

Biological and phytochemical studies of *Calotropis procera*: A review

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Abstract

Herbal medicinal plants are being used for a very long period of time by the people who don't have any easy access to modern medicine. Calotropis Procera showed significant biological activities in different research studies for instance antimicrobial activity, antidiabetic activity, skin healing properties, insecticidal activity, toxicity, anticancer activity: antimalarial activity, antidiarrheal

activity, anti-inflammatory activity, hepatoprotective activity, antifertility activity, muscle contraction, gastroprotective activity, cardiovascular activity, cold, fever, diarrhea, eczema, indigestion, boils, treating jaundice, asthma, diarrhea, leprosy, eczema, cough, dysentery, hepatic and splenic enlargement, leprosy, intestinal worms, Painful joints, Baldness and bronchitis. The phytochemicals which are identified by various techniques are benzoylisolinolone, benzoylinesolone, calotropagenin, calotropin, multiflavenol, calotropenyl acetate, terpinol ester, uzarigenin, triterpenoids, calofriedelenyl, procerleanol type (A) and (B), proceranol, procerurdenyl acetate, methyl myristate, methyl behenate, N-doctriacont-6-ene and glyceryl mono-oleoyl-2-phosphate.

Keywords: Calotropis procera, Biological, phytochemicals

INTRODUCTION

Background of the study

Medicinal plants are easy and quick source of treating various types of disease without costing a lot of money and without having any severe side effect. Herbal medicinal plants are being used for a very long period of time by the people who don't have any easy access to modern medicine. In Pakistan there are plenty of herbal plants each having different properties and different qualities. In the same way the *Calotropis procera* is also a popular and most commonly found herbal plant in Pakistan and all over the world as well. This plant is usually used by the native people of Pakistan for its various type of health care properties. This plant is recognized by the family *Asclepiadaecae*. It is widely spreaded in half of the area of the world including subcontinent Asia, America, Africa and Australia (Al-Snafi, 2015). In different regions of the world the plant is recognized with different names. *Calotropis*, *Calotrope* and *dead sea plant* are the English names of the plant. In Pakistan and India, the common names of the plant are *oak* and *madar*. Turkish name of the plant is *isipekag* while Arab called this plant as *oshar*, *kisher* or the *dead sea*

plant. In Spanish language it is known as cazuela, algodón, bomba and extranjero (Sudesh, Bhawana, Karishma, & pooja, 2012).

Occurrence of *Calotropis procera*

The countries like Indonesia, Malaysia and china it is frequently found (Sharma, Yelne, Dennis, Joshi, & Billore). Apart from this it is also abundantly found in some other Asian countries like Pakistan, Afghanistan, India and Nepal. It is also found in African countries such as Kenya, Nigeria and Niger. A large population of this plant is also distributed in Australian sub-continent. A large area of pacific island and Caribbean island is also covered with this plant (Chatterjee & Prakash, 1995; Rahman & Wilcock (1991). This plant is completely used for medicinal purpose Including its leaves, flowers, root, latex and stem (Meena, Yadav, & Meda, 2011).

Phytochemistry of *Calotropis procera*

Chemical analysis of the plant reveals a lot of chemical that have been found in the plant. The root of the plant is consisting of two chemicals namely benzoylisolinolone and benzoylinesolone. The chemical analysis of the leaves shows the presence of two compounds calotropagenin and calotropin. Furthermore, the flowers of the plant are composed of multiflavenol and calotropenyl acetate. While the latex of the plant is consisting of terpinol ester and uzarigenin (Yoganarasimhan, 2000). Apart from this the plant has also been investigated for its various kind of compounds such as triterpenoids, calopfriedelenyl, procerleanol type (A) and (B) (Ansari & Ali, 2001).

The two new phytochemicals have also been reported in the plant which is proceranol procerurdenyl acetate. These compounds have been discovered along with some other known compounds, methyl myristate, -methyl behenate, N-doctriacont-6-ene and glyceryl mono-oleoyl-2-phosphate. The chemical reaction and the spectral data analysis method has been used for the structural analysis of the following compounds (Saber, Maharan, & Rizkallah, 1969).

