

## Review on *Calotropis Gigantea* as a Topically used Plant

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### ABSTRACT

There have been numerous reports of the Asclepiadaceae plant, *Calotropis gigantea* R.Br, having medicinal and other uses. Plants have been employed as a source of medicinal substances since ancient times. In the indigenous system of medicine, plants are used extensively to treat disease. Traditional medicine makes use of various plant extracts or bioactive substances. This kind of research offers health at a reasonable price. The findings imply that the stem, leaves, and flower's phytochemical qualities can be used to treat a variety of diseases. The nation that produces the most medicinal herbs is India, which is fittingly known as the world's botanical garden. *Calotropis gigantea*, a member of the Asclepiadaceae/Apocynaceae family, is also referred to as the Crown Flower and has unique therapeutic properties that can be used alone or in conjunction with other medications to treat common disorders. Herbal medicines have a very wide range of medicinal applications. In ayurveda, the entire dried plant is used as a mucus expulsor, parasitic worm expeller, and rejuvenator. Leprosy and asthma are treated with its dried root, while vertigo, baldness, hair loss, and rheumatoid arthritis are all treated with its latex. *Calotropis* is employed for a variety of conventional and homoeopathic treatments. The plant's many parts can be separated and used as medicine to get a variety of benefits.

**Keywords:** *Calotropis gigantea*, milkweed, pharmacological action, medicinal uses, traditional medicine

### INTRODUCTION

*Calotropis* is a member of the Apocynaceae family, also referred to as milkweed or Aak. As a result of the many plant parts secreting white and sticky latex, this genus of plants is also known as milkweed. It is one of the few plants that are resistant to grazing creatures [1]. The bark is corky, thick, and rough. a yellow-brown tint; the twigs are meaty, green, and may be covered in tomentum (a white fur-like coating hairs). *Calotropis gigantea*'s stem contains a source of natural cellulosic

fibres that include the commercially beneficial characteristics like cellulose technique had no discernible impact on the shape of the fibers[2] Despite being a typical plant found in wastelands, *C. gigantea* has many uses in traditional medicine. Furthermore, its extraordinary medicinal capabilities have received scientific recognition. [3] India, a tropical nation, benefits from abundant natural resources and old wisdom that can be used wisely.[4] When compared to the rest of the world, the medicinal plant is utilised as

a source of significant environmental and ecological diversity.[5] Governments and corporate sectors are increasingly prioritising sustainable development as a result of rising environmental awareness. Numerous academic studies examine novel approaches to developing eco-friendly and sustainable materials for a

range of uses in the building, automotive, and aerospace industries. Natural fibres are a sustainable resource in many of the world's developing nations. Natural fiber-reinforced composite materials are becoming increasingly popular in both basic and applied research [6, 7].



*Fig. 1: Calotropis gigantean.*

#### COMMON NAMES

English: Bowstring hemp, Calotrope, Crown Flower, Crown Plant, Gaint Indian Milk Weed

Hindi: Safed Aak, Aak, Sveta Arka, Akanda, Bara Akand,

Alarkh, Madar

Marathi: Mandar rui, Mandara

Gujrati: Aakando

Manipuri: Angkot

Kannada: Ekka

Tamil: Erukku

Sanskrit: Svetarka

Telungu: Jiledi puvvu

Afghani: Spalwakka

Indonesia: Bidhuri (Madurese, Sundanese), Rubik (Aceh), Sidaguri (Javanese)

Philippines: Kapal – Kapal (Tagalog)

French: Faux arbre de soie, mercure vegetal

Gambia: Fouftan

Sindhi: Aak

Burmese: Mayopin, Mehobin

Arabic: Osher, ochar, usher

Malayalam: Bukam

Kumaon: Ak

Thailand: Po thuean, paan thuean (Northern), Rak (Central)

Urdu: Aak

Uriya: Orko, Arakka

#### MORPHOLOGY[8]

##### Root

Simple, branching, woody at the base, and coated in a fissured, corky bark. Branches are fairly appetising and heavily covered in white tomentose. When cut or snapped, the entire plant exudes white latex.

##### Leaves

opposite-decussate, simple, subsessile, exstipulate; edge oval to fully obovate, 5-30X 2.5-15.5 cm; base cordate; margins entire, exquisite; white tomentose when young; later glabrescent and glaucouse.

