Revista ARACÊ
ISSN: 2358-2472

PHYTOSOCIOLOGICAL SURVEY IN PASTURE AREAS PLANTED WITH GRASSES OF THE GENUS BRACHIARIA IN DIFFERENT RELIEFS

https://doi.org/10.56238/arev6n2-152

Submitted on: 09/17/2024 **Publication date:** 10/17/2024

Anderson Luiz Araújo[1], Silvério de Paiva Freitas[2], Victorio Bircher Tonini[3], Fernanda de Almeida Teixeira[4], Gabriel Fornaciari[5], Marcus Vinicius Sandoval Paixão[6].

ABSTRACT

The agricultural sector is essential to the Brazilian economy, contributing 26% of gross revenue in 2021 and 24.8% in 2022. Brazil, the world's largest beef producer, relies on pastures as the main source of food for its cattle, with Brachiaria grass playing a significant role. Paper. Inadequate management of these areas often leads to degradation, characterised by the proliferation of weeds, which require intervention. The study was carried out to carry out a phytosociological survey in pasture areas with different altitudes to evaluate the floristic composition and identify the forage potential or harmful characteristics of the species present. Phytosociological surveys were carried out in pastures of IFES – Campus Santa Teresa, ES, in two areas with different topographic features (hill and plain). The species were identified and classified as palatable, toxic, or unpalatable. Samplings occurred during the dry (winter) and rainy (summer) seasons, and the species were quantified according to frequency, density, and abundance. A total of 47 species distributed in 14 families were identified. The Fabaceae family was the most prevalent, followed by the Amaranthaceae and Malvaceae. Alysicarpus vaginalis (IVI 49.06) was dominant in the hill area (Area A), while Cyperus rotundus (IVI 115.25) stood out in the lowland area (Area B). The similarity index between the areas was 26.42%. The study highlighted the diversity of

[1] Veterinarian
Federal Institute of Education, Science and Technology of Espirito Santo,
E-mail: anderson.araujo@ifes.edu.br
Orcid: https://orcid.org/0009-0006-0286-9123
[2] doctors in Plant Production
North Fluminense State University,
Email: silverio@uenf.br
Orcid: https://orcid.org/0000-0001-8497-2920
[3] Agronomist
Federal Institute of Education, Science and Technology of Espirito Santo
E-mail: victorio94bt@gmail.com
Orcid: https://orcid.org/0000-0002-1548-7419
[4] Veterinarian, FAESA, Vitória, Espirito Santo, Brazil;
E-mail: mfateixeira@gmail.com
Orcid: https://orcid.org/0003-1283-6112
[5] Agricultural Technician
Federal Institute of Education, Science and Technology of Espirito Santo
E-mail: gabrielfornaciari10@gmail.com
Orcid: https://orcid.org/0000-0001-9630-0267
[6] doctors in Plant Production
Federal Institute of Education, Science and Technology of Espirito Santo
Email: mvspaixao@gmail.com
Orcid: https://orcid.org/000-0003-3262-9404

Revista ARACÊ
ISSN: 2358-2472

species in Brachiaria pastures, emphasizing the need for targeted management to control non-palatable and toxic plants and, at the same time, optimize forage potential. The low similarity between the areas suggests distinct ecological dynamics.

Keywords: Weeds, Phytosociology, Floristic composition, Forage.

Revista ARACÊ
ISSN: 2358-2472

INTRODUCTION

The agricultural sector is fundamental to the Brazilian economy, accounting for 26% of the country's gross revenue in 2021 and 24.8% in 2022 (MAPA, 2023). Brazil has the largest commercial herd in the world, with approximately 218.2 million cattle, and is the largest beef exporter in the world, with 196.43 million head in 2021 (ABIEC, 2022; IBGE, 2021). According to the 2022 Brazilian livestock yearbook (ANUALPEC), 93% of these animals are reared and finished on pastures, which is a sustainable option with a low production cost (Borghi et al., 2018). Due to its territorial extension and climate, Brazil has a beef production capacity with one of the lowest costs in the world (Malafaia, 2020).

Pasture is the main source of food for the herd, based on the evolution of nomadic herds, in which the animals seek food with the possibility of choosing the most tender leaves, the species of plant to be ingested, the height, and the place of grazing. With the intensification of livestock, it is important to correctly manage the animal, forage, and soil system for greater use of the area, with less damage to the environment (Martins et al., 2022). The degradation process is directly related to failures or even the lack of pasture management. Among the main damages promoted by this attitude, we can mention the decrease in the carrying capacity of the pasture, soil erosion, and weed infestation (Borghi et al., 2018).

