Babul (Acacia nilotica)

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Common names

Babul, babool, prickly acacia, black piquant, egyptian acacia, indian gum arabic tree, gum arabic tree, thorn mimosa, thorny acacia, kikar, sant tree [English]; goma arábica, acacia gomifera [Spanish]; acacia de cayenne, gommier rouge [French]; Lekkerruikpeul [Afrikaans]; سنط نيلي [Arabic]; 阿拉伯金合欢 [Chinese]; [Hindi]; [Malayalam]; [Punjabi]; Акация нильская [Russian]; [Tamil]; [Telugu]

Species

Acacia nilotica (L.) Willd. ex Delile [Fabaceae]

Synonyms

Acacia adansonii Guill. & Perr., *Acacia arabica* (Lam.) Willd., *Acacia arabica* var. *cupressiformis* J. Stewart, *Acacia arabica* var. *indica* Benth., *Acacia arabica* var. *kraussiana* Benth., *Acacia arabica* var. *tomentosa* Benth., *Acacia benthamii* Rochebr., *Acacia nilotica* subsp. *adansonii* (Guill. & Perr.) Brenan, *Acacia scorpioides* (L.) W. Wight, *Acacia subalata* Vatke, *Acacia vera* Willd., *Mimosa adstringens* Schumach. & Thonn., *Mimosa arabica* Lam., *Mimosa nilotica* L., *Mimosa scorpioides* L., *Vachellia nilotica* (L.) P.J.H. Hurter & Mabb

Taxonomic information

Acacia nilotica encompasses nine subspecies distinguished by the shape and pubescence of the pods and the habit of the tree: *indica, kraussiana, leiocarpa, nilotica, subalata* and *tomentosa* in Africa, *cupressiformis* and *hemispherica* in the Indian continent, and *adstringens* in both continents. Those subspecies were long considered to be separate species and some of the taxonomic confusion surrounding *Acacia nilotica* was not cleared up until the 1970s (Brenan, 1983).

Feed categories

- Forage trees
- Legume forages
- Forage plants

Related feed(s)

Description

Babul (*Acacia nilotica* (L.) Willd. ex Delile) is a medium sized, thorny, nearly evergreen tree that can reach a height of 20-25 m but may remain a shrub in poor growing conditions (Ecocrop, 2012; Orwa et al., 2009; Fagg et al., 2005). The trunk is short, thick (1 m in diameter) and cylindrical, covered with grey bark. The crown may be flattened or rounded. The root system depends on the growing conditions and subspecies: a deep taproot in dry conditions and extensive lateral roots in flooded conditions. The leaves are 5-15 cm long, alternate and compound with 7 to 36 pairs of elliptical, 1.5-7 mm long x 0.5-2 mm broad, grey-green, hairy leaflets. Flowers are sweetly scented and bright to golden yellow in colour. The fruits are linear, flattened, narrow indehiscent pods, 4-22 cm long and 1-2 cm broad, dark-brown to grey in colour and glabrous or velvety. The pods contain 8 to 15 elliptical, flattened bean-shaped dark seeds (Orwa et al., 2009; Cook et al., 2005; Fagg et al., 2005). There are two groups of *Acacia nilotica* subspecies. The first group (*nilotica, tomentosa, cupressiformis*, *indica*) consists of tall riverine trees that grow in seasonally flooded areas. Their pods have a characteristic "necklace" shape with constrictions between the seeds. The second group (*adstringens*, *kraussiana*, *leiocarpa*, *subalata*) grows in drier areas and has straight-edged pods (Ndoye-Ndir et al., 2008).

Acacia nilotica is a multipurpose tree: it provides timber, fuel, shade, food, fodder, honey, dye, gum and fences. It also impacts the environment through soil reclamation, soil enrichment, protection against fire and wind, and as a haven for biodiversity and ornament. It is widely used in ethno-medicine (Orwa et al., 2009; Cook et al., 2005; Fagg et al., 2005). However it is considered a weed in some areas including Australia, the Galapagos Islands, and the Pacific Islands (US Forest Service, 2012).

Acacia nilotica is a useful fodder source, and sometimes a very important one, particularly in dry regions. The foliage and the pods dropped during the dry season can be a fundamental source of nutrients in periods of feed scarcity (Orwa et al., 2009; Carter, 1994; Audru et al., 1993).

