IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

"Calotropis gigantea—From Traditional Wisdom to Modern Therapeutics: A Holistic Review of Its Phytochemical and Pharmacological Potential"

Miss. Sanika B Lonkar[1] , prof. Aditya S Kakad[2] , Dr. Swati P Deshmukh[3]

[1]Student ,of shraddha institute of pharmacy ,Washim

[2]Prof Department of Pharmaceutics, Shraddha Institute of Pharmacy, Washim

[3]Principal , Department of Pharmacology, Shraddha Institute of Pharmacy, Washim

Corresponding Author :-

Miss, Sanika Baliram Lonkar

Email ID:- sanikalonkar04@gmail.com

Student, Shraddha Institute of Pharmacy Kondala Zamre Washim 444505

Abstract:

Calotropis gigantea Linn is a well-known medicinal plant often called milk weed. It has been used for a long time in the Unani, Ayurveda, and Siddha systems of medicine. This plant is native to India, China, and Malaysia, but it can be found almost everywhere around the world. Every part of the plant has been used for medicinal purposes and plays an important role in several Unani medicines used to treat various health issues. In traditional Unani writings, it is said to have many helpful properties, such as helping to get rid of worms, increasing appetite, reducing gas, tightening tissues, strengthening the body, helping to clear mucus, causing vomiting, making the body sweat, reducing inflammation, calming the mind, helping wounds to heal, acting as an antidote, and aiding digestion. It is used to treat conditions like asthma, stomach pain, cholera, menstrual issues, and toothache. The plant contains various chemicals like giganteol, alpha and beta calotropenol, beta-amyrin, and other substances. Calotropis gigantea has been found to have several health benefits, including helping with asthma, acting as an antioxidant, killing bacteria and viruses, helping wounds to heal, reducing inflammation, treating diarrhea, protecting the liver,

and lowering blood sugar levels.The latex, leaves, flowers, bark, and roots of this plant are used as remedies for treating various health issues.

Keywords:

Calotropis gingantea , phytochemical , pharmocological Activity , phytochemistry.

Introduction:

Plants that have healing abilities or provide useful health benefits to the body are called “Medicinal Plants”. It has been found that plants which naturally create and collect certain special chemicals, such a s alkaloids, glycosides, tannins, volatile oils, and also contain minerals and nutrients, have the ability to help in healing.In ancient Ayurvedic medicine, the plant Calotropis gigantea is known as “Sweta Arka” and Calotropis procera is known as “Raktha Arka”. In this study, we focus on Calotropis gigantea. Calotropis gigantea is a flowering plant that belongs to the Asclepidaceae family. It is also known by other names such as Akada, Aak, Mandar, Aakh, etc. Calotropis gigantea is a common weed found in dry areas and is also known as giant milkweed. This plant is native to countries like India, Bangladesh, Myanmar, China, Indonesia, Malaysia, Pakistan, the Philippines, Thailand, and Sri Lanka. It has ovalshaped, light green leaves, a milky stem, and clusters of waxy flowers that are either white or lavender in color. C. gigantea is often found in India and is used for various medicinal purposes in traditional medicine. Recently, it has been scientifically studied for several medicinal properties.

Fig 1. calotropis gingantea

The flowers have been found to have painrelieving and antimicrobial properties, as well as being toxic to some cells.

The leaves and other parts of the plant have been reported for their ability to treat diarrhea, fight fungal infections, kill bacteria, and act as antioxidants. The roots have been found to have fever-reducing effects, celltoxicity, antimicrobial effects, insect-killing properties, wound-healing abilities, effects on the central nervous system, and the ability to block certain chemicals. The plant’s latex has been reported to have laxative effects, help in blood clotting, aid in wound healing, and kill microbes. The stem has been found to have harmful effects on the liver.

This review aims to provide a general overview of the medicine and biomolecular properties of C. gigantea and tohighlight future
research opportunities for developing effective therapeutic compound Keywords:

Common name:

In English: Calotropis, calotrope, giant milkweed.

