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Beyond Dung: Attractiveness of Native and Exotic Fruits to Dung Beetles in the Brazilian Savanna

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ABSTRACT

Dietary breadth enhances animal resilience in environments where resources are unpredictable or declining, enabling species to exploit alternative food sources when primary ones are scarce. In dung beetles (Coleoptera: Scarabaeinae), frugivory is an increasingly recognised foraging strategy, particularly in tropical regions experiencing mammalian declines. Here we evaluated the attractiveness of native *Caryocar brasiliense* (pequi) and exotic (banana) fruits to dung beetles in the Brazilian Cerrado. Furthermore, we compared the attractiveness of fresh and 48-h fermented pequi. We hypothesised that traps baited with native fruits (fresh and fermented) would attract higher abundance, biomass and diversity of dung beetles than those baited with exotic fruit, and that fermented pequi would be more attractive than fresh pequi due to the odour of decaying fruit. We collected 426 individuals, representing 14 dung beetle species, where *Canthidium* sp. was classified as specialist of fermented pequi. Traps baited with pequi, both fresh and fermented, attracted significantly higher diversity, abundance and biomass than banana. However, species richness and composition did not differ significantly among bait types, indicating generalist feeding strategies related to fruits. The fermentation stage of pequi did not influence attraction, suggesting that volatile cues from fresh fruits are sufficient to trigger beetle foraging, highlighting the role of native fruits in supporting dung beetle diversity. These findings highlight the potential of native fruits as an important food resource for dung beetles and underscore the importance of using native fruits known to attract these insects to improve fruit-based sampling methods for dung beetle assemblages in Neotropical landscapes.

1 | Introduction

Dietary plasticity allows animals to exploit a broader range of food resources, increasing their resilience to environmental variability and resource scarcity (Johnson 2000). Insects often exhibit remarkable trophic plasticity, allowing them to exploit alternative food resources when their primary dietary sources are scarce or absent (Hawlena et al. 2011; Leonhardt et al. 2020). This flexibility can be crucial for survival and reproductive success in environments subject to resource fluctuations or human disturbance (Crowder and Snyder 2010; Dennis et al. 2011). Such behavioural shifts have been observed in various insect groups, including coleopterans (e.g., Halffter and Halffter 2009), hemipterans (e.g., Panizzi 2000) and dipterans (e.g., Denno and Cothran 1975), and are particularly advantageous in tropical ecosystems with marked seasonality. Since environmental changes strongly influence the quality and availability of food and nutrients (Birnie-Gauvin et al. 2017; Snell-Rood et al. 2015), understanding how insect assemblages respond to different food types can help predict insect diversity and identify species that are more likely to withstand shortages of primary resources (Correa et al. 2023).

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Dung beetles (Coleoptera: Scarabaeinae), traditionally known due to their coprophagous diet, have increasingly been observed using alternative resources such as carrion and fruits (Halffter and Halffter 2009), especially in the Neotropics (Salomão et al. 2014; Correa et al. 2023). Indeed, frugivory among dung beetles has been reported in several Neotropical species, with fruits serving both as adult food and as larval provisioning material (Halffter and Halffter 2009; Sarges et al. 2012). Frugivory in dung beetles may represent an evolutionary response to ecological shifts, particularly the decline of large mammalian fauna after the Pleistocene, which drastically reduced the availability of dung as a reliable food resource (Halffter and Matthews 1966; Scholtz et al. 2009). In this context, the change in diet from coprophagy to necrophagy, frugivory or mycetophagy is not radical, because from the carrion, fruit or decaying fungi, adult dung beetles can only ingest thick paste containing juices and microorganisms (Halffter and Halffter 2009). This explains why it is so frequent to find adults of the same species (especially in the humid tropical forests of America) feeding on dung, carrion and decomposing fruits (Halffter and Halffter 2009).

Field studies have shown that dung beetles are attracted to fruits of Brazilian native trees such as *Caryocar brasiliense* A.St.-Hil. (pequi), *Butia capitata* (Mart.) Becc. (butiá) and several species of *Attalea* and *Syagrus*, highlighting the ecological relevance of these interactions (Pereira and Martinez 1956; Pereira and Halffter 1961; Gill 1991; Vaz-de-Mello et al. 1998; Santos et al. 2016; Almeida-Bezerra et al. 2022; Bernardes et al. 2025). Such interactions can promote seed burial and dispersal, enhancing plant recruitment and gene flow (Andresen and Urrea-Galeano 2022). Despite their importance, frugivory and its role in dung beetle assemblages remain poorly studied, particularly in the Cerrado biome—the largest, most biodiverse and most threatened tropical savanna on the planet that is recognised as a global biodiversity hotspot (Myers et al. 2000). Investigating fruit attractiveness to dung beetles in the Brazilian Cerrado can provide insights into mechanisms of species coexistence and spatial distribution, as well as the role of fruits in sustaining dung beetle populations in this threatened ecosystem.

