

AGRONOMIC PERFORMANCE AND GENETIC VARIABILITY OF *Panicum maximum* ACCESSIONS IN THE CERRADO OF FEDERAL DISTRICT, BRAZIL



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Introduction

In the last three decades, the Brazilian Savanna (locally called "Cerrado") (Figure 1) became the most important beef cattle production region in Brazil. Around 90% of all beef produced in the region comes from pasture-based systems. Intensively-managed and fertilised *P. maximum* pastures can be highly productive and economic). As a result, farmers are demanding new *P. maximum* cultivars for using in well-fertilised pastures or in crop-pasture rotation systems.

Objective

Evaluate the agronomic performance and the genetic variability of *P. maximum* accessions in the Brazilian Cerrado.



Figure 1. Brazilian Savanna (locally called "Cerrado")

Methods

Twenty-four *P. maximum* accessions, being six cultivars (Mombaça, Tanzânia, Massai, Vencedor, Milênio and Aruana) and 18 previously selected accessions were studied (Figure 2). The experiment was established on 21/11/02 at Embrapa Cerrados (15°35'30" S, 47°42'30" W, altitude 1007 m), on a highly fertilised clayey Dark Red Latosol, in a randomised complete block design with three replicates (Figure 2). Each plot had 12.5 m². Six cuts at a 20-cm stubble height were performed on 05/02, 12/03, 16/04, 25/06, 27/10 and 01/12/2003 (Figure 2). The leaf lamina (LDMY) and stem (SDMY) dry matter yields (kg ha⁻¹) in each cut and the crude protein (CP), neutral detergent fibre (NDF) and in vitro organic matter digestibility (IVOMD) contents in cuts 1 to 4 were evaluated. Means comparisons were carried out at the P < 0.05 significance level. Random Amplified Polymorphic DNA (RAPD) molecular markers were used to estimate the genetic variability (Figure 2).



Figure 2. Photos of the experiment and research actions.

RESULTS

The overall LDMY and SDMY means were 11266 kg/ha (LSD = 3683 kg/ha) and 3763 kg/ha (LSD = 2091 kg/ha), respectively (Table 1). The accessions PM31, PM33 and PM34 were the most promising in the first evaluation year, because of highest leaf production (mean + 1 standard deviation) and lowest stem production (mean - 1 standard deviation) (Figure 3). CP, IVOMD and NDF contents for accessions and cultivars varied similarly throughout the cuts. CP and IVOMD decreased (P < 0.05) in the fourth cut while NDF remained fairly constant during the experiment. The genetic distances between the 24 accessions ranged from 0.054 to 0.415 (Table 2). The lowest genetic distances occurred between accessions PM39 and PM40 (0.054), PM31 and Massai (0.110), and PM42 and Tanzânia (0.132). Cultivars Mombaça, Milênio, Vencedor and Aruana are genetically distinct and are not related to the remaining collection. The dendrogram and dispersion analysis evidence the genetic variability of the 24 accessions of *Panicum maximum* (Figure 4).

Table 1. Agronomic performance of *Panicum maximum* accessions in the Brazilian Cerrado.

	Accumulated LDMY in six cuts				Accumulated SDMY in six cuts			
	1	2	3	4	1	2	3	4
Overall mean	178	180	169	102	687	686	703	610
Cultivars	183	188	173	105	699	698	704	618
Accessions	176	178	168	100	683	682	702	607
LSD (0.05)	3683				2091			
	CP (g/kg)				IVOMD (g/kg)			
	1	2	3	4	1	2	3	4
Overall mean	178	180	169	102	687	686	703	610
Cultivars	183	188	173	105	699	698	704	618
Accessions	176	178	168	100	683	682	702	607
LSD (0.05)	39				102			
genotype (cut)	39				102			
cut (genotype)	22				60			