Description of *Calotropis procera*

The plant *Calotropis procera* belong to the family asclepiadaceae. There are approximately 2-thousand species and 180 genera of the

plant. The plant is highly distributed in the world including tropical and sub-tropical areas of the world. It is an evergreen plant which usually grow in the desert. The leaves of the plant are very soft and fluffy. It has branches with a single or some stem. Leaves are very flat and large in size. Leaves are usually near the tip of the growing region. The stem is covered with a bark which is light grey in color. Furthermore, the plant contains a valuable sap which is released by cutting a leaf, flower or stem. The roots can reach the depth of soil up to 1.7 or 3.0 meter. Leaves are usually dark green in color and the veins inside the leaves are white in color. Leaves can be long with the maximum length of up to 7-18 centimeter and can be broad up to 5-13 centimeter. There are minor hair like structure present on the surface of the leaves which can be felt by rubbing or pressing the leaves. The flower's color varies from pink to white. Flowers are present at the tip of the plant. The number of sepals in flower are usually 5 and length of the sepals can be 5-4 centimeter.

The plant also contains fruit which are green in color. The seeds are enclosed in the fruit. The seeds are brown in color containing a bunch of white hairs. These hairs are very important as they help in floral establishment of plant with the help of wind, animal and water. It also helps in the long-distance transportation of the seed (Orwa et al., 2009; Sharma, 1968). The plant loves to grow in sandy soil. It has the ability to tolerate drought for a long time. It also grows in the saline environment and can fight various environmental changes. The plant has a great level of adaptability for various environmental conditions including heat, cold, salinity, and drought (Orwa et al., 2009). The latex is very important because it is a rich source of ethnomedicines (Batello, Marzot, & Touré, 2004). The plant can reach its maximum size of 2.5 to 6 meters when it reaches 3 or 5 years. The plant can also be used to make bags, net, paper and ropes (Orwa et al., 2009).



Traditional uses of *Calotropis procera*

The plant is used in many regions of the world for treating various disease. Common diseases like cold, fever, diarrhea, eczema, indigestion and boils are treated with the help of following plant. It is also helpful for treating jaundice and removing thorn from the body. Each part of the plant possesses different properties thus each part can be used for treating different health problems. The root is used to treat conditions like asthma, diarrhea, leprosy, eczema, cough and dysentery. During the diarrheal treatment it converts the feces into a semisolid material and help to get rid of diarrhea. On the other hand, the stem is used to kill intestinal worms and to treat skin conditions as well (Parihar, Sharma, Ghule, Sharma, 2012: Abhishek, Mohit, & Ameeta, 2010). This plant is also recommended for the treatment of hepatic and splenic enlargement, leprosy and intestinal worms. Painful joints can be treated by using the latex of the plant. Latex is also helpful to treat swelling. Leaves are abundantly used for treating many health issues. They can also be used to treat joints pain and swelling. The leaves contain a type of oil. This oil contains a lot of properties. Oil from the leaves are used to treat the paralyzed part of the body. Flowers have their own benefits. They are used to treat cough, digestive problems, stomachic, loss of appetite and asthma.

The root is used to kill worms in the intestine and used to treat abdominal pain as well (Khan & Khanum, 2005: Khairnar, Bhamare & Bhamare, 2012). In India the leaves are used for the purpose of worshipping (Khare, 2004). The people in the village use the latex to make certain medicine which can be used to treat the wounds, boils and skin burn. In African countries specially Nigeria the other types of herbs are mixed *Calotropis procera* to make ointment for

treating leprosy, diarrhea, fever, cold, eczema and rheumatism. Baldness is also treatable by the help of the plant. This plant is highly used for treating joints pain, hair fall, paralysis and tooth decay (Burkill, 1985). The bleeding area of the body is treated with the latex to stop the bleeding (Bhatt, Joshi, & Tewari, 2009).