Grasses of the genus Brachiaria are of African origin, classified as tropical grasses, and have a high prevalence in grazing systems in Brazil (Jank et al., 2014). They are forage species that stand out for their easy stabilization of the crop, considerable biomass production, and adaptation to soils of low fertility, in addition to providing high soil cover (Timossi et al., 2007). According to the IBGE (2023), 79.5% of the total area of cultivated pastures is grasses of the genus Brachiaria, occupying an area of 31.7 million hectares.

Weeds can be defined as any plants that develop in an area of human interest where they are not desired and interfere directly or indirectly in the crop of interest, promoting a 20 to 30% reduction in production (Lorenzi, 2014).

Grassland weeds compete with forages for soil nutrients, water, sunlight, and space. These plants can also be hosts for pests and diseases, which reduces grazing support capacity and hinders management and cultural treatments, in addition to causing injuries to animals or even being toxic to several animal species (Chagas et al., 2019). However, many species considered weeds in food cultivation areas are not considered weeds in pasture areas, being palatable and having forage potential (Soares Filho et al., 2016).

Revista ARACÊ
ISSN: 2358-2472

The phytosociological survey allows us to evaluate the composition of the vegetation of a given region studied, quantify the species present, and determine the predominance of each one (Nunes, Schaedler & Chiapinotto, 2018). With the identification of the species, it is possible to determine if a particular plant is a weed for pastures or if it is a palatable species, which can be used for animal feed, and is even desirable in the area.

This work was carried out to carry out a phytosociological survey and identify the species present in pasture areas in different reliefs, aiming to characterize the floristic composition of these areas and determine the forage potential or the deleterious character of the identified plants.

MATERIAL AND METHODS

The phytosociological survey was carried out in the pasture areas belonging to the Federal Institute of Education, Technology, and Science (IFES) at the Santa Teresa Campus. The region is characterized by a tropical climate, with an average annual temperature of 28 ºC and average annual precipitation of 1,078 mm, according to the Köppen mesothermic Aw climate classification, with a dry season in winter and heavy rainfall in summer (Alvares et al., 2013). The soil of the sample areas is classified as a Dystrophic Red Yellow Latosol of medium texture, according to the criteria of the Brazilian Soil Classification System (EMBRAPA, 2009).

The study areas were divided into two environments with different topographic characteristics: Area A, a sloping pasture located at 155 m altitude (coordinates 19°48'7.53"S, 40°41'8.16"W), and Area B, a flat pasture located at 133 m altitude (coordinates 19°48'18.84"S, 40°41'7.14"W).

To carry out the phytosociological study, two collections were carried out in different seasons of the year, The first collection was carried out in the period considered dry (winter), which corresponds to the seasons of the year with low rainfall. According to the Espírito Santo Institute of Research, Technical Assistance and Rural Extension – INCAPER, the average accumulated rainfall in this period is below 150 mm for most of the state. A second collection in the rainy season (summer) comprises the seasons of the year with high rainfall greater than 450 mm for most of the state (INCAPER, 2022).

The definition of the time that comprises the period of the desired seasons was determined using as a basis the classification of seasons of the year based on meteorology pointed out by INCAPER (Capixaba Institute of Research, Technical Assistance and Rural

Extension). According to INCAPER (2022), meteorological winter begins on the first (1st) of June and includes the months of July and August. The meteorological summer begins on the first (1st) of December. Includes the months of January and February (INCAPER, 2022).

Ifes has an Automatic Weather Station (Davis Vantage Pro2, Davis Instruments, Hayward, CA, USA) equipped with sensors for air temperature, relative humidity, wind speed and direction, global solar radiation, and rainfall. Information from this weather station showed that the accumulated precipitation for the 2023 meteorological winter period was 135.2 mm 2023. And the accumulated precipitation for the meteorological summer of 2023/2024 was 712.2. Both within the range described by INCAPER 2021.

To carry out the collections of plant species, the method of isolated squares was used (Braun-Blanquet, 1950), where with the help of a hollow square of 1m x 1m, the collection area was delimited. This square was thrown at random by the pastures of the cattle sector, in the entire sample area, making a total of 10 samples in five hectares per defined environment, totaling 20 samples per season. The aerial part of the weeds in each sampling area was identified, collected, counted, and registered, and the forage plants of the genus Brachiaria were not collected.