Overall, studies using fresh or rotten fruits as bait to attract dung beetles are scarce in the Neotropical region (Mora-Aguilar et al. 2023). In the studies conducted, fermented banana is the most commonly employed bait. For example, Salomão et al. (2014) and da Silva et al. (2012) captured dung beetles in the Atlantic Forest using this resource; Cajaíba et al. (2017) in the Amazon Forest; and Medina and Lopes (2014) in the Caatinga biome. However, although bananas are easily available in local markets, they are not native to this region and may therefore not adequately attract Scarabaeinae species in this context (da Silva et al. 2012). Furthermore, it has been reported that a significant number of dung beetle species are attracted to native fruits (Halffter and Halffter 2009). Nevertheless, the relative attractiveness of native and exotic fruits to these insects remains poorly understood (e.g., Salomão et al. 2014).

Although previous studies have reported dung beetles feeding on fruits, the ecological significance of frugivory for dung beetle assemblages in Neotropical ecosystems remains poorly understood. Here, we address both gaps by experimentally comparing the attractiveness of native and exotic fruits to dung beetles, aiming to evaluate how frugivory contributes to resource use and community structure. More specifically, we compared dung beetle assemblage (species richness, abundance, diversity, biomass and assemblage structure) attracted to banana (exotic) and pequi (native). Furthermore, since the attraction of dung beetles to fruits may be influenced by the stage of fruit decomposition (Gill 1991; Chaboteaux et al. 2023), we compared the attractiveness of fermented and fresh pequi fruits, which are often found in nature. We hypothesise that traps baited with native fruits (fermented and fresh) will attract higher abundance, biomass and diversity of dung beetles when compared to exotic fruits. We believe it is because pequi fruits are widely distributed in the Cerrado biome (Oliveira and Scariot 2010) and their seeds are often dispersed by dung beetle species (Vaz-de-Mello et al. 1998; Bernardes et al. 2025). However, as dung beetles attracted to fruits are the majority generalists (Halffter and Halffter 2009), we do not expect a difference in the dung beetle species composition attracted to each fruit type. Finally, we expect that fermented pequi will attract more dung beetles than fresh pequi because decaying fruit is particularly attractive to a variety of species of the Scarabaeinae (Gill 1991).

2 | Material and Methods

2.1 | Study Area

The study was conducted in a region of Cerrado domain vegetation, in the Brazilian municipality of Aquidauana, Mato Grosso do Sul, Brazil (19°54′36″ S; 55°50′16″ W; 130 m a.s.l. Figure 1). The climate of the region is highly seasonal and classified as tropical savanna (Aw) according to Köppen (Alvares et al. 2014) with annual precipitation ranging from 1200 to 1300 mm and a mean annual temperature of 26°C (Cristaldo et al. 2017).

The study area is characterised by a mixture of two phytophysiognomy of the Cerrado sensu stricto: (i) a woody layer composed of trees and large shrubs such as *Qualea grandiflora* Mart., *Lafoensia pacari* St. Hill. and *Magonia pubescens* St. Hill. (3–8 m tall; canopy cover 50%–90%), and (ii) a ground layer dominated by grasses, herbs and small shrubs (Fina and Monteiro 2013). The pequi trees are widely distributed in the native vegetation of the studied region.

2.2 | Obtaining Fruit Baits

The banana (*Musa acuminata*, 'nanica' variety) and pequi (*Caryocar brasiliensis*) fruits used as baits were purchased locally in Aquidauana. Approximately 1.5 kg of each fruit was placed separately in sealed plastic bags and kept under ambient field temperature (~28°C) for 48 h to allow natural fermentation before trap installation. This time frame was selected to initiate microbial fermentation and produce noticeable volatile release, without causing advanced decay that could alter fruit structure and to simulate the early stages of natural fruit decomposition commonly observed in the Cerrado during the rainy season. In addition, a portion of pequi fruit was kept frozen for 48 h, matching the period used for the fermentation of banana and pequi baits. After this period, the frozen fruits were placed directly in the traps in the field, where they remained active for 48 h,

