Calotropis (Calotropis procera)

Description | Nutritional aspects | Nutritional tables | References

Click on the "Nutritional aspects" tab for recommendations for ruminants, pigs, poultry, rabbits, horses, fish and crustaceans




Common names

Akund, apple of Sodom, auricula tree, madar, mudar, roostertree, rubber bush, rubber tree, small crownflower, Sodom's milkweed, Sodom apple, stabragh, king's crown [English]; arbre à soie, pommier de Sodome, arbre de Satan [French]; algodão de seda [Portuguese]; manzana de Sodoma [Spanish]; nfogonfogon [Bambara]; Oscher, Fettblattbaum [German]; boah [Swahili]; bồng bồng lá nhỏ [Vietnamese]; faftan [Wolof]; عشار طويل [Arabic]; [Bengali]; פְּתִילַת הַמִּדְבָּר הַגְּדוֹלָה [Hebrew]; [Malayalam]; Содомское яблоко [Russian]; [Tamil]

Species

Calotropis procera (Aiton) W. T. Aiton [Apocynaceae]

Synonyms

Asclepias procera Aiton

Feed categories

- Forage plants
- Other forage plants

Related feed(s)

Description

Calotropis (*Calotropis procera* (Aiton) W. T. Aiton) is a spreading shrub or medium-sized tree reaching 2.5 to 6 m in height. It has a deep taproot, 3-4 m deep, and a secondary root system with woody lateral roots that may rapidly regenerate adventitious shoots when the plant is injured. The stems are crooked and covered with a fissured corky bark. The grey-green leaves are 15-30 cm long and 2.5-10 cm broad and have a succulent and waxy appearance, hence the name *procera*, which means wax in latin (Ecoport, 2011; Ecocrop, 2011; Orwa et al., 2009). The flowers are pentamerous, small, cream or greenish white at the base and purple violet at the extremity of the lobes. The fruit is a fleshy and inflated, up to 10 cm or more in diameter (Orwa et al., 2009; Kiew, 2001).

Calotropis procera is a multipurpose tree. The stems yield a fibre useful for making ropes, bags, nets and paper (Orwa et al., 2009). The seeds contain a white silky floss that is a potential silk replacer (Batello et al., 2004). The wood is valuable as a timber and fuel (Orwa et al., 2009; Kiew, 2001). The milky sap (latex) is renowned for its ethno-medicinal properties (Batello et al., 2004; Iqbal et al., 2005) and as a food, particularly as a coagulation agent for cheese making in West Africa (O'Connor, 1993). Calotropis yields 90 t of biomass twice a year and is a potential source of renewable energy (Parsons et al., 2001).

Calotropis is also used as fodder. Young pods, senescing leaves and flowers can be fed to goats, camels, and sheep (more rarely to cattle) in times of scarcity. The latex contains toxic components that may be harmful to livestock (see **Potential Constraints** on the "Nutritional aspects" tab).

Distribution

Calotropis procera originated from the Afro-Asian monsoonal regions. It spread on an arc expanding from north western Africa (Mauritania, Senegal), through the Arabian Peninsula and Middle-East to the Indian subcontinent. It was introduced to subtropical America, the Mascarene Islands, drier parts of Australia and probably South-East Asia.

Calotropis is found from sea level up to an altitude of 1300 m in semi-arid conditions (150 to 1000 mm annual rainfall) on sandy soils. However, it can withstand a wide range of soil textures. It is tolerant of soil salinity and of beach front salt spray. On excessively drained soils, it can withstand up to 2000 mm annual rainfall. It quickly becomes established in open habitats with little competition, along degraded roadsides, lagoon edges and in overgrazed native pastures and rangelands (Orwa et al., 2009). When calotropis is damaged, it readily develops suckers from the roots (Parsons et al., 2001). Calotropis seeds are spread by wind and animals and may be transported long distances in flood waters (Parsons et al., 2001).

Environmental impact

Weed

Calotropis procera is considered a noxious weed in Australia and Hawaii (US Forest Service, 2011; Parsons et al., 2001). It can be a serious weed in pastures, overgrazed rangelands, and poorly managed hay fields (Francis, 2002). In places where the number of calotropis is small, it is recommended to remove the tree mechanically together with its deep tap-root and lateral roots to prevent the growth of suckers. Light competition with tall weeds, brush, and especially grass may be an efficient way to weaken calotropis and to prevent seed germination (Parsons et al., 2001; US Forest Service, 2011). Chemical control is

advisable for larger calotropis colonies. Sowing buffel grass (*Cenchrus ciliaris*) may help controlling calotropis due to its allelopathic toxicity towards calotropis roots (Parsons et al., 2001).