Distribution

Acacia nilotica originated from Africa, the Arabian peninsula and the Indian subcontinent (USDA, 2012). It is now commonly found or cultivated within 30°N and 20°S in almost all tropical and subtropical areas of Africa, Asia, Australia and the Caribbean (Ecocrop, 2012; Orwa et al., 2009; Fagg et al., 2005). Of the nine *Acacia nilotica* subspecies, six are found in Africa (*indica, kraussiana, leiocarpa, nilotica, subalata, tomentosa*), two in the Indian subcontinent (*cupressiformis* and *hemispherica*)

and one (*adstringens*) occurs in both continents.

Acacia nilotica is a pioneer species. It can grow from sea level up to an altitude of 2000 m, on a wide variety of soils and climatic conditions. The two *Acacia nilotica* types have the following growing conditions:

Subspecies	Pod shape	Rainfall	Temperature range	Frost tolerance	Soil depth	Soil texture	Drainage	Particular conditions
indica, *nilotica*, *tomentosa*	Necklace-shaped	600-2300 mm	15-28°C	Moderate	Low, granite to clayey	Heavy	Low	Seasonally flooded
adstringens, *leiocarpa*, *subalata*, *kraussiana*	Straight-edged	100-1500 mm	15-28°C	Moderate	High	Light, medium	High	Drier areas

Forage management

Acacia nilotica propagates by seeds carried in animal droppings or by direct seeding (Fagg et al., 2005; Carter, 1994). The trees begin fruiting within 5-7 years and yield about 18 kg pods/year (Ecocrop, 2012). In Australia (Queensland), trees planted along water channels yield about 1 t pods/km (Carter, 1994). DM yield of tree leaves varied from 0.2 to 2.0 t/ha/year (Rai et al., 2007).

The trees are browsed by livestock or lopped for fodder. Pods can be eaten on the ground or browsed by livestock or collected to be fed on the farm. The forage management of *Acacia nilotica* can be quite complex as various parts of the plants are used at different periods of the year for different types of animals. For instance, an extensive survey carried out in Djibouti on *Acacia nilotica* subsp. *tormentosa* describes how the foliage, flowers and pods are used by Afar communities to feed sheep, goats and camels (Audru et al., 1993).

Environmental impact

Soil improvement and reclamation

Acacia nilotica is an N-fixing legume that can be grown with grass or cereal crops in order to enhance their N value. It is used as a pioneer species in the reclamation of mining areas and in areas where degradation and erosion have occurred, an example being the Chambal ravines in India (Fagg et al., 2005; Carter, 1994).

Weed

Acacia nilotica is considered a noxious weed in Australia where it was introduced, as it was later found to be detrimental to companion grasses and crops yields (Carter, 1994).

Datasheet citation

Heuzé V., Tran G., Eugène M., Bastianelli D., Lebas F., 2016. *Babul (Acacia nilotica)*. Feedipedia, a programme by INRA, CIRAD, AFZ and FAO. http://www.feedipedia.org/node/346 *Last updated on March 23, 2016, 15:09*

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Babul (Acacia nilotica)

Nutritional attributes

The overall nutritional value of *Acacia nilotica* is difficult to evaluate as the parts browsed by the animals or lopped for fodder include variable proportions of leaves, petioles, twigs, shoots, flowers and pods at various stages of maturity. The composition of these materials, and particularly their amount of fibre and tannins, is quite variable. *Acacia nilotica* leaves and browse are not very rich in protein (10-20% DM) but not very fibrous either (ADF 18% in the 10-30% DM range with some recorded values over 30% DM). The pods are slightly poorer in protein (10-14% DM) and contain more fibre (ADF 17-27% DM). The seeds contain much more protein (19% DM) and fibre (29% DM). However, the amount of tannins can be extremely important, both in the leaves (up to 25% total extractable tannins and 5% condensed tannins (Rubanza et al., 2005), and in the pods, where the content in soluble phenolics is particularly high. Those phenolics tend to reduce the palatability and feeding value of *Acacia nilotica* browse and pods (Ngwa et al., 2002; Mlambo et al., 2008). The presence of large amounts of tannins can give rise to artificially high fibre contents (Mlambo et al., 2008).