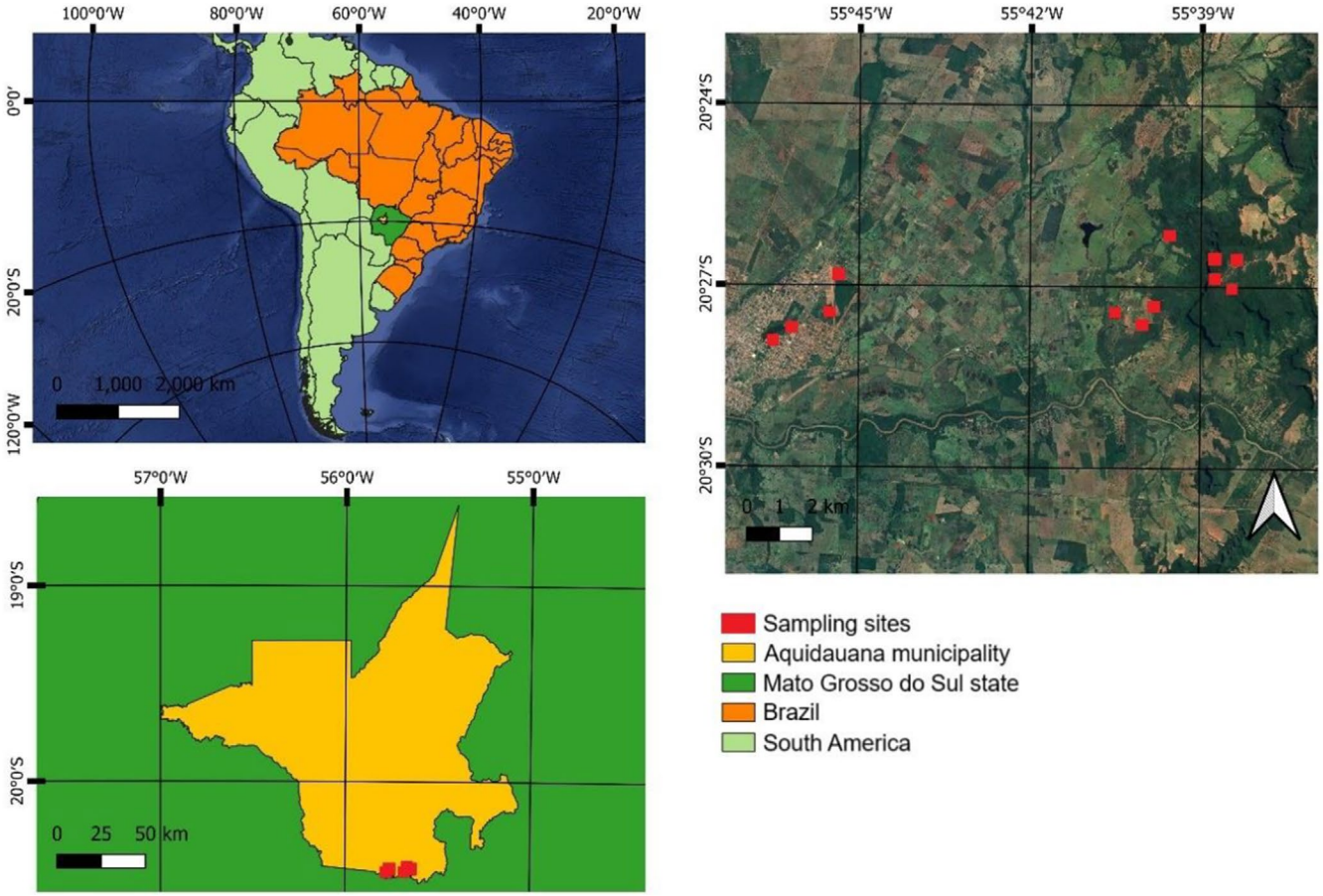


FIGURE 1 | Localisation of the studied area in Aquidauana, Mato Grosso do Sul state, Brazil, highlighting the 12 sites of sampling in the Brazilian Cerrado.

allowing complete thawing under natural ambient temperature (~28°C).

2.3 | Experimental Protocol and Dung Beetle Trapping

We sampled dung beetles during the rainy season (February 2025), which comprises the most appropriate sampling period in the study region (Correa et al. 2019) and the period of availability of pequi fruits in nature (Oliveira and Scariot 2010). We sampled dung beetles at 12 Cerrado vegetation fragments separated by a minimum distance of approximately 0.5 km (Figure 1). The distance among fragments was used to ensure independence of the samples (da Silva and Hernández 2015). Therefore, fragments were considered as replicates ($n = 12$ sites). The sites were distributed across two distinct landscapes, some within the urban perimeter of Aquidauana and others in rural surroundings (Figure 1).

At each sampling site, we placed a 100-m linear transect, 100 m away from its edge and delimited three sampling points along the transect (50 m apart from each other). At each sampling point, we installed a set of three baited pitfall traps separated from each other by 3 m in a triangular shape (Correa et al. 2018; Ferreira, Puker, et al. 2020). In total, we had a sampling effort of 108 traps (3 traps * 3 sampling points * 12 sampling sites), 36 per fruit baited type (fermented banana, fermented pequi and fresh pequi).

Each trap consisted of a plastic container (15 cm diameter, 9 cm depth) installed at ground level, covered with plastic lids (15 cm diameter) supported with three wooden sticks (25 cm) to reduce desiccation of the bait and to avoid rainwater accumulation. Within each trap, 250 mL of a solution (salt + neutral detergent; 1.5%) was added. The baits were placed in plastic containers (50 mL) at the centre of each trap using a wire as a bait holder.