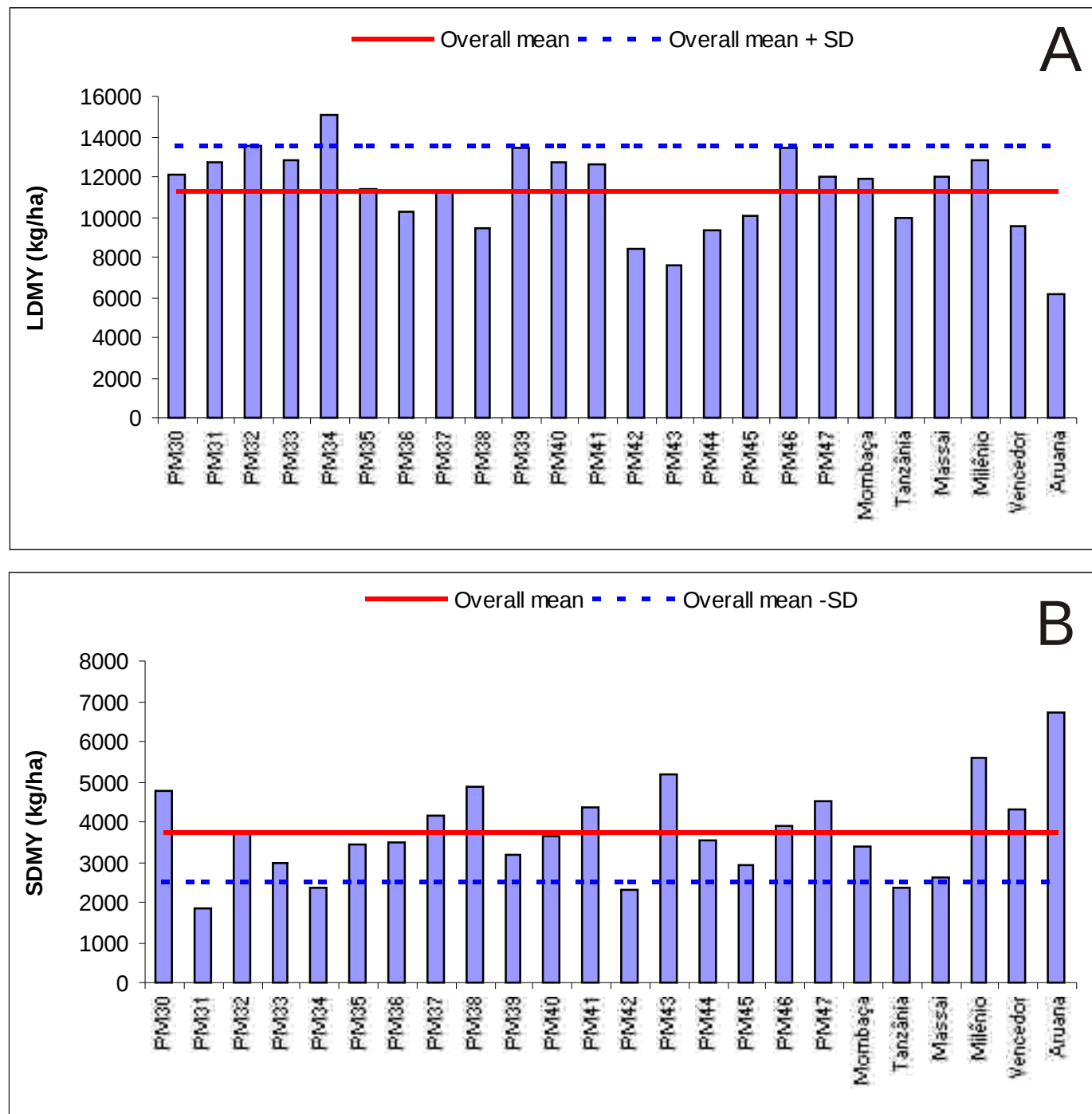


Figure 3. The leaf lamina (LDMY) and stem (SDMY) dry matter yields (kg ha⁻¹).

Table 2. Genetic distances of 24 accessions of *Panicum maximum* calculated using RAPD.

