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Pinto peanut (Arachis pintoi)

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Common names

Pinto peanut [Inglés]; arachide Pinto [French]; perennial forage peanut, perennial peanut [Spanish]; amendoim forrageiro [Portuguese]; kacang pinto [Indonesian]; Cỏ đậu [Vietnamese]; ถั่ว ลิสง เถา [Thai]

Species

Arachis pintoi Krapov. & W.C. Greg. [Fabaceae]

Feed categories

Legume forages | Oil plants and by-products | drilling plants

Related feed(s)

Description

Pinto peanut (*Arachis pintoi* Krapov. & W.C. Greg.) is a perennial tropical legume useful for pasture, ground cover and as an ornament. Pinto peanut is a valuable forage, easy to establish, persistent, and combines well in mixtures under a wide range of climate and soil conditions, including heavy grazing (Khamseekhiew et al., 2001).

Morphology

Pinto peanut is a stoloniferous perennial creeping legume that can reach 20-50 cm in height and form dense swards. It is strongly tap-rooted and has many secondary nodulated roots. The stems are initially prostrate and then become ascendant. The leaves are tetrafoliolate. The leaflets are oblong-obovate to obovate in shape, 4.5 cm long x 3.5 cm broad, glabrous and darker green at their upper side and pubescent underneath (Cook et al., 2005). The flowers are yellow, borne on short axillary racemes and very similar to groundnut flowers but smaller. Like groundnut, once pollinated, the flower stalks elongate and grow down into the soil, penetrating up to a depth of about 7 cm. The fruit is a terminal underground, one-seeded pod, 1-1.5 cm long and 6-8 mm in diameter. It is found in the upper 10 cm of the soil (Cook et al., 2005).

use

Pinto peanut is mostly used as a permanent pasture in intensive grazing systems and in very shaded situations under plantation crops. It can be used as a ground cover or as an ornament (Cook et al., 2005). *Arachis pintoi* is tolerant to heavy grazing and is compatible with aggressive grasses such as *Brachiaria* (Hess et al., 2003). It is potentially capable of producing high yields of forage in the tropics and improving soils and degraded pastures (Cab Jiménez et al., 2008).

Distribution

Pinto peanut originated from Brazil and is now widespread in the wet tropics and subtropics. It has been introduced to many areas including Argentina, Australia, Colombia and the USA, and more recently to countries in South-East Asia, Central America and the Pacific (Cook, 1992). Pinto peanut is found from sea level up to an altitude of 1400 m. It can grow in areas where annual rainfall is above 1100 mm but does better where it is above 1500 mm. Suitable average annual temperature is between 21 and 22 °C. Pinto peanut adapts to a wide range of soils, from sands to clays, preferably well-drained, with low to moderate fertility. It is often found on soils with high Al or Mn content but it has only low to moderate tolerance of salinity. Soil pH can range from 4.5 to 7 but pinto peanut does better above 5.4. It is sensitive to permanently waterlogged conditions but can withstand some periods of flooding, and can survive dry spells of up to 4 months duration. Pinto peanut does particularly well under shaded conditions (Cook et al., 2005).

drilling management

Establishment

Pinto peanut seeds require a well-prepared seedbed and should be sown 2-6 cm deep. Seedlings develop quickly and can completely cover the ground within 6 months. Pinto peanut can also be propagated through cuttings. Pinto peanut has no particular nutrient requirements but responds well to P, K, Ca and Mg fertilizers (Cook, 1992). Once established, pinto peanut stands are very persistent and difficult to eradicate. The plant spreads by stolons, which grow up to 2 m/year in the wet tropics, and 1 m/year in the subtropics. Management through grazing or mowing may enhance its ability to spread. For example, low and regular grazing will maintain its production potential at a high level (Cook et al., 2005).