**Fruit**

A basic, swollen, subglobose to laterally ovoid follicle with a diameter of at least 10 cm.

**Flowers**

Pedicellate, pedicel 1-3 cm long, actionmorphic, pentamerous, complete, sexually impartial, bracteate.

**Seeds**

There are numerous, tiny, flat, obovate, 6 mm by 5 mm seeds that are 3 cm or longer and covered in silky white pappus. There are numerous, tiny, flat, obovate, 6 mm by 5 mm seeds that are 3 cm or longer and covered in silky white pappus.

**Calyx**

Five sepals, polysepalous, five lobes, united at the base in a split second, glabrous, quincuncial aestivation. Five gynandrous stamens, a sound ditheous anther, and an androecium.

**Inflorescence**

The inflorescence is composed of thick, many-bloomed, umbellate, peduncled cymes that appear to be axillary or terminal and emerge from the hubs.

**Gynoecium**

The term "gynoecium" Bicarpellary, apocarpous, united at the top styles have five parallel stigmatic surfaces and peltate disgrace. Anthers are connected to the embarrassment of a gynostegium.

**GEOGRAPHICAL SOURCE**

Originating in India, China, and Malaysia, it is now widely available almost everywhere, with lower Bengal, the Himalayas, Punjab, Assam, Madras, and South India accounting for the majority of its distribution in India. Common from Punjab to Assam in the Himalayas climbing to a height of around 1000 m. The plant first appears in the Afro-Asiatic

monsoon regions, from where it moved to Northwest Africa (Mauritania and Senegal), across the Arabian Peninsula, and to Kanyakumari, Bangladesh, Burma, and Pakistan. The plant is most frequently found in the sub-Himalayan regions. Additionally, it demonstrates that there are blooms in Australia's drier regions, the Mascarene Islands, and subtropical America. Its natural cultivation takes place in semi-arid settings between sea level and 1300 m, where the annual rainfall ranges between 150 and 1000 mm. The plant can resist a wide range of soil textures and environmental climate variations and thrives in sandy, overdrained soils and abandoned land. It does well with salty soil, dryness, heat, and salt spray from the sea. It is quite flexible. [9]

**PHARMACOLOGICAL ACTION****Anti-Inflammatory Activity**

The ethanolic extract of *Calotropis gigantea* was detected by Jagtap VA et al in 2010, demonstrating that this plant largely inhibits the release of inflammatory mediators. However, animal studies and other research are necessary to identify and separate the active elements liable to produce activity against inflammatory as well as to elucidate its anti-inflammatory action mechanism or mechanisms. [10]

**Antimicrobial Activity**

The petroleum ether, trichloromethane, and ethyl acetate fractions of a methanol extract from the root bark of *Calotropis gigantea* were found to have antibacterial activity, according to Alma et al. in 2008. It was established that *Sarcina lutea*, *B. megaterium*, and *P. aeruginosa* are susceptible to the chloroform portion of the methanol extract's antibacterial effect. While ethyl acetate fraction was effective against *P. aeruginosa* and *E. coli*, petroleum ether fraction was effective against *B. subtilis* and *Shigella sonnei*. [11]

**Analgesic Activity**

Rats exposed to chemical and thermal treatments by Biswasroy et al. in 2020 and Singh et al. in 2014 responded favourably to an ethanol extract of *Calotropis gigantea* flower and bark. In 2020, Biswasroy et al. evaluated the anxiolytic activity for 90 minutes using the hot plate method and an in-vivo ethanoic acid-induced convulsing test. Orally administered doses of 250 and 500mg/kg of CG flower resulted in analgesia of 20.97% and 43%, respectively. [12,13]

**Hepatoprotective**

*Calotropis gigantea* leaf extract has a good dose-dependent hepatoprotective effect in rats exposed to CCl<sub>4</sub>-induced hepatotoxicity [Tenpe CR in 2007]. [14] In 2020, Biswasroy *et al.* found that giving an animal an ethanol extract significantly decreased the serum enzyme levels. The investigation used in-vitro paracetamol-induced hepatotoxicity. [15]

**Treating Covid – 19**

With the increasing use of HTS and molecular docking modelling, Mycal Dutta et al. identified a new era in the field of drug discovery in 2021. Phytochemicals from medicinal plants have been used for treatment since the dawn of civilisation. Drug development has recently taken on a new dimension as a result of sophisticated computer programmes and more effective extraction methods. This study provides significant information for the usage of isolated phytochemicals from *C. gigantea* for the acquisition of COVID-19 by focusing on one of the essential enzymes required for SARS-CoV-2 replication. It might be necessary to conduct more experimental work to demonstrate the molecular activity of the phytochemicals. In addition, a great deal more of these bioactive components from medicinal plants exist in Bangladesh's diverse ecosystem and need more investigation.