In Hindi: akada, madar, aak, akdo.

In French: algodón de seda, pomme de Sodome, arbre à soie du Sénégal, arbre à soie, cotonsoie.

Botanical Description:

Taxonomical classification ;

Table 1. classification of Calotropis Gigantea Linn.

Kingdom	Plantea
Order	Gentianales
Family’	Asclepiapiadideae
Subfamily	Asclepiadoiae
Genus	Calotropis
Species	Gingantea

Morphology:

Root:

Simple , branched, woody at the base and covered with a cracked, corky bark; branches are somewhat pleasant and thickly covered with white, fuz zy hairs; they become smooth and shiny quickly when young.

All parts of the plant release white sticky sap when cut or broken.

Leaves:

Opposite and arranged in a cross shape, straight, almost without a stalk, and without leaf sheaths; leaf shape is oval to broadly oval, measuring 5–30 cm long by 2.515.5 cm wide; tip is sharply pointed and ends in a small tip; base is heartshaped; edges are smooth, pleasant, and covered with white fuzzy hairs when young, but later become smooth and shiny.

Fruit:

A single, fat, swollen, nearly round or slightly egg-shaped pod that can grow up to 10 cm or more in size

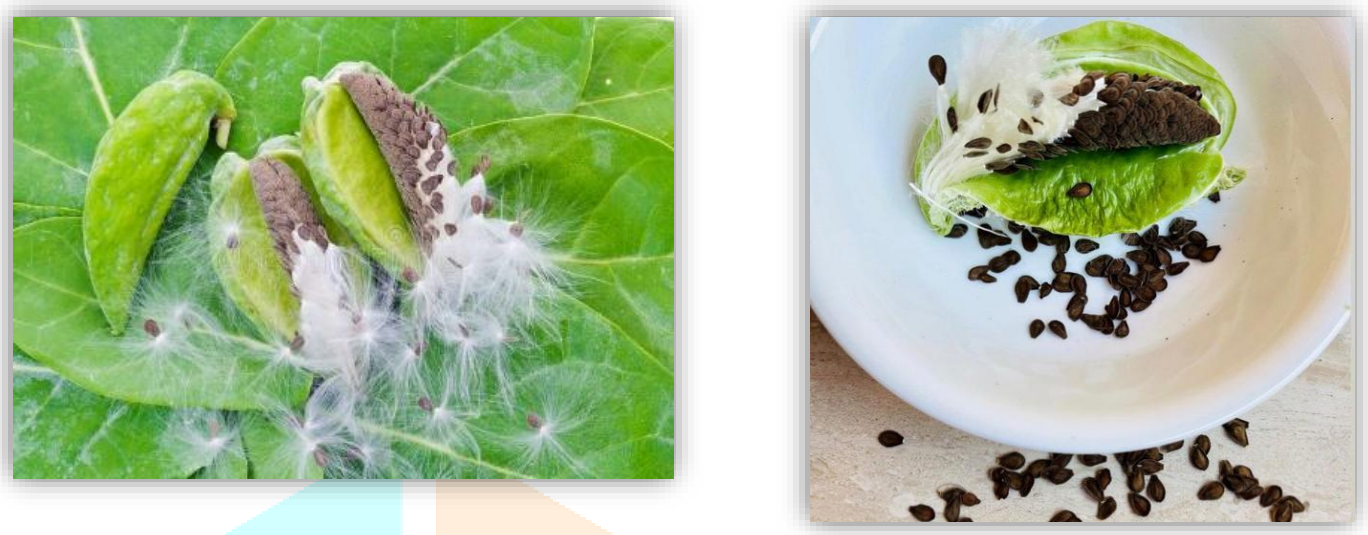

Fig 2 :Calotropis fruils are ellipsoid or ovoid, containing 350-500 seeds with tufts of white, silk Hair or pappus

Seeds:

Numerous, small, flat, and oval-shaped, measuring 6 x
5 mm, packed together with silky white hair-like structures at least 3 cm long.

