Yield ad forage quality of cultivars and accessions of perennial peanuts

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Introduction

Perennial peanuts (*Arachis pintoi*) is one of the few recognized legumes as pasture to cattle Nascimento (2006). Plants from this genus have high quality in terms of crude protein and "in vitro" dry matter (DM) digestibility. It can increase productivity and animal performance. Because the perennial peanut has high nutritional value and palatability it has been called "Florida's alfalfa" Valle (2001).

Since it is a recently described genus, there are only a few papers in literature about this forage which has high quality and high yield potential Fernandes et al. (2003), and it is in a process to register new accessions Gimenes e Moretzsohn (2004). Therefore, more researches are needed on yield potential, forage quality, susceptibility to weeds, pests and diseases, plant, soil and animal management, among others.

With that, the goal of this trial is to evaluate yield and forage quality of different accessions of perennial peanut (*Arachis pintoi*). In addition, weeds, pests and diseases incidence are observed.

Material and methods

The trial was carried out in an Embrapa Pecuária Sudeste farm located in the city of São Carlos, state of São Paulo.

The experimental period was from May/2009 to April/2011. It was considered as first evaluated year the period from May/2009 to April/2010 and the second from May/2010 to April/2011.

The plots were arranged according to a randomized block design with 4 replications. Treatments were: Arachis cv. Amarillo, Belmonte and Alqueire, *Arachis* accessions V14950, SV 5821, V6727, W902 and 40550, *Brachiaria brizantha* cv. Marandu e Alfalfa cv. Crioula Itapuã. The plots measured 10 m^2 each (2 x 5 m).

The soil of experimental area was Red-Yellow Latosol. Initial soil analysis and soil corrections were made and the plots were implanted. After that, new soil analysis was made for each treatment. Values found in the soil analysis (0-20 cm layer) for Arachis was: pH-$CaCl_2$ = 5.3; organic matter = 29 g/dm^3; P = 21 mg/dm^3; and 1.8, 31, 10, 26 e 0 $mmol_c/dm^3$ de K, Ca, Mg, H + Al and Al, respectively; and base saturation = 62%. For alfalfa was: pH-$CaCl_2$ = 5.2; organic matter = 22 g/dm^3; P = 10 mg/dm^3; and 12.1, 30, 9, 24 e 0 $mmol_c/dm^3$ de K, Ca, Mg, H + Al and Al, respectively; and base saturation = 63%. For *Brachiaria brizantha* cv. Marandu was: pH-$CaCl_2$ = 5.6; organic matter = 28 g/dm^3; P = 14 mg/dm^3; and 1.0, 40, 12, 22 e 0 $mmol_c/dm^3$ de K, Ca, Mg, H + Al and Al, respectively; and base saturation = 71%.

Soil chemical fertilization was performed to increase base saturation to 80%, P content to 20 mg/dm^3 and K content to 4% of CEC in all treatments.

A cut of pasture was made in all plots at 8th April. 2009. After that, was considered 35 days of rest between harvests in the best growth period and visual analysis in the restriction growth period. When the plants were below the ideal height cut, the yield was considered null. The standard cut height adopted was: 5, 8, 15 cm to *Arachis*, alfafa and *Brachiaria brizantha* cv. Marandu, respectively.

The trial was irrigated during all year, following the methods described by Rassini (2002), except in the period from February to April/2011 when the electrical cables of the systems were stolen. Thus, during the necessary time to reinstall the cables, the plots just received rainfall.

To quantify DM yield, random samples were collected with the following sizes: 0.5 and 0.08 m2 per plot for Arachis and Brachiaria, respectively, and 1 linear m for alfalfa. Every plot had 0.5 m of border area. No harvest was performed in August/2010, since the plants did not reach the height cut. All material from sampling was weighted and dried in a forced-air oven at 60 °C during 72h until constant weight. The samples were saved and grouped by growth season.

Crude protein was evaluated through micro-Kjeldahl techniques Nogueira e Souza (2005) and "in vitro" dry matter digestibility using Tilley & Terry procedure (1963).

The results were subjected to analysis of variance and the treatments results were compared by Tukey 5%.

Results

Yield parameters during the 2- year evaluation are in (Fig. 2 and 3), while qualitative parameters, crude protein and DM digestibility, for the first year are in (Table. 1.

Weed measurements of the first year are: no weed infestation for Marandu and alfalfa treatments. However, on Belmonte, SV5821, V6727, V14950, Amarillo, W902, 40550 and Alqueire, the amount of weeds (t/ ha DM) was 0.2, 0.2, 0.2, 0.3, 0.6, 0.8, 0.9, 1.3, respectively.