Accessions	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1 PM-30	0.000	0.353	0.209	0.202	0.178	0.226	0.229	0.232	0.235	0.264	0.280	0.283	0.211	0.294	0.263	0.333	0.266	0.277	0.313	0.274	0.415	0.291	0.275	0.344
2 PM-31	0.353	0.000	0.307	0.349	0.283	0.327	0.295	0.321	0.315	0.333	0.334	0.376	0.349	0.369	0.343	0.305	0.303	0.333	0.414	0.340	0.310	0.356	0.369	0.359
3 PM-32	0.209	0.307	0.000	0.152	0.156	0.222	0.213	0.218	0.224	0.239	0.238	0.234	0.221	0.263	0.274	0.292	0.263	0.277	0.310	0.229	0.326	0.274	0.297	0.362
4 PM-33	0.202	0.349	0.152	0.000	0.180	0.200	0.222	0.228	0.237	0.239	0.255	0.268	0.236	0.319	0.285	0.330	0.271	0.305	0.262	0.213	0.353	0.319	0.284	0.330
5 PM-34	0.178	0.283	0.156	0.180	0.000	0.235	0.188	0.202	0.204	0.230	0.230	0.262	0.208	0.268	0.263	0.287	0.244	0.259	0.280	0.230	0.318	0.279	0.231	0.291
6 PM-35	0.226	0.327	0.222	0.200	0.235	0.000	0.219	0.284	0.277	0.271	0.247	0.280	0.212	0.319	0.263	0.302	0.283	0.316	0.289	0.222	0.345	0.277	0.272	0.348
7 PM-36	0.229	0.295	0.213	0.222	0.188	0.219	0.000	0.183	0.240	0.239	0.219	0.286	0.255	0.323	0.254	0.254	0.284	0.323	0.349	0.241	0.322	0.286	0.250	0.327
8 PM-37	0.232	0.321	0.218	0.228	0.202	0.284	0.183	0.000	0.233	0.220	0.231	0.333	0.295	0.304	0.225	0.245	0.241	0.284	0.355	0.289	0.348	0.261	0.280	0.282
9 PM-38	0.235	0.315	0.224	0.237	0.204	0.277	0.240	0.233	0.000	0.231	0.257	0.211	0.256	0.314	0.301	0.324	0.287	0.275	0.311	0.289	0.330	0.307	0.297	0.346
10 PM-39	0.264	0.333	0.239	0.239	0.230	0.271	0.239	0.220	0.231	0.000	0.054	0.257	0.275	0.276	0.264	0.269	0.209	0.280	0.326	0.253	0.362	0.284	0.270	0.320
11 PM-40	0.263	0.324	0.238	0.258	0.230	0.250	0.219	0.233	0.257	0.054	0.000	0.251	0.258	0.268	0.260	0.292	0.218	0.283	0.302	0.232	0.348	0.277	0.236	0.306
12 PM-41	0.263	0.376	0.234	0.268	0.262	0.280	0.286	0.333	0.211	0.257	0.251	0.000	0.233	0.330	0.333	0.411	0.348	0.311	0.307	0.249	0.378	0.307	0.307	0.359
13 PM-42	0.211	0.349	0.221	0.236	0.208	0.212	0.255	0.295	0.256	0.275	0.258	0.233	0.000	0.300	0.249	0.327	0.265	0.251	0.333	0.132	0.371	0.246	0.295	0.326
14 PM-43	0.294	0.369	0.283	0.319	0.268	0.319	0.323	0.304	0.314	0.276	0.288	0.330	0.309	0.000	0.275	0.263	0.284	0.267	0.322	0.352	0.378	0.284	0.313	0.333
15 PM-44	0.263	0.343	0.274	0.285	0.263	0.263	0.254	0.225	0.301	0.264	0.260	0.333	0.249	0.275	0.000	0.216	0.232	0.292	0.345	0.268	0.414	0.263	0.291	0.340
16 PM-45	0.333	0.305	0.292	0.330	0.287	0.302	0.254	0.245	0.324	0.269	0.292	0.411	0.327	0.263	0.216	0.000	0.187	0.235	0.330	0.337	0.348	0.246	0.316	0.347
17 PM-46	0.266	0.303	0.283	0.271	0.246	0.283	0.284	0.241	0.287	0.211	0.218	0.348	0.265	0.287	0.232	0.187	0.000	0.172	0.273	0.306	0.330	0.234	0.283	0.340
18 PM-47	0.277	0.333	0.277	0.305	0.259	0.316	0.323	0.284	0.275	0.280	0.283	0.311	0.251	0.267	0.292	0.235	0.172	0.000	0.291	0.298	0.339	0.274	0.312	0.372
19 Mombaça	0.313	0.414	0.310	0.262	0.280	0.289	0.349	0.355	0.311	0.326	0.299	0.307	0.333	0.322	0.345	0.335	0.273	0.291	0.000	0.301	0.390	0.314	0.289	0.402
20 Tanzânia	0.274	0.340	0.229	0.213	0.230	0.222	0.241	0.289	0.289	0.253	0.230	0.249	0.132	0.352	0.268	0.337	0.306	0.298	0.301	0.000	0.333	0.290	0.304	0.293
21 Massai	0.415	0.110	0.326	0.353	0.318	0.345	0.322	0.348	0.330	0.362	0.344	0.378	0.371	0.378	0.414	0.348	0.330	0.330	0.390	0.333	0.000	0.341	0.383	0.356
22 Milênio	0.291	0.356	0.274	0.319	0.279	0.277	0.286	0.261	0.307	0.284	0.277	0.307	0.246	0.284	0.263	0.246	0.234	0.274	0.314	0.290	0.341	0.000	0.277	0.313
23 Vencedor	0.275	0.369	0.297	0.284	0.231	0.272	0.250	0.280	0.297	0.270	0.233	0.307	0.295	0.313	0.291	0.316	0.283	0.312	0.289	0.304	0.353	0.277	0.000	0.219
24 Aruana	0.344	0.359	0.362	0.330	0.291	0.348	0.327	0.282	0.346	0.320	0.303	0.393	0.326	0.333	0.340	0.347	0.337	0.372	0.402	0.293	0.356	0.313	0.219	0.000

