodrao, A.M. Anticancer Activity of Upavisha Snuhi: A Comprehensive Update. J. Pharm. Sci. Innov, 2020; 9: 162–166.

55. Kasote, D.M.; Katyare, S.S.; Hegde, M.V.; Bae, H. Significance of Antioxidant Potential of Plants and its Relevance to Therapeutic Applications. Int. J. Biol. Sci., 2015; 11: 982–991.
56. Shah, J.J.; Jani, P.M. The shoot apex of Euphorbia neriifolia Linn. Proc. Nat. Inst. Sci. India, 1963; 30: 81–91.
57. Upadhyaya, C.; Sathish, S. A review on Euphorbia neriifolia plant. Int. J. Pharm. Chem. Res., 2017; 3: 149–154.
58. Shamim, S.A.; Fatima, L. Pharmacological actions and therapeutic benefits of thuhar (Euphorbia neriifolia): A review. Pharma Innov. Int. J., 2018; 7: 221–222.
59. Mali, P.Y.; Panchal, S.S. Pharmacognostical and Physico-chemical Standardization of Euphorbia neriifolia Leaves. Pharmacogn. J., 2017; 9: 696–705.
60. Shah, J.J.; Jani, P.M. The shoot apex of Euphorbia neriifolia Linn. Proc. Nat. Inst. Sci. India, 1963; 30: 81–91.
61. Sharma, D.K. Bioprospecting for Drug Research and functional foods for the prevention of diseases- Role of flavonoids in drug development. J. Sci. Indust. Res., 2006; 65: 391–401. Sustainability, 2023; 15: 1225 63 of 68.
62. Rudall, P.J. Laticifers in Euphorbiaceae-a conspectus. Bot. J. Linn. Soc., 1987; 94: 143–163.
63. Mallavadhani, U.V.; Satyanarayana, K.V.S.; Mahapatra, A.; Sudhakar, A.V.S.; Narasimhan, K.; Pandey, D.K.; Thirunavokkarasu, M. Development of Diagnostic Microscopic and Chemical Markers of Some Euphorbia Latexes. J. Integr. Plant Biol., 2006; 48: 1115–1121.
64. Pullaiah, T. Medicinal Plants of India; Department of Botany, Sri Krishnsdevaraya University: Anantapur, India, 2002; 1: 245–246.