

Morpho-Taxonomic Study Based on Wild Weed Plant Species *Calotropis procera* (Aiton)—Whole Plant

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Abstract

This work is an attempt to make a taxonomic study on *Calotropis procera* plant in Tehama area, Al-Baha region of Saudi Arabia. Al-Baha Province is divided by huge and steep Rocky Mountains into two main sectors, a lowland coastal plain at the west, known as “Tihama” and a mountainous area with an elevation of (1500) to (2450) m above sea level at the east, known as “Al-Sarat or Al-Sarah” which form a part of Al-Sarawat Mountains range. The study included a scientific description of the family *Apocynaceae* and the scientific classification of the species *Calotropis procera*. Botanical names, synonyms and vernacular names (Local names) were presented. Botanical description is determined depending on its vegetative, floral and fruit characteristics. Notes on habitats and distribution were provided. The plant species has been illustrated by photos in its habitat. Chemical components, medicinal properties and local uses were included. The study revealed that *Calotropis procera* is widely spread throughout the study area and it has great medicinal importance, so it requires more comprehensive studies for identification. The study aims to: (Number one is deleted). 1) Determine the distribution and habits of the species *Calotropis procera*. 2) Provide medicinal properties and local uses of *Calotropis procera*. The method was recorded due to Dr. Jacob Thomas, Herbarium Dept., College of Science, King Saud University. Authors recommend recent accurate techniques such as DNA fingerprinting to identify the species. More Biochemical studies on the effective chemical compounds are required for the medicinal importance of the plant.

Keywords

Aiton, *Apocynaceae*, Usher

1. Introduction

Calotropis procera is a species of flowering plant in the dogbane family *Apocynaceae* found in native to North Africa, Tropical Africa, Western Asia, South Asia, and Indochina. It is commonly known as milkweed because of the latex of production. The latex produced is toxic when ingested by mammals, affecting the heart as well as causing nausea and vomiting [1].

Calotropis procera is a plant of arid and semi-arid climates, it can tolerate very low annual rainfall (150 mm.) and a dry season of up to (10) months. Annual monthly temperatures where *C. procera* is found generally ranged between (20°C - 30°C), it is not frost-tolerant and grows on a wide variety of soil types and will survive on alkaline and saline soils though prefers free-draining sandy soils. *C. procera* is found at a range of altitudes from exposed coastal sites to medium elevations up to (1300 m). *Calotropis* species are considered as common weeds in Saudi Arabia.

It is a serious weed in pastures, overgrazed rangelands and poorly managed hay fields. It successfully competes with desirable pasture species and it is capable in forming dense thickets that interfere with stock management, particularly mustering activities. It is reported to contain a bitter principle called calotropin which is a cardiac poison. In western Africa, the plant has been suspected of causing ill effects and sometimes death in sheep and goats.

It is considered as a toxic plant in South Florida & USA. This species is very difficult to control and eradicate mainly because seeds are wind-dispersed and plants are fire resistant. The species of *Calotropis procera* is adequately identified using vegetative, floral, morphological features and fruit characteristics. The glycosides of *Calotropis procera* are: calotropin, calotoxin, calactin, uscharidin and voruscharin. The milky exudation from the plant is a corrosive poison (Figure 1). *Calotropis* species are poisonous plants; calotropin, a compound in the latex is more toxic than strychnine. Calotropin is similar in structure to two cardiac glycosides which are responsible for the cytotoxicity of *Apocynum cannabinum*. Extracts from the flowers of *Calotropis procera* have shown strong cytotoxic activity. The extracts are also harmful to the eyes [2] (Figure 2). *C. procera* revealed activities of flower extracts against swelling and fever in rats and also antibacterial activities.

The three major components of the essential oil extracted from dried leaves beside other constituents (Table 1) of *Calotropis procera* are terpenoids; phytol and its isomers 3,7,11,15-tetramethyl-2-hexadecens-1-01 and 6,10,14-trimethyl-2-pentadecanone. Phytol is a product of the hydrolysis of chlorophyll and it forms part of the molecules of vitamin (E) and (K) [3].

Pharmaceutical preparation consists of a terpenoid and an antihistaminic. The latex of *C. procera* is used in traditional medicine as a purgative, antisyphilitic and antidontalgic agent and as a cure for verrucas. Extracts from latex, leaves and flowers in Morocco had more effect on yeasts than on fungi. Root extract has hepatoprotective effects against experimental liver damage in animals

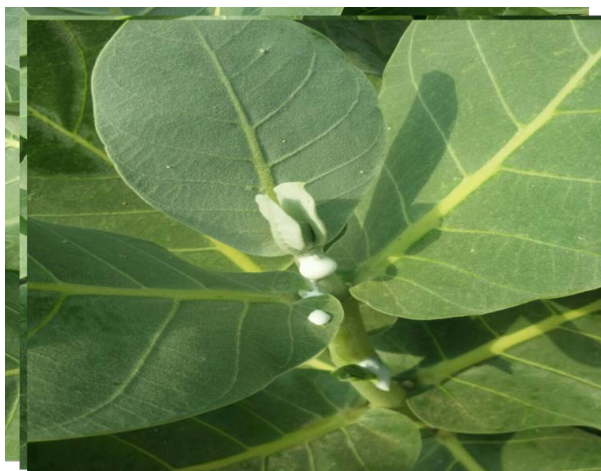


Figure 1. *Calotropis procera* Aiton (Milky Sap from Stem and Leaves).



