



# *Calotropis procera* (Aiton) W.T. Aiton

## APOCYNACEAE

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### Synonyms

*Apocynum syriacum* Garsault; *Apocynum syriacum* S.G.Gmel.; *Asclepias gigantea* Willd.; *Asclepias patula* Decne.; *Asclepias procera* Aiton; *Calotropis gigantea* var. *procera* (Aiton) P.T.Li; *Calotropis hamiltonii* Wight; *Calotropis heterophylla* Wall.; *Calotropis inflexa* Chiov.; *Calotropis persica* Gand. (WFO 2023).

### Vernacular Names

**Morocco:** tûrja (تورج), tûrza (تورز), tâwarza (تاورز), tâwarzat (تاورزت), tâwarja (تاورج), tûrza (تورز), tûrja (تورج) (Fakchich and Elachouri 2021). **Algeria:** tûrha (توره), (كركنك) (kranka) (Miara et al. 2019a, b). **English:** apple of Sodom.

### Botany and Ecology

*Calotropis procera* is a soft-wooded, perennial shrub (Fig. 1a, b), which belongs to the family of Apocynaceae and subfamily Asclepiadaceae (the milkweed family) (Al-Rowaily et al. 2020).

The word “*Calotropis*” is derived from Greek, meaning “beautiful,” which refers to its flowers; whereas “*procera*” is a Latin word referring to the cuticular wax

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**Fig. 1** (a) and (b) Habit and the size of *Calotropis procera*. (Photos taken by Subhasis Panda). (c) and (d) flowers and the habit of *Calotropis procera*. (Photos taken by Dr. Ouasti Mohammed)

present on its leaves and stem (Hassan et al. 2015), and the scientific name of the family is derived from Asklepios, the Greek god of medicine (Parsons and Cuthbertson 2001). It is an evergreen xerophytic perennial shrub plant, grows in many arid and semiarid countries' habitats (Al-Rowaily et al. 2020). This plant is known for its milky latex used in medicine. The stem of *C. procera* occurs as single- or many-stemmed soft-wooded shrubs that reach a height of 2–6 m, with stem diameters of 25 cm (Little et al. 1974; Orwa et al. 2009). The leaves are simple, slightly thick, or fleshy. They are pubescent when young and glabrous on both sides on maturity. They have a waxy appearance and contain a white milky sap (Murti et al. 2010; Sharma et al. 2012). Leaves are large up to 15 cm long and 10 cm broad, with no leaf stalk (Fig. 1d) (Kleinschmidt and Johnson 1977). Flowering takes place throughout the year (Little et al. 1974). The flowers are regular, bisexual, and have a faint odor (Fig. 2a) (Parsons and Cuthbertson 2001). The fruits are follicle



**Fig. 2** (a) flowers, (b) fruits of *Calotropis procera*. (Photos taken by Dr. Ouasti Mohammed)

(8–14 × 6–9 cm) (Fig. 2b), sub-globose to obliquely ovoid (Howards 1989; Sharma et al. 2012). Seeds are numerous (350–500 per fruit), flat, obovate, 6 × 5 mm, with silky white pappus of 3 cm or longer (Orwa et al. 2009). Fruiting takes place throughout the year (Little et al. 1974).

In Morocco, it is considered as a medicinal and aromatic plant even very rare, it is found in the Saharan Morocco, Anti-Atlas, and in the Middle Atlantic Morocco (Fennane and Rejdali 2016), it occupies the river beds (Wadis) and palm groves.

Despite its toxicity, this plant is widely used in traditional medicine and pharmacology for it has many properties: diaphoretic, anthelmintic, anti-syphilitic, and purgative (Bellakhdar 1997).