Traps were baited with 40 g of fermented banana, 40 g of fermented pequi or 40 g of fresh pequi (*Caryocar brasiliense*). The baits were placed in 50-mL plastic containers positioned at the trap centre and suspended by a wire. All bait types were installed simultaneously and remained exposed for the same 48-h sampling period (see Mora-Aguilar et al. 2023). This standardised exposure ensured that, despite the brief initial thawing of fresh pequi, all treatments had ample time to release volatiles and function effectively as attractants. Therefore, any short-term difference in volatile emission at the beginning of the sampling period was unlikely to bias comparisons among bait types. After 48-h, beetles were collected and preserved in 70% ethanol for subsequent identification.

Dung beetles were separated to the genus level (Vaz-de-Mello et al. 2011), which was subsequently identified to species level by

a specialist (Fernando Z. Vaz-de-Mello). Voucher specimens are deposited in the Coleção Entomológica de Mato Grosso Eurides Furtado (CEMT) (Cuiabá, Mato Grosso, Brazil). To estimate the total biomass of dung beetles, all individuals collected were dried (40°C ± 2°C) in a desiccator (SolidSteel—SSA) until constant weight. Then, up to 20 individuals of each species were weighed on a precision scale (0.0001 mg) (Gehara AG 200). The average mass of each species was then multiplied by its abundance for each bait type in each sampling site.

2.4 | Data Analysis

To assess the survey's completeness for each bait type, we estimated the sample's completeness using the sample coverage analysis with the 'iNext' package (Chao et al. 2014; Hsieh et al. 2016). This measure of sample completeness reveals the proportion of the number of individuals in an assemblage belonging to the taxonomic groups (i.e., species) represented in the sample. We estimated the sample coverages using an individual-based approach. In addition, we plotted species rank-abundance distributions to visually compare patterns of species dominance in each bait type.

To compare the dung beetle diversity among bait types, Hill numbers were used. Diversity was estimated considering ^{0}D (species richness, which is independent of each species abundance), ^{1}D (exponential of Shannon, which considers the relative abundance of each species, thus representing the number of abundant species in the assemblage) and ^{2}D (inverse of Simpson, which gives a higher weight to species abundance than q1, thus representing the number of dominant species) (Chao et al. 2014; Hill 1973; Jost 2006). Diversity numbers were calculated in iNEXT software v. 1.0 (Hsieh et al. 2016).

We used Generalised Linear Mixed Models (GLMMs) to analyse the effects of fruit types (explanatory variables) on abundance, biomass, species richness (^{0}D), abundant species (^{1}D) and dominant species (^{2}D) of dung beetles (response variables), treating bait type as a fixed factor and sampling site as a random factor. Including site as a random effect allowed us to control for unmeasured spatial variation (e.g., microhabitat, vegetation structure or land use differences) that could otherwise influence dung beetle assemblages and bias the estimation of fixed effects. All GLMMs were subjected to residual analysis to detect the best distribution of errors (Crawley 2013). Gaussian errors were used for abundant species (^{1}D), dominant species (^{2}D) and biomass. Negative binomial errors were used for species richness (^{0}D) and the number of individuals. Models were verified for the residuals for normality, homogeneity of variance and presence of outliers using the 'DHARMa' R package (Hartig 2021). Models with negative binomial errors were conducted with the package 'MASS' (Venables and Ripley 2002) and were analysed in R software (R Core Team 2024). Then, we undertook contrast analysis to test pairwise differences, considering p-value < 0.05 as a significant difference (Crawley 2013).

To verify differences in species composition among fruit types, we used Permutational Multivariate Analysis of Variance (PERMANOVA) (Anderson 2001). To test the heterogeneity of multivariate dispersions of samplings (i.e., sampling sites) among the different fruit types, we used Permutational Multivariate Analysis of Dispersion (PERMDISP) (Anderson 2001). The PERMANOVA and PERMDISP were performed based on the Bray–Curtis dissimilarity matrix, which is sensitive to species abundances. To reduce bias due to the discrepancies of species abundances, we transformed data (square-root). PERMANOVA and PERMDISP were implemented in the Primer with PERMANOVA+ software version 6.0 (Clarke and Gorley 2006).

We used the indicator value method following Dufrene and Legendre (1997) to identify associations between dung beetle species and types of fruit. We used 5000 randomisations to determine the statistical significance of the observed indicator value (Monte Carlo test; $p < 0.05$). This analysis was performed with the 'indicspecies' package in R software (Cáceres et al. 2022; R Core Team 2024).

3 | Results

We collected 426 individuals from eight genera and 14 species of dung beetles. A total of eight species ($N = 62$) were recorded in fermented banana, 11 species ($N = 206$) in fermented pequi and 12 species ($N = 158$) in fresh pequi (see Table S1). There was a total of two rare species (i.e., *singleton* or *doubleton*) in the fermented banana, four in fermented pequi and four rare species in fresh pequi (Table S1). The sample coverage estimator revealed high sampling efficiency (> 98% in all fruit baits) (Table S1). This indicates that we made an adequate effort to represent the dung beetle assemblages attracted to fruits in our sampling sites.