Association

Pinto peanut does well in combination with many grasses and legume trees but is seldom sown with forage legumes. Pinto peanut can be sown with creeping grasses (*Brachiaria decumbens*, *B. Humidicola*, *Paspalum notatum*, *Axonopus fissifolius*, *Digitaria eriantha*, *Cynodon dactylon* and *C. Nlemfuensis*) or bunch grasses (*Megathyrsus maximus*, *Paspalum atratum*). It can be sown under leguminous trees such as *Leucaena leucocephala* and *Calliandra calothyrsus* (Cook et al., 2005).

Yield

Pinto peanut can produce 5 t DM/ha/year in pure stands under shade and 3 t/ha/year in full light. When sown in a mixture with *Brachiaria humidicola*, it produced 5 t/ha while the latter produced 20 t/ha (Cook, 1992).

Pasture

Pinto peanut is mainly used as a pasture legume for grazing. Its creeping habit prevents its use in cut-and-carry systems (Cook et al., 2005).

Environmental impact

Soil cover

Pinto peanut is a good ground cover crop that can completely cover the soil in less than 6 months (Ecocrop, 2014). Pinto peanut has been used in Costa Rica and Columbia for protection of steep roadsides (Abdul-Baki et al., 2002). In Asia, pinto peanut is used as a cover crop in oil palm plantations (Khamseekhiew et al., 2001). Pinto peanut was assessed as a cover crop in banana plantations in the West Indies and in Costa Rica where it was suggested that it could decrease nematode infestation (Quénéhervé et al., 2002; Vargas-Calvo, 1998).

Live mulch, weed controller and weed potential

Pinto peanut is used as a live mulch for soil conservation and weed suppression, particularly in shaded situations such as under trees and vines. Once established, pinto peanut may outcompete weeds and is thus useful for weed control. In its early stages, it may be useful to control weeds to ease its development (Abdul-Baki et al., 2002). In the subtropics it can be used in no-till or low-till systems in combination with ryegrass (Cook, 2007). Pinto peanut may become a weed in warmer areas (Cook et al., 2005).

datasheet citation

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Nutritional attributes

Pinto peanut forage is a good tropical forage, and it has been referred to as the best herbaceous legume available for the humid tropics of Costa Rica (Hernandez et al., 1995). Fresh pinto peanut forage has a high protein content (18-25% DM), and a relatively low level of NDF (44-56% DM), but a relatively high concentration of lignin (6-12% DM) (Hess et al., 2003; Valentim et al., 2003; Ferreira et al., 2012b; Silva et al., 2010; Khamseekhiew et al., 2001; Ladeira et al., 2002; Schnaider et al., 2014). The ADF concentration of pinto peanut seems very variable, from relatively low levels close to 21-31% DM (Ferreira et al., 2012b; Khamseekhiew et al., 2001; Silva et al., 2010), to high levels close to 36-41% DM (Ferreira et al., 2012a; Delgado et al., 2007; Hess et al., 2003; Schnaider et al., 2014). Unlike many tropical grasses, the quality of *Arachis pintoi* is maintained during the dry season, with a protein concentration greater than 11% DM and an *in vitro* DM digestibility similar to that observed during the rainy season (63%) (Hess et al., 2002). Ca and P concentrations of 15.4 and 4.1 g/kg DM, respectively, have been reported (Delgado et al., 2007). Mixed pastures containing 39% of *Arachis pintoi* had the same nutritive value as mixed pastures containing 24% of red clover (Azevedo Junior et al., 2012a).

ruminants

Pinto peanut is a good forage supplement for ruminants fed on low quality tropical grasses due to its high protein content. Pinto peanut is widely used in tropical grazing systems for ruminants in South and Central America, in mixed swards in association with grass species such as *Pennisetum purpureum* (Olivo et al., 2009; Olivo et al., 2012; Crestani et al., 2013), *Cynodon dactylon* (Paris et al., 2009), *Brachiaria sp.* (Cab Jiménez et al., 2008; Hernandez et al., 1995); and sometimes with white clover (*Trifolium repens*) as an additional legume (Olivo et al., 2012; Diehl et al., 2013).

