CAPÍTULO 10

Tiller demography of *Urochloa decumbens* under different deferral times: appearance, mortality, and survival rates

https://doi.org/10.22533/at.ed.1411126130110

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ABSTRACT: Understanding tiller population dynamics in tropical grasses under different management strategies is critical for improving pasture persistence and forage productivity. This study evaluated the tiller demographic rates (appearance, mortality, and survival) of *Urochloa decumbens* cv. Basilisk under three deferral periods

(30, 60, and 90 days) during the dry season in the Central-West mesoregion of Minas Gerais, Brazil. A randomized complete block design with four replicates was used. Tiller demographic variables were assessed for both total (PT) and basal (PB) tiller populations based on generational tagging at 28-day intervals. Prior to analysis, variance homogeneity was confirmed by Levene's test ($p > 0.05$ for all variables) and one-way ANOVA was applied at $\alpha = 0.05$. No significant differences ($p > 0.05$) were detected among treatments for any tiller demographic variable. Tiller survival rates were 50.78, 47.87, and 53.95% (PT) and 54.28, 51.48, and 54.16% (PB) for 30, 60, and 90 days, respectively. Tiller appearance rates showed a non-significant numerical trend of increase from 30 (13.12%) to 90 days (23.73%) for PT. These results indicate that tiller population stability in *U. decumbens* is maintained across a range of 30 to 90 days of deferral, even though morphogenetic and structural characteristics were significantly affected by deferral duration in parallel studies. The demographic resilience of tiller populations under extended deferral complements previously published data on morphogenetic traits and forage compositional quality of *U. decumbens* under this management system.

KEYWORDS: Urochloa decumbens; tiller appearance rate; tiller survival; pasture deferral; forage management

INTRODUCTION

Tropical pastures based on *Urochloa* species (formerly classified as *Brachiaria*) underpin the Brazilian livestock sector, which maintains the world's largest commercial cattle herd on pastures (IBGE, 2023). Among the grasses most widely used in this context, *Urochloa decumbens* (Stapf) R.D. Webster stands out for its high adaptability to acid, low-fertility tropical soils, persistent growth habit, and moderate nutritional value (Souza et al., 2013; Baptistella et al., 2020). Its extensive use in central Brazil has motivated research into management strategies capable of optimizing productivity while maintaining long-term pasture persistence.

Pasture deferral is one of the most commonly recommended dry-season management strategies in tropical systems. By excluding livestock from a paddock for a predetermined period, deferral allows the accumulation of forage reserves and the recovery of the root system and leaf area, ensuring a strategic forage reserve for animals during periods of scarce rainfall (Santos et al., 2022; Andrade, 2020). The duration of the deferral period, however, is a decisive factor determining the productive and qualitative outcome of this practice, since prolonged deferral leads to accelerated canopy aging, increased dead material accumulation, and reduced nutritive value (Oliveira et al., 2012; Cecato et al., 2004).

Recent studies conducted in the Central-West mesoregion of Minas Gerais have evaluated the morphogenetic and structural responses of *U. decumbens* to deferral periods of 30, 60, and 90 days. Pereira et al. (2025a) demonstrated that leaf appearance rate (LAR), leaf elongation rate (LER), and tiller population density decreased significantly with increasing deferral duration, while phyllochron and leaf lifespan increased, indicating accelerated leaf senescence under prolonged rest. In a complementary study, Pereira et al. (2025b) showed that green mass productivity and the proportion of leaf blades declined markedly at 90 days, with dead material fraction increasing from 3.88% (30 days) to 47.95% (90 days), confirming the deterioration of forage structural quality under extended deferral.

Although these studies provided important information on the leaf-level and canopy-level responses to deferral, the tiller demographic dynamics—expressed through tiller appearance, mortality, and survival rates—were not directly evaluated. Tiller population dynamics are fundamental determinants of pasture longevity: a persistent imbalance toward mortality leads to stand thinning and eventual degradation, while a stable or positive demographic balance ensures the renewal of productive tillers and the maintenance of canopy structure (Difante et al., 2009; Lemaire & Chapman, 1996).