In the fermented banana, of the 62 individuals sampled, the dominant species were: *Canthidium barbacenicum* Preudhomme de Borre, 1886 (24.19%), *Ateuchus* sp. (22.58%) and *Canthon unicolor* Blanchard, 1843 (22.58%). In fermented pequi, of the 206 individuals sampled, the dominant species were: *Ateuchus* sp. (28.64%), *C. barbacenicum* (22.36%) and *C. unicolor* (16.02%). In fresh pequi, of the 158 individuals sampled, the dominant species were: *Deltochilum* cf. *komareki* (15.82%), *C. barbacenicum* (22.78%) and *Ateuchus* sp. (15.82%) (Figure 2).

Species richness per sampling site ranged between 0 and five species in fermented banana, between 0 and seven species in fermented pequi and between 0 and eight species in fresh pequi (Table S1). The average species richness (^{0}D) did not differ among fruit baits ($F_{2,21} = 5.61$, $p = 0.06$—Figure 3A). The number of abundant dung beetle species (^{1}D) ($F_{2,21} = 6.48$, $p = 0.03$) was higher in fermented pequi compared with fermented banana. However, there was no significant difference between fermented banana and fresh pequi (Figure 3B). The number of dominant dung beetle species (^{2}D) ($F_{2,21} = 5.32$, $p = 0.07$—Figure 3C) did not differ among fruit bait types.

Regarding dung beetle abundance, fermented banana had between 0 and 23 individuals recorded in each sampling site, fermented pequi ranged from 0 to 66 individuals, while fresh pequi recorded between 0 and 62 individuals (Table S1). The average abundance was higher in the fermented pequi and fresh pequi than in fermented banana ($\chi^{2}_{2,21} = 15.48$, $p < 0.01$—Figure 4A), which did not differ in their abundances. Finally, the biomass ($F_{2,21} = 7.13$, $p = 0.03$—Figure 4B) was higher in fermented pequi

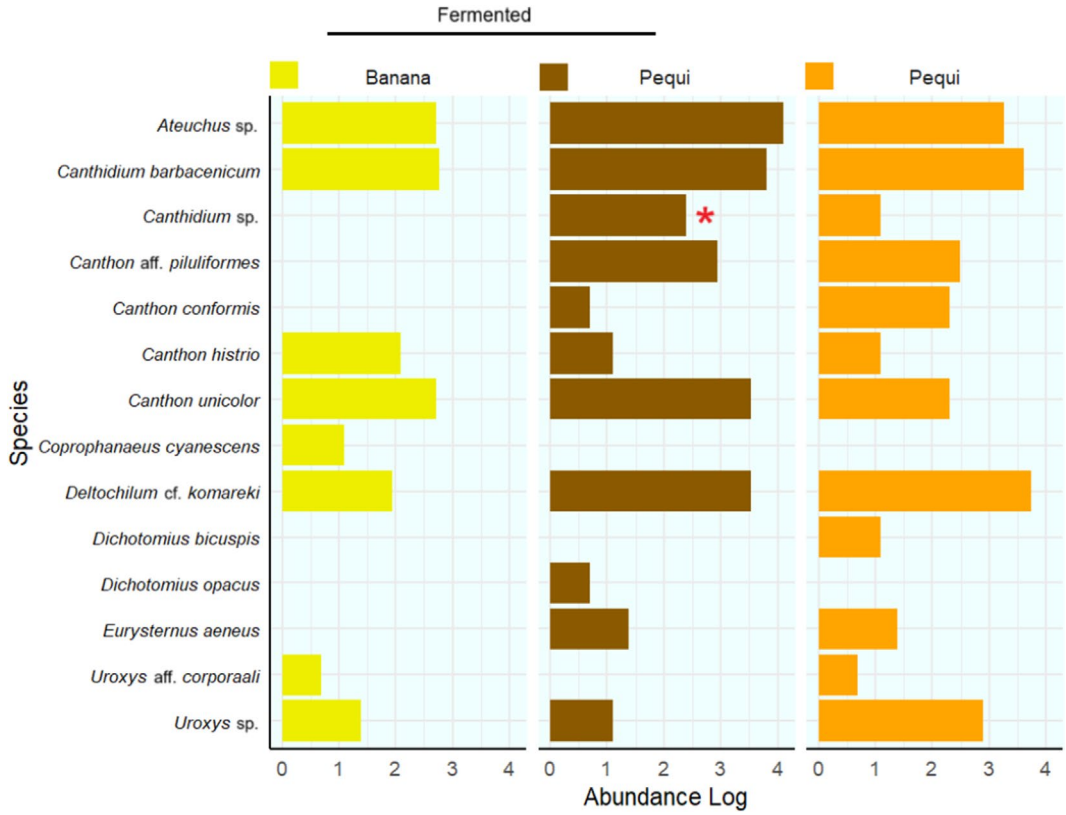


FIGURE 2 | Rank-abundance distribution of dung beetle species sampled in pitfall traps baited with fermented banana, fermented pequi and fresh pequi, in the Brazilian Cerrado. Red asterisk = indicator species of each fruit type.

compared with fermented banana. However, no significant differences were observed between fermented banana and fresh pequi (Figure 4B).