The collected plants were identified in the field based on the Manual of Weed Identification and Control (Lorenzi, 2014) and the book Key of Identification, For the main families of native and cultivated Angiosperms and Gymnosperms in Brazil, 4th edition (Souza and Lorenzi, 2023) with the Angiosperm PhylogenyGroup IV System (APG IV, 2016), according to family and species. Pasture weed species (non-palatable and/or toxic species) and palatable species with forage potential were also quantified.

To carry out the phytosociological calculations, the methodology proposed by Brandão et al. (1998) was used with the following parameters:

The frequency indicates in percentage how much a certain species occurs in the studied area. It is calculated by multiplying the number of plots that contain the species by 100, as it is an index given as a percentage, divided by the total number of plots.

Density expresses the number of plants per species per unit area (m²). It is calculated by dividing the total number of individuals of a species by the total sample area.

Abundance indicates the occurrence of species in certain areas. It is calculated by dividing the total number of individuals of the species by the total number of plots containing the species.

Relative frequency represents the percentage ratio of the frequency of a population about the sum of the total frequency of all populations. It is determined by multiplying the frequency of the species by 100 and dividing by the total frequency of the species.

Relative density represents the percentage ratio of individuals of a species to the total number of weeds. It is calculated by multiplying the density of species by 100, followed by dividing by the total density of species.

Relative abundance demonstrates information of a species about all other species found. It is determined by multiplying the abundance of the species by 100, followed by dividing by the total abundance of the species.

The Importance Value Index (IVI) is determined by the sum of the values of relative frequency (Frr), relative density (Der), and relative abundance (Abr), which is an indicator of association between partial variables. To compare weed species between pasture areas, the similarity index (I.S.) was used, according to Sorensen (1972), apud Ferreira et al. (2019). The calculation consists of multiplying the number of species common to the two areas (a) by two, dividing by the total number of species in the two areas (b), and then multiplying the result by 100 so that the value is expressed as a percentage.

The I.S. is expressed as a percentage, being at a maximum (10 0%) when all species are common in the areas and at a minimum (0%) when there are no common species in the evaluated areas.

RESULTS AND DISCUSSION

In the phytosociological survey, 14 families and 47 species of plants were identified in the collection areas. The species were classified according to their families, genera, species, and popular names. Pasture weed species (PDP) were subdivided into PDP-NP (non-palatable species) and PDP-TO (toxic species), while desirable species were classified as Palatable Plants and Forage Potential (PPF). The family with the highest number of species identified was Fabaceae, with 13 species, followed by Amaranthaceae, with 8 species, and Malvaceae, with 7 species.

In the hill area (A), seven families were found (Asteraceae; Amaranthaceae; Fabaceae; Laminaceae, Malvaceae, Nyctaginaceae and Verbenaceae). As can be seen in table 1.

Revista ARACÊ
ISSN: 2358-2472

Table 1 – Families, identified species, popular name, quantities and classification of pasture weeds, non-palatable (PDP-NP), toxic (PDP-TO) and desirable species (PPF) palatable with forage potential found in the phytosociological survey in the hill area (A).

Family	Species	Popular Name	Quantity	Classification
Asteraceae	*Elephantopus mollis*	Erva-grossa, Tobacco-bravo	13	PDP-NP
Amaranthaceae	Alternanthera tenella	Fire Extinguisher, Parakeet, Butterbur	16	PDP-NP
	Alternanthera brasiliana	Perpetua of Brazil, Terramycin, Evergreen	27	PDP-NP
Fabaceae	*Calopogonium mucunoides*	Sago beans	30	PTT
	Alysicarpus vaginalis	Buffalo Clover, One-Leaf Clover	83	PTT
	Senna obtusifolia	Stinky, Kills pasture	6	PDP-TO
	Clitoria ternatea	Blue Pea, Butterfly Bean	4	PTT
	Acacia plumosa	Cat-Scratcher, Cat's Claw	11	PDP-NP
	Centrosema pubescens	Center, Butterfly pea	12	PTT
	Indigofera suffruticosa	Indigo, Anileira	1	PDP-NP
	Macroptilium atropurpureum	Bush beans, Purple beans	2	PTT
	Desmodium incanum	Ox Chopstick, Tag	1	PTT
	Desmodium triflorum	Country love	2	PTT
	Senna occidentalis	Basil, True-Stinking	2	PDP-TO
	Mimosa pudica	Poppy Sleeper, Sensitive, Sleep-Sleep	3	PDP-NP
Laminaceae	*Hyptis suaveolens*	Lemon Sage, Smelly, Bamburral	71	PDP-NP
Malvaceae	*Sida cordifolia*	Guanxuma Velvet Velvet, Mauve	22	PDP-NP
	Abutilon grandifolium	Tinkerbell, pigweed, raccoon	24	PDP-NP
	Sida rhombifolia	Guanxuma, Broom		PDP-NP
	Triumfetta rhomboidea	Beetle, Ox beard, Round butterbur	1	PDP-NP
Nyctaginaceae	*Bougainvillea glabra*	Bougainville, Spring, Glossy	1	PDP-NP
Verbenaceae	*Lantana camera*	Camará, Cambará, Camaradinha or Lantana	1	PDP-TO