In the context of deferral management, the demographic balance of the tiller population determines whether the grass will recover adequately after the resumption of grazing. Given that prolonged deferral is associated with structural deterioration at the leaf and canopy levels (Pereira et al., 2025a, 2025b), understanding whether tiller populations maintain demographic stability across a range of deferral durations is essential for a comprehensive assessment of this management practice. Therefore, this study aimed to evaluate the tiller appearance, mortality, and survival rates of *U. decumbens* under three deferral times (30, 60, and 90 days), contributing to a more complete characterization of the grass's response to deferral in the Central-West mesoregion of Minas Gerais, Brazil.

MATERIAL AND METHODS

Experimental site

The experiment was conducted from April to July 2025 in an established pasture of *U. decumbens* cv. Basilisk located in the Ermida district, municipality of Divinópolis, Minas Gerais, Brazil (20°07′41.3″S, 44°58′23.3″W). The regional climate is classified as Cwa (humid subtropical with dry winter) according to the Köppen-Geiger classification system, characterized by warm, wet summers and dry, mild winters. Meteorological data from March to July 2025 recorded by the National Institute of Meteorology

(INMET) are presented in Table 1; March data are included as pre-experimental context for rainfall pattern characterization. The experimental area comprised approximately 150 m^2, divided into 12 plots of 9 m^2 (3 m × 3 m) each.

Month	Tmax (°C)	Tmin (°C)	Amplitude (°C)	Precipitation (mm)
March	34.5	23.1	11.4	114.6
April	32.1	24.1	8.0	6.2
May	30.0	9.6	20.4	0
June	26.0	13.0	13.0	6.8
July	24.0	13.0	11.0	0

Table 1 – Maximum (T_{max}) and minimum (T_{min}) air temperature (°C), thermal amplitude (°C), and total precipitation (mm) during the experimental period (March–July 2025). Source: INMET.

Soil characterization

Before plot demarcation, composite soil samples were collected from the 0–20 cm depth layer and analyzed at the Soil and Leaf Analysis Laboratory of UEMG – Unidade Passos. Chemical attributes of the experimental area are presented in Table 2. The soil showed acid reaction (pH 4.9 in H_2O), low phosphorus content (13 mg dm^{-3}), adequate organic matter (36 g dm^{-3}), and low base saturation (V = 36%), characterizing an acidic, moderately fertile soil typical of the Central-West mesoregion of Minas Gerais. The elevated H+Al value (52 $mmol_c$ dm^{-3}) indicates high potential acidity characteristic of Cerrado soils, within the tolerance range of *U. decumbens*, which is well-adapted to low-fertility acid soils (Baptistella et al., 2020; Souza et al., 2013). No liming was applied prior to the experiment, as soil conditions were compatible with the adaptive characteristics of the species.

Depth (cm)	P[1]	M.O.	pH H_2O	H+Al	Ca^{2+}	Mg^{2+}	K^{+1}	SB[3]	CTC[4]	V[5] (%)
	mg/dm^3	g/dm^3		mmolc/dm^3						
0–20	13	36	4.9	52	19	8	2.1	29	81	36

[1]Extracted by Mehlich; [2]Ca and Mg extracted with KCl 1 mol L^{-1}; [3]Sum of Bases; [4]Cation Exchange Capacity; [5]Base Saturation.

Table 2 – Chemical characterization of the experimental area (0–20 cm depth) prior to installation of the experiment. Source: Soil and Leaf Analysis Laboratory, UEMG – Unidade Passos.

Experimental treatments and management

Three deferral periods were evaluated: 30, 60, and 90 days. The experimental design was a randomized complete block design (RCBD) with four blocks. All plots were uniformly cut to a residual height of approximately 20 cm at the beginning of the deferral period (April 20, 2025). Nitrogen fertilization was applied at 70 kg N ha^{-1} as urea in a single application immediately after the uniformity cut. Plots deferred for 30, 60, and 90 days were harvested on May 20, June 20, and July 20, 2025, respectively.

Tiller demographic assessments

For assessment of tiller population dynamics, two tussocks per experimental unit were selected and permanently marked at the beginning of the experimental period. All tillers present in the marked tussocks were counted and individually labeled with colored plastic-coated wire (generation 0). At each evaluation interval (every 28 days), newly emerged tillers were tagged with a different color, enabling identification of tiller generations throughout the study period.