The digestion can be improved by consuming the root of the plant. Application of root powder is very beneficial because it can be useful to treat bronchitis, enlargement of liver and spleen, leprosy, eczema and asthma (Agharkar, 1991). The latex of the leaf is used to abort babies. In women it is used to contract the muscles of uterus which triggers the safe birth of the baby (Moustafa, Ahmed, Nabil, Hussein, & Omran, 2010). The root bark of the plant is used for multiple purpose. The basic treatment from the root bark include the treatment of skin disease, to treat enlarged abdominal viscera, cough, paralysis, bronchitis, asthma, inflammation and tumors can also be treated with the help of root bark (Chopra, Abrol, & Handa, 1983). The extract of root is used to treat body pain and headache. Harsh malarial fever is also treated with root extract in some area of the world. Apart from this it can also cure leprosy, eczema, cough, elephantiasis and asthma (Kayode, 2006). In west Africa the root bark is significantly used as a coagulation agent in the process of making cheese (O' Connor, 1993).

The charcoal obtain from the root is mixed with some oils and applied on the skin, it is very helpful to treat leprosy and syphilis. This blend of oil is very effective because it can treat various skin disorders. Anorexia and indigestion are also treated with the help of charcoal blend oil (Bhatt, Joshi, & Tiwari, 2009). In most of the traditions the castor oil is applied on the warmed leaves of *Calotropis procera* and these leaves are then tied on the body organ to relieve joint pain (Kumar, 2009). It is also used to treat impurities in the blood. Cold and cough can also be treated with this method. Migraine can also be treated with this method (Oudhia & Tripathi, 1998). The wet or dry leaves of *Calotropis procera* are burnt and the smoke from the leaves is inhaled, it is beneficial for asthma patients and the people who are suffering from cold, cough or headache (Rastogi & Mehrotra, 1991). The latex of the plant is used against the snake bite

it is very effective until a medical help is reached (Bhogaonkar & Kadam, 2007).

Using *Calotropis procera* without consulting a doctor can be dangerous. The latex is extremely poisonous if it is consumed orally it will produce a mercury like effect in the body which can cause various health problems in human and animals as well. The plant contains another poisonous compound called calotropin. Calotropin is also very poisonous and can be used to treat cavities in the tooth (Siddiqui, Alam, & Husain, 1989). This plant is also able to treat cancer and the tumors caused by the cancer with the help of crystalline protein. The crystalline protein can also be used to heal wounds. Anti-mycoplasmal activity is also noticed in the plant (Muraina, et al., 2010). The alcoholic extract of the plant act as an antifertility agent by stimulating the estrogen in the human reproductive tract. The latex is commercially used in the industries to remove hairs from the leather. The latex is fermented with salt which is used to remove the hairs from the skin of the goat as a result (Nari leather) is formed which is an important ingredient in the binding of books (Singh, Wadhvani, & Johri, 1996).



There are two species of the plant *Calotropis procera* and *Calotropis gigantea*. Both species belong to same family *asclepiadacea*. Both species differ from one another due to their environmental adaptability and in the appearance. Both have different habitat in the world. *Calotropis gigantea* is mostly found in south Asian countries like, India, Pakistan, Nepal and Sri lanka. It is also found in south east Asian countries like, Indonesia, Malaysia, Myanmar, Philippines, Thailand, China and Vietnam. It is also found in Hawaiian island as well (Bertreau, 1913). While *Calotropis procera* is found in Asian as

well as African countries. It highly found in the tropical regions of Africa such as Angola and Madagascar. It also grows in the arid areas' middle east and northern Africa (Silva, et al., 2010).

LITERATURE REVIEW

Calotropis procera is the center of attention for many research institutes due to its god gifted biological activities. Studied conducted in the past showed a plenty of biological activities found in the plant. Some of its biological activities include, anticancer activity, antimicrobial activity, antifungal and hepatoprotective activities. Each part of the plant posses' different biological properties. Latex has been reported for its Anti-inflammatory activity, it is also beneficial for healing the wounds. Root have been studied for their Anti-ulcerative and Anti-fertility activity (Kamath & Rana, 2002; Basu et al. 1997).