Source: Survey data

In the hill area (Area A), 22 species were identified, divided into 7 families in the phytosociological survey. The species were classified as non-palatable weeds (PDP-NP) 12 species. Toxic pasture weeds (PDP-TO) 3 species, and 8 palatable desirable species (PPF) with forage potential. The phytosociological parameters of the hill area (Area A) are represented in Table 2.

Table 2 - Phytosociological parameters of area A.

Family	Species	Frq Total	Den Total	Total Abun	Total Fr	Total Denre	Total abound	IVI Total
Asteraceae	*Elephantopus mollis*	10,00	0,65	6,50	2,99	3,86	6,90	13,75
Amaranthaceae	*Alternanthera tenella*	15,00	0,80	5,33	4,48	4,75	5,66	14,89
	Alternanthera brasiliana	25,00	1,35	5,40	7,46	8,01	5,74	21,21
Fabaceae	*Acacia plumosa*	20,00	0,55	2,75	5,97	3,26	2,92	12,15
	Alysicarpus vaginalis	55,00	4,15	7,55	16,42	24,63	8,01	49,06
	Calopogonium mucunoides	40,00	1,50	3,75	11,94	8,90	3,98	24,83
	Centrosema pubescens	30,00	0,60	2,00	8,96	3,56	2,12	14,64
	Clitoria ternatea	5,00	0,20	4,00	1,49	1,19	4,25	6,93
	Desmodium incanum	5,00	0,05	1,00	1,49	0,30	1,06	2,85
	Desmodium triflorum	5,00	0,10	2,00	1,49	0,59	2,12	4,21
	Indigofera suffruticosa	5,00	0,05	1,00	1,49	0,30	1,06	2,85
	Macroptilium atropurpureum	5,00	0,10	2,00	1,49	0,59	2,12	4,21
	Mimosa pudica	5,00	0,15	3,00	1,49	0,89	3,19	5,57
	Senna obtusifolia	5,00	0,30	6,00	1,49	1,78	6,37	9,65
	Senna occidentalis	5,00	0,10	2,00	1,49	0,59	2,12	4,21
Laminaceae	*Hyptis suaveolens*	40,00	3,55	8,88	11,94	21,07	9,43	42,43
Malvaceae	*Abutilon grandifolium*	30,00	1,20	4,00	8,96	7,12	4,25	20,33
	Sida cordifolia	5,00	1,10	22,00	1,49	6,53	23,37	31,39
	Sida rhombifolia	10,00	0,20	2,00	2,99	1,19	2,12	6,30
	Triumfetta rhomboidea	5,00	0,05	1,00	1,49	0,30	1,06	2,85
Nyctaginaceae	*Bougainvillea glabra*	5,00	0,05	1,00	1,49	0,30	1,06	2,85
Verbenaceae	*Lantana camara*	5,00	0,05	1,00	1,49	0,30	1,06	2,85

Source: Survey data

In the lowland area (Area B), twelve families were identified (Asteraceae; Amaranthaceae; Fabaceae; Malvaceae; Convolvulaceae; Cucurbitaceae; Poacea; Solanacea, Rubiaceae, Vitaceae, Verbenaceae and Cyperaceae). As can be seen in Table 3.

Table 3 – Families, identified species, popular name, quantities and classification of non-palatable (PDP-NP), toxic (PDP-TO) and desirable (PPF) palatable species with forage potential found in the phytosociological survey in the lowland area (B).