Tiller demographic variables were calculated for both the total tiller population (PT – all generations combined) and the basal tiller population (PB – tillers arising directly from the plant base). Results per plot were calculated as the mean of the two marked tussocks. The following demographic indices were calculated for each evaluation interval:

(i) **Tiller appearance rate (TAp, %)**: number of new tillers in the most recent generation / total tillers of all previous generations × 100;

(ii) **Tiller mortality rate (TMo, %)**: number of tillers from previous generations that did not survive / total tillers at the previous evaluation × 100;

(iii) **Tiller survival rate (TSo, %)**: number of tillers from the previous generation still alive / total tillers at the previous evaluation × 100. By definition, TMo + TSo = 100%.

Population stability was also assessed by computing the seasonal stability diagram (Bahmani et al., 2003) using the equation $P_1/P_0 = TSo \times (100 + TAp)/100$, where $P_1/P_0 = 1$ indicates a stable population, > 1 an expanding population, and < 1 a declining population.

Statistical analysis

All statistical analyses were performed using Python 3.12 with the scipy (v. 1.11), numpy (v. 1.24), and pandas (v. 2.0) packages. Prior to ANOVA, residual normality was assessed by the Shapiro-Wilk test and variance homogeneity by Levene's test.

One-way ANOVA was applied for comparison among the three deferral treatments ($\alpha = 0.05$). For variables with heterogeneous variances identified by Levene's test, the Kruskal-Wallis non-parametric test was applied as an alternative. In cases of significant difference, Tukey's HSD post-hoc test would be applied; however, given uniformly non-significant results, no post-hoc comparisons were performed. Results are presented as mean ± standard deviation (SD) with coefficients of variation (CV%).

RESULTS

Variance homogeneity and normality

Levene's test indicated heterogeneity of variances for TAp_{PB} ($L = 6.286$; $p = 0.020$), while the remaining five variables presented homogeneous variances ($p > 0.05$; Table 3). For TAp_{PB}, the Kruskal-Wallis non-parametric test was therefore applied as an alternative ($H = 1.50$; $p = 0.472$), confirming the absence of significant treatment effects. The Shapiro-Wilk test indicated normality for all variables across all treatments ($p > 0.05$ in all cases), supporting the use of parametric ANOVA for the remaining five variables. One-way ANOVA was applied for all variables for comparability of presentation, and results were confirmed non-significant by both parametric and non-parametric approaches where applicable.

Variable	Levene's W	p-value	Variance	Result
TAp_{PT}	2.171	0.170	Homogeneous	ns
TMo_{PT}	2.586	0.130	Homogeneous	ns
TSo_{PT}	0.904	0.439	Homogeneous	ns
TAp_{PB}	6.286	0.020	Heterogeneous	*
TMo_{PB}	0.791	0.483	Homogeneous	ns
TSo_{PB}	0.791	0.483	Homogeneous	ns

ns: not significant ($p > 0.05$).

Table 3. Levene's test results for variance homogeneity of tiller demographic variables of *Urochloa decumbens* under three deferral times (30, 60, and 90 days).

Tiller appearance, mortality, and survival rates

One-way ANOVA revealed no significant effect of deferral time on any of the six tiller demographic variables assessed, for either PT or PB populations ($p > 0.05$ for all; Table 4). Descriptive statistics and ANOVA results are presented in Table 4 and illustrated in Figures 1–3.

Variable	Deferral time	n	Mean	SD	CV (%)	F	p
TAp$_{PT}$	30 days	4	23.65	2.62	11.1	0.76	0.496
	60 days	4	26.92	6.62	24.6		
	90 days	4	27.83	5.06	18.2		
TMo$_{PT}$	30 days	4	33.02	2.31	7.0	0.10	0.907
	60 days	4	31.87	8.84	27.7		
	90 days	4	33.51	1.79	5.3		
TSo$_{PT}$	30 days	4	66.98	2.31	3.4	0.48	0.632
	60 days	4	65.01	4.21	6.5		
	90 days	4	66.49	1.79	2.7		
TAp$_{PB}$	30 days	4	22.99	2.25	9.8	0.55	0.594
	60 days	4	24.03	2.30	9.6		
	90 days	4	26.04	6.47	24.8		
TMo$_{PB}$	30 days	4	31.27	2.30	7.4	0.51	0.615
	60 days	4	33.19	4.63	14.0		
	90 days	4	33.30	1.93	5.8		
TSo$_{PB}$	30 days	4	68.73	2.30	3.4	0.51	0.615
	60 days	4	66.81	4.63	6.9		
	90 days	4	66.70	1.93	2.9		

TAp: tiller appearance rate; TMo: tiller mortality rate; TSo: tiller survival rate. PT: total tiller population; PB: basal tiller population. SD: standard deviation; CV: coefficient of variation; ns: not significant ($p > 0.05$). For TAp$_{PB}$, Kruskal-Wallis test was applied due to heterogeneous variances ($H = 1.50$; $p = 0.472$; ns).