Six species were recorded in all three fruit bait types. The fermented banana had two species recorded exclusively in this fruit bait and shared one species with fresh pequi and no species with fermented pequi (Figure 5). *Dichotomius opacus* (Blanchard, 1845) was recorded only in fermented pequi, and this bait shared four species with fresh pequi (Figure 5). *Dichotomius bicuspis* (Germar, 1824) was exclusively collected in fresh pequi (Figure 5). Species composition (Pseudo-$F = 0.98$; $p = 0.44$) and dispersion of the sample units (Permdisp-$F = 3.37$; $p = 0.07$) did not differ among the fruit baits. Of the 14 species collected, only one species, *Canthidium* sp. (IndVal = 71.30%, $p = 0.002$), was associated with fermented pequi.

4 | Discussion

Understanding how dung beetles perceive different types of fruit is essential for advancing knowledge of their trophic ecology and the ecological role of fruits in Neotropical ecosystems. This study provides the first evaluation of native and exotic fruits' attractiveness to dung beetles in the Brazilian Cerrado. We found that species diversity, abundance and biomass of dung beetles were higher in traps baited with native fruits compared to exotic ones, although species' richness and composition did not differ significantly among fruit types. Additionally, the stage of decomposition of pequi fruit did not influence dung beetle attraction. These findings highlight the importance of native fruits as alternative food resources for dung beetles and their potential use to improve fruit-based sampling methods for Neotropical assemblages.

We recorded 14 dung beetle species in traps baited with both native and exotic fruits, with high sampling efficiency. Some species, such as *Dichotomius bicuspis* and *D. opacus*, were reported for the first time in the studied region (Correa CMA, pers. obs.), suggesting that native fruits contribute to the local and regional distribution of dung beetles (Halffter and Halffter 2009; Fuentes-Jacques et al. 2023). In addition, one species, *Canthidium* sp., showed a significant association with fermented pequi. Although this association does not necessarily indicate strict specialisation, its exclusive and/or frequent occurrence in fermented pequi traps and absence in banana baits suggest a genuine attraction to fermented native fruits. Several *Canthidium* species are known to feed on fruits or nest inside them (Halffter and Halffter 2009), indicating a possible evolutionary link between this genus and decaying plant matter. As *Canthidium* is one of the most diverse and taxonomically complex genera of Neotropical Scarabaeinae (Schoolmeesters 2025), further studies including behavioural observations are required to confirm this association. Overall, our findings contribute to expanding the knowledge of dung beetle fauna associated with fruits in the Neotropical region, particularly within the Brazilian Cerrado, a threatened tropical savanna.

We found higher abundance, biomass and diversity in traps baited with pequi (native) than with banana (exotic). Such

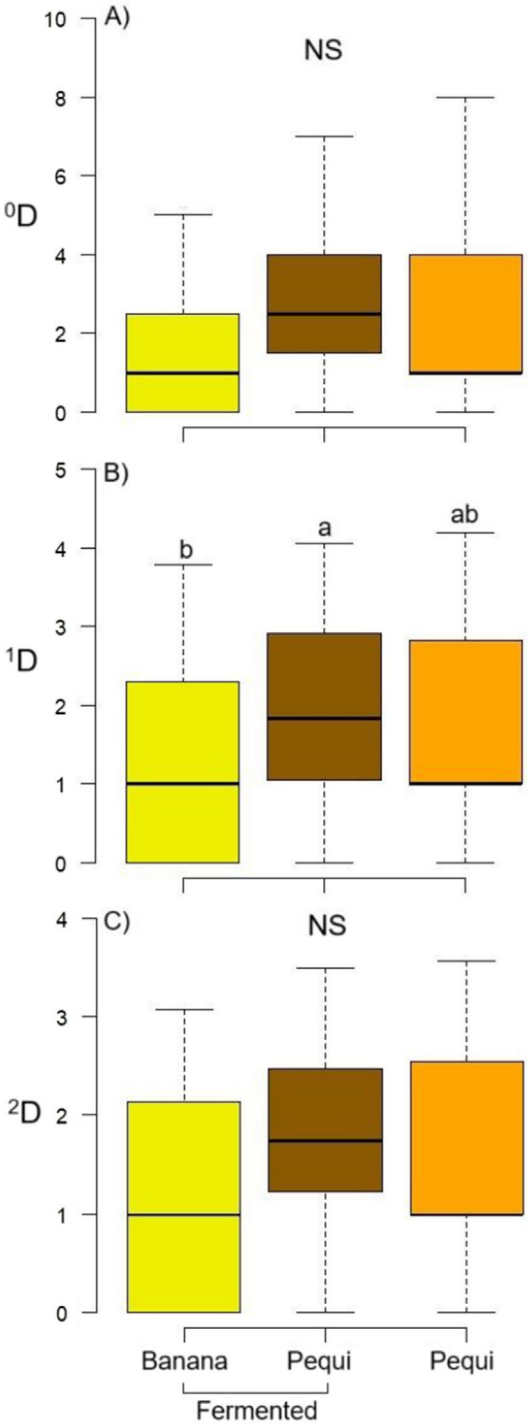


FIGURE 3 | Average species richness (^{0}D) (A), exponential of Shannon (^{1}D) (B), and inverse of Simpson (^{2}D) (C) of dung beetles sampled in pitfall traps baited with fermented banana, fermented pequi and fresh pequi, in the Brazilian Cerrado. Different letters above the bars indicate statistically significant differences ($p < 0.05$). Error bars represent ± SE. NS, no significance ($p > 0.05$).