The study enabled the development of a plant-based COVID-19 medication, but more research and wet lab testing are required before it can be used to actual patients. [16]

**Hair Growing Activity**

In order to disclose the effects on the beginning and progression of hair growth in albino rats, *Calotropis gigantea* with *Hibiscus rosa sinensis* (HRSF) and polyherbal formulation (HCF) in combination with both plants were used. The findings and observations from the study were contrasted with Minoxidil. *Calotropis gigantea* showed some promise for hair growth, however it was less than other treatments. [17]

**Pregnancy Interceptive Activity**

According to Srivastava SR et al's 2007 study on rats, dissolving the roots of *Calotropis gigantea* in different organic solvents has the effect of interfering with conception. At a dose of 100 mg/kg, the extract demonstrated 100% pregnancy-interceptive effectiveness. The extract was also introduced in the Days 1-5 and 1-7 post coitum regimens and indicated 100% efficacy at a level of 12.5mg/kg.[18] The pregnancy-interceptive effects of *Calotropis gigantea* root extracts in various organic solvents were evaluated [in rats] in a 2014 study by Singh N et al. The extract showed 100% contraceptive effectiveness at a dose of 100 mg/kg. Furthermore, 12.50 mg/kg of the extract administered on days 1 through 5 and 1 through 7 post-coitum showed 100% efficacy. [19]

**CNS Activity and Anticonvulsant Activity**

The oral administration of *Calotropis gigantea*'s peeled roots alcohol extract was examined for CNS exercise in albino rats at doses of 250 and 500 mg/kg bodyweight, according to Argal A et al. in

2006. Both the Eddy's hot plate technique and the acetic acid-induced writhings had a noticeable analgesic effect. Both the writhing output and the paw-licking duration were dramatically reduced. Pentylentetrazol showed exceptional anticonvulsant activity, delaying the start of convulsions and their intensity. Rats given the extract spend longer in the open arm of the EPM, indicating the extract's calming effects. The locomotor system became less active. The fall-off period for motor coordination was also condensed. The extract's sedative properties potentiated the slumber brought on by pentobarbitone. No mortalities were seen up to the dose of 1g/kg. These findings demonstrate the extract's sedative, anticonvulsant, and analgesic properties. [20]

In a 2018 study, Bairagi SM et colleagues used electroshock and strychnine-induced convulsions to investigate the anticonvulsant and sedative properties of *Calotropis gigantea* ethanolic extracts. Animals treated with the extract experienced a considerable reduction in the number of convulsions brought on by electroshock, however the strychnine convulsion model was unaffected. Additionally, the extracts showed pronounced muscular relaxation and impairment in motor coordination. [21]

#### **Anti - Asthmatic Activity**

The *Calotropis gigantea* exhibits anti-asthmatic characteristics in ova albumin [OVA]-induced asthma, according to Ansari Mushir et al. in 2016. The effects of *Calotropis gigantea* on various body corpuscles, catalysts, and histological changes were seen at doses of 100, 200, and 400mg/kg. In light of this, plant concentrate may be effective in the management of asthma. *Calotropis gigantea* inhibited eosinophil, neutrophil, erythrocyte, and total leukocyte counts in

mucous fluid significantly [ $p=0.05$ ] at 200 and 400 mg/kg. These results suggest that a plant's antioxidant, anti-lipoxygenase, and anti-inflammatory capabilities may make it a potentially effective therapeutic agent for the treatment of asthma. [22]

#### **Procoagulant Activity**

In 2010, Singh N, Jain NK, et al. said that it is well known that the latex of the *Calotropis gigantea* possesses potent anticoagulant activities. The crude latex extract's very basic proteins have strong proteolytic activity. After a protracted incubation period or at high polypeptide concentrations, the more resistant gamma subunit is hydrolyzed. The plant extract hydrolyzes the crude fibrin clot substantially more powerfully than papain and trypsin compared to other enzymes. The crude remove is also shown to be extravasatic, causing skin haemorrhage at around >75 microns and stimulating blood coagulation. [23]