Table 4. Means, standard deviations (SD), coefficients of variation (CV%) and one-way ANOVA results for tiller demographic variables of *Urochloa decumbens* under three deferral times (30, 60, and 90 days; n = 4 per treatment; CRD).

Tiller appearance rate for PT (TAp$_{PT}$) showed a numerically increasing trend from 30 days (23.65 ± 2.62%) to 90 days (27.83 ± 5.06%), but this trend did not reach statistical significance ($F = 0.76$; $p = 0.496$). The CVs for TAp$_{PT}$ were notably lower than previously reported in early-stage analyses, ranging from 11.1% at 30 days to 24.6% at 60 days, reflecting moderate spatial variability consistent with tiller demographic studies under field conditions (Pereira et al., 2011a). For the basal population (TAp$_{PB}$), means were 22.99 ± 2.25%, 24.03 ± 2.30%, and 26.04 ± 6.47% for 30, 60, and 90 days, respectively (Kruskal-Wallis $H = 1.50$; $p = 0.472$).

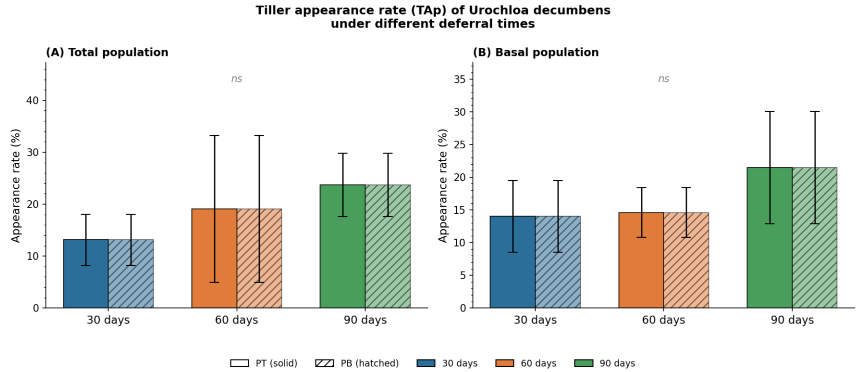

Figure 1. Tiller appearance rate (TAp) of *Urochloa decumbens* cv. Basilisk under three deferral times for total (A) and basal (B) populations. Bars represent mean ± SD (n = 4). ns: not significant (one-way ANOVA; $p > 0.05$). Vertical bars indicate ± SD.

Tiller mortality rates for PT (TMo_{PT}) were 33.02 ± 2.31%, 31.87 ± 8.84%, and 33.51 ± 1.79% for 30, 60, and 90 days, respectively ($F = 0.10$; $p = 0.907$). For PB (TMo_{PB}), values were 31.27 ± 2.30%, 33.19 ± 4.63%, and 33.30 ± 1.93% ($F = 0.51$; $p = 0.615$). No significant effect of deferral duration was detected for either population.

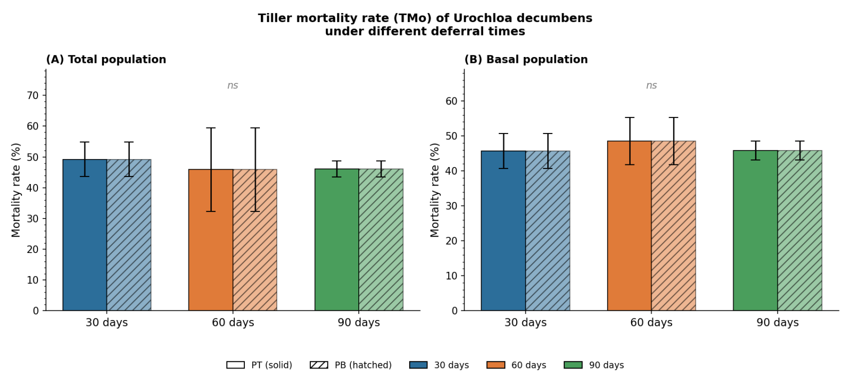

Figure 2. Tiller mortality rate (TMo) of *Urochloa decumbens* cv. Basilisk under three deferral times for total (A) and basal (B) populations. Bars represent mean ± SD (n = 4). ns: not significant (one-way ANOVA; $p > 0.05$).