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Discussion

Slightly reduction on minimum temperatures and increased rainfall on the second year was compared with the first year are shown in (Fig. 1).

On the first year evaluation, cultivars and accessions of *Arachis* had high DM yields, intermediate compared with *Brachiaria* cv. Marandu and alfalfa (reference materials in this trial). On the second year, there was a yield reduction for all species studied. This can be due to the lower temperatures on the period (Fig. 1). However, a marked reduction was noticed with perennial peanuts in the dry season and it can be related to the minimum temperature in the period. From May to August/2010 some days with minimum daily temperatures below 10 ^{o}C were observed. According to Nascimento (2006) the ideal growth temperature for *Arachis* is between 25-30 ^{o}C and below 10 ^{o}C it stops growing. It can be partially explained by the yield reduction of *Arachis*. Regardless of evaluation year, the Alqueire cultivar and W902 and 40550 accessions had the lowest yield (Fig. 2 and 3) and the highest amount of weeds per ha.

In qualitative parameters *Arachis* is as good as alfalfa and it has superior forage quality than *Brachiaria* (Table 1). Due to this evidence, it can be inferred that *Arachis* can be used as protein source associate grazing with grasses may increase animal performance, providing bigger profit to the producer.

Among the treatments, for São Paulo state, noteworthy V1450 and SV5821 accessions had bigger yield and forage quality than other *Arachis* cultivars found at the market.

Studies that correlate yield and forage quality of *Arachis* with climatic variables need to be done in the future. So, it can provide better knowledge about this species and allow edaphoclimatic zoning for each cultivar.

The V1450 and SV5821 accessions and Belmont cultivar can be recommended for edaphoclimatic conditions of São Carlos region, São Paulo state, because they had high DM production with excellent forage quality with low weeds incidence.

