Stylo (Stylosanthes guianensis)

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Common names

- *Stylosanthes guianensis* var. *guianensis*: Brazilian stylo, brazilian lucerne, common stylo, stylo [English]; luzerne brésilienne, luzerne du Brésil, luzerne tropicale [French]; brasilianische Luzerne [German]; alfalfa do nordeste, trifolio, mangericão do compo, saca estrepe [Portuguese]; alfalfa de Brasil, lengua de rana, tarbardillo [Spanish]
- *Stylosanthes guianensis* var. *intermedia* (Vogel) Hassl.: fine stem stylo [English]

Species

Stylosanthes guianensis (Aublet) Sw. [Fabaceae]

Synonyms

Var. *guianensis*: *Stylosanthes gracilis* var. *subviscosa* (Benth.) Burkart, *Stylosanthes guianensis* var. *canescens* M. B. Ferreira & Sousa Costa, *Stylosanthes guianensis* var. *microcephala* M. B. Ferreira & Sousa Costa, *Stylosanthes guianensis* var. *pauciflora* M. B. Ferreira & Sousa Costa, *Stylosanthes guianensis* var. *subviscosa* Benth., *Stylosanthes guianensis* var. *vulgaris* M. B. Ferreira & Sousa Costa, *Trifolium guianense* Aubl.

Var. *intermedia* (Vogel) Hassl.: *Stylosanthes campestris* M.B. Ferreira & Sousa Costa, *Stylosanthes hippocampoides* Mohlenbr., *Stylosanthes montevidensis* Vogel var. *intermedia* Vogel

Feed categories

- Legume forages
- Forage plants

Related feed(s)

- Townsville stylo (Stylosanthes humilis)
- Caribbean stylo (Stylosanthes hamata)
- African stylo (Stylosanthes fruticosa)

Description

Stylo (*Stylosanthes guianensis* (Aublet) Sw.) is a tropical legume shrub widely grown for forage throughout the tropics and subtropics.

Morphology

Stylo is a short-lived, erect or semi-erect perennial legume that can reach a height of 1-1.5 m. Stylo has a strong taproot that is nodulated. The stems are many-branched and may be woody at the base. Stylo does not twin, unlike other legumes. Stylo is a leafy species that remains green under dry conditions. The leaves are trifoliolate with elliptical to lanceolate leaflets, 0.5-45 mm long x 20 mm broad. The inflorescence is a densely flowered spike, with up to 40 flowers/head. Flowers are yellow to orange with black or red stripes. The fruit is a one-seeded pod, 2-3 mm long x 1.5-2.5 mm wide. The seed are very small, pale brown or purple in colour (US Forest Service, 2014; Cook et al., 2005; Mannetje, 1992). There are 7 varieties of stylo, notably var. *guianensis* (common stylo) and var. *intermedia* (fine stem stylo) (Mannetje, 1984). Fine stem stylo has finer and shorter stems than the common stylo (1-2 mm in diameter and only 30 cm in height). Its inflorescence is a denser cluster and the seeds are yellowish brown (Cook et al., 2005; Mannetje, 1984).

Utilisation

Stylo is particularly suited for forage in subhumid tropical and subtropical areas with a marked dry season. Stylo is used for hay, cut-and-carry systems and pasture (Cook et al., 2005). Stylo is fairly palatable to livestock when mature and can grow on relatively infertile soils. It can be intercropped with rice and oversown in natural grasslands. It is a valuable cover crop in coconut and palm oil plantations (Husson et al., 2008; Skerman et al., 1990; Göhl, 1982). While normally used for ruminant production, *Stylosanthes guianensis* is also used to feed pigs in South-East Asia (Khoutsavang, 2005).