Digestibility and degradability

The *in vitro* DM digestibility of fresh pinto peanut forage is high, within the range of 62-72% (Carulla et al., 1991; Hess et al., 2002; Ferreira et al., 2012b; Fernandes et al., 2013). The *in vitro* DM digestibility of *Arachis pintoi* hay is also high, between 71 and 79%, from regrowth ages of 30, 60 and 75 days (Fernandes et al., 2011; Fernandes et al., 2013). *In vivo* DM, OM and NDF digestibilities of hay determined in sheep were 64%, 68% and 54%, respectively. These values were higher than those obtained with *Medicago sativa* hay (60% and 51% for DM and NDF digestibilities, respectively) (Ladeira et al., 2002). Based on *in vitro* measurements, the potential DM degradation at 48 h ranges from 54 to 61% depending on the genotype (Ferreira et al., 2012b). *In vitro* studies show a high ability of pinto peanut to improve conditions in the rumen, including ammonia levels, microbial populations (protozoa and bacteria), production of volatile fatty acids and nutrient degradation when added to protein-deficient forages (Hess et al., 2003).

In situ NDF degradability in bulls has been found to be 58% at 72h, which was the highest value in a study comparing six tropical legumes at the vegetative stage (Delgado et al., 2007). In Malaysia, in a trial with indigenous cattle (173 kg BW), both soluble and potentially degradable fractions of DM and CP were high, particularly when compared to *Leucaena leucocephala* cultivars. Intestinal degradation of DM and CP was also much greater than that of *Leucaena leucocephala*, and close to that of *Gliricidia sepium* (Khamseekhiew et al., 2001).

Beef cattle

Pure pinto peanut pastures may be used as an additional feed to supplement animals grazing mainly tropical grasses pastures, by giving access to the legume pastures for a few hours daily. In Brazil, even when the grass pasture is of good quality (*Pennisetum purpureum*, 17% protein and 53% NDF), grazing 5 h/d in an adjacent pinto peanut pasture enabled steers to increase their daily DM intake by 16% and daily weight gain from 0.70 to 0.97 kg/d. Enteric methane production per kg DM intake was not affected by grazing or not grazing pinto peanut pastures (Andrade et al., 2014).

Like other forage legumes, pinto peanut may be used in mixed swards in order to reduce mineral N fertilizer requirements. In Brazil, in Charolais steers, a mixture of *Pennisetum purpureum* and *Arachis pintoi* (85:15) receiving no N fertilizer provided a similar stocking rate, daily DM intake (2.4% of BW), average daily gain (0.76 kg/d) and performance on a per ha basis as pure *Pennisetum purpureum* receiving 200 kg N/ha/year (Crestani et al., 2013).

In Costa Rica, including pinto peanut in bread grass (*Brachiaria brizantha*) pastures increased live weight gain/ha by 30% at a high stocking rate and by 11% at a low stocking rate (Hernandez et al., 1995). In Brazil, however, with a high level of nitrogen fertilisation (200 kg N/ha/year), including pinto peanut with Bermuda grass (*Cynodon dactylon)* did not support an increased stocking rate and did not increase the daily weight gain of heifers. In the same experiment, where no N fertilizer was added, including pinto peanut into Bermuda grass pastures allowed heifers to produce more than 1000 kg LWG/ha/year with a daily LWG of 0.38 kg/d (Paris et al., 2009).

Sheep

In Brazil, voluntary intake of Santa Inês sheep (40 kg) increased with the replacement of *Cynodon dactylon* hay (protein 11% DM) by pinto peanut hay (protein 21% DM), up to 60% inclusion (Fernandes et al., 2013). Likewise, voluntary intake of Texel × Suffolk wethers increased by 12% by replacing 30% of *Pennisetum purpureum* (protein 10% DM) by pinto peanut hay (protein 17% DM), without affecting *in vivo* OM and NDF digestibilities of the diet (Schnaider et al., 2014). Given as the sole feed, *Arachis pintoi* hay was fed at 1.32 kg DM/day to sheep (33 kg), equivalent to 4.0% of BW or 90 g/kg $BW^{0.75}$ (Ladeira et al., 2002).

Goats

No information found (2014).