Potential constraints

Tannins

All parts of the plant contain high levels of tannins that may hamper protein digestibility and animal performance (Carter, 1994). Incidences of lethal poisoning, probably due to tannins, when goats consumed excess *Acacia nilotica* pods, were reported in South Africa. Symptoms included abortions, dyspnoea, tachycardia, methemoglobinemia, rumen atony and hyperglycemia. Caution is recommended when feeding *Acacia nilotica* pods to goats on a daily basis (Terblanche et al., 1967 cited by Mlambo et al., 2008). It should be noted that the measurement and nutritional interpretation of phenolics and tannins content in *Acacia* species are particularly difficult (Mlambo et al., 2008).

Other secondary metabolites

Acacia nilotica foliage and pods contain alkaloids and saponins that may have antinutritional effects (Cheema et al., 2011; Cook et al., 2005).

Ruminants

The leaves and stems of *Acacia nilotica* are readily browsed by sheep, cattle, goats and camelids. Trees can be lopped for foliage during dry periods to provide supplemental feeding to livestock (Carter, 1994). In the drier areas of Sub-Saharan Africa, for instance, the pods ripen and fall well into the dry season when there are few alternative protein sources. They may be collected to be brought back to the village to feed the livestock or sold in fodder markets. In some regions, the animals are taken to the trees and the pods are consumed as they fall down naturally or are knocked down by herders (Mlambo et al., 2008; Tanner et al., 1990). Different ruminant species do not eat the same plant parts: in Djibouti, it was observed that camels preferred the non-lignified tips of branches once the leaves had been eaten by sheep and goats. Camels ate the pods whole while goats discarded the seeds and ate only the pod husks. Young female goats were fed almost exclusively with fallen inflorescences at the end of the flowering period (Audru et al., 1993).

Foliage

Information regarding digestibility values for *Acacia nilotica* leaves is scant but *in vivo* DM digestibility of 55% (Barbind et al., 1994) and 66% (*in sacco* 48 h, Cheema et al., 2011) have been reported. The latter value should result in a ME value under 10 MJ/kg DM. *Acacia nilotica* leaves included at up to 20 % in goat diets had a detrimental effect of nutrient digestibility, N absorption and retention and rumen bacteria (Sotohy et al., 1997). In a comparison with four other *Acacia* species (*Acacia karroo*, *Acacia tortilis*, *Acacia sieberiana*, *Acacia rhemniana*), young dried leaves of *Acacia nilotica* were found to be among the most palatable with an intake of about 200 g/d in sheep and goats (Mokoboki et al., 2011). The relationship between tannins and palatabilty is not simple: in a comparison between browse fodder of *Acacia nilotica*, *Acacia seyal* and *Sesbania sesban* as a protein supplement to a tef straw-based diet in sheep and goats, acceptability was similar for the three browses even though the *Acacia* species contained more condensed tannins than *Sesbania* (Ebong, 1995).

Pods

In some areas, such as South Africa, *Acacia nilotica* pods have been reported to be favoured by both cattle and goats during dry periods (Chepape et al., 2011). However, while the pods supply protein and energy, their high tannin content is detrimental to their digestibility, degradability and palatability (Ngwa et al., 2002; Mlambo et al., 2008, Rubanza et al., 2003a). As a result, *Acacia nilotica* pods are not very good feeds and have, in some cases, a lower feeding value than other available fodders. In sheep fed maize stover supplemented with acacia pods, lower growth rates were reported with *Acacia nilotica* than with *Acacia tortilis* and *Faidherbia albida* and it was considered to be a less suitable protein source than those species (Tanner et al., 1990). *Acacia nilotica* pods were found to be able to meet the maintenance requirements of sheep but they were of low digestibility and phosphorus supplementation was required (Chellapandian et al., 2003). The pods are not palatable and using them as a supplement has resulted in a high refusal rate (Ncube et al., 1994).

Several methods have been proposed to alleviate the negative effects of tannins in *Acacia nilotica*-based diets for ruminants. The use of tanniniferous browse fodder such as *Acacia nilotica* could be optimized through feeding a mixture of supplements with readily available nitrogen to dilute the tannin antinutritional activity (Rubanza et al., 2003a). Sun-drying may also help to reduce tannin content (Rubanza et al., 2003a; Ebong, 1995). Soaking pods with polytethylene glycol (PEG) was shown to increase significantly *in vitro* gas production and 95-h organic matter degradability (from 69 to 79%) but this treatment is too costly for smallholder farmers (Mlambo et al., 2001). While alkaline treatment with NaOH or NH_3 can be dangerous, one economical and readily available source of alkaline material is wood ash solution: pods crushed and soaked in a wood ash

solution showed a decrease in the concentration of soluble tannins (Sikosana, 2006).