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## Local Medicinal Uses

**Morocco:** All the parts, that is, root, stem, leaf, flowers, and fruits of *C. procera* are in common use in indigenous system of medicine. In Morocco *C. procera* is used in traditional medicine and pharmacology for his many properties to treat many diseases such as dermal, diabetes, allergy, cardiovascular pathologies, nervous system problems, gastrointestinal problems, and respiratory pathologies. The leaves decocted is used to treat eczema and psoriasis. Also, the stem decocted is recommended for rinsing wounds (Fakchich and Elachouri 2021; Ajjoun et al. 2022). **Algeria:** The leaves infused are used to treat skin problems (Miara et al. 2019a, b). **Libya:** This plant is recommended for abscess and rheumatic (El-mokasabi et al. 2018). **Jordan:** This plant infused is antispasmodic and is used to treat gastric diseases (Al-Qura'n 2009). The population smoked leaves for asthma and cough (Qasem 2015). The latex is used for ringworm, dog bite wounds, and skin diseases; it is also used in tanning industry (Qasem 2015). The plant has analgesic, diaphoretic, and emetic properties; It is used for breathing difficulty, pain, and scorpion stings (Qasem 2015). It is a source of natural chemicals; the bitter sap is traditionally dried and used to fill aching tooth cavities (Qasem 2015). Leaf poultices are used to heal rheumatism, skin diseases, paralysis, and cold. Powder of roots and

flowers are used to cure rheumatoid arthritis and dysentery, and its paste is used for leukoderma. Its roots in boiling water mixed with wheat flour, butter, and sugar used to cure gastric problems (Qasem 2015). **Egypt:** The leaves are used for blisters and abscesses (Mahmoud 2015). Also, this plant is recommended to treat mumps and relieve itching (Goodman and Hobbs 1988). **Mauritania:** This plant is utilized for wounds, colds, scabies, and fresh wounds (Mohamed and Hmeyada 2009). **Pales-tine:** The aerial parts is decocted and administered orally to treat skin diseases (Jaradat et al. 2016). **Israel:** The drops of extracted sap are added to hot water and applied externally to treat skin diseases, paralysis, and cold (Said et al. 2002).

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## Local Food Uses

The extract of *C. procera* has been used as coagulant in parts of West Africa countries for traditional cheese making, including Nigeria and the republic of Benin. Previously, cheese making with this juice was purely empirical and little was known about the properties of the juice and the mechanism of milk coagulation (Ogundiwin and Oke 1983). Consequently, the quality of the cheese is highly variable and often very poor, reducing its acceptability in urban areas (Aworh and Egounlety 1985). Recently, a partially purified milk clotting enzyme was extracted from Sodom apple leaves. Adetunji and Salawu (2008) have showed that *C. procera* have a higher nutrient composition, especially the values obtained for fat, protein, sugar, Zn, and Cu were the highest.

Also, the extract of *C. procera* plant showed a significant effect as a nematicide (Rao and Mehrotra 1977; Ahmed et al. 1996) and molluscicide (Larhsini et al. 1997); it is also used as an insecticide (Chandra and Lal 1993; Meshran 1995; Moursy 1997; Khan et al. 2019) and fungicide (De Freitas et al. 2011; Freitas et al. 2020). Some studies show that the plant has a potential to be utilized as bioinsecticide and biofungicide in agricultural and industrial practices.

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## Toxicity

*C. procera* causes acute toxicity in plant and animal cells, including humans (El Badwi et al. 1998). Concerning the toxicity–bioactivity relationship, on the one hand, Lima et al. (2011) suggest that the plant induces acute cardiotoxicity and hepatotoxicity. On the other hand, a safety assessment study revealed that the use of extract of this plant in single high doses (up to 3 g kg<sup>-1</sup>) is not toxic to guinea pigs until that treatment longer than 90 days is provided (de Mossa et al. 1991). For further study, the latex proteins of the plant, when administered orally, had no adverse immunological reactions in mice, even at 5000 mg kg<sup>-1</sup>; but their intraperitoneal administration caused death after 1 h in response to a dose of 150 mg kg<sup>-1</sup> (Bezerra et al. 2017). However, these toxic aspects are not well researched and further studies are needed to validate the medicinal prospects of *Calotropis procera*.

The milky sap contains a complex mix of chemicals, some of which are steroidal heart poisons known as “cardiac aglycones.” These belong to the same chemical family as similar ones found in foxgloves (*Digitalis purpurea*). The plant contains steroidal components that are the cause of its toxicity. In the case of the *Calotropis* glycosides, their names are calotropin, calotoxin, calactin, uscharidin, and voruscharin.

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