Poultry

Pinto peanut forage is rich in fibre and its nutritional value to poultry is, therefore, low. No scientific study is available on its use for poultry, although it is quoted as a potential feed source for rural poultry (CIAT, 1994). Its similarity with related species (groundnut, rhizoma peanut) suggests that the leaves could have a positive effect on pigmentation of egg yolk.

Rabbits

Arachis pintoi foliage, green or dry (hay), is a palatable forage for rabbits (Huang et al., 2004), just a little bit less palatable than *Leucaena leucocephala* leaves (Nieves, 2009; Nieves et al., 2004; Nieves et al., 1995). When offered *ad libitum* together with limited quantity of concentrate (5.8% of live weight/day), pinto peanut hay was better consumed than grass hay such as *Sorghum halepense* hay, but the DM intake only represented about 10% of the total daily DM intake (Garcia Gomez, 2006). In agreement with these results obtained in Puerto Rico, in a study conducted in China, pinto peanut hay replaced 10% of the concentrate feed with a non-significant improvement of growth rate, and a significant improvement of economical benefit (+ 7.5%). Higher substitution levels (20-30%) were not satisfactory (Huang et al., 1998). Fresh *Arachis pintoi* distributed mixed (50:50) with fresh pangola grass (500 g/d), in addition to 50 g of concentrate, provided an average growth rate of 21.7 g/d *vs.* 10.7g/d for the control treatment (50 g of concentrate + 500 g of green traditional local forage) (Huang et al., 2004).

Ground hay of pinto peanut was safely introduced at up to 30% in a complete diet for growing rabbits (Nieves et al., 1997). The slight reduction of growth rate with a 40% inclusion rate was most probably the consequence of an imbalance of the diet, rather than of any noxious agent present in the forage. Effectively, the *Arachis pinto* proteins were sufficient to cover lysine requirement (96%), but the sulphur-containing amino acids content represented only 56% of the requirements (Lebas, 2004). The absence of toxic compounds is suggested by the moderate growth rate without any problem observed for rabbits fed on a mixture of fresh *Arachis pintoi* and *Pennisetum purpureum* (50:50) (Nieves et al., 1996). However, a significant reduction of growth rate was observed with 30% pinto peanut hay, in comparison with lower levels of incorporation: 31.0 g/d with 30% *vs.* 34.4 g/d with 20% (Oropeza et al., 2006). If in the later study an effort was made to take into account the protein quality of pinto peanut, the variation of formulation for each additional 10% of pinto peanut hay (from 0 to 30%) was not linear, a situation that could partly explain the non linear results obtained with a reduced number of rabbits (8/treatment).

The only study of *Arachis pintoi* hay digestibility available in the literature proposes an energetic value of 8.29 MJ/kg DM, with a protein digestibility of 75% (Nieves et al., 2008).

Arachis pintoi foliage could then be safely used as a source of protein and fibre in rabbit feeding, fresh, as hay or incorporated in a complete diet. The only limitation seems to be the respect of the rabbit's nutritional requirements.

Horses and donkeys

In horses, *in situ* caecal DM, NDF and protein degradabilities of *Arachis pintoi* are high and close to the values reported for *Stylosanthes guianensis* and *Macrotyloma axillare* (lime-yellow pea), and higher than values reported for *Medicago sativa* and *Desmodium ovalifolium* (Silva et al., 2010).

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Tables of chemical composition and nutritional value

- Pinto peanut (Arachis pintoi), aerial part, fresh
- Pinto peanut (Arachis pintoi), aerial part, hay

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

Pinto peanut (Arachis pintoi), aerial part, fresh

Main analysis	Unit	Avg	SD	me	Max	Nb
Dry matter	% as fed	21.2	4.0	16.5	26.8	16
Crude protein	% DM	21.4	2.4	18.0	25.4	31
Crude fibre	% DM	27.3				*
NDF	% DM	53.3	3.2	43.3	56.3	20
ADF	% DM	32.8	4.9	26.5	38.9	20
Lignin	% DM	8.1	1.5	6.3	12.4	12
Ether extract	% DM	1.3	0.3	0.9	1.8	16
Ash	% DM	6.6	3.7	2.5	11.6	18
Gross energy	MJ/kg DM	19.0				*