Biological activities of *Calotropis procera*

Antimicrobial activity

Antimicrobial activity was performed on 4 different types of bacteria such as *Escheria coli*, *staphylococcus aureus*, *pseudomonas aeruginosa*, *streptococcus pyogen*. The ethanolic and aqueous extract of leaves and root were isolated. The effect of the following extract was studied against the 4 different kind of bacteria. The result obtained confirmed that the ethanolic and aqueous extract of root and leaves has inhibited the growth of following bacteria. However, the ethanolic extract has a greater inhibitory effect as compare to aqueous extract (Ramos et al., 2003). The same experiment was performed using the chloroform extract and petroleum ether extract of the plant. The growth of the *pseudomonas aeruginosa* was significantly decreased with the minimum inhibition of 16, 17 and 19 millimeters. Inhibitory properties of chloroform extract of root and leaves were more potential against the *pseudomonas aeruginosa* (Kumar, Gupta & Pandey, 2013). The growth of gram positive and gram-negative bacteria is highly inhibited by the aqueous and methanolic extract obtain from the leaves of the plant (Mako et al., 2012). In Saudi Arabia the extract

of the plant was isolated that was growing in the wild. The effect of the plant extract was experimentally checked against the gram positive and the gram-negative bacteria. experimental result was positive. Antibacterial activity was noticed in half of the extract of the plant (Moronkola, Ogukwe, & Awokoya, 2011). The different extract of plant at different concentration also showed Antimicrobial activity. Methanolic, chloroform, and ethyl extract at different concentration of 150 to 100ml inhibit the growth of different microbes. Ethyl acetate extract is a very strong Antimicrobial agent while the methanol extract does not have much potential against the microbes (Yesmin, Uddin, Mubassara, & Akond, 2008).

Antidiabetic activity

The plant is also known for its Antidiabetic activity. The albino rats were used to check the effect of extract obtained from the root. The aqueous, methanolic, and petroleum ether extract were isolated from the root. The rats were treated with the per day dose of 250mg for 15 days. The result obtained after 15 days showed that the aqueous extract and the methanolic extract of root has a greater potential to control diabetes in rats (Samy & Chow, 2012). The extract of dry latex was also checked for its Antidiabetic activities. The albino rats were treated with the daily dosage of (100 to 400 mg) aqueous extract of dry latex. It significantly produced a antihyperglycemic effect in the rats. Furthermore, the aqueous extract also reduced the level of glucose in the urinary track of rats. The level of thiobarbituric acid reactive substance was also normalized in the diabetic rats (Mahmoud et al., 2009). The consumption of dry latex in rats increased the production of glycogen and decreased the level of glucose in the blood. Weight loss was also maintained in the diabetic rats (Yadav, Nagori, & Desai, 2014).

Skin healing properties

Skin healing properties of *Calotropis procera* were also examined. In this experiment 92 patients took part. The experiment continued for around 9 months. The result obtained from the experiment were extraordinary. 14% of the patients showed complete and satisfactory result. The sign and symptoms of all kind of skin problems were

almost gone. In 24% patients the result was excellent. While in 33% of the patients the result was good. 10% of the patients showed fair result while in 20% of the patients the result the result was not impressive and satisfactory (Kumar, Dewan, Sangraula, & Kumar, 2001). In another experiment the wound healing properties of the plant was checked on rabbits. For around 21 days the rabbit was treated with the plant to check its wound healing properties. The diameter of the wound was measured just before the experiment in order to compare them with the final result. Rabbits were divided into 2 groups. The rabbit in group 1 were treated with 50% solution of latex mixed with honey and triamcinolone. The size of the wound was reduced in the rabbits treated with 50% solution of latex. While there was not any noticeable change in the rabbits that was not treated with any kind of solution (Falguni, & Minoo, 2012). Calo- protein which is obtain from the aqueous solution of *Calotropis procera* is applied on the wound of mice it dramatically reduced the size of wound and showed antibiotic activity as well (Moronkola, Ogukwe, & Awokoya, 2011).