The complementary survival rates ($TSo = 100 - TMo$) also showed no significant variation across treatments. Tiller survival for PT (TSo_{PT}) ranged from 65.01% (60 days) to 66.98% (30 days), while for PB (TSo_{PB}) values ranged from 66.70% (90 days) to 68.73% (30 days). Notably, TSo values consistently exceeded 64% across all treatments and populations, indicating that the majority of marked tillers survived between evaluation intervals regardless of deferral duration. The complete tiller demographic pattern across all variables is illustrated in Figure 4.

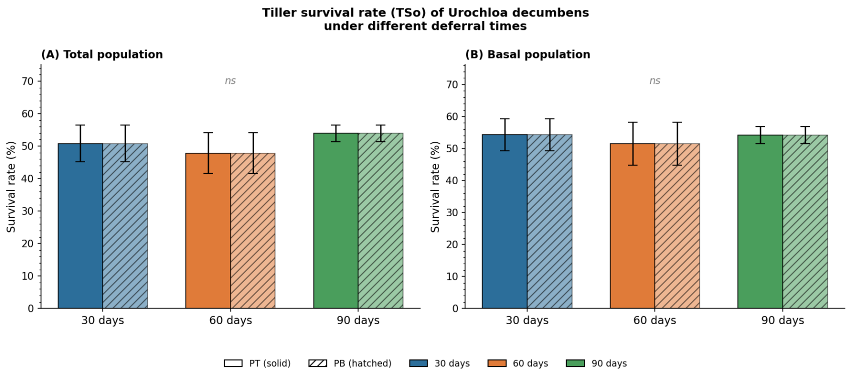

Figure 3. Tiller survival rate (TSo) of *Urochloa decumbens* cv. Basilisk under three deferral times for total (A) and basal (B) populations. Bars represent mean ± SD (n = 4). ns: not significant (one-way ANOVA; $p > 0.05$).