Minerals	Unit	Avg	SD	me	Max	Nb
Calcium	g/kg DM	15.4				1
Phosphorus	g/kg DM	4.1				1

Amino acids	Unit	Avg	SD	me	Max	Nb
Arginine	% protein	4.0				1
Cystine	% protein	0.8				1
Histidine	% protein	1.7				1
Isoleucine	% protein	3.3				1
Leucine	% protein	6.2				1
Lysine	% protein	4.8				1
Methionine	% protein	1.3				1
Phenylalanine	% protein	4.0				1
Threonine	% protein	3.4				1
Tryptophan	% protein	0.2				1
Valine	% protein	4.2				1

Secondary metabolites	Unit	Avg	SD	me	Max	Nb
Tannins (eq. tannic acid)	g/kg DM	36.9				1

In vitro digestibility and solubility	Unit	Avg	SD	me	Max	Nb
DM digestibility, pepsin	%	69.3	2.2	65.7	72.1	10

Ruminant nutritive values	Unit	Avg	SD	me	Max	Nb
OM digestibility, ruminants	%	64.6				*
Energy digestibility, ruminants	%	61.8				*
OF ruminants	MJ/kg DM	11.7				*
ME ruminants	MJ/kg DM	9.3				*
a (N)	%	10.0				1
b (N)	%	66.9				1
c (N)	h-1	0100				1
Nitrogen degradability (effective, k=4%)	%	58				*

Nitrogen degradability (effective, k=6%)	%	52	*

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

References

Delgado et al., 2007 ; Ferreira et al, 2012. ; Ferreira et al, 2012. ; Kaligis et al., 1990 ; Khamseekhiew et al., 2001 ; Silva et al., 2010 ; Tedeschi et al., 2001 ; Valentim et al., 2003

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Pinto peanut (Arachis pintoi), aerial part, hay

Main analysis	Unit	Avg	SD	me	Max	Nb
Dry matter	% as fed	87.8	4.7	79.8	92.3	5
Crude protein	% DM	19.2	3.5	13.5	24.2	10
Crude fibre	% DM	29.8		23.2	29.8	2 *
NDF	% DM	48.2	4.5	43.3	57.2	10
ADF	% DM	36.7	5.8	26.2	46.7	8
Lignin	% DM	9.8	1.5	8.0	12.4	7
Ether extract	% DM	2.0	0.4	1.5	2.6	5
Ash	% DM	8.8	2.0	5.0	11.0	7
Gross energy	MJ/kg DM	18.7				*

Minerals	Unit	Avg	SD	me	Max	Nb
Calcium	g/kg DM	20.7				1
Phosphorus	g/kg DM	3.5				1
Potassium	g/kg DM	13.9				1
Sodium	g/kg DM	1.2				1
Magnesium	g/kg DM	5.3				1

Ruminant nutritive values	Unit	Avg	SD	me	Max	Nb
OM digestibility, ruminants	%	68.4				1
Energy digestibility, ruminants	%	64.8				*
OF ruminants	MJ/kg DM	12.1				*
ME ruminants	MJ/kg DM	9.6				*
Nitrogen digestibility, ruminants	%	70.0				1
a (N)	%	27.3				1
b (N)	%	63.3				1

Rabbit nutritive values	Unit	Avg	SD	me	Max	Nb
Energy digestibility, rabbit	%	44.5				*
OF rabbit	MJ/kg DM	8.3				1
Nitrogen digestibility, rabbit	%	66.8				1
MEn rabbit	MJ/kg DM	7.6				*

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

References

Fernandes et al., 2011 ; Fernandes et al, 2013. ; Gonzalvo et al., 2001 ; Hess et al., 2003 ; Ladeira et al., 2002 ; Nieves et al., 2004 ; Nieves et al., 2008 ; Schnaider et al., 2014

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