Flowers:

Have leaf-like bracts, are complete, have both male and female parts, are showy, have five parts, with the female part at the bottom, have a small stalk, and the stalk is 1–3 cm long.

Calyx:

Has five sepals that are separate, five lobed, joined at the base, become smooth, and are arranged in a pattern like a square.

Androecium:

Has five stamens that are fused together, with two-chambered anthers that are healthy.

Inflorescence:

A thick, many-flowered cluster that looks like an umbrella, with a stalk, growing from the main stem and appearing either near the leaf axils or at the end of the stem.

Gynoecium:

Has two carpels that are separate, with styles that join at the top, and a broad, flat surface with five parallel sticky areas.

The anthers are attached to the base of the carpels, forminga structure called a gynostegum

MACROSCOPICAL CHARACTERISTICS:

Macroscopic features of different parts of Calotropis are described as follows:

Root

The root is complete.

The bark separates from the wood, with a thickness of 0.5–2.0 cm. It has rootlets with a diameter between 0.2 and 0.5 cm. The outside is pale grey and has wrinkles when fresh. When cut or injured, it produces a lot of white latex. The fracture is not complete.

Leaf

The leaves are simple, opposite, slightly attached to the stem, thick, fleshy, and leathery. They are 10–15 cm long and 4.5–6.5 cm wide. The shape is broad at the base, slightly heartshaped, and has a pointed tip. The underside near the point where the leaf joins the stem has short, simple hairs. Young leaves are covered with a greyish coating. Mature leaves are smooth or almost hairless and have a light green color.

Evaluation of antimicrobial activity of Calotropis gigantea extracts on two main skin infection causing bacteria-Escherichia Coli and Staphylococcus aureus. IJFANS International Journal of Food and Nutritional Sciences.

The flowers are regular, bisexual, and have colors such as lilac, pale pink, purple, or light greenish yellow.

They emit a faint smell. They are arranged in simple or rarely compound cymelike clusters at the ends of peduncles that grow from alternate sides of the stem. Each group is surrounded by small, pointed, scalelike leaves that fall off. The flower buds are oval-shaped.

Calyx

The calyx has five broad, ovate lobes with small, fleshy glands at the base.

Corolla

The corolla is regular, fused, and has a color of pale pink or lilac.

It is shaped like a broad bell with a short neck and five wide, oval or lanceshaped lobes that spread outward.

Stamens

There are five stamens, attached at the base of the corolla.The filaments are joined together to form a column. This column has five notice able, radiating, crown-like structures that are fully attached but slightly shorter than the column. The structures are fleshy and pale purple or yellowish white. They are flat on the sides and have a curved, hollow spur at the base and two short, curved, blunt cuticles towards the top, just below the tip. The anthers are short and broad, with wide triangular, thin membranes that are bent over the sides of the stigma.

Root bark

The main roots have a rounded top and the rest of
the root spirals.These hard roots are greyish white in color and release sap when

the bark is cut. The bark of older roots is cracked in some places. The outer part of the bark is yellowish grey, while the inside is yellowish white. The top layer is spongy and rough, while the inner part is smooth and sticky. When dried, the bark has a bitter taste.

Geographical Distribution:

Gigantea Linn belongs to the family Asclepiadaceae,which has 180 genera and about. 2,200 species.These plants are mainly found in tropical and subtropical areas around the world. The plant is originally from the Afro-Asiatic monsoon regions and has spread to Northwest Africa, including Mauritania and Senegal, through the Arabian Peninsula. It grows most commonly in the sub-Himalayan regions and from the Deccan to Kanyakumari, as well as in Bangladesh, Burma, and Pakistan.It also appears in subtropical America, the Mascarene Islands, and the drier parts of Australia. Its natural cultivation takes place from the sea.