Insecticidal activity

The chemical constituents present in the plant is well known for its larvicidal activity. A low concentration is enough to get rid of larvae. Its application caused the reduce body weight in larvae and inhibit its growth (Upadhyay, 2014). The toxic components in the latex such as flavonoids, acetogenine, triterpenes and lectins cause the cellular level destruction in the larvae. The organ formed in the larvae become non-functional and defaulted. Apart from this the toxic components lead to the formation of larvae with less body weight and weak body texture. Following abnormalities caused by the toxins are irreversible. These changes will cause the larvae to die (Carlini, Fatima, & Grossi, 2002). *Calotropis procera* is also blessed with the endogenous soluble protein. These proteins are known for their insecticidal activity. This is the reason that the herbivores insect does not eat this plant because the plant is consisting of endogenous soluble protein which them away from the herbivore insects (Konno et al., 2004). Similarly, there are some enzyme inhibitor for example alpha amylase, protease and kinases. They also help the plant by saving them from herbivore

insect (Giordani, Benyahia, Teissere, & Noat, 1992). Plant also contain some bitter and distasteful ingredients. These components are phenolic glycosides, monoterpenes, alkaloids, 2-trideconon, resins, enzymatic protein, saponins and tannins. These components are naturally present in the latex which possess a huge variety of biological activity (Ramos et al., 2011). Presence of these components make the plant very distasteful and bitter to be eaten (Salunke, Kotkar, Mendki, & Upasani, 2005). Latex also prevent the embryonic development and egg hatching properties in some insects. If a female insect is expose to 20 to 40% dose latex for 24 hours, then there are possibilities that latex affect her reproductive system (Upadhyay, 2011). Latex also cause a dramatic reduction in the percentage of eggs laid per day. It also disturbs oviposition. Gonadotropic cycle is also obstructed in female insect. Once the female insect is in contact with latex it will increase the time period which is required by the larvae to convert into an adult insect. Latex can also be used as a pesticide to kill various type of pest in the field that damage the crop. Latex can also prevent the male female interaction by preventing the spermicidal activities. It is a very good technique to control the pest without damaging the crops (Hifsa, Ismat, & Abida, 2010).

Toxicity

This plant is very dangerous for grazing animals because it contains such toxic substance that can lead to the death of grazing animals. The old traditions that live in the forest used the toxic latex to make poison arrows for the purpose of hunting. The latex is extremely poisonous and direct contact can lead to extreme pain in the eyes and sometime loss of vision (Basak, Bhaumik, Mohanta, & Singhal, 2009).

Anticancer activity

Calotropis procera has the potential to be used in the medicines. Herbal drugs can also be made from the plant but without the processing of toxic material the medicine formed will be toxic (Kumar, & Arya, 2006). The plant has apoptotic ability in animals' model and cell lines (Mathen, Hardikar, & Peter, 2011). Plant is blessed with a novel compound called cardenolide. This compound is capable of in-vitro antitumor activity plus a greater tolerance inside the body. In

the same way another compound has been isolated from the plant which shows anti-tumor activity (Habib, & Karim, 2012). The aqueous extract from the *Calotropis procera* was used to make nano particles. These nano particles are toxic in nature. The cytotoxic nature of the nano particles is used against the cell lines and tumor cell (Taylor et al., 2013). Furthermore, the latex protein has been tested to be toxic inside the body and will inhibit the growth of cancer cell and will also inhibit sarcoma 180 respectively (Oliveria et al., 2007).