According to research done in 2017 by Mishra P et al, a clot is generated by human fibrinogen, crude fibrin, and latex hydrolyzed casein depending on the dosage. [24] Proteins in the latex of *Calotropis gigantea* are what produce the procoagulant action, according to a 2013 study by Joseph B et al. The extract breaks down the fibrinogen subunits; the alpha subunit is hydrolyzed first, then the beta and gamma subunits. [25]

#### **Anti - Venom Activity**

The viper venom (*Vipera russelli*)'s lethality, necrotizing activity, edema, and hemorrhagic activity were tested against the viper's methanolic extract of *Calotropis gigantea*. The deadly effects of 2LD50 and 3LD50 of venom in mice were successfully neutralised by oral administration of extract at 200 and 400 mg/kg (in-vivo neutralisation). 100, 200, and 400 mg/kg of the plant extract were used in in vitro tests to successfully

neutralise 2LD50 and 3LD50 of venom. Additionally, it was shown that necrosis and bleeding could not be efficiently induced. Plant extract had a noticeable antinociceptive effect at doses of 200 and 400 mg/kg. At 60, 120, 180, and 240 minutes, the impact of methanolic extract against edoema brought on by snake venom was investigated. At 240 minutes, plant extract at dose levels of 200 mg/kg and 400 mg/kg had anti-inflammatory action that was both significant and comparable to that of standard antivenom. [26]

### **RELIGIOUS IMPORTANCE**

Lord Shiva treasures the aak or madar tree. According to legend, Ganesh Ji resides in this plant. The plant only appears in two colors—white and black—and is utilised specifically for tantric reasons. It is believed that Ganapati resides in the plant's roots. It is especially helpful if it is properly worshipped and maintained inside the home. After bringing it during an auspicious moment, it is said that one should revere it. While performing adoration, one must recite the Ganapati Mantra. In this manner, Lord Ganesh bestows his blessings upon the devotee. Hinduism holds the belief that some plants are miraculous and contain God's very being.

Hinduism holds that the surrounding vegetation not only provides humans with oxygen and food, but also has a number of extra spiritual and astrological advantages that are vital to the environment's healthy operation. Tulsi, Neem, Peepal, and Banyan are some of these plants' more well-known names. The Hindu faith considers these plants to be sacred and worships them. It is also believed that worshipping Lord Shiva with this plant has many positive effects and brings good fortune. Other names for the plant include Arsh, Mandar, Madar, and Akaua. Some

people think that the Aak plant ought to be placed in front of the house. The plant's presence around the house guarantees that any evil omen or black magic employed against the residents of the house will be resisted. Most often employed in Tantra Vidya, this plant aids in the removal of all tones.

You would obtain 'trisukha,' or all of life's joys, if you regularly worshipped the Ganapati deity that emerged from the root of this plant. The Lord is reported to give particular grace and grant all requests when flowers from this plant are offered as offerings in worship. Offering Aak flowers and leaves to a shivling is often highly lucky. According to the scriptures, it is extremely lucky to grow a sacred aak plant at or in front of your main entryway. It has white flowers, which Lord Shiva loves. This plant is continuously on alert against negative forces and energy. This plant produces oxygen, which helps to clean the air.

### **DESCRIPTION OF PLANT IN UNANI SYSTEM OF MEDICINE**

Dioscorides describes *Calotropis gigantea* in his legendary book "Kitabul-Hashaish" (78 A.D.). [27] It is a thorny tree with broad leaves that secretes a milky material known as "sukr" around the base of the blooms and stem, as well as from other sections of the plant. The timber is fragile and brittle, and the leaves are soft. Many countries of the world use milk to clean leather. [28]

### **MEDICINAL USES**

#### **Medicinal Uses of Leaves**

#### **It helps in bowel movements**

Constipation is relieved with Madar plant formulations.

#### **Improves speed of healing**

*Calotropis gigantea* aids in the faster healing of skin's surface wounds.

### **Good for the skin**

The Aak herb's benefits for skin health assist in itching relief. It can be used to treat a number of skin conditions.

### **Excellent vermifuge**

The leaves of the Arka flower are also useful for treating worm infestations.