Pigs

Feeding pigs with *Acacia nilotica* leaf meal at a low (10%) inclusion rate depressed nutrient digestibility, increased endogenous protein secretion and increased the activity of liver enzymes. However, it did not reduce growth rate and was therefore considered as a potentially viable technology (Halimani et al., 2005; Halimani et al., 2007).

Poultry

No information found (2013).

Rabbits

Acacia nilotica browse is very palatable to rabbits: young *Acacia nilotica* trees are so abundantly grazed by wild rabbits in South Africa than protection against rabbits has been considered necessary to avoid their complete destruction (Walker et al., 1986 cited by Auld, 1995).

Feeding a diet containing 4% of *Acacia nilotica* leaf meal to growing rabbits did not result in differences in intake and digestibility. It was concluded that the amount of tannins in the diet was insufficient to have negative effects and this level of inclusion (4%) was ideal for supplementation (Mashamaite et al., 2009). However, studies investigating higher inclusion rates of *Acacia nilotica* forage or pods are necessary before it becomes possible to give recommendations for rabbits, mainly because of the numerous and proven pharmacological effects of the plant, which is widely used in ethno-medicine (Agunu et al., 2005). Some of these effects can be considered positive: for example, leaf extracts are able to stimulate lactation in rats (Lompo-Ouedraogo et al., 2004) and whole leaves and pods can inhibit *Clostridium perfringens* development in rabbits (Sotohy, 2004). However, *Acacia nilotica* extracts are also known to be hypoglycemic and to affect intestinal motility in the rabbit, two effects that would be negative in commercial rabbit production (Gilani et al., 1999; Ali et al., 2012).

Datasheet citation

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Feed categories
All feeds
Forage plants
- Cereal and grass forages
- Legume forages
- Forage trees
- 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
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Babul (Acacia nilotica)

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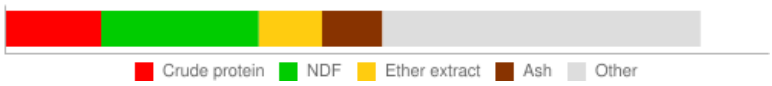
Tables of chemical composition and nutritional value

- Babul (Acacia nilotica), leaves, fresh
- Babul (Acacia nilotica), pods, dry
- Babul (Acacia nilotica), pods, fresh
- Babul (Acacia nilotica), seeds
- Babul (Acacia nilotica), pod husks

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

Babul (Acacia nilotica), leaves, fresh



Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	50.0	9.3	35.1	60.4	5
Crude protein	% DM	13.7	1.5	10.8	17.6	36
Crude fibre	% DM	13.0	2.1	10.1	17.4	27
NDF	% DM	22.7	5.8	13.7	43.1	27
ADF	% DM	17.0	7.0	10.4	35.6	29
Lignin	% DM	6.5	1.2	4.8	8.7	27
Ether extract	% DM	9.1	3.3	3.2	14.8	25
Ash	% DM	8.7	2.5	5.2	15.2	35
Gross energy	MJ/kg DM	19.1		19.1	21.9	2 *

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	18.1	4.7	11.4	33.5	20
Phosphorus	g/kg DM	1.4	0.3	1.0	2.2	20
Potassium	g/kg DM	7.8	3.1	3.0	14.8	18
Sodium	g/kg DM	0.3	0.4	0.1	1.5	10
Magnesium	g/kg DM	2.2	1.8	0.7	8.4	18
Manganese	mg/kg DM	75	63	26	247	11
Zinc	mg/kg DM	39	51	13	200	12
Copper	mg/kg DM	9	3	5	17	11

Secondary metabolites	Unit	Avg	SD	Min	Max	Nb
Tannins (eq. tannic acid)	g/kg DM	48.7	50.5	15.8	236.0	17
Tannins, condensed (eq. catechin)	g/kg DM	13.0	20.6	0.1	52.8	12

Ruminant nutritive values	Unit	Avg	SD	Min	Max	Nb
OM digestibility, Ruminant	%	65.6				
Energy digestibility, ruminants	%	62.7				*
DE ruminants	MJ/kg DM	11.9				*
ME ruminants	MJ/kg DM	9.8				*
ME ruminants (gas production)	MJ/kg DM	7.1				1
Nitrogen digestibility, ruminants	%	65.1				1
a (N)	%	30.2				1
b (N)	%	22.2				1
c (N)	h-1	0.042				1
Nitrogen degradability (effective, k=4%)	%	42				*
Nitrogen degradability (effective, k=6%)	%	39				*