Traditional uses:

Ayurvedic uses:

The parts of the plant used in Ayurvedic medicine are the leaves, either fresh or dried, the roots and root bark,and the

flowers.The powdered leaves are used for quick healing of wounds, as a purgative, and to treat indigestion. They are also used for skin issues and problems with the liver. The dried leaves are used to improve sexual health, including issues like penile dysfunction, and are thought to act as an aphrodisiac. Hot poultices made from the leaves are applied to the stomach to ease pain, stop headaches, and also help with sprains by reducing swelling and pain. The flowers are used in a milk drink to treat many health issues like coughs, colds, asthma, indigestion, and cholera. They are collected from September to February and are also used in a paste form to treat piles.

The plant is also used in folk medicines.

Traditionally, it has been used as an antifungal, an antipyretic, and an analgesic. The dried leaves act as an expectorant and have anti-inflammatory properties, helping with paralysis and rheumatic pains. The dried latex and root are used a s an antidote for snake bites. It is also used as an abortifacient, for treating piles, and forintestinal worms. The tender leaves are used to treat migraines. The powdered root bark in capsule for m is effective against diarrhea and asthma.

Siddha:

The leaves of C. gigantea are used to treat ulcers, intestinal worms, vatha diseases, periodic fever, and poisonous snake bites. Root of this plant are crushed well and applied well by rubbing hard over the bitten area. Latex of this plant is used to alleviate dental difficulties, rat bite, swellings, gonococcal arthritis and other rheumatic ailments. Flowers are used to cure bronchial.

Phytochemistry:

Benzoylinesolone and benzoylisolinelone are found in the root bark, while proceragenin and cardioid are found in the plants. Calotropin and calotropagenin are found in the leaves and stem, whereas calotropenyl acetate, multifl avenol, uzarigenin, and terpenol ester are found in the flower . Triterpenoids such as calotropursenyl acetate and calopfriedelenyl, a norditerpenyl ester, calotropternyl ester, oleanene triterpenes like calotropoleanyl ester, procerleanol A and B, and cardiac glycosides such as calotogenin, calotropin, uscharin, calotoxin, and calactin have been found in this plant through chemical analysis. Additionally, the existence of cardenolides and anthocyanins in the plant has been studied. An examination of the roots' phytochemistry of Procera Calotropis Along with the well-known substances N-dotriacont-6-ene, glyceryl mono-oleolyl-2-phosphate, methyl myrisate, methyl behenate, and glyceryl-1, 2-dicapriate-3-phosphate, Linn produces two new phytoconstituents: procerursenyl acetate and proceranol. Based on spectrum data analysis and chemical reactions, the new compounds' structures have been determined to be urs-18 alpha-II-12, 20 (30)-diene-3 beta-yl acetate, and n-triacontan-10 beta-ol. A-amyrin, β-amyrin, lupeol, β-sitosterol, and flavanols such as quercetin-3-rutinoside have also been discovered to be present in the root bark. The main active ingredient in the leaves is mudarine, which is

also present in resin, a bitter yellow acid, and three deadly glycosides called calotoxin, uscharin, and calotropin.

Pharmocological Activity:

Anti-diarrhoeal activity

The anti-diarrheal effect of a hydroalcoholic (50:50) extract from the aerial parts of Calotropis gigantea was studied using a castor oil-induced diarrhea model in rats.

The rate of gastrointestinal movement was measured as the percentage of the longest distance traveled by charcoal divided by the total length of the small intestine. The weight and volume of intestinal contents caused by castor oil were studied using the enteropooling method.

Antipyretic activity

The roots of Calotropis gigantea have been traditionally used in Indian medicine for conditions like leprosy, eczema, syphilis, elephantiasis, ulceration, and cough.