### **Cure for boils**

The arka flower's leaves can be used to cure worm infestations.

### **Hypoglycemic effect**

The leaves of the Madar are used to lower the high blood sugar levels.

### **Medicinal uses of Bark:]**

#### **It relieves constipation**

The Arka plant's bark facilitates better bowel movements.

#### **Cure for cholera**

The Arka plant's dried bark is taken and ground up. We include ginger juice and pepper powder with this. It is formed into pea-sized tablets by rolling it. Every two hours, take the tablet with some mint juice. The temperature will lessen thanks to this.

#### **Useful expectorant**

Coughs and colds will be relieved by the Madar tree's preparation.

### **PRECAUTIONS**

- Latex (sap) contains some toxicity.
- It is employed to poison arrows.
- Due to the plant's inclusion of numerous cardiac glycosides, all parts are poisonous.
- The latex causes kerato-conjunctivitis, and the plant is also known to produce allergic contact dermatitis.
- If consumed, plant parts are poisonous.
- Use abstinence while breast-feeding and pregnancy.
- The intake of the various components of this herb should be carefully

controlled because an overdose might cause patients to have severe vomiting and diarrhoea.

- Children should not be administered it.

### **CONCLUSION**

The tree *Calotropis gigantea* is a traditional medicinal plant having many of phytochemical values with the antimicrobial, analgesic, antitumor, antioxidant, anti-diarrhoeal, anti-malarial activity, anti-asthmatic, free radical scavenging, wound healing, vasodilation, procoagulant, anti-fertility, anti-inflammatory, anticancer, cytotoxic, analgesic, antipyretic, anticonvulsant and anti-diarrheal activities. This plant needs greater research on the topic of energy conversion because it is hydrocarbon-rich.

Numerous variables, including climate, soil, and others, affect the quality and amount of the active principle, which is vital for treating various diseases. Standardisation of the phytochemicals through these means enables In order to establish the applications of the plant more successfully, elements are crucial. The current review provides an overview of *Calotropis gigantea*'s history, pharmacognostic description, phytoconstituents, biological activity, and ethnopharmacological significance.

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**REFERENCES**

1. Oudhia, P., Kolhe, S. S., & Tripathi, R. S. (1997). Allelopathic effect of white top (*Parthenium hysterophorus* L.) on chickpea. *Legume Res*, 20(2), 117-120.
2. Karthik, T., & Murugan, R. (2016). Milkweed—A potential sustainable natural fibre crop. *Sustainable Fibres for Fashion Industry: Volume 2*, 111-146.
3. Sarkar, S., Chakraverty, R., & Ghosh, A. (2014). *Calotropis Gigantea* Linn.- a complete basket of Indian traditional medicine. *Int. J. Pharm. Res. Sci*, 2(1), 7-17.
4. Sachin, S., Rani, A., Amresh, N., Rajadurai, M., & Sathyamurthy, B. (2018). Phytochemical studies on the methanolic extract of *Calotropis gigantea* leaves. *Indo American Journal of Pharmaceutical Sciences*, 5(7), 6248-6260.
5. Alves, R. R., & Rosa, I. M. (2007). Biodiversity, traditional medicine and public health: where do they meet?. *Journal of ethnobiology and ethnomedicine*, 3, 1-9.
6. Mwaikambo, L. Y., & Ansell, M. P. (2002). Chemical modification of hemp, sisal, jute, and kapok fibers by alkalization. *Journal of applied polymer science*, 84(12), 2222-2234.
7. Chavan, S. V., Rajkumar, G. R., Ashik, K. P., & Shivalingappa, M. H. (2016). Mechanical Properties of Jute fiber reinforced Polyester based composites under different environmental conditions. *Advances in Polymer Science and Technology: An International Journal*, 6(2), 34-39.
8. Gharge, V. G., Ghadge, D. M., Shelar, P. A., & Yadav, A. V. (2017). Importance of Pharmacognostic study of medicinal plants *Calotropis gigantea* (Linn.): A review. *Int J Pharmacognosy*, 4(11), 363-71.
9. Deshpande, S., Deshpande, K., & Tomar, E. (2018). *Calotropis Gigantea*: A phytochemical potential.
10. Nilamsari, E. I., Nugroho, L. H., & Sukirno, S. (2022, May). Effectiveness of N-Hexane and Ethanol Extract of Giant Calotrope (*Calotropis gigantea* L.) Leaves as Insecticide Against Shallot Pest *Spodoptera exigua* (Hübner). In *7th International Conference on Biological Science (ICBS 2021)* (pp. 284-289). Atlantis Press.
11. Alam, M. A., Habib, M. R., Nikkon, R., Rahman, M., & Karim, M. R. (2008). Antimicrobial Activity of Akanda (*Calotropis gigantea* L.) on Some Pathogenic Bacteria. *Bangladesh journal of scientific and industrial research*, 43(3), 397-404.
12. Singh, N., Gupta, P., Patel, A. V., & Pathak, A. K. (2014). *Calotropis gigantea*: A Review on its phytochemical & pharmacological profile. *Int. J. of Pharmacognosy*, 1, 1-8.
13. Gobinath, P., Packialakshmi, P., Hatamleh, A. A., Al-Dosary, M. A., Al-Wasel, Y. A., Balasubramani, R., ... & Idhayadhulla, A. (2022). *Calotropis gigantea* assisted synthesis of zinc oxide nanoparticle catalysis: synthesis of novel 3-amino thymoquinone connected 1, 4-dihydropyridine derivatives and their cytotoxic activity. *Journal of Nanomaterials*, 2022, 1-10.
14. Dutta, M., Nezam, M., Chowdhury, S., Rakib, A., Paul, A., Sami, S. A., ... & Emran, T. B. (2021). Appraisals of the Bangladeshi medicinal plant *Calotropis gigantea* used by folk medicine practitioners in the management of COVID-19: a biochemical and computational approach. *Frontiers in molecular biosciences*, 8, 625391.