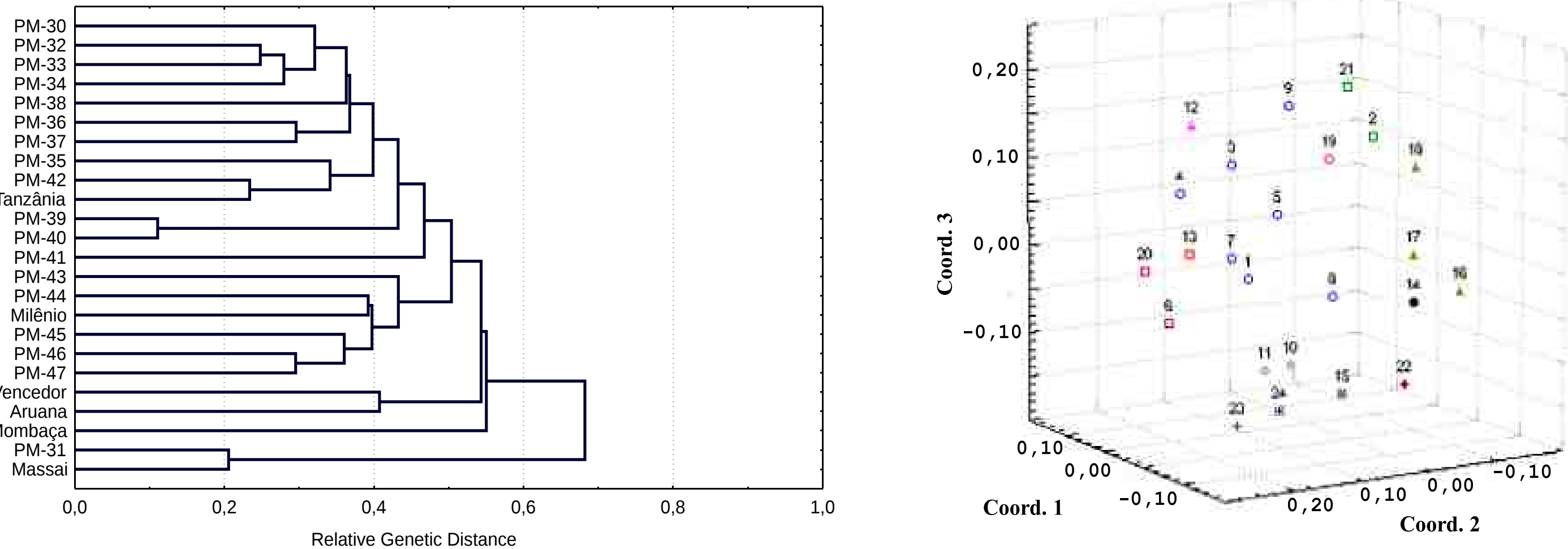


Figure 4. Dendrogram and dispersion analysis of 24 accessions of *Panicum maximum* (Table 2) based on the genetic distances calculated using RAPD markers.

CONCLUSIONS

There were no differences in LDMY and SDMY between the means of cultivars and accessions, however, there were differences among the accessions, thus permitting the identification of promising accessions on the basis of forage production components. Molecular characterisation was an efficient tool to show the variability among the accessions and cultivars.