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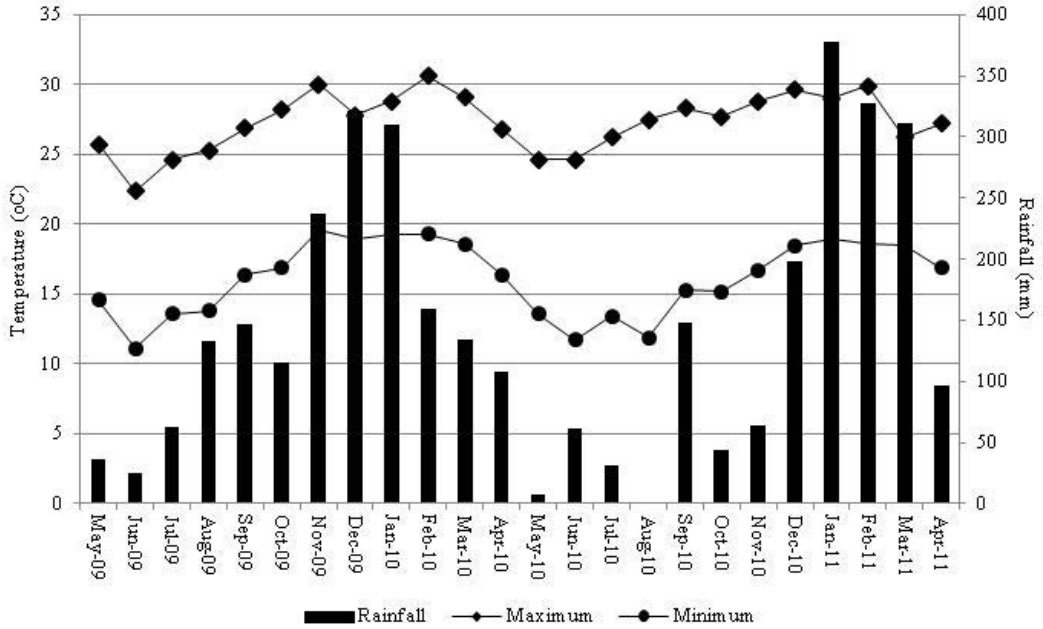
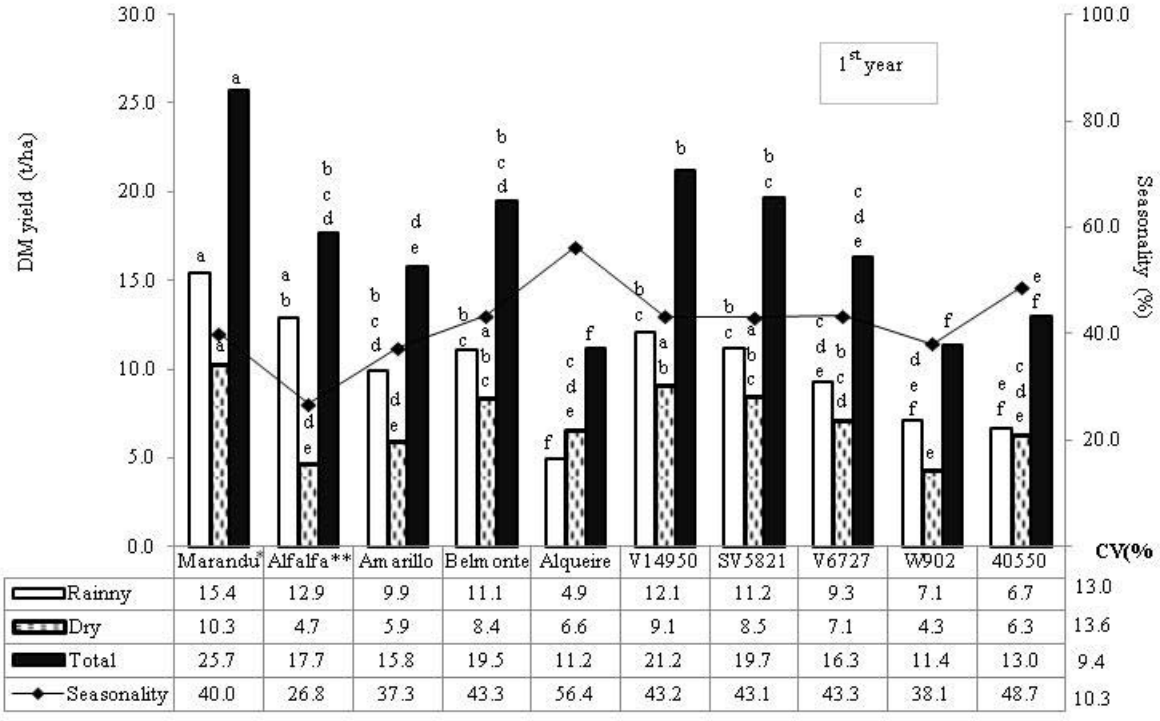
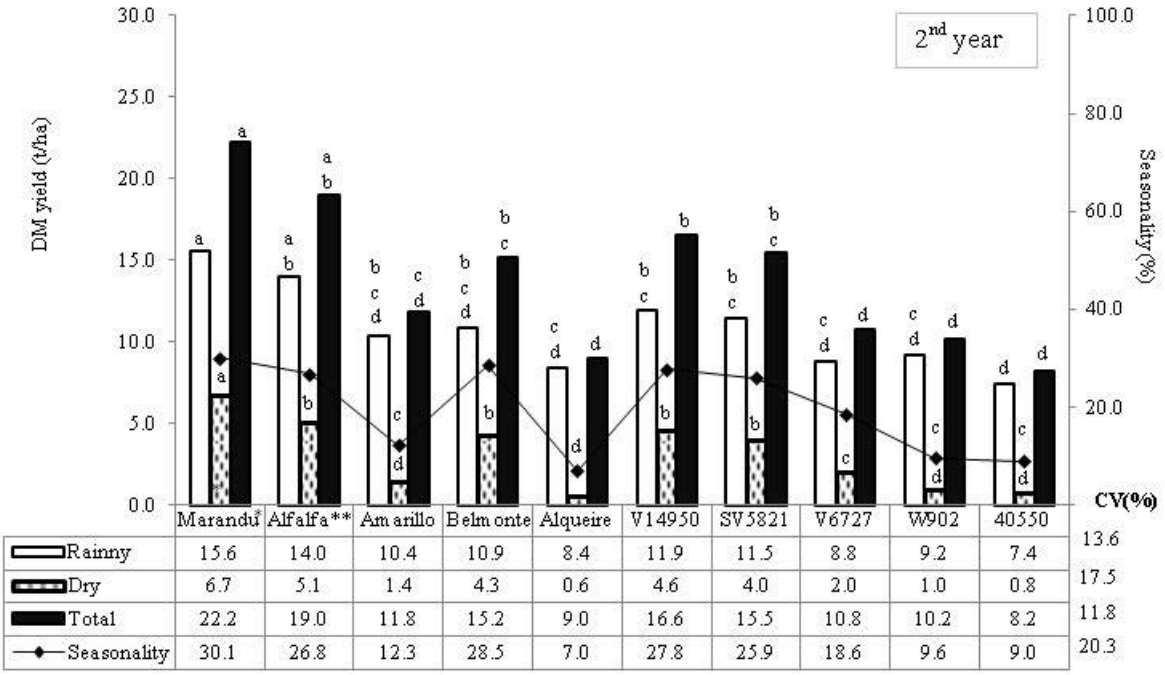


Figure 1. Maximum and minimum temperature and rainfall during the experimental period.