Latex protein has also reported cytotoxic and anti-tumor activity in transgenic mouse having hepatocellular carcinoma. Novel protein has been discovered from the plant which suppress the growth of tumor in breast cancer by blocking path NF- κ B way (Samy et al., 2012). Chronic liver injuries can also be treated with the help of plant. Tumor growth has also been suppressing in mice having ehrlich ascites carcinoma. Anticancer activity has also been noticed in the active components of *Calotropis procera*. As compare to any conventional drug the active compound in the plant has shown a greater suppressive activity against the cancerous cell. In upcoming time, it can be used as an alternative drug to treat various type of cancer. *Calotropis procera* is a better source for making herbal medicine without causing any inflammation (Kapoor, 2001). Different extract of root was isolated using ethyl acetate, methanol, aqueous water, and hexane. Effect of root extract was examined using Hep2 cancer cell line. Microscope was used to examine the morphological changes in the cell line. While flow cytometry was used to check the cell cycle parameter. The cell line was treated with different extract of root. Aqueous extract of root did not exhibit any kind of cytotoxicity of Hep2 cell line while the ethyl acetate extract showed 96.3% cytotoxicity on Hep2 cell line. Methanolic extract exhibited 72.7% cytotoxicity while the hexane extract exhibited total cytotoxicity of 60.5%. cytometric analysis of cell line showed that the root extract enhanced apoptosis and arrested the cell cycle of Hep2 cell line in S-phase of cell cycle. As a result, the cell will not be able to enter the G-phase of cell cycle. Final result demonstrated that root extract promotes the apoptosis of Hep2 cell line and inhibited its proliferation (Mathur, Gupta, Mathur, & Velpandian, 2009).

Antimalarial activity

The plant is also able to treat malarial infection. Different extract obtained from various part of the plant have been studied to be effective against malaria. The extract of flowers and buds are the most effective extract. Any how the extract need further studies and it is the major prof that botanical uses of plant for treating disease are favorable (Sharma, & Sharma, 2000).

Anti-inflammatory activity

Though the latex is poisonous and can cause various health problems, but proper application can be useful to treat various medical conditions. It has been reported that the latex is a potent compound to treat inflammation (Sangraula, Dewan, & Kumar, 2002). The expression was performed on the rats. The experimental result demonstrated that the latex not only reduce the inflammation but is also played a protective role against the oxidative stress (Kumar, & Roy, 2007). Flower extract have been reported to protect the inflammation. Despite the fact that the latex prevent inflammation, it also induced some condition like paw edema, peritonitis, and hemorrhagic cystitis. These are allergic response which can be treated by the application of inflammatory drugs. Protein components from the latex are also used to trat cancer and suppress the growth of cancerous cell. It also deals with the different mediator which are involve in causing inflammation (Arya, & Kumar, 2005).

Antidiarrheal activity

Apart from its anti-inflammatory activity the dry latex has also been investigated for its antidiarrheal activity. The rats were treated with 50mg/kg oral dose of dry latex. The dry latex reduced the severity of diarrhea. 80% of the rats were rats were protected from the diarrhea (Kumar, Dewan, Sangraula, & Kumar, 2001).

Hepatoprotective activity

Although the plant is blessed with plenty of phytochemical but there is no solid proof that plant is hepatoprotective agent. That is reason that forced the researcher to continue their research. The bark of the root was experimentally analyzed to check its hepatoprotective

activity. Experiment was performed on paracetamol induced hepatitis rats. Rats were given the 70% ethanolic extract of flower. The biochemical marker which were released upon the damage of liver. The level of the biomarker was brought to a normal level in the rats treated with 70% ethanolic extract of flower (setty et al., 2007).

Antifertility activity

Plant is also responsible for causing infertility in animals. Albino rats were treated with the ethanolic extract of root. It caused hormonal disbalance and infertility in rats (Iqbal, Lateef, Jabbar, Mohammed, & khan, 2005). It also interrupted the oestrous cycle in female eats (Aderounmu et al., 2013).

Muscle contraction

Plant extract were also investigated for its effect on smooth muscles. For this purpose, the extract of ethyl acetate and butanol were isolated. It increased the activity of ileum and duodenum. Furthermore, it also relaxed the skeletal muscle. It showed that this plant not only help in the treatment of disease but also exert various effect of some part of the body (Dewan, Sangraula, & Kumar 2000).