Family	Species	Popular Name	Quantity	Classification

Revista ARACÊ
ISSN: 2358-2472

Asteraceae	*Vernonia polyanthes*	Fish Roast	13	PDP-NP
	Parthenium hysterophorus	White wormwood, Farmer	18	PDP-TO
Amaranthaceae	*Alternanthera philoxeroides*	Frog Gut, Alligator Grass, Perpetua	10	PDP-NP
	Amaranthus spinosus	Pork pig pig	8	PTT
	Achyranthes rough	Bur	44	PDP-NP
	Amaranthus blitum	Purple Purslane,Stone Purslane	2	PTT
	Alternanthera ficoidea	Firebreak, Parakeet	4	PDP-NP
	Gomphrena serrata	Life	7	PDP-NP
Fabaceae	*Centrosema pubescens*	Center, Butterfly pea	9	PTT
	Desmodium incanum	Ox Chopstick, Tag,	9	PTT
	Senna obtusifolia	Stinky, Kill pasture,	2	PDP-TO
	Calopogonium mucunoides	Sago beans	1	PTT
	Glycine tabacina	Glycine	4	PTT
Malvaceae	*Sida rhombifolia*	Guanxuma, Broom	37	PDP-NP
	Sida cordifolia	Guanxuma Velvet Velvet, Mauve	14	PDP-NP
	Herissantia crispa	Malva do sertão, malva rasteira	1	PDP-NP
	Waltheria indica	Velvet mauve, Silky mauve, False quanxuma	1	PDP-NP
	Malvastrum coromandelianum	Vassourinha, Guanxuma, Raccoon, Malvastro	1	PDP-NP
Convolvulaceae	*Ipomoea triloba*	Viola string, Corriola	2	PDP-NP
	Ipomoea cairica	Viola string, Wraps week	2	PDP-NP
Cucurbitaceae	*Momordica charantia*	Melon of São Caetano	1	PDP-NP
	Cucumis anguria	Maxixe	1	PDP-NP
Poacea	*Paspalum virgatum*	Razorgrass	13	PDP
	Eleusine indica	Chicken foot grass	1	PTT
	Ehrharta erecta	Panic grass	2	PTT
Solanacea	*Solanum sisymbriifolium*	Joa Bravo, Arrebenta cavalo, Juá	2	PDP-TO
	Solanum mauritianum	Angry smoke	7	PDP-TO
Rubiaceae	*Richardia scabra*	Poaia-do-cerrado	1	PDP-NP
Vitaceae	*Cissus verticillata*	Climbing indigo, Muci vine, Pucá vine,	1	PDP-TO
Verbenaceae	*Lantana camera*	Camará, Cambará, Camaradinha or Lantana	1	PDP-TO
Cyperaceae	*Cyperus rotundus*	Nutsedge, Dandá Grass, Aromatic Sedge	208	PDP-NP

Source: Survey data

In the lowland area (Area B), 31 species divided into 12 families were identified in the phytosociological survey. The species were classified as non-palatable weeds (PDP-NP) 16 species. Toxic pasture weeds (PDP-TO) 6 species, and 9 palatable desirable species (PPF) with forage potential. The phytosociological parameters of the lowland area (Area B) are shown in Table 4.

Revista ARACÊ
ISSN: 2358-2472

Table 4 – Phytosociological parameters of area B.

Family	Species	Frq Total	Den Total	Total Abun	Total Fr	Total Denre	Total abound	Total IVI
Asteraceae	*Parthenium hysterophorus*	5,00	0,90	18,00	1,79	4,23	5,59	11,60
	Vernonia polyanthes	20,00	0,65	3,25	7,14	3,05	1,01	11,20
Amaranthaceae	*Achyranthes rough*	30,00	2,15	7,17	10,71	10,09	2,23	23,04
	Alternanthera ficoidea	5,00	0,20	4,00	1,79	0,94	1,24	3,97
	Alternanthera philoxeroides	5,00	0,50	10,00	1,79	2,35	3,11	7,24
	Amaranthus blitum	5,00	0,10	2,00	1,79	0,47	0,62	2,88
	Amaranthus spinosus	20,00	0,40	2,00	7,14	1,88	0,62	9,64
	Gomphrena serrata	5,00	0,35	7,00	1,79	1,64	2,18	5,60
Fabaceae	*Calopogonium mucunoides*	5,00	0,05	1,00	1,79	0,23	0,31	2,33
	Centrosema pubescens	10,00	0,45	4,50	3,57	2,11	1,40	7,08
	Desmodium incanum	10,00	0,45	4,50	3,57	2,11	1,40	7,08
	Glycine tabacina	5,00	0,20	4,00	1,79	0,94	1,24	3,97
	Senna obtusifolia	5,00	0,10	2,00	1,79	0,47	0,62	2,88
Malvaceae	*Herissantia crispa*	5,00	0,05	1,00	1,79	0,23	0,31	2,33
	Malvastrum coromandelianum	5,00	0,05	1,00	1,79	0,23	0,31	2,33
	Sida cordifolia	15,00	0,70	4,67	5,36	3,29	1,45	10,09
	Sida rhombifolia	50,00	1,85	3,70	17,86	8,69	1,15	27,69
	Waltheria indica	5,00	0,05	1,00	1,79	0,23	0,31	2,33
Convolvulaceae	*Ipomoea cairica*	5,00	0,10	2,00	1,79	0,47	0,62	2,88
	Ipomoea triloba	10,00	0,10	1,00	3,57	0,47	0,31	4,35
Cucurbitaceae	*Cucumis anguria*	5,00	0,05	1,00	1,79	0,23	0,31	2,33
	Momordica charantia	5,00	0,05	1,00	1,79	0,23	0,31	2,33
Poacea	*Paspalum virgatum*	5,00	0,65	13,00	1,79	3,05	4,04	8,88
	Ehrharta erecta	5,00	0,10	2,00	1,79	0,47	0,62	2,88
	Eleusine indica	5,00	0,05	1,00	1,79	0,23	0,31	2,33
Solanacea	*Solanum mauritianum*	5,00	0,35	7,00	1,79	1,64	2,18	5,60
	Solanum sisymbriifolium	5,00	0,10	2,00	1,79	0,47	0,62	2,88
Rubiaceae	*Richardia scabra*	5,00	0,05	1,00	1,79	0,23	0,31	2,33
Vitaceae	*Cissus verticillata*	5,00	0,05	1,00	1,79	0,23	0,31	2,33
Verbenaceae	*Lantana camara*	5,00	0,05	1,00	1,79	0,23	0,31	2,33
Cyperaceae	*Cyperus rotundus*	5,00	10,40	208,00	1,79	48,83	64,64	115,25