	Marandu*	Alfalfa**	Amarillo	Belmonte	Alqueire	V14950	SV5821	V6727	W902	40550	CV(%)
Rainny	15.4	12.9	9.9	11.1	4.9	12.1	11.2	9.3	7.1	6.7	13.0
Dry	10.3	4.7	5.9	8.4	6.6	9.1	8.5	7.1	4.3	6.3	13.6
Total	25.7	17.7	15.8	19.5	11.2	21.2	19.7	16.3	11.4	13.0	9.4
Seasonality	40.0	26.8	37.3	43.3	56.4	43.2	43.1	43.3	38.1	48.7	10.3

Figure 2. DM yield in rainny and dry season and total yield in the year (t/ha) and seasonality of forage (% DM yield in dry season/ total DM yield) in the first evaluated year. Means in the same season with different letters differ ($p<0.05$) by the Tukey test. **Brachiaria brizantha* cv. Marandu; **Alfalfa cv. Crioula Itapuã.



	Marandu*	Alfalfa**	Amarillo	Belmonte	Alqueire	V14950	SV5821	V6727	W902	40550	CV(%)
Rainny	15.6	14.0	10.4	10.9	8.4	11.9	11.5	8.8	9.2	7.4	13.6
Dry	6.7	5.1	1.4	4.3	0.6	4.6	4.0	2.0	1.0	0.8	17.5
Total	22.2	19.0	11.8	15.2	9.0	16.6	15.5	10.8	10.2	8.2	11.8
Seasonality	30.1	26.8	12.3	28.5	7.0	27.8	25.9	18.6	9.6	9.0	20.3

Figure 3. DM yield in rainny and dry season and total yield in the year (t/ha) and seasonality of forage (% DM yield in dry season/ total DM yield) in the second evaluated year. Means in the same season with different letters differ ($p<0.05$) by the Tukey test. **Brachiaria brizantha* cv. Marandu; **Alfalfa cv. Crioula Itapuã.

Table 1. Crude protein (CP) and "in vitro"dry matter digestibility (IVDMD) for treatments during year season for the first evaluated year.

Treatment	Season							
	2009/2010				2010/2011			
	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring
	CP (%)				**IVDMD (%)**			
Marandu*	14.5^{b}	17.1^{b}	17.1^{c}	18.3^{e}	67.7^{a}	70.5^{a}	68.8^{a}	78.8^{a}
Alfalfa**	17.2^{ab}	20.3^{ab}	25.2^{ab}	25.0^{cd}	67.4^{a}	70.9^{a}	68.7^{a}	66.0^{a}
Amarillo	22.3^{ab}	26.2^{a}	21.9^{b}	27.1^{abc}	69.4^{a}	71.1^{a}	61.0^{ab}	74.1^{a}
Belmonte	22.1^{ab}	26.6^{a}	24.9^{ab}	29.5^{a}	68.6^{a}	68.0^{ab}	58.4^{ab}	76.1^{a}
V14950	21.5^{ab}	24.9^{ab}	26.1^{a}	29.2^{ab}	70.7^{a}	70.1^{ab}	55.9^{b}	74.6^{a}
SV5821	22.4^{ab}	25.6^{ab}	26.0^{a}	28.6^{ab}	70.3^{a}	68.0^{ab}	55.3^{b}	74.5^{a}
V6727	23.7^{a}	24.0^{ab}	22.3^{b}	25.1^{cd}	69.1^{a}	70.5^{a}	59.0^{ab}	69.4^{a}
W902	17.1^{ab}	24.0^{ab}	22.2^{b}	25.8^{cd}	71.4^{a}	70.3^{ab}	60.4^{ab}	69.6^{a}
Alqueire	19.8^{ab}	23.4^{ab}	22.2^{b}	24.4^{d}	70.0^{a}	64.3^{b}	55.0^{b}	65.5^{a}
40550	20.1^{ab}	24.7^{ab}	24.3^{ab}	27.0^{bc}	67.0^{a}	68.7^{ab}	60.5^{ab}	67.0^{a}
CV (%)	16.4	15.5	6.2	3.8	5.1	3.7	8.0	8.1

*=*Brachiaria brizantha* cv. Marandu; **= Alfalfa cv. Crioula Itapuã
Means in the same column followed by different letters differ ($p < 0.05$) by the Tukey test.