Stylosanthes guianensis var. *guianensis* used to be a widely used forage, not only in its native South America but also in South-East Asia, Africa and Australia, where many cultivars had been developed to suit local Australian growing conditions (Mannetje, 1992). However, in the 1970s, a major outbreak of the disease anthracnose, caused by the fungus *Colletotrichum gloeosporioides*, devastated stylo cultivation throughout the world, and popular cultivars such as Schofield, Cook and Graham were found highly sensitive to this disease. Since then, breeding efforts have focused on developing anthracnose-resistant cultivars. CIAT 184, developed in Peru, is resistant to anthracnose in the humid tropics, and cultivars derived from this line have been successfully cultivated in South America (Amezquita et al., 1991), China (Devendra et al., 1993; Liu Guodao et al., 1997), South-East Asia (Laos, Khoutsavang, 2005; Vietnam, Thang et al., 2010; Thailand, Kiyothong et al., 2004) and the Congo (Kinshasa) (Bulakali et al., 2013). Other varieties of *Stylo guianensis* are also available as commercial cultivars. Ubon stylo (*Stylosanthes guianensis* var. *vulgaris* x var. *pauciflora*) is anthracnose-resistant. Fine stem stylo has a lower drought

tolerance than common stylo but a higher resistance to anthracnose (Mannetje, 1992). One fine stem stylo cultivar (Oxley), bred in Australia at the end of the 1960s, is adapted to sandy soils of the subtropics (Cook et al., 2005).

Distribution

Stylosanthes guianensis is native to Central and South America, where it is used in the manner of alfalfa. It was naturalized in many tropical and subtropical areas where it became a popular legume forage (Cook et al., 2005; Mannetje, 1992). However, its cultivation largely ceased after an outbreak of anthracnose in the 1970s and only resumed in the 1990s, after anthracnose-resistant lines were developed and released commercially.

Stylo is found from 20°N to 32°S, and from sea level up to an altitude of 2000 m (Cook et al., 2005; Mannetje, 1992). Stylo can grow in places where annual rainfall ranges from 700 to 5000 mm, but it does better between 1000 and 2500 mm for common stylo and between 600 and 1800 mm for fine stem stylo. Stylo is a warm season growing legume that thrives in places where annual temperatures are between 23 and 27°C. However, stylo can survive light frost (0°C) and can remain productive down to 15°C. Fine stem stylo has more frost tolerance than common stylo. Stylo does well in most soils from sands to light clays (including those that are relatively infertile or deprived of P) provided they are well-drained. Soil pH ranging from 4 to 8.3 is acceptable to var. *Guianensis,* which also has some tolerance of Al and Mn. Fine stem stylo prefers neutral soils. Stylo is not salt tolerant. It is a full light species (Cook et al., 2005).

Forage management

Establishment

Stylo can be sown alone or mixed with companion species. In Australia, it is often oversown in native grasslands (Partridge, 2003). Stylo can be sown in plots (7-12 seeds/plot) and should not be buried as the seeds are very small. Stylo can be broadcast when overseeded in grassland. In humid areas, stylo can be sown at any time provided that there is no dry period during its establishment. In drier parts, it should be sown as soon as possible after the start of the rainy season, and at least two months before the rain stops (Husson et al., 2008).

Yield

Stylo is a high yielding forage legume that can produce 10-20 t DM/ha depending on soil fertility (Cook et al., 2005).

Association

Stylo can be mixed with tropical grasses such as *Brachiaria* spp., *Andropogon gayanus*, *Chloris gayana*, *Digitaria eriantha*, *Heteropogon contortus*, *Hyparrhenia rufa*, *Melinis minutiflora*, *Pennisetum purpureum* or *Setaria sphacelata*. It can be outshaded when it is sown with Guinea grass (*Megathyrsus maximus*) (Cook et al., 2005). Stylo is not often sown with other legumes but it can be intercropped with rice, maize or cassava, depending on soil fertility (Husson et al., 2008).

Pasture

Stylo can be grazed but it is sensitive to heavy grazing. It should not be grazed until 6-8 weeks after sowing. Rotational grazing is preferable with 4-8 week rest intervals (Skerman et al., 1990). Stylo has been used to improve the nutritive value of natural grasslands in Australia (Partridge, 2003).

Cut-and-carry system

Stylo can be easily cut and then fed fresh to livestock. It is, however, not very palatable when young and it is advised to wilt it to soften its bristles before offering it to the animals (Skerman et al., 1990).

Hay and silage

Stylo can make valuable hay but should be handled carefully so that it does not shed its leaves. For sward longevity, stylo should not be cut below 20 cm and no more than once a year (Skerman et al., 1990). Stylo may be used as silage when ensiled with salts and molasses (FAO, 2014).

Deferred feed

Stylo is a valuable deferred feed for cattle as its palatability increases with maturity (Skerman et al., 1990).