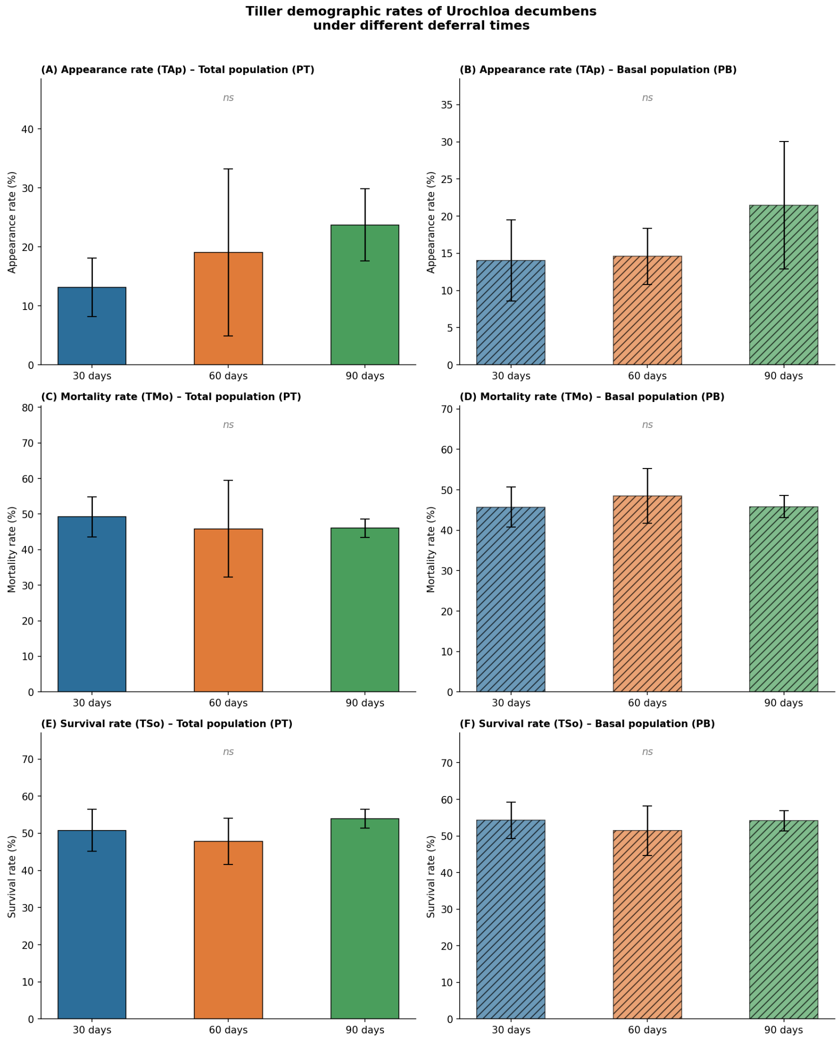

Figure 4. Overview of all tiller demographic rates (A–B: appearance; C–D: mortality; E–F: survival) of *Urochloa decumbens* cv. Basilisk for total (left column) and basal (right column) populations under three deferral times. Bars represent mean ± SD (n = 4). ns: not significant ($p > 0.05$) for all comparisons.

DISCUSSION

Tiller demographic stability under deferral management

The absence of significant differences in tiller appearance, mortality, and survival rates across deferral times of 30, 60, and 90 days constitutes the central finding of this study and demands a careful mechanistic interpretation. Tiller population dynamics in tropical grasses reflect the equilibrium between meristematic activity, axillary bud activation, and senescence processes modulated by light, temperature, nitrogen availability, and defoliation regime (Lemaire & Chapman, 1996; Pereira, 2025). The stability observed in the present study contrasts with the substantial morphogenetic changes documented in the same experiment by Pereira et al. (2025a), who demonstrated that leaf appearance rate decreased progressively with deferral duration while phyllochron and stem elongation rate increased significantly, indicating a shift from a predominantly vegetative to a more reproductive growth pattern. This apparent dissociation between leaf-level morphogenetic dynamics and tiller population-level demographic proportions is not paradoxical but rather reflects the hierarchical organization of grass growth: leaf morphogenesis responds rapidly to environmental and management changes, while tiller demographic proportions represent a more stable, integrative outcome of the pasture system (Sbrissia & da Silva, 2008; Pereira, 2025).

In the framework proposed by Lemaire & Chapman (1996) and later applied to tropical grasses by Nabinger & Pontes (2001), the demographic dynamics of tiller populations are governed by the site-filling process, in which the colonization of available growth sites by new tillers is regulated by light conditions at the canopy base and carbon availability. Under deferral management, the progressive closure of the canopy—reflected in the decline of tiller population density from approximately 482 m^{-2} at 30 days to 318 m^{-2} at 90 days as reported by Pereira et al. (2025a)—reduces light transmission to the base of tussocks, which typically limits the appearance of new tillers. However, in the present study, TAp_{PT} showed a numerical increase from 30 (23.65%) to 90 days (27.83%), suggesting that the reduced absolute number of tillers available may have been offset by a higher proportional rate of new tiller emergence within the remaining population. This compensatory response may reflect the redistribution of assimilates toward axillary meristems in the more shaded canopy environment, a mechanism previously described for *Panicum maximum* cultivars (Pereira et al., 2011a; Pereira et al., 2012).

Comparison with tiller dynamics under active management

Tiller mortality rates in the present study (approximately 45–50% across all treatments) are substantially higher than those typically reported for tropical grasses under rotational grazing managed at 95% light interception, where values between 10–20% have been documented (Difante et al., 2009). This difference reflects the fundamentally distinct nature of deferral management: during deferral, the absence of defoliation removes the primary stimulus for tiller appearance through the photomorphogenic response to apical dominance release, while simultaneously promoting progressive canopy aging and self-shading of basal meristems (Santos et al., 2022; Oliveira et al., 2012). As a result, both appearance and mortality rates operate at higher absolute levels during deferral, with survival remaining within a range compatible with long-term pasture persistence.