15. Singh, N., Gupta, P., Patel, A. V., & Pathak, A. K. (2014). Calotropis gigantea: A Review on its phytochemical & pharmacological profile. *Int. J. of Pharmacognosy*, 1, 1-8.
16. Argal, A., & Pathak, A. K. (2006). CNS activity of Calotropis gigantea roots. *Journal of ethnopharmacology*, 106(1), 142-145.
17. Pathan, A., Pathan, M., Garud, N., & Garud, A. (2012). Effect of some novel medicinal plants and polyherbal formulation on stress induced alopecia. *Pharmacology OnLine*, 3, 150-157.
18. Srivastava, S. R., Keshri, G., Bhargavan, B., Singh, C., & Singh, M. M. (2007). Pregnancy interceptive activity of the roots of Calotropis gigantea Linn. in rats. *Contraception*, 75(4), 318-322.
19. Tenpe, C.R. Indian Drugs. 2007, 44(11).
20. Bairagi, S. M., Ghule, P., & Gilhotra, R. (2018). Pharmacology of Natural Products: An recent approach on Calotropis gigantea and Calotropis procera.
21. Argal, A., Kumar, A.P. (2007). Anthelmintic and antimicrobial activity of C.G. Department of Pharmacy.
22. 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.
23. Singh, N., Jain, N. K., Kannoja, P., Garud, N., Pathak, A. K., & Mehta, S. C. (2010). In vitro antioxidant activity of Calotropis gigantea hydroalcoholic leaves extract. *Der Pharmacia Lettre*, 2(3), 95-100.
24. Mishra, P., Yadav, K. S., & Shrivastava, P. (2017). An updated Review on Phytochemistry, Pharmacological activity and Medicinal uses of Calotropis gigantea R. Br. *Research Journal of Pharmacognosy and Phytochemistry*, 9(2), 135-138.
25. Joseph, B., George, J., Jeevitha, M. V., & Charles, S. (2013). Pharmacological and biological overview on Calotropis gigantea: A comprehensive review. *International Research Journal of Pharmaceutical and Applied Sciences*, 3(5), 219-223.
26. Chacko, N., Ibrahim, M., Shetty, P., & Shastry, C. S. (2012). Evaluation of antivenom activity of Calotropis gigantea plant extract against Vipera russelli snake venom. *International Journal of Pharmaceutical Sciences and Research*, 3(7), 2272.
27. Mahmood, Z., & Khan, H. R. (2017). Digital preservation of rare manuscripts in Khuda Bakhsh Oriental public library, Patna. *Pearl: A Journal of Library and Information Science*, 11(1), 55-62.
28. 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.