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

References

Abdulrazak et al., 2001; Barbind et al., 1994; Blair Ralns, 1963; Cheema et al., 2011; CIRAD, 1991; Khanum et al., 2007; Makkar et al., 1998; Rubanza et al., 2003; Rubanza et al., 2005; Sotohy et al., 1997; Tefera et al., 2008

Last updated on 24/10/2012 00:43:40

Babul (Acacia nilotica), pods, dry

Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	90.9	3.4	84.9	93.7	10
Crude protein	% DM	11.7	1.4	9.2	13.7	18
Crude fibre	% DM	18.0	4.1	12.3	28.5	15
NDF	% DM	26.8	4.1	22.2	34.6	13
ADF	% DM	21.3	3.1	17.2	27.3	14
Lignin	% DM	5.7	1.9	1.9	8.3	10
Ether extract	% DM	2.2	0.8	0.8	4.1	16
Ash	% DM	5.1	1.1	3.5	7.8	19
Starch (polarimetry)	% DM	11.3				1
Water-soluble carbohydrates	% DM	10.3				1
Gross energy	MJ/kg DM	18.3				*

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	6.2	2.1	3.4	10.9	11
Phosphorus	g/kg DM	1.7	0.5	0.7	2.8	11
Potassium	g/kg DM	9.9	4.9	0.3	13.4	6
Sodium	g/kg DM	0.2	0.1	0.0	0.3	3
Magnesium	g/kg DM	1.7	0.5	1.3	2.8	7
Manganese	mg/kg DM	60	60	17	150	5
Zinc	mg/kg DM	27	6	17	31	5
Copper	mg/kg DM	9	3	5	13	5
Iron	mg/kg DM	139		112	166	2

Amino acids	Unit	Avg	SD	Min	Max	Nb
Alanine	% protein	3.5				1
Arginine	% protein	5.5				1
Aspartic acid	% protein	10.9				1
Glutamic acid	% protein	8.4				1
Glycine	% protein	4.0				1
Histidine	% protein	2.4				1
Isoleucine	% protein	2.5				1
Leucine	% protein	4.3				1
Lysine	% protein	4.0				1
Methionine	% protein	0.7				1
Phenylalanine	% protein	2.5				1
Proline	% protein	14.9				1
Serine	% protein	1.9				1
Threonine	% protein	1.9				1
Tyrosine	% protein	2.2				1
Valine	% protein	4.0				1

Secondary metabolites	Unit	Avg	SD	Min	Max	Nb
Tannins (eq. tannic acid)	g/kg DM	81.8	47.8	49.4	187.1	7
Tannins, condensed (eq. catechin)	g/kg DM	3.6	6.9	0.1	14.0	4

Ruminant nutritive values	Unit	Avg	SD	Min	Max	Nb
OM digestibility, Ruminant	%	66.2				1
Energy digestibility, ruminants	%	63.2				*
DE ruminants	MJ/kg DM	11.5				*
ME ruminants	MJ/kg DM	9.5				*
ME ruminants (FAO, 1982)	MJ/kg DM	10.0				1
Nitrogen digestibility, ruminants	%	51.7				1
a (N)	%	63.7				1
b (N)	%	30.0				1
c (N)	h-1	0.026				1
Nitrogen degradability (effective, k=4%)	%	75				*
Nitrogen degradability (effective, k=6%)	%	73				*

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

References

Barman et al., 2006; CIRAD, 1991; Dougall et al., 1958; French, 1934; FUSAGx/CRAW, 2009; Mlambo et al., 2008; Ngwa et al., 2002; Patel, 1966; Sawe et al., 1998; Shayo et al., 1999; Tanner et al., 1990; Walker, 1975

Last updated on 02/05/2013 16:56:10

Babul (Acacia nilotica), pods, fresh

Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	40.4				1
Crude protein	% DM	12.2		11.2	13.2	2
Crude fibre	% DM	18.0		15.3	20.7	2
Ether extract	% DM	3.5		1.7	5.3	2
Ash	% DM	5.2		4.4	6.1	2
Gross energy	MJ/kg DM	18.6				*

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	9.5		5.4	13.7	2
Phosphorus	g/kg DM	1.8		1.7	2.0	2
Potassium	g/kg DM	12.5				1
Magnesium	g/kg DM	1.4				1