Figure 2. *Calotropis procera* Aiton (Flowers & Fruit).

Table 1. Preliminary phytochemical screening of leaf powder of *Calotropis procera*. [8].

Phyto chemicals	Petroleum ether extracts (60°C - 80°C)	Chloroform extracts	Ethanol extracts	Water extract
Alkaloids	-	-	-	-
Sugars	-	-	+	-
Phenols	-	+	+	+
Flavonoids	-	-	+	-
Saponins	-	-	-	+
Steroids	+	-	+	-
Terpenoids	-	+	+	-
Tannins	+	-	+	+
Fatty acids	-	-	-	-
Glycosides	+	+	+	+

“+” = Presence of the compound; “-” = Absence of compound.

[4]. Extracts from *C. procera* latex have larvicidal activity against mosquitoes. Flower extracts have strong cytotoxic activity (Figure 1).

Anti-inflammatory activity in rats of a chloroform-soluble fraction from Roots showed analgesic potential in demonstrated mice. *C. procera* extracts can be used as a coagulant in cheese-making. The fractionation of the crude latex produced by the green parts of the plant aims to evaluate its toxic effects upon egg hatching and larval development of *Aedes aegypti* [5].

2. Material and Method

2.1. Equipment and Tools

- Basket, plastic bags, knife and pair of scissors were used for collecting the plant materials.
- A note book and a pencil were used to record the information on habits, habitats, distribution, and color of fruits and flowers.
- A camera was used to photograph plant samples in their habitats.
- A plant press made of alternating pieces of equal size of cartons, newspapers and a rope was used to press and dry plant specimens.

2.2. Plant Materials

Plant samples were collected by the authors from different places in the study area through several trips, three trips per week had been done throughout the study area during the summer season (May-July). Twenty plant samples were collected and identified in space of (300 m.). The plant samples were taken to the laboratory in the faculty of the science and art in EL-Mikhwa. Then the samples were examined using needles and hand lens.

2.3. Plant Samples Identification

The identified species were well dried and mounted in album with a card of identification included: the date of collection, place, habit, habitat, scientific name, vernacular name and the collector (The names of the authors who collected the species) and left in the lab as a tiny herbarium.

3. Results and Discussion

3.1. Results

Calotropis procera (Aiton) W.T.Aiton. **William Townsend Aiton** (2 February 1766-9 October 1849) was an English botanist. He was born at Kew on 2 February 1766.

Synonym: *Asclepias procera* Aiton

Vernacular name: Usher (traditional name known in wide Arab countries).

Scientific classification:

Kingdom: *Plantae*

Division: *Eudicot*

Class: *Asterids*

Order: *Gentianales*
Family: *Asclepiadaceae*
Genus: *Calotropis*
Species: *Calotropis procera* Aiton

3.2. Habitat

Found mostly in semi-arid and arid inland areas as well as in the drier parts of tropical and sub-tropical regions. A weed of disturbed sites, roadsides, waste areas, near inland watercourses, coastal sand dunes, grasslands, open woodlands and pastures.

3.3. Botanical Description

Dicot, shrub. Stems erect, contains a milky white sap (**Figure 1**), branched from the base of the plant upwards. Younger stems are greyish-green in colour, smooth in texture and have a covering of whitish coloured hairs. Mature stems have a deeply fissured, cork-like, bark that is light brown in colour. Leaves simple (**Figure 3**), opposite, contain a milky white sap, ovate in shape, sessile, apex acute, upper surface is mostly glabrous, while the underside may be densely covered in tiny white hairs or have a tuft of stiff hairs (**Figure 4**) at the base of the midrib. Inflorescence axillary cymose forming cluster of (3 - 15) flowers (**Figure 2**). Flowers white with purplish tips, hermaphrodite, actinomorphic, sepals (5), free, imbricate, petals (5), united, valvate, stamens (5), united, epipetalous, ovary superior, two locular. Fruits are large follicles, greyish-green in colour, sub-globose, each fruit contains numerous brown, flattened seeds with a tuft long, white, silky hairs on axile placenta.