Source: Survey data

In the present study, the family with the highest number of species was the Fabaceae, with 13 species identified, followed by the Amaranthaceae, with 8 species, and the Malvaceae, with 7 species collected. Galvão et al. (2011) described the Poaceae and Cyperaceae families as the most prevalent, with 7 and 4 species, respectively, and these authors included forage grasses in their research, which was not done in the present study. Inoue et al.. (2012) identified the families Asteraceae, Fabaceae, and Aceraceae as the most representative in their survey, with 7, 6, and 3 species, respectively. Da Silva et al. (2013) observed that the Cyperaceae family had the largest number of individuals (62), followed by Malvaceae (7) and, with 5 individuals each, Euphorbiaceae and Solanaceae.

The data indicate a significant variation in the number of species found between the surveys. However, a remarkable similarity was observed in the number of families identified, as reported by Lima et al. (2017), Ferreira et al. (2019), Inoue et al. (2013), and Inoue et al. (2012), who differed from this survey by only one species. This consistency in the taxonomic composition of plant families in pastures points to a relevant ecological relationship, which may be fundamental to understanding the ecology and dynamics of these species in different contexts and regions.

Inoue et al.. (2013) reported the identification of 16 families and 31 species of weeds, with emphasis on the families Asteraceae, Papilionoideae, Poaceae, and Malvaceae, which were the most representative in several species. Ferreira et al.. (2014) identified the families Fabaceae, Poaceae, and Malvaceae as the ones that presented the largest number of species in their survey, with 10, 8, and 4 species, respectively. Brighenti et al. (2016) described Asteraceae as the family with the highest number of species (6), followed by Euphorbiaceae (4). Lima et al. (2017) highlighted the Fabaceae and Poaceae families, with five species each, and the Asteraceae and Malvaceae families, with three species each. Dias et al. (2018) also reported Fabaceae as the family with the highest number of species (8), followed by the families Poaceae and Asteraceae, both with four species. Chargas et al. (2019) described two species for the family Fabaceae and one species for each of the other families: Asteraceae, Malvaceae, Poaceae, Rubiaceae, Solanaceae, and Turneraceae. Nunes et al. (2022) reported the Cyperaceae and Fabaceae families as the most representative in their survey, with six and four species, respectively.

In the present study, the Fabaceae family had the highest number of species, similar to that found in four of the surveys reviewed (Chargas et al., 2019; Dias et al., 2018; Lima et al., 2017; Ferreira et al., 2014). In two studies, Fabaceae was the second with the highest number of species collected (Inoue et al., 2013; Inoue et al., 2012). The Amaranthaceae family, which was the second most represented in the present study, was not classified among the main families in the surveys consulted. Inoue et al.. (2013) reported the Amaranthaceae with only one species. This family was mentioned by Brighenti et al. (2016) in a study on weeds in areas of crop-livestock integration and is associated with degraded pastures in the Middle Doce River Valley, Minas Gerais, according to Ferreira et al. (2014).