Environmental impact

Soil improver

Stylo is a N-fixing legume that readily nodulates and improves soil N mineral status. It is able to extract P from soils that are very poor in this nutrient and it is tolerant of low Mo levels. In Laos, stylo fallow increased rice yield and decreased weed biomass (Saito et al., 2006). In Nigeria, a stylo fallow preceding a maize crop resulted in a yield of maize similar to that obtained with the addition of 45 kg N/ha (Tarawali, 1991).

Weed controller

Stylo was reported to control weeds such as *Striga asiatica*, *Rottboellia exaltata*, *Borreria alata*, *Boerhavia diffusa* and *Imperata cylindrica* (Husson et al., 2008).

Datasheet citation

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Nutritional attributes

Stylosanthes guianensis has a variable protein content, which is usually moderate (about 14% DM) but can be as low as 6% or exceed 20% DM. The fibre content is quite high (more than 25% DM crude fibre). Stylo contains condensed tannins (Baloyi et al., 2001; Thang et al., 2010).

Potential constraints

No toxicity was reported (as of 2015).

Ruminants

Stylo is a valuable forage legume for ruminants, usually fed as hay (or sun-dried), cut-and-carry forage, or grazed. Like other legumes, *Stylosanthes guianensis* is often used as a supplement during the dry season to improve the nutritive value of low quality forages, including crop residues or by-products such as rice straw (Thang et al., 2010), maize stover (Said et al., 1993), or other locally available forages (Matizha et al., 1997; Akinlade et al., 2002; Kiyothong et al., 2004; Pen et al., 2013).

Palatability

The palatability of *Stylosanthes guianensis* increases with maturity. Fresh young stylo is not very palatable to livestock, possibly due to the bristles borne on the stems (Skerman et al., 1990; FAO, 2014). Stylo has a low palatability during the rainy season, but is readily eaten in the dry season. If kept short, it does not become woody but remains leafy and palatable (Göhl, 1982). Satisfactory intake was observed in zebu cattle when stylo was fed fresh as a supplement (Pen et al., 2013). Stylo seems to be more palatable when it is wilted before being stall-fed to cattle (Skerman et al., 1990; FAO, 2014).

Digestibility

The OM digestibility of *Stylosanthes guianensis* ranges between 51 and 67% which is low compared to other tropical legumes (Gardener et al., 1982; Mupangwa et al., 2000; Magalhaes et al., 2003). It has a high proportion of moderately soluble proteins compared with other tropical legumes (Magalhaes et al., 2003).

Dairy cattle

In Thailand, *Stylosanthes guianensis* hay used in association with cassava hay in moderate amounts (1-2 kg/d), as a supplement for dairy cows fed a basal forage of moderate quality reduced significantly the amount of concentrate without altering milk production (Kiyothong et al., 2004).

Growing cattle

In Cambodia, the inclusion of 30% fresh *Stylosanthes guianensis* significantly improved OM intake in zebu steers, allowing a better utilisation of a low protein basal diet by improving the efficiency of microbial protein production in the rumen (Pen et al., 2013). In Vietnam, with crossbred (Yellow x Sindhi) growing cattle fed a basal diet of urea-treated straw, molasses and concentrates, supplementation with 1 kg/d sun-dried *Stylosanthes guianensis* or a 50:50 mixture or *Stylosanthes* and cassava foliage resulted in intake, OM digestibility and live-weight gain comparable (though slightly lower) to that obtained with soybean meal supplementation, but N retention was lower. Results with stylo supplementation were higher than those obtained with cassava hay (Thang et al., 2010).

Sheep

In Zimbabwe, when offered as a sole forage to adult sheep, *Stylosanthes guianensis* hay was well ingested and fully covered their energy and N requirements for maintenance. Intake was higher than for *Cassia rotundifolia* and similar to that of lablab (*Lablab purpureus*) and *Macroptilium atropurpureum* (Mupangwa et al., 2000).

With growing sheep, the inclusion of 30% or more of *Stylosanthes guianensis* hay in the diet of growing lambs fed poor quality forage substantially increased their intake, OM digestibility and live-weight gain (Ethiopia, Said et al., 1993; Zimbabwe, Matizha et al., 1997; Nigeria, Akinlade et al., 2002). In comparison trials with other legume hays, *Stylosanthes guianensis* hay was better than *Macrotyloma axillare* (Said et al., 1993), *Desmodium intortum* (Said et al., 1993), *Desmodium uncinatum* (Matizha et al., 1997) and *Lablab purpureus* (Akinlade et al., 2002); was comparable to *Aeschynomene histrix* (Akinlade et al., 2002); but was inferior to *Macroptilium atropurpureum* (Matizha et al., 1997).