The current study tested the antipyretic effect of this plant by using a TAB (Typhoid) vaccine-induced fever model in rats and rabbits. In both yeast-induced and TAB vaccine-induced fever, a significant reduction in fever and normalization of body temperature were observed when the extract was given at doses of 200 and 400 mg/kg intraperitoneally.

CNS activity

An alcoholic extract of peeled roots of Calotropis gigantea was tested orally in albino rats at doses of 250 and 500 mg/kg for central nervous system (CNS) activity.

Strong analgesic effects were seen in Eddy's hot plate and acetic acid-induced writhing tests. The time rats took to lick their paws was delayed, and the number of writhing movements was greatly reduced. The extract also showed anticonvulsant effects as it delayed the onset and reduced the severity of pentylenetetrazole-induced convulsions. Additionally, the extract-treated rats spent more time in the open arm of the elevated plus maze (EPM), showing anxiolytic activity.

Analgesic activity

The alcoholic extract of the flowers of Calotropis gigantea was given orally to mice and tested for analgesic activity using chemical and thermal models.

In the acetic acid-induced writhing test, a 20.97% and 43.0% inhibition in the number of writhes was observed at doses of 250 and 500 mg/kg, respectively. In the hot plate test, the time taken to lick the paw was delayed. The analgesic effect was noticed after 30 minutes of dose administration, peaking after 90 minutes.

Anti-inflammatory activity

The anti-inflammatory effect of the extract was studied using models like carrageenin- and kaolin-induced rat paw edema for acute inflammation, and cotton pellet granuloma and adjuvant-induced arthritis models for chronic inflammation.

Antipyretic activity was tested using the yeast-induced pyrexia method. The phenylquinone-induced writhing method in mice was used for analgesic activity. The test compounds showed varying levels of anti-inflammatory activity, with peak effects observed at 2 hours. The alkaloid fraction had comparatively high initial anti-inflammatory activity. The residual anti-inflammatory effect of the alkaloid fraction of Calotropis gigantea suggests that it may influence the malic enzyme of the filarial worm Setaria digitata.

Hepatoprotective activity

The methanolic extract of Calotropis gigantea leaves showed good hepatoprotective activity in a dose-dependent manner against carbon tetrachloride (CCl4)-induced liver toxicity in rats.

Antitussive activity

Leaf extract showed antitussive (cough-suppressing) activity because of the presence of alkaloids and glycosides.

Herbal Soap preparation:

Collection of Plant Material

Fresh leaves or flowers from the Calotropis gigantea plant are gathered and cleaned properly.

Preparation of Extract

The collected plant parts are crushed and boiled in water for 10 to 15 minutes.
After boiling, the liquid is filtered and set aside.

Soap Base Preparation

A sodium hydroxide (NaOH) solution is made by mixing NaOH with distilled water, and it is let to cool down.
Coconut oil and castor oil are used as the base for the soap.

Mixing

The cooled NaOH solution is carefully poured into the oil mixture while stirring constantly.
Once mixed, the Calotropis gigantea extract is added, and any optional fragrance or color can be included at this stage.

Molding and Curing

The combined mixture is poured into molds and left to harden for 24 to 48 hours.
Once it has solidified, the soap bars are taken out and placed to cure for approximately 10 to 15days.

Methods:

Fresh and fully grown leaves from the C. procera plant were collected and cleaned thoroughly with running tap water followed by distilled water. The leaves were then dried in a hot air oven at 40°C. Once dry, the leaves were ground into a fine powder using a mechanical grinder. The powdered material was then extracted with distilled water using a Soxhlet extractor. The extracts were then concentrated at 40°C under reduced pressure (72 mbar) using a rotary evaporator and dried further with a lyophilizer. The dried extract was stored in an airtight container at 4°C for future use.

Extraction

The fresh leaves and stems were first washed with tap water to remove any dirt or unwanted substances.