Secondary metabolites	Unit	Avg	SD	Min	Max	Nb
Tannins (eq. tannic acid)	g/kg DM	91.5				1

Ruminant nutritive values	Unit	Avg	SD	Min	Max	Nb
OM digestibility, Ruminant	%	88.3				*
Energy digestibility, ruminants	%	84.5				*
DE ruminants	MJ/kg DM	15.7				*
ME ruminants	MJ/kg DM	12.9				*
Nitrogen digestibility, ruminants	%	39.3				1

Pig nutritive values	Unit	Avg	SD	Min	Max	Nb
Energy digestibility, growing pig	%	61.9				*
DE growing pig	MJ/kg DM	11.5				*

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

References

CIRAD, 1991; Madhavilatha et al., 1999

Last updated on 24/10/2012 00:43:40

Babul (Acacia nilotica), seeds

Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	93.5	1.3	91.9	94.9	4
Crude protein	% DM	20.4	3.9	15.8	28.3	8
Crude fibre	% DM	19.4	3.8	16.6	24.8	4
NDF	% DM	37.2	6.0	30.6	45.7	7
ADF	% DM	29.3	4.0	24.9	36.1	7
Lignin	% DM	4.2	2.0	1.5	7.6	6
Ether extract	% DM	4.2	1.9	1.6	7.0	6
Ash	% DM	5.7	1.0	4.0	6.9	7
Starch (polarimetry)	% DM	1.9				1
Gross energy	MJ/kg DM	19.2		18.1	19.9	2 *

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	7.9	2.3	5.5	10.0	3
Phosphorus	g/kg DM	3.4	0.5	3.0	4.0	3
Potassium	g/kg DM	10.9	1.2	9.6	12.1	3
Magnesium	g/kg DM	2.5	0.0	2.5	2.5	3
Manganese	mg/kg DM	44				1
Zinc	mg/kg DM	44				1
Copper	mg/kg DM	26				1

Amino acids	Unit	Avg	SD	Min	Max	Nb

Alanine	% protein	3.3	3.3	3.4	2
Arginine	% protein	7.7	6.6	8.8	2
Aspartic acid	% protein	8.9	8.3	9.4	2
Cystine	% protein	8.7			1
Glutamic acid	% protein	11.8	11.2	12.3	2
Glycine	% protein	5.9			1
Histidine	% protein	3.6	2.6	4.7	2
Isoleucine	% protein	2.8	2.6	2.9	2
Leucine	% protein	6.1	5.7	6.5	2
Lysine	% protein	5.7	4.6	6.8	2
Methionine	% protein	2.4	0.2	4.6	2
Phenylalanine	% protein	3.0	2.9	3.0	2
Proline	% protein	4.6	4.2	5.0	2
Serine	% protein	3.5	2.0	4.9	2
Threonine	% protein	2.3	1.9	2.7	2
Tyrosine	% protein	1.9	1.2	2.6	2
Valine	% protein	3.4	2.8	4.0	2

Secondary metabolites	Unit	Avg	SD	Min	Max	Nb
Tannins (eq. tannic acid)	g/kg DM	3.9	1.7	2.7	5.8	3
Tannins, condensed (eq. catechin)	g/kg DM	1.6				1

Ruminant nutritive values	Unit	Avg	SD	Min	Max	Nb
OM digestibility, Ruminant	%	70.0				
Energy digestibility, ruminants	%	68.2				*
DE ruminants	MJ/kg DM	13.1				*
ME ruminants	MJ/kg DM	10.5				*

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

References

Barman et al., 2006; CIRAD, 1991; Kumaresan et al., 1984; Mlambo et al., 2008; Ngwa et al., 2002; Tanner et al., 1990

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Babul (Acacia nilotica), pod husks

Main analysis	Unit	Avg	SD	Min	Max	Nb
Crude protein	% DM	10.1	2.9	7.4	13.2	3
NDF	% DM	24.6	4.5	21.4	29.8	3
ADF	% DM	19.0	3.6	15.7	22.8	3
Lignin	% DM	5.8		5.2	6.4	2
Ash	% DM	6.0		5.4	6.5	2
Starch (polarimetry)	% DM	13.4				1

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

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Mlambo et al., 2008; Ngwa et al., 2002; Tanner et al., 1990

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Babul (Acacia nilotica)

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