patterns indicate a stronger preference for native fruits as food resources (Levins 1968; Dufrene and Legendre 1997). Differences in the quantity and quality of volatile compounds released by each fruit type (Evangelista et al. 2024) likely produced distinct odours that mediated dung beetle foraging decisions (Dormont et al. 2007; Stavert et al. 2014), explaining the greater attractiveness of pequi. Further analyses of these volatiles could clarify their specific role in attracting different beetle species. Additionally, pequi fruits are abundant in the study region and their fruiting period coincides with the peak activity of dung beetles in the Cerrado (Frizzas et al. 2020), offering an important alternative resource when mammalian dung and carrion are scarce (Halffter and Halffter 2009). These ecological and chemical factors together likely explain the higher beetle assemblages associated with pequi.

The composition and species richness of dung beetles did not differ between banana and pequi. The lack of differences in species composition between banana and pequi supports the view that most Neotropical dung beetles are trophic generalists capable of exploiting a wide range of decomposing organic substrates, including both native and exotic fruits (Halffter 1991; Halffter and Halffter 2009). Adult Scarabaeinae are morphologically and physiologically adapted to feed on soft, microbe-rich materials such as fermented fruits (Holter et al. 2002; Holter and Scholtz 2005), without requiring strict dietary specialisation. Therefore, the absence of species turnover between fruit types likely reflects the ecological flexibility and opportunistic foraging strategies of dung beetles in the Cerrado, where resource availability is both seasonal and spatially heterogeneous.

The lack of differences in abundance, species richness, diversity and composition between dung beetles attracted to fresh and 48-h fermented pequi indicates that even early decomposition stages release sufficient volatiles to attract these insects. Dung beetles respond strongly to compounds emitted during the early fermentation of organic matter, including dung, carrion and fruit (Dormont et al. 2007; Stavert et al. 2014). Given their feeding adaptations for pasty, microbe-rich substrates, even naturally ripened fresh fruits may trigger foraging behaviour (Halffter and Halffter 2009). Thus, the 48-h fermentation period may not have significantly altered the chemical profile of pequi under warm tropical conditions, where microbial activity develops rapidly (e.g., Evangelista et al. 2024). These results reinforce the generalist feeding strategies of Cerrado dung beetles and suggest that short-term fermentation may not be a major determinant of assemblage structure, although longer fermentation periods should be tested in future studies.

4.1 | The Ecological Implications of Native Fruits to Dung Beetles in the Brazilian Cerrado

Our results emphasise that conserving native fruit-bearing trees in the Cerrado is crucial for maintaining dung beetle assemblages. These trees act as key alternative food sources (Bernardes et al. 2025), especially in landscapes where native mammals, the primary providers of dung, are scarce or declining due to habitat loss (Ferreira, Collen, et al. 2020). For instance, *Oxysternon palemo* Castelnau, 1840 shows frugivorous behaviour by manipulating and burying pequi fruits, functioning as a secondary seed disperser (Bernardes et al. 2025). Such behavioural plasticity reflects broader Neotropical patterns in which frugivory enables Scarabaeinae beetles to persist under reduced dung availability (Halffter and Halffter 2009). Consequently, native fruit trees can serve as keystone resources, sustaining dung beetle populations in fragmented or disturbed habitats and