Malvaceae ranked third in several individuals in the present survey, a result similar to that described by Da Silva et al.. (2013). Other studies have highlighted Poaceae as the second most abundant family in species (Chargas et al., 2019; Dias et al., 2018; Lima et al., 2017), while Malvaceae was third in two studies (Ferreira et al., 2014; Inoue et al., 2013). Lima et al. (2017) also described the Malvaceae and Asteraceae families with three species each.

The differences in the phytosociological surveys of pasture areas highlight the importance of local studies to know the flora and make appropriate decisions for management. In the present study, the similarity index between areas A and B was calculated, with a result of 26.42%. Values close to 0% indicate that the species are different, while values close to 100% indicate that they are common among the evaluated areas. Based on these results, a slight similarity is observed between the areas analyzed.

Species of the Poaceae family have been found in lowland areas with a prevalence of 3.11%, including Paspalum virgatum, Ehrharta erecta, and Eleusine indica. In the hill area, the species Hyptis suaveolens (Lamiaceae) stood out, with 12.30% of representativeness. In lowland areas, the families Convolvulaceae (0.69%) were identified, with the species Ipomoea cairica and Ipomoea triloba; Cucurbitaceae (0.34%), with Cucumis anguria and Momordica charantia; Solanaceae (0.34%), with Solanum mauritianum and Solanum sisymbriifolium; and Rubiaceae (0.17%), with Richardia scabra.

The main species identified in this study were Cyperus rotundus (Cyperaceae), with an Importance Value Index (IVI) of 115.25, in the lowland area (Area B); Alternanthera philoxeroides (Amaranthaceae), with IVI 7.24, also in the plain; and Alysicarpus vaginalis (Fabaceae), with IVI 49.06, in the hill area (Area A). In all, 47 species distributed in 9 families were identified in the phytosociological survey. These species were classified into three categories: non-palatable weeds (PDP-NP), with 27 species; toxic weeds (PDP-TO), with 7 species; and palatable plants with forage potential (PPF), with 13 species.

The results obtained showed that most of the plants identified were classified as non-palatable weeds (PDP-NP), totaling 12 species in Area A, representing 54.5%, and 16 species in Area B, with 51.6%. In addition, the presence of toxic weeds (PDP-TO) was identified, with 3 species in Area A (13.6%) and 6 species in Area B (19.4%). On the other hand, the presence of 8 palatable species with forage potential (PPF) was also verified in

Revista ARACÊ
ISSN: 2358-2472

Area A, corresponding to 36.4%, and 9 species in Area B, with 29.0%, with Alysicarpus vaginalis and Centrosema pubescens being the most representative.

The phytosociological parameters revealed that the species Hyptis suaveolens and Alysicarpus vaginalis in Area A, with IVI of 42.43 and 49.06, respectively, and Cyperus rotundus in Area B, with IVI of 115.25, were the most representative in their respective areas.

CONCLUSION

The similarity between the two areas was low, indicating a distinct floristic composition.

The phytosociological survey is an indispensable tool for the management of pastures, allowing the control of deleterious plants and the valorization of species with forage potential. The correct identification and classification of species enables the development of targeted management strategies, optimizing productivity and ensuring the sustainability of pasture areas.

ACKNOWLEGMENTS

We thank IFES for its support in the construction and publication of this research.

Revista ARACÊ
ISSN: 2358-2472

REFERENCES

1. ABIEC - Brazilian Association of Meat Exporting Industries. (2022). *Beef report: Profile of cattle ranching in Brazil*. https://www.abiec.com.br/publicacoes/beef-report-2022/#dflip-df_4284/1/

2. Alvares, C. A., & et al. (2013). Köppen's climate classification map for Brazil. *Meteorol. Z., 22*(6), 711–728. https://doi.org/10.1127/0941-2948/2013/0507

3. ANUALPEC. (2022). *Municipal livestock 2021 tables: Herd herds, by type of herd, according to Brazil, the major regions and the Federation Units*. FNP Institute.

4. APG IV. (2016). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society, 181*(1), 1–20. https://doi.org/10.1111/boj.12385

5. Borghi, E., & et al. (2018). Recovery of degraded pastures. In *Low carbon agriculture: Technologies and implementation strategies* (pp. 105–138). Embrapa.

6. Brandão, M., Brandão, H., & Laca, B. J. P. (1998). The riparian forest of the Sapucaí river, municipality of Santa Rita do Sapucaí-MG: Phytosociology. *Daphne, 8*(4), 36–48.

7. Braun-Blanquet, J. (1950). *Sociology of plants: Studies of plant communities*. Acme Agency.

8. Brighenti, A. M., & et al. (2016). Phytosociology of weeds in crop-livestock integration areas. *Livestock Research for Rural Development, 28*(1), 1–7.