Pigs

Stylo can be fed to pigs as fresh material (whole crop or leaves), as silage or as leaf meal, and is often used for this purpose in South-East Asia. Before being offered to pigs, *Stylosanthes guianensis* should be chopped to a length shorter than 5 cm (Keoboualapheth et al., 2003; Norachack et al., 2004; Kaensombath et al., 2013). The high fibre content decreases the energy value (the estimated ME for growing pigs being 7.8 MJ/kg DM; Phengsavanh et al., 2013), which may impair growth performance. *Stylosanthes guianensis* is commonly used to increase the protein content of local diets but its low lysine content (4.5% of protein) may result in an amino acid imbalance.

Fresh stylo

In China, fresh *Stylosanthes* (including *Stylosanthes guianensis*), mixed with wheat or rice bran and other ingredients, has long been used by pig farmers as a partial substitute to cereal grain in order to reduce feed costs (Bai Changjun et al., 2004). In Laos, fresh stylo used to supplement a low protein diet fed to growing pigs (10-40 kg) was included at 6.4% of the diet DM with

positive effects on body weight gain and feed conversion ratio (Keoboualapheth et al., 2003; Phengsavanh et al., 2006). Higher levels of inclusion in the diet (more than 20% DM) decreased feed intake due to the high fibre content of stylo (Norachack et al., 2004; Phengsavanh et al., 2013). Replacing soybean meal with stylo decreased body weight gain and reduced the feed conversion ratio (Phengsavanh et al., 2013; Kaensombath et al., 2013).

Stylo leaf meal

In the mid-1990s, smallholders in Hainan (China) began to harvest *Stylosanthes*, sun-dry it and grind it to make a powder they could offer to pigs and poultry. Pigs were fed a diet containing 10-15% *Stylosanthes* meal or green *Stylosanthes* cut into 2-4 cm pieces and cooked with other food wastes. Blends of different stylo leaf meals (45% *Stylosanthes guianensis*, 45% *Stylosanthes hamata* and 10% *Stylosanthes scabra*) were included at 20-30% of the diet (Bai Changjun et al., 2004).

Poultry

Stylo has a relatively high fibre content, and thus a low energy value estimated at 7.2-7.6 MJ/kg DM (Bai Changjun et al., 2004), which prevents it from being a major ingredient for poultry diets. However, small amounts of stylo leaf meal have been tested to partially replace other ingredients such as bran. In Nigeria, with starter broiler chicks, growth performance was depressed by the inclusion of 5% stylo leaf meal, although this result was not constant (Onwudike et al., 1979a; Onwudike et al., 1979b). In growing and finishing broilers, levels of 5% seemed safe, and higher levels have been offered successfully in Nigeria, China and India (Onwudike et al., 1979b; Bai Changjun et al., 2004; Krishna et al., 2008). A Chinese trial showed a trend towards lower performance with increasing stylo from 3 to 6% and 9% (Bai Changjun et al., 2004). In layers, good quality stylo meal (more than 20% protein) did not significantly decrease laying rate when used below 10% of the diet (Onwudike et al., 1978). However, this experiment was done with hens with a low laying rate (53% in control group) and this result should not be extrapolated to high producing layers.

In general, stylo leaf meal should preferably be limited to 2-5% in broilers, and feeding stylo to young birds should be avoided. Stylo was fed successfully at a higher rate to other bird species: 8-12% to ducks and 15-20% to geese (Bai Changjun et al., 2004). When formulating diets with stylo, special care should be taken to ensure correct energy levels and amino acid balance. In less intensive production systems, stylo may be fed at higher levels and used as green forage for broilers or layers (Gupta et al., 1992).