The leaves were then dried in the shade and ground into a powder, which was stored in a clean zip-lock plastic bag for later use. To extract the chemicals from the powdered leaves and stems,

The percolation method was used, specifically the Soxhlet extraction technique. The powdered sample was placed in two separate thimbles of the Soxhlet apparatus. The round-bottom flask was filled two-thirds with hexane and connected to the extractor. The solvent was then heated to around 40 degrees Celsius, and the extraction process was allowed to run for about an hour. After this, the solvent containing the extract was concentrated using a rotary evaporator at 40 degrees Celsius. The resulting hexane extract was then dried using a heat source and stored properl future use. A methanol extract was also prepared in a similar way, with the solvent being heated to
Approximately 70 degrees Celsi

Traditional uses:

In Ayurveda

The leaves of C. gigantea are used to treat paralysis, swellings, and intermittent fevers.
The flowers help with asthma, catarrh, loss of appetite, worm infections, inflammation, and fever.
The root bark is used for skin infections, intestinal worms, worm infections, cough, and fluid buildup in the abdomen.
Powder made from the roots helps with asthma, bronchitis, and digestive issues, and it also increases stomach secretions.

In Siddha
The leaves of C. gigantea are used to treat snake bites, repeated fever, vatha-related diseases, intestinal worms, and ulcers.
The root is crushed and rubbed firmly on the bitten area.
The l
atex from the plant helps with dental problems, rat bites, swellings, gonococcal arthritis, and other joint pains.
The flowers are used to treat bronchial asthma.

Results and discussion:
Extractive value of Calotropis gigantea by Soxhlet method

Sequential extraction of Calotropis gigantea was done using hexane, chloroform, ethyl acetate, and ethanol, based on the polarity of the solvents.The percentage yield was found to be as follows:

Table 2. Pereentage yield of different extracts of Argemone mexicana and calotropis Gigantea

Sr no	Extract	Extractive value(%) of Calotropis Gigantea	
1	Hexane	12%	
2	Chloroform	14%	
3	Ethyl acetate	10%	
4	Ethanol	16%	

Conclusion:

In recent years, ethnomedicinal studies have gained a lot of attention because they highlight many little-known and unknown healing qualities, especially from plants.Research on C. gigantea has shown its potential as a medicine and shows it to be a useful plant with many health benefits. As scientists look for new medicines from natural sources, making modern medicines from C. gigantea could help treat various diseases. It is important to carry out thorough research and development to protect C. gigantea and create products that improve its economic value.

References:

1. Deshmukh, P. T., Fernandes, J., Atul, A., & Toppo, E. (2009). Wound healing activity of Calotropis gigantea root bark in rats. Journal of ethnopharmacology, 125(1), 178-181.

2. Kumar, S., Dewan, S., Sangraula, H., & Kumar, V. L. (2001). Anti-diarrhoeal activity of the latex of Calotropis procera. Journal of Ethnopharmacology, 76(1), 115-118.

3. Kumar, H., Sharma, S., & Vasudeva, N. (2021). Pharmacological profile of Calotropis gigantea in various diseases: A profound look. Int J Creat Res Thoughts, 9(2), 2987-96.

.

4. Pradeepkumar, P., Govindaraj, D., Jeyaraj, M., Munusamy, M. A., & Rajan, M. (2017). Assembling of multifunctional latex-based hybrid nanocarriers from Calotropis gigantea for sustained (doxorubicin) DOX releases. Biomedicine & Pharmacotherapy, 87, 461-470.

5. Mushir, A., Jahan, N., & Ahmed, A. (2016). A review on phytochemical and biological properties of Calotropis gigantea (Linn.) R. Br. Discovery Phytomedicine, 3(3), 15.
6. Bairagi, S. M., Ghule, P., & Gilhotra, R. (2018). Pharmacology of Natural Products: An recent approach on Calotropis gigantea .

7. Meena, A. K., Yadav, A., & Rao, M. M. (2011). Ayurvedic uses and pharmacological activities of Calotropis procera Linn. Asian journal of traditional medicines, 6(2), 45-53.