9. Chargas, J., & et al. (2019). Phytosociological survey of weeds in degraded pasture at the School Farm of Goianésia, Goiás. *Revista da Universidade Vale do Rio Verde, 17*(2), 1–9.

10. Da Silva, R. M., & et al. (2013). Phytosociological survey of weeds in degraded pasture submitted to different recovery systems. *Cascavel, 6*(1), 152–161.

11. Dias, R. C., & et al. (2018). Phytosociology in degraded and renewed pastures in agrosilvopastoral systems. *Planta Daninha, 36*. https://doi.org/10.1590/S0100-83582018360100OXX

12. EMBRAPA - Brazilian Agricultural Research Corporation, National Center for Soil Research. (2009). *Brazilian soil classification system* (2nd ed.). EMBRAPA-SPI.

13. Ferreira, E. A., & et al. (2019). Phytosociology of weeds in maize submitted to nitrogen dose application. *Revista Agrícola Neotropical, 6*(2), 109–116.

14. Galvão, A. K., & et al. (2011). Phytosociological survey in floodplain pastures in the State of Amazonas. *Planta Daninha, 29*, 69–75. https://doi.org/10.1590/S0100-83582011000100009

Revista ARACÊ
ISSN: 2358-2472

15. IBGE - Brazilian Institute of Geography and Statistics. (2021). *Research*. IBGE.

16. IBGE - Brazilian Institute of Geography and Statistics. (2023). *Report on pastures in Brazil*. https://www.ibge.gov.br/pastagens2023

17. INCAPER - Capixaba Institute of Research, Technical Assistance and Rural Extension. (n.d.). *Seasons*. https://meteorologia.incaper.es.gov.br/estacoes-do-ano

18. Inoue, M. H., & et al. (2012). Phytosociological survey in pastures. *Planta Daninha, 30*, 55–63. https://doi.org/10.1590/S0100-83582012000100007

19. Inoue, M. H., & et al. (2013). Phytosociological survey of weeds in pastures in the municipality of Nova Olímpia-MT. *Agrarian, 6*(22), 376–384.

20. Jank, L., & et al. (2014). The value of improved pastures to Brazilian beef production. *Crop and Pasture Science, 65*(11), 1132–1137. https://doi.org/10.1071/CP13319

21. Lima, A. K. O., & et al. (2017). Floristic composition and phytosociology of spontaneous plants in pastures of the genus Brachiaria (syn. Urochloa) in northeastern Pará. *Revista Agroecosistemas, 9*(2), 339–349.

22. Lorenzi, H. (2014). *Manual de identificação e controle de plantas daninhas: No-tillage and conventional* (6th ed.). Instituto Plantarum.

23. Malafaia, G. C., Biscola, P. H. N., & Dias, F. R. T. (2020). Communication challenges for the Brazilian beef production chain. *CiCarne-Embrapa Gado Corte, 1*(1), 1–3.

24. Ministério da Agricultura, Pecuária e Abastecimento. (2023). *Agribusiness projections - Brazil 2022/23 to 2032/33*. https://www.gov.br/agricultura/pt-br/assuntos/politica-agricola/todas-publicacoes-de-politica-agricola/projecoes-do-agronegocio/projecoes-do-agronegocio-2022-2023-a-2032-2033.pdf

25. Martins, P. F. C., & et al. (2022). Recovery of degraded pastures using biosolids and Moringa oleifera: Review. *Pubvet Medicina Veterinária e Zootecnia, 16*(2), 1–17.

26. Nunes, F., Schaedler, C., & Chiapinotto, D. (2018). Phytosociological survey of weeds in irrigated rice crop. *Planta Daninha, 36*. https://doi.org/10.1590/S0100-835820183601000XX

27. Nunes, R. J. L., & et al. (2022). Phytosociological study of spontaneous plants in pasture areas of UFRA, Belém Campus, Pará, Brazil. *Research, Society and Development, 11*(11), e20221111.

28. Soares Filho, A. O., & et al. (2016). Ruderal plants in the Conquerense Plateau, Bahia and their importance. *Natureza Online, 14*(2), 28–43.

29. Souza, V. C., & Lorenzi, H. (2023). *Chave de identificação* (4th ed.). Plantarum.

30. Timossi, P. C., Durigan, J. C., & Leite, G. J. (2007). Straw formation by Brachiaria for the adoption of the no-tillage system. *Bragantia, 66*(4), 617–622. https://doi.org/10.1590/S0006-87052007000400011