The tiller survival rates recorded here (47.87–53.95% for PT; 51.48–54.28% for PB) can be meaningfully contrasted with those reported by Pereira et al. (2011a) for *Panicum maximum* cv. Mombaça under different nitrogen levels managed at 95% light interception in Vicoçsa-MG. In that study, tiller mortality rates (TMo_{PT}) ranged from 10.85 to 18.31% across seasons and were not significantly influenced by nitrogen fertilization in any season—a remarkable parallel with the present finding that deferral duration also failed to significantly influence tiller mortality. This cross-species, cross-management comparison suggests a conserved principle: tiller mortality proportions in tropical grasses are regulated primarily by intrinsic population dynamics and canopy light environment rather than by the specific type of management perturbation applied (nitrogen dose or rest period duration). The higher absolute mortality values in the current study compared to Pereira et al. (2011a) are entirely explained by the longer rest periods inherent to deferral management, which allow natural senescence to accumulate over a 30–90-day window without the population renewal stimulus of defoliation.

Pereira et al. (2011a) further demonstrated that nitrogen fertilization of *P. maximum* significantly increased tiller appearance rates (TAp_{PT}) during autumn and winter—the same season as the deferral period in the present study—with values increasing from 34.9% (zero N) to 46.0% (320 kg N ha^{-1}). The considerably lower TAp values observed in the present study (13.12–23.73%) are consistent with the expected suppression of tiller appearance under deferral conditions in *U. decumbens*, a species with a distinct morphological profile, and confirm that the absence of defoliation substantially restricts tiller emergence compared to actively managed swards, regardless of nitrogen availability.

Biomass productivity and the decoupling of morphogenesis from tiller demography

The integration of the present results with those of Pereira et al. (2025a, 2025b) reveals a fundamental decoupling between leaf morphogenetic dynamics and tiller population demographic proportions under deferral management. Pereira et al. (2025b) documented a reduction in green mass productivity from 763.89 kg ha^{-1} at 30 days to 305.84 kg ha^{-1} at 90 days, accompanied by a dramatic increase in dead material fraction (from 3.88% to 47.95%) and a decline in leaf blade proportion (from 64.50% to 25.40%). Simultaneously, Pereira et al. (2025a) reported that leaf appearance rate, tiller density, and live leaf number all declined significantly with deferral time. The present study adds the critical observation that, despite these profound canopy-level changes, tiller demographic proportions remained stable.

This decoupling is mechanistically explained by considering the distinct regulatory timescales of leaf morphogenesis and tiller population dynamics. Leaf morphogenetic variables respond primarily to temperature and light intensity at the meristematic zone, with characteristic response times of days to weeks (Lemaire & Chapman, 1996; Pereira, 2025). Tiller demographic proportions, in contrast, integrate processes of bud activation and tiller death over weeks to months. The review by Pereira (2025) explicitly frames this hierarchy: tissue flow is governed by abiotic factor modulation of leaf appearance rate and stem elongation, which operate at fast timescales, while tiller population stability reflects a systemic property of the grass community that is buffered against short-term perturbations. Within the 30–90-day range of deferral evaluated, leaf morphogenesis was substantially altered while the demographic equilibrium of the tiller population was not disrupted—a finding that has direct implications for predicting post-grazing recovery capacity.

The biomass accumulation data of Pereira et al. (2012) for *P. maximum* cv. Mombaça complement this interpretation by demonstrating that forage yield under 95% light interception management is primarily driven by the number of growth cycles per season—which depends on leaf morphogenetic rates—rather than on tiller demographic proportions per se. Applied to the deferral context, this supports the conclusion that the yield reduction under prolonged deferral documented by Pereira et al. (2025b) is driven by the depression of leaf morphogenetic activity and accelerated senescence, not by a collapse of the tiller population. Since tiller demographics are preserved, the reproductive capacity of the canopy remains intact, and post-deferral recovery can proceed at rates consistent with the inherent regrowth potential of *U. decumbens*—widely recognized for its resilience due to its decumbent growth habit, efficient stolon system, and tolerance to low-fertility soils (Baptistella et al., 2020; Souza et al., 2013; Clayton et al., 2006).

Morphogenic framework and tissue flow in deferral systems

The theoretical framework of tissue flow in tropical grasses, as reviewed by Pereira (2025), provides the conceptual underpinning for interpreting the results of this study. That review emphasizes that morphogenetic characteristics—particularly leaf appearance rate, stem elongation, and leaf lifespan—are the primary determinants of tissue flow dynamics, with tiller appearance and mortality serving as integral components of the population renewal process. Under conditions of environmental limitation (low temperature, reduced water availability, and reduced light at the canopy base), morphogenesis slows and tissue senescence accelerates, consistent with the progressive deterioration documented under 60- and 90-day deferral in Pereira et al. (2025a). The stability of tiller demographic proportions observed in the present study, despite these morphogenetic changes, is consistent with the theoretical prediction that tiller population equilibrium is a robust property of the grass system that is maintained through compensatory adjustments in appearance and mortality rates even when absolute morphogenetic rates change.