8. Raut, G. V., Kohale, T. S., Burange, P. J., Chaudhary, P. H., & Ruikar, D. B. (2024). Development and evaluation of tablet formulation from Calotropis gigantea Linn (leaf extract).

9. Garba, I. (2012). Phytochemical and antibacterial properties of Calotropis procera (Ait) R. Br.(Sodom Apple) fruit and bark extracts. International Journal of Modern Botany.

10. Adebayo, O. R., Efunwole, O. O., Raimi, M. M., Oyekanmi, A. M., & Onaolapo, I. O. (2015). Proximate, mineral element, antibacterial activity and phytochemical screening of Bomubomu leaves (Calotropis procera). Int. J. Contemp. Appl. Sci, 2(9).

11. Adebayo, O. R., Efunwole, O. O., Raimi, M. M., Oyekanmi, A. M., & Onaolapo, I. O. (2015). Proximate, mineral element, antibacterial activity and phytochemical screening of Bomubomu leaves (Calotropis procera). Int. J. Contemp. Appl. Sci, 2(9).

12. Patel, S. H. W. E. T. A., Dubey, A. N. U. B. H. A. V., Kumar, G. A., & Sekhar Ghosh, N. (2023). Evaluation of antimicrobial activity of Calotropis gigantea extracts on two main skin infection causing bacteria-Escherichia Coli and Staphylococcus aureus. IJFANS International Journal of Food and Nutritional Sciences, 12(1), 145-156.

13. Sharma, R., Thakur, G. S., Sanodiya, B. S., Savita, A., Pandey, M., Sharma, A., & Bisen, P. S. (2012). Therapeutic potential of Calotropis procera: A giant milkweed. ISOR J Pharm Bio Sci, 4(2), 42-57.

14. Mathur, R., Gupta, S. K., Mathur, S. R., & Velpandian, T. (2009). Anti-tumor studies with extracts of Calotropis procera (Ait.) R. Br. Root employing Hep2 cells and their possible mechanism of action. Indian journal of experimental biology, 47(5), 343.

15. Sharma, V. D., Mishra, R. K., Dhanraj, C. B., Verma, S., Yadav, M. K., Marde, R., … & Pandey15, P. Calotropis gingantea Significant Role in Dogs Bite.

16. RAMAMURTHY, J. (2020). Evaluation of Cytotoxic Activity of Calotropis Gigantea Mouthwash-An In Vitro Study. International Journal of Pharmaceutical Research (09752366.

17. Nalwaya, N., Pokharna, G., Deb, L., & Jain, N. K. (2009). Wound healing activity of latex of Calotropis gigantea. Int J Pharm Pharm Sci, 1(1), 176-181.

18. Yogi, B., Gupta, S. K., & Mishra, A. (2016). Calotropis procera (Madar): A medicinal plant of various therapeutic uses–A review. Bull. Env. Pharmacol. Life Sci, 5(7), 74-81.

19. Yesmin, M. N., Uddin, S. N., Mubassara, S., & Akond, M. A. (2008). Antioxidant and antibacterial activities of Calotropis procera Linn. American-Eurasian Journal of Agricultural & Environmental Sciences, 4(5), 550-553.

20. Ningsih, D. S., Celik, I., Abas, A. H., Bachtiar, B. M., Kemala, P., Idroes, G. M., & Maulydia, N. B. (2023). A Review of the Ethno-dentistry Activities of Calotropis gigantea. Malacca Pharmaceutics, 1(1), 8-15.

21. Dutta, T., & Deepak, D. In Situ and In Vitro Pharmacognostic Study of Calotropis gingantea

22. Tossou, M. L., Ballogou, V. Y., Maina, J., & Gicheha, M. (2018). Effect of Calotropis procera on the proximate composition and potential toxicity of Wagashi (traditional cheese) in Benin. Food Sci Qual Manag, 74, 30-6.