Soil erosion control, soil improver and afforestation

Calotropis can act as a soil binder and as a nurse crop for more valuable species in afforestation programs (Orwa et al., 2009; Campolucci et al., 1990). It has been used as source of green manure in rice fields (Orwa et al., 2009; Banta et al., 1984).

Other environmental services

- Calotropis is considered an indicator of overgrazed, disturbed lands in arid and sub-arid areas (Tezara et al., 2011).
- Calotropis roots can be washed, cooked and transformed into a biosorbent for wastewater Cu remediation (Hifsa et al., 2010).
- Calotropis extracts, chopped leaves, and latex have shown *in vitro* and *in vivo* nematicidal properties (Anver et al., 1992; Charu Jain et al., 1997 cited by Francis, 2002).

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- Cereal and grass forages
- Legume forages
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- Aquatic plants
- Other forage plants

Plant products/by-products
- Cereal grains and by-products
- Legume seeds and by-products
- Oil plants and by-products
- Fruits and by-products
- Roots, tubers and by-products
- Sugar processing by-products
- Plant oils and fats
- Other plant by-products

Feeds of animal origin
- Animal by-products
- Dairy products/by-products
- Animal fats and oils
- Insects

Other feeds
- Minerals
- Other products

Latin names
Plant and animal families
Plant and animal species

Resources
Broadening horizons
Literature search
Image search
Glossary
External resources
- Literature databases
- Feeds and plants databases
- Organisations & networks
- Books
- Journals

Calotropis (Calotropis procera)

Description | Nutritional aspects | Nutritional tables | References

Potential constraints

Poisonous compounds

Calotropis latex contains digitalin-like heart poisons and emetic substances, the effects of which on livestock are debated. It was thought that leaves contain low concentrations of these substances. Indeed, no ill effects have been reported in cattle grazing calotropis in Indonesia and Australia. However, several sheep and goats deaths have been reported in Sudan (Parsons et al., 2001), which suggests that toxicity depends on biotypes or environment conditions during the growth of the plant (Radunz et al., 1984).

A histopathological study has revealed that fresh calotropis leaves have adverse cardiac and hepatic effects in both mice and sheep. The ingestion of calotropis leaves resulted in tachycardia and transitory cardiac arrhythmias in sheep (Lima et al., 2011). The toxic effects may be alleviated through drying and calotropis hay would be safer than fresh calotropis leaves for sheep and goats (Costa et al., 2009). Calotropis latex was found to cause nervousness, frequent urination, frothing at the mouth, dyspnoea and diarrhea in goats (El Badwi et al., 1998).

Ruminants

In arid regions, domestic (sheep, goats and camels) and wild (gazelles) ruminants eat the leaves and flowers of *Calotropis procera* during droughts, but they graze on it sparingly. If the leaves are chopped and mixed with other feed, consumption greatly increases with no ill effects (Abbas et al., 1992, Nehra et al., 1987; Gallacher et al., 2006).

Nutritional value

In nutritional terms, this species provides important nutrients with emphasis on protein, average value of 20% DM, and an *in vitro* digestibility above 70% (Fall Touré, 1991; Cruz et al., 2007; Costa et al., 2009). No tannins were detected in *Calotropis procera* (Cruz et al., 2007). *In vivo* OM digestibility of *Calotropis procera* hay measured in sheep reached 75%, and voluntary intake reached 60 g DM/kg $LW^{0.75}$ (Silva et al., 2001).

Sheep

Several trials in Brazil have highlighted the potential and the limits of *Calotropis procera* hay in meat-producing lambs. Calotropis hay replacing sorghum hay was found to be an attractive and technically viable option at the inclusion rate of 17%, but higher inclusion rates (33% and 50%) affected negatively the growth rate, the health of the animals and meat pH (Madruga et al., 2008). Calotropis hay could also replace up to 30% (18% of the total diet) of the maize grain and soybean meal in the diet without compromising performance and nutrient consumption (Torres et al., 2010). The same inclusion rate did not affect the tissue composition, ratios and muscularity index of leg and physical-chemical parameters. Substitution levels above 30% affected negatively the sensory attributes of the meat (juiciness, flavour and overall acceptability) (Costa et al., 2011).

Goats

In dairy goats, *Calotropis procera* hay included at up to 22% in the diet may increase intake and nutrient digestibility (Pereira et al., 2010). It could be included at up to 60% without depressing the essential fatty acids content of the milk (Pereira et al., 2009).