Rabbits

Fresh stylo

Fresh stylo is frequently used as a cut-and-carry fodder for rabbits by smallholders in Asia (Phaikaew et al., 2004), and Africa (Nigeria, Odeyinka et al., 2007). Stylo with a moderate to low protein content (less than 15% DM) used as sole forage is not able to support maintenance or growth (Adegbola et al., 1985; Raharjo et al., 1986). On the contrary, when the protein level is high (19-20% DM), stylo can be used as sole feed for growing rabbits. In Nigeria, fresh *Stylosanthes guianensis* forage provided better growth rate (8.0 g/d *vs.* 6.7 g/d) than *Lablab purpureus* forage, or the fresh leaves of Mexican sunflower (*Tithonia diversifolia* Hemsl.) (Omole et al., 2007). This difference in ability of stylo forage to sustain growth is probably related to the low protein digestibility in mature plants (54%, Raharjo et al., 1985) compared to that of young forage (protein digestibility 70%, protein 20% DM, when cut every 40-45 days, Omole et al., 2007), which is slightly higher than that observed for dehydrated alfalfa of the same protein content (Perez et al., 1998). The low protein level associated with a low protein digestibility exacerbates the deficiency of *Stylosanthes guianensis* in supplying sulphur-containing amino acids and lysine: 56% and 86% of requirements, respectively (Lebas, 2004).

As a source of protein and fibre, *Stylosanthes guianensis* can be used profitably to supplement other less fibrous fresh forages such as water spinach (Khuc Thi Hue et al., 2006) or to supplement concentrate diets (Hongthong Phimmasan et al., 2005a; Jin et al., 2007; Iyeghe-Erakpotobor et al., 2008).

Dried stylo

Dried stylo has been used safely in balanced diets for growing rabbits and breeding does. Inclusion levels were 25-30% for growth and reproduction (Fomunyam et al., 1984), or 40% for growth (Harris et al., 1981). Stylo is a source of calcium but its low phosphorus content requires supplementation with minerals or ingredients rich in phosphorus, such as wheat bran.

Fish

No information found (2015).

Other species

Snails

In Kenya, stylo replaced papaya leaves in snail diets. Stylo increased snail feed intake and performance. Stylo had no deleterious effect on snail quality parameters (Okpeze et al., 2007).

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Tables of chemical composition and nutritional value

- Stylo (Stylosanthes guianensis), aerial part, fresh
- Stylo (Stylosanthes guianensis), hay

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

Stylo (Stylosanthes guianensis), aerial part, fresh

Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	27.0	8.0	15.6	52.9	962
Crude protein	% DM	14.0	3.4	6.2	21.7	1079
Crude fibre	% DM	31.2	4.2	20.8	41.5	1065
NDF	% DM	49.6	8.5	35.0	61.8	25 *
ADF	% DM	38.1	6.8	25.6	51.2	42 *
Lignin	% DM	8.7	1.7	5.5	10.8	31 *
Ether extract	% DM	2.4	0.6	1.2	4.2	1040
Ash	% DM	8.8	1.9	4.7	13.9	1035
Gross energy	MJ/kg DM	18.5	1.1	18.2	21.4	7 *

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	13.8	3.6	4.6	23.3	1050
Phosphorus	g/kg DM	2.3	1.0	0.7	4.6	1051
Potassium	g/kg DM	17.6	6.4	5.1	31.2	954
Sodium	g/kg DM	0.2	0.2	0.0	0.7	29
Magnesium	g/kg DM	3.6	1.1	1.5	6.4	924
Manganese	mg/kg DM	93	44	39	290	113
Zinc	mg/kg DM	33	13	14	75	113
Copper	mg/kg DM	11	3	6	16	114
Iron	mg/kg DM	187		156	218	2

Amino acids	Unit	Avg	SD	Min	Max	Nb
Alanine	% protein	5.2	0.3	5.0	5.5	3
Arginine	% protein	4.9	0.4	4.4	5.3	4
Aspartic acid	% protein	9.9	1.4	8.7	11.4	3
Cystine	% protein	1.0	0.1	0.9	1.2	5
Glutamic acid	% protein	10.2	1.0	9.3	11.5	4
Glycine	% protein	4.8	0.1	4.7	4.9	3
Histidine	% protein	2.0	0.1	1.8	2.2	4
Isoleucine	% protein	3.3	0.6	2.6	3.7	4
Leucine	% protein	7.2	0.6	6.5	8.0	4
Lysine	% protein	4.5	0.8	3.1	5.2	5
Methionine	% protein	1.2	0.2	0.9	1.4	4
Phenylalanine	% protein	5.1	0.3	4.8	5.6	4
Proline	% protein	4.4	0.8	3.7	5.3	3
Serine	% protein	4.4	0.1	4.3	4.5	3
Threonine	% protein	4.3	0.3	4.0	4.7	5
Tryptophan	% protein	0.9		0.6	1.1	2
Tyrosine	% protein	5.2	0.9	4.1	5.9	3
Valine	% protein	4.1	0.7	3.3	5.1	5