4. Medicinal Properties

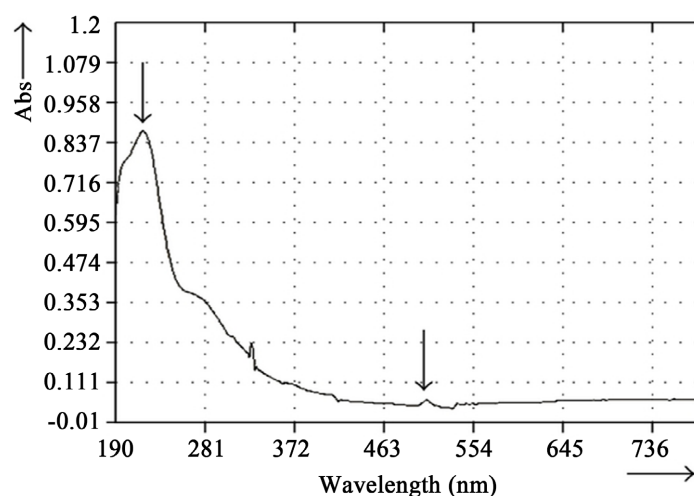
The milky sap contains a complex mix of chemicals, some of which are steroidal



Figure 3. *Calotropis procera* Aiton (Stem & Leaves).



Figure 4. *Calotropis procera* Aiton (Tuft Seeds).



Graph 1. Molecules absorb radiations under specific wavelengths scanned in the entire range (75 - 190 nm.) through UV-Visible spectroscopic scan of *C. procera* root aqueous extract [9].

heart poisons known as cardiac aglycones (**Graph 1**). Some of its medicinal properties are used for the treatment of various ailments as in the case of many types of fevers, rheumatism, indigestion, cough, cold, eczema, asthma, elephantiasis, nausea, vomiting and diarrhea [6].

The latex of *Calotropis procera* is a rich source of proteins (**Figure 1**) that have anti-inflammatory, anti-nociceptive and selective cytotoxic and anti-tumorigenic properties [7]. *Calotropis* acts as a purgative, anthelmintic, anticoagulant, palliative (in problems with respiration, blood pressure), antipyretic, analgesic, and induces neuromuscular blocking activity [5].

Local Uses

Despite of serious toxicity of the milky sap for humans and also for livestock,

local uses are mentioned for digestive disorders including diarrhea, constipation, stomach ulcers and for painful conditions including toothache, cramps, joint pain and parasitic infections including elephantiasis and worms. Some people use the plant for syphilis, boils inflammation, epilepsy, hysteria, fever, muscular spasm, warts, leprosy, gut, snakebites and cancer.

5. Discussion

Calotropis procera is widespread in the area that agrees with the work of [10]. *Calotropis procera* is considered a drought-resistant, salt-tolerant species, that grows in open habitats and it is particularly, common in overgrazed pastures and on poor soils where there is little competition from grasses. It is also found along roadsides, watercourses, river flats and coastal dunes and is often prevalent in disturbed areas. Cattle often stay away from the plant because of its unpleasant taste and its content of cardiac glycosides. Observations on the distribution density of the plant and biomass are confirmed by the above-mentioned properties.

The decoction of the aerial parts of *Calotropis procera* is commonly used in Saudi Arabian traditional medicine for treatment of variety of diseases including fever, joint pain muscular spasm and constipation. The results of study carried out by [11] showed a significant antipyretic, analgesic and neuromuscular blocking activity on smooth muscle of guinea pig ileum. Using *Calotropis procera* in asthma therapy referred to the rich abundance of thymoquinone and phytol compounds isolated from essential oil extracted from its seeds and leaves [12]. Study on the effect of the plant extract on the host of intestinal parasite *Schistosoma mansoni* gave scientific support for using the plant latex as a biological pesticide to get rid of these snails. Using *Calotropis procera* latex as a biological pesticide was confirmed by the work of [5].

The study carried out by [7] confirmed that tissue culture of *C. procera* is able to produce therapeutic-grade proteins that have the potential to relieve inflammation and pain associated with inflammatory disorders.

The importance of *Calotropis procera* is very obvious not only ecological wise but also as medicinal plant that could lead to great economic benefits.

6. Conclusions and Recommendation

From the above results and discussion it can be concluded that the *Calotropis procera* is dominant in the study area.

Depending on the wide range of habitat, the identified species is vital for various ecosystems and play a key role in maintaining the region's environmental balance and stability. It also helps in the protection of watersheds, stabilization of slopes, improvement of soils and moderation of climate.

The medicinal properties of *Calotropis procera* tell us how this plant is important to take care of and to make use of it. Therefore, the authors recommend the following:

- 1) More studies are required to identify the entire flora of the region.
- 2) Comprehensive taxonomic studies using new techniques in the fields of Ecology, Histology, Cytogenetic, Biochemistry and Molecular Biology should be conducted to identify *Calotropis procera*.
- 3) Comprehensive Pharmacological studies on the whole plant *Calotropis procera* are required for using this plant because it's widely spread in the study area.

People have to be conscious about doses when they are using the plant in the medicinal field.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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