Anthelmintic and anticoccidial activity

An aqueous extract of *Calotropis procera* flowers was shown to have a good anthelmintic activity against nematodes in sheep (Iqbal et al., 2005). Calotropis latex given to sheep in single oral doses of 0.01 ml or 0.02 ml/kg body weight reduced, but did not suppress, nematode egg production (Al-Qarawi et al., 2001). *Calotropis procera* latex also had an anticoccidial activity in adult sheep (single oral doses of 0.02 ml/kg body weight), and repeated treatment of lambs with *Calotropis procera* latex and sulfadimidine was suggested (Mahmoud et al., 2001).

Poultry

Calotropis procera hay has no value in poultry diets, as attested by the extremely low energy value of 3.4 MJ/kg measured by Arruda et al., 2010.

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- Legume forages
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- Aquatic plants
- Other forage plants

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- Cereal grains and by-products
- Legume seeds and by-products
- Oil plants and by-products
- Fruits and by-products
- Roots, tubers and by-products
- Sugar processing by-products
- Plant oils and fats
- Other plant by-products

Feeds of animal origin
- Animal by-products
- Dairy products/by-products
- Animal fats and oils
- Insects

Other feeds
- Minerals
- Other products

Latin names
Plant and animal families
Plant and animal species

Resources
Broadening horizons
Literature search
Image search
Glossary
External resources
- Literature databases
- Feeds and plants databases
- Organisations & networks
- Books
- Journals

Calotropis (Calotropis procera)

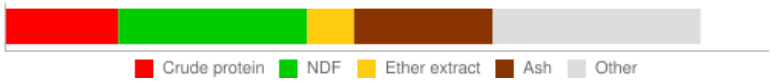
Description | Nutritional aspects | Nutritional tables | References

Tables of chemical composition and nutritional value

- Calotropis (Calotropis procera), aerial part, fresh
- Calotropis (Calotropis procera), fruits

Avg: average or predicted value; SD: standard deviation; Min: minimum value; Max: maximum value; Nb: number of values (samples) used

Calotropis (Calotropis procera), aerial part, fresh



Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	14.6	3.0	12.4	18.0	3
Crude protein	% DM	16.2	1.9	13.4	20.9	18
Crude fibre	% DM	18.0	3.5	14.1	27.0	13
NDF	% DM	27.2	4.3	21.1	38.6	15
ADF	% DM	25.1	3.2	20.7	34.4	19
Lignin	% DM	7.6	1.7	4.6	10.4	18
Ether extract	% DM	6.7	2.3	3.9	12.5	15
Ash	% DM	20.0	2.4	15.1	25.2	17
Gross energy	MJ/kg DM	16.9				*

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	21.5	6.0	8.3	27.8	10
Phosphorus	g/kg DM	2.6	1.0	1.5	4.3	10
Potassium	g/kg DM	28.6	6.9	18.9	38.3	7
Sodium	g/kg DM	13.1				1
Magnesium	g/kg DM	8.8	1.7	6.8	12.4	7
Manganese	mg/kg DM	413				1
Zinc	mg/kg DM	48				1
Copper	mg/kg DM	11				1

Secondary metabolites	Unit	Avg	SD	Min	Max	Nb
Tannins (eq. tannic acid)	g/kg DM	0.1	0.3	0.0	1.0	10
Tannins, condensed (eq. catechin)	g/kg DM	0.0		0.0	0.0	2

The asterisk * indicates that the average value was obtained by an equation.

References

CIRAD, 1991; Nsahlai et al., 1999

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Calotropis (Calotropis procera), fruits

Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	93.0				1
Crude protein	% DM	14.9				1
Crude fibre	% DM	20.2				1
NDF	% DM	30.5				1
ADF	% DM	25.6				1
Lignin	% DM	3.6				1
Ether extract	% DM	8.5				1
Ash	% DM	14.3				1
Total sugars	% DM	3.4				1

Gross energy	MJ/kg DM	18.2				*

Secondary metabolites	Unit	Avg	SD	Min	Max	Nb
Tannins (eq. tannic acid)	g/kg DM	0.0				1

Pig nutritive values	Unit	Avg	SD	Min	Max	Nb
Energy digestibility, growing pig	%	58.4				*
DE growing pig	MJ/kg DM	10.6				*

The asterisk * indicates that the average value was obtained by an equation.

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- Minerals
- Other products

Latin names
Plant and animal families
Plant and animal species

Resources
Broadening horizons
Literature search
Image search
Glossary
External resources
- Literature databases
- Feeds and plants databases
- Organisations & networks
- Books
- Journals

Calotropis (Calotropis procera)

Description | Nutritional aspects | Nutritional tables | References

References

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