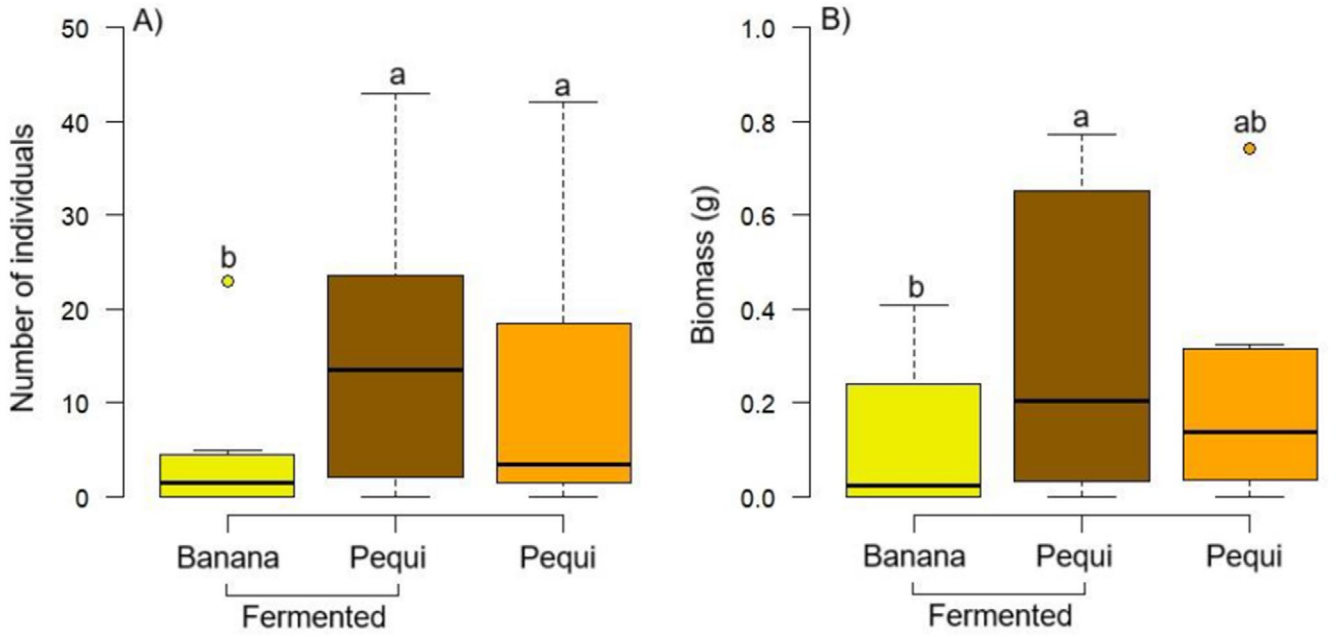


FIGURE 4 | Average abundance (A) and biomass (B) of dung beetles sampled in pitfall traps baited with fermented banana, fermented pequi and fresh pequi, in the Brazilian Cerrado. Different letters above the bars indicate statistically significant differences ($p < 0.05$). Error bars represent ± SE.

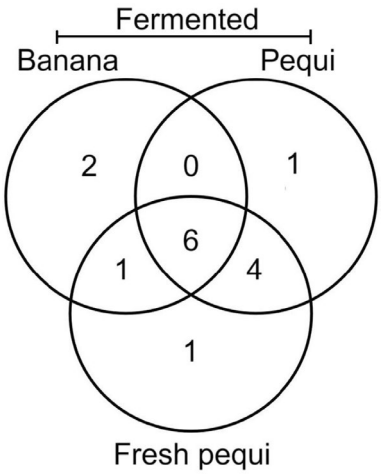


FIGURE 5 | Number of dung beetle species sampled in pitfall traps baited with fermented banana, fermented pequi and fresh pequi in the Brazilian Cerrado. Diagram components represent species unique to fermented banana (circle left), the number of species unique to fermented pequi (circle right) and to fresh pequi (circle below) and species shared by the different fruit types (overlap).

enhancing vital processes such as seed dispersal and nutrient cycling (Andresen and Urrea-Galeano 2022). Conservation strategies for the Cerrado should therefore integrate the protection and restoration of native fruit-bearing trees, alongside mammal conservation (Nichols et al. 2009), to ensure the long-term maintenance of these assemblages and their ecological functions.

These findings have broader implications for biodiversity conservation in the Cerrado, one of the most threatened tropical savannas worldwide. Habitat conversion and fragmentation are expected to reduce the abundance and diversity of native fruiting plants (e.g., Santos et al. 2022) that provide essential resources for dung beetles, particularly in mammal-depauperate landscapes. Lower fruit availability may limit the persistence of frugivorous and generalist species, impairing key ecosystem functions such as seed dispersal and nutrient cycling (Rogers et al. 2021; Andresen and Urrea-Galeano 2022). Protecting and restoring native fruit-bearing trees is thus essential not only for maintaining dung beetle diversity but also for safeguarding the ecological processes that underpin the resilience and functionality of the Cerrado under growing anthropogenic pressures.

5 | Conclusions

This study addresses a critical knowledge gap by providing the first empirical evidence on the attractiveness of native fruits to dung beetles in the Cerrado. Our results demonstrate that native fruits such as *Caryocar brasiliense* attract diverse and more abundant dung beetle assemblages than exotic fruits, emphasising their ecological relevance as alternative resources in mammal-depauperate landscapes. These findings highlight that the conservation of native fruit-bearing trees is essential not only for maintaining dung beetle diversity but also for preserving key ecological processes such as seed dispersal and nutrient cycling. Finally, our study advances understanding of how dung beetles persist under resource-limited conditions and underscores the importance of integrating fruit-tree conservation into biodiversity management strategies for the Cerrado.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Table S1:** Abundance, species richness and sample coverage of dung beetles collected in pitfall traps baited with fermented banana, fermented pequi and fresh pequi in Aquidauana, Mato Grosso do Sul, Brazil.