Gastroprotective activity

To perform this experiment the gastric ulcer was induced in the rats. After that the methanolic extract of various part of the plant was applied on the rat. Mucosal damage was prevented after applying the ethanolic extract. it also regulated the level of oxidative stress marker in the body such as superoxide dismutase and glutathione. Methanolic extract was also involved in maintaining the tissue integrity. Further analysis revealed that the gastric hemorrhage was also reduced by using the ethanolic extract (Ramos et al., 2012). Gastrointestinal protective activity was observed when the rats were treated with 400 mg/kg of ethanolic extract (CH) of stem bark. The (HE) hydrochloric extract of the stem bark was also isolated for the same purpose. Both extracts were divided into 2 fractions for performing the bioassay. The chloroform extract was divided in 4 fractions of (CF1), (EF1), (NF1) and (BF1). Hydrochloric extract was also divided into following fractions. (BF2), (CF2), (EF2) and (NF2). Each fraction from each

extract was investigated for their protective role against gastromucosa. NF1 fraction from the ethanolic extract and BF2 fraction from the hydrochloric extract showed gastroprotective activity. It was demonstrated that the chloroform extract has a greater potential against the ulcer (Bharti, Wahane, & Kumar, 2010).

Cardiovascular activity

latex also perform cardiovascular protecting activity. In mice the isoproterenol induced myocardial infraction was protected by using the plant latex. The mice were given the ethanolic extract of latex according to their body weight. Each mouse was given 300mg/kg extract for 3 times a day. It continued for 30 days. After 30 days the serum level marker in the mice was significantly reduced (Roy, Sehgal, Padhy, & Kumar, 2005). The ethanolic, ethyl acetate, and n-butanol extract of different part of the plant were isolated and the effect was checked on the heart of a toad. Different amount of each extract was applied on the heart. Application of different type of extract decreased the heart rate of toad. Negative chronotropism and positive inotropism was induced in toad heart (Ahmed, Rana, & Dixit, 2004).

Non-medical uses of plant

Calotropis procera can also be used in daily life for making the things easier for us. In many countries the plant is cultivated for making roof of the house. Fiber obtained from the stem are used to make bags, paper, and net (Orwa, Mutua, Kindt, Simons, & jamnadass, 2010). The plant produces a huge quantity of pulp which is used to make paperboard. The stem produce fiber that are used to make rope (Oun, & Rahim, 2016). The tiny hairs in the seeds are used in the pillow and mattresses as a stuffing. It was first used by ancient Egyptian people. They used to cultivate it for this purpose (Bertreau, 1913). It is an alternative to replace silk (Batello, Marzot, & Touré, 2004). The seed hairs also have insulating properties (Ali, & Zeitoun, 2012). The plant is hydrophobic in nature they have the capability to be used as an adsorbent material especially for hydrocarbon such as oil (Zheng, Zhu, Wang, & Hu, 2016). The water adsorbing property of the plant increased by blending it with the fiber of cotton and polypropylene

(Cao et al, 20180. In some areas of the world the plant is used for cooking purpose (Varshney, & Bhoi, 1988). Plant is also being studies for making biofuel. In European countries the plant is being studied for its ability to make biodiesel (Razon, 2008). The seed of *Calotropis procera* is consist of 26% of oil. The main component of the oil are linolenic acid, oleic acid, stearic acid, and palmitic acid (Rao, Pantulu, & lakshminarayana, 1983). In 1992 the dry mass of *Calotropis procera* was studies for biogas production. The leaves were soaked into water and the P.H was maintained 7.5. The experiment produced 3.6 to 2.9 liter of biogas per day (Traore, 1992). Same experiment was tried with fresh leaves of *Calotropis procera* along with buffalo and cow dung as a result increased amount of biogas was produced (Shilpkar, Shah, & Chaudray, 2007).

Although the plant is toxic and dangerous for livestock but in some areas in drought season the livestock has been noticed to graze the leaf and flower of plant. Researcher believed that toxicity of the plant is dependent on the environmental conditions in which it grows (Abdullah et al., 2017). However, the dry leaves and flower have less toxic substance like cardiotoxic, glycosides and flavonoids (Belem et al., 2016). In many areas the remaining residues of plant from the biofuel production is used as an animal feed (Erdman, 1983). The dry flower contain nectar crystal are used to make sugar residues. The inner part of the flower is also processed into a sweetmeat called chinees candy. One thing should be kept in mind that the nectar may also contain poisonous material which can cause death (Zahrani, & Robai, 2007).

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