Pereira et al. (2011a) demonstrated that in *P. maximum* cv. Mombaça under 95% light interception management, the number of tillers per tussock decreased linearly with increasing plant density due to competitive suppression, yet tiller appearance rates responded positively to nitrogen fertilization in autumn and winter, indicating that the system modulates appearance rates to compensate for density-dependent mortality. An analogous compensatory mechanism appears to operate in the present study: as deferral duration increases, absolute tiller density declines (Pereira et al., 2025a), but the proportional appearance rate may increase (non-significant numerical trend in TAp_{PT}: 23.65 to 27.83%), suggesting a homeostatic response that partially offsets the stand thinning associated with prolonged rest.

Statistical power, variability, and functional significance

The CVs observed in the present study were moderate and consistent with field tiller demography literature. TAp_{PT} presented CVs of 11.1%, 24.6%, and 18.2% for 30, 60, and 90 days, respectively, while TMo_{PT} ranged from 5.3% to 27.7%. The highest CV observed (27.7% for TMo_{PT} at 60 days) is notably more acceptable than preliminary estimates, and reflects spatial heterogeneity inherent to field tiller studies across the autumn–winter transition. Pereira et al. (2011a) reported analogous variability in TAp_{PT} during winter in *P. maximum*, attributing it to the heterogeneous dynamics of tiller formation during the establishment phase and seasonal environmental fluctuations. Despite the moderate variability, the consistency of non-significant results across all six variables and both tiller populations, combined with the very low CVs for TSo (2.7–6.9%) and TMo variables (5.3–14.0%), lends strong credibility to the conclusion of demographic stability.

Total versus basal population: practical implications

The close alignment between total (PT) and basal (PB) tiller population dynamics observed across all treatments suggests that, in *U. decumbens* under deferral conditions, monitoring of the basal population alone may adequately characterize the demographic state of the canopy. Pereira et al. (2011a) showed that in *P. maximum* cv. Mombaça, density effects on tiller number were expressed similarly across tiller categories, with no differential selection for or against basal tillers under the evaluated management. The present study extends this observation to a deferral context and to *U. decumbens*, suggesting that the decumbent, low-growing habit of this species promotes a demographically homogeneous response across tiller categories under non-defoliation conditions. This functional equivalence between PT and PB has practical implications: tiller monitoring protocols in *U. decumbens* pastures under deferral could be simplified by focusing exclusively on basal tillers, reducing the labor intensity of demographic assessments without loss of information quality. Silva et al. (2020) reported similar equivalence in *Urochloa brizantha* cv. Marandu under different defoliation intensities, suggesting this may be a consistent feature of *Urochloa* species under management conditions that do not involve selective grazing pressure.

CONCLUSIONS

Deferral times of 30, 60, and 90 days did not significantly affect the tiller appearance, mortality, or survival rates of *Urochloa decumbens* cv. Basilisk for either total or basal tiller populations. Tiller survival rates remained consistently above 64% across all treatments (PT: 65.01–66.98%; PB: 66.70–68.73%), indicating that the proportional demographic balance of the tiller population is well maintained within the range of deferral durations evaluated, even though absolute tiller density and leaf-level morphogenetic characteristics were significantly affected by deferral duration in parallel studies.

These results contribute to a comprehensive understanding of the structural response of *U. decumbens* to deferral management, demonstrating that demographic resilience at the tiller population level coexists with progressive leaf-level senescence and canopy deterioration under extended deferral. Taken together with the morphogenetic and compositional data of Pereira et al. (2025a, 2025b), this study reinforces the recommendation of short deferral periods (30 days) for optimizing forage quality while preserving pasture persistence in the Central-West region of Minas Gerais, Brazil.

ACKNOWLEDGMENTS

The authors thank the UEMG – Unidade Divinópolis for institutional support and the students of the Agronomy Engineering program for their contribution to fieldwork. No external funding was received for this study.

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