Secondary metabolites	Unit	Avg	SD	Min	Max	Nb
Tannins (eq. tannic acid)	g/kg DM	13.2		10.5	15.9	2

Ruminant nutritive values	Unit	Avg	SD	Min	Max	Nb

OM digestibility, ruminants	%	56.6	5.5	51.4	66.8	10 *
Energy digestibility, ruminants	%	54.1				*
DE ruminants	MJ/kg DM	10.0				*
ME ruminants	MJ/kg DM	8.0				*
Nitrogen digestibility, ruminants	%	60.3	9.5	42.0	77.3	10
a (N)	%	13.5				1
b (N)	%	49.5				1
c (N)	h-1	0.180				1
Nitrogen degradability (effective, k=4%)	%	54				*
Nitrogen degradability (effective, k=6%)	%	51				*

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

References

Abaunza et al., 1991; Ajayi et al., 2008; Ajayi et al., 2009; Aka et al., 2004; Aumont et al., 1991; Buntha et al., 2006; CIRAD, 1991; Heinritz et al., 2012; Iyeghe-Erakpotobor et al., 2008; Jingura et al., 2001; Kambashi et al., 2014; Keoboualapheth et al., 2003; Khuc Thi Hue et al., 2006; Milford, 1967; Nasrullah et al., 2003; Nguyen Van Sao et al., 2010; Pozy et al., 1996; Scaut, 1959; Silva et al., 2010; Xandé et al., 1989

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Stylo (Stylosanthes guianensis), hay

Main analysis	Unit	Avg	SD	Min	Max	Nb
Dry matter	% as fed	84.8	12.0	61.6	95.2	44
Crude protein	% DM	10.4	3.9	3.5	16.9	45
Crude fibre	% DM	35.6	4.9	27.3	45.2	39
NDF	% DM	53.8	7.4	46.9	63.7	6 *
ADF	% DM	42.5	7.9	33.4	53.5	6 *
Lignin	% DM	9.6	4.3	7.1	18.8	6 *
Ether extract	% DM	2.0	0.5	1.0	2.6	40
Ash	% DM	6.9	1.7	3.7	10.0	44
Gross energy	MJ/kg DM	18.7				*

Minerals	Unit	Avg	SD	Min	Max	Nb
Calcium	g/kg DM	9.8	2.7	3.1	15.2	41
Phosphorus	g/kg DM	1.5	0.6	0.6	2.4	41
Potassium	g/kg DM	14.8	5.7	5.7	23.9	31
Magnesium	g/kg DM	2.7	0.7	1.2	4.1	31
Manganese	mg/kg DM	27				1
Zinc	mg/kg DM	11				1
Copper	mg/kg DM	4				1

Amino acids	Unit	Avg	SD	Min	Max	Nb
Arginine	% protein	5.3				1
Cystine	% protein	1.2				1
Glycine	% protein	4.5				1
Histidine	% protein	1.6				1
Isoleucine	% protein	3.8				1
Leucine	% protein	6.1				1
Lysine	% protein	3.5				1
Methionine	% protein	1.7				1
Phenylalanine	% protein	4.1				1
Threonine	% protein	4.1				1
Tryptophan	% protein	1.4				1
Tyrosine	% protein	3.8				1
Valine	% protein	5.2				1

Secondary metabolites	Unit	Avg	SD	Min	Max	Nb
Tannins, condensed (eq. catechin)	g/kg DM	18.9		15.6	22.1	2

Ruminant nutritive values	Unit	Avg	SD	Min	Max	Nb
OM digestibility, ruminants	%	57.9		51.3	61.7	2 *
Energy digestibility, ruminants	%	54.5				*
DE ruminants	MJ/kg DM	10.2				*
ME ruminants	MJ/kg DM	8.2				*
Nitrogen digestibility, ruminants	%	73.0		61.2	84.8	2

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

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