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RESEARCH PAPER

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Combined effect of irrigation frequency and leaf harvesting intensity on soil water content and productivity of baobab (*Adansonia digitata*) seedlings in vegetable production

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ABSTRACT

Climatic variability increasingly disrupts rainfall patterns, constraining water availability and plant productivity in arid and semi-arid regions. For *Adansonia digitata*, sustainable domestication requires improved irrigation and harvest management. This study examines the effects of irrigation frequency and cutting intensity on soil moisture, growth, and biomass yield under market gardening conditions. The present research analyzes the effect of irrigation frequency and harvesting intensity on soil water content, growth and biomass yield of *Adansonia digitata* in market gardening. An experimental set-up in two-factor factorial blocks was set up, consisting of irrigation frequency (F0, F25, F50 representing respectively 0%, 25% and 50% of the irrigation deficit) and harvesting intensity (I25, I50 corresponding to 25% and 50% of the total number of leaves). Soil water content was significantly affected by irrigation frequency and its interaction with harvesting intensity, with reductions of 8-14% under F25 and F50 compared to F0, while harvesting alone had no effect. Plant height, stem diameter, and leaf number increased over time and were influenced by both irrigation and harvesting intensity, with higher values under F50 and H25. Fresh and dry leaf yields were primarily determined by harvesting intensity, with significant interactions with irrigation, showing up to 51% higher yields under optimal combinations. These results highlight the importance of integrated irrigation and harvesting intensity management to optimize the productivity of *Adansonia digitata* in vegetable farming. In short, integrated practices can improve soil water availability and maximize biomass yield, thus contributing to the resilience of agricultural systems to climatic hazards and improving the incomes of rural populations.

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INTRODUCTION

Forest ecosystems are a major source of food for living beings, providing about 30% of the products exploited by humans (Angelsen *et al.*, 2014). Among these resources, wood and non-wood forest products occupy a central place in the daily lives of the populations (Loubelo, 2012; Strigler, 2012). In Benin, non-timber forest products are an integral part of the diets of urban and rural populations (Ekué *et al.*, 2008). These resources contribute significantly to the socio-economic and nutritional well-being of populations, while also serving medicinal and religious uses (Codjia *et al.*, 2003). Non-timber forest products (NTFP) of plant origin are mainly used as leafy vegetables, green tea and in traditional medicine (Loubelo, 2012). The Baobab is an emblematic agroforestry species in Africa (Kyndt *et al.*, 2009), playing a crucial role in the fight against malnutrition and food insecurity. In Benin, it is the second most important wild tree that provides leafy vegetables after *Vitex doniana* and before *Moringa oleifera*, and is ranked as the first most important traditional leafy vegetable in the country's arid zone (Dansi *et al.*, 2008).

This multi-use resource (Dossa *et al.*, 2015) benefits from enormous local knowledge regarding its food, medicinal and cultural applications (Assogbadjo *et al.*, 2007; Dovie, 2003). Baobab leaves are particularly used as vegetables in several regions of Benin during the dry season, a period during which the local populations must fill certain socio-economic gaps (Codjia *et al.*, 2003). According to local people, these leaves have healing, regulating and stimulating properties, in addition to their intrinsic nutritional qualities (Dansi *et al.*, 2008).

In the current context of rapid global warming, the populations of several species providing NTFP, including the Baobab, are seriously threatened by land use intensification and unsustainable harvesting (Waya *et al.*, 2022), as well as the direct impacts of climate change on natural ecosystems. In addition to these threats, water availability is a critical factor for crop production, particularly in arid and semi-arid regions where the Baobab tree lives (Rjeibi *et al.*, 2015). Water stress is one of the most common environmental stresses affecting plant growth, development, and survival (Aslam *et al.*, 2012), thus compromising the natural regeneration and productivity of Baobab stands. Faced with this alarming situation, the domestication and cultivation of the Baobab through market gardening appears to be a sustainable alternative solution to ensure the conservation of the species and guarantee the availability of leaves throughout the year. This approach would not only significantly increase the harvest of fresh *Adansonia digitata*, but also ensure the reliability and quality of supply, while significantly reducing the harvesting pressure on natural Baobab populations. Despite these potential benefits and the urgency to develop sustainable production systems, few studies have examined the local factors, including edaphic, water and agronomic factors influencing the growth and functional traits of Baobab seedlings under controlled vegetable growing conditions.

Previous research has demonstrated a significant dependence between the frequency and intensity of harvesting on one hand, and growth and biomass production on the other, using various species such as *Leucaena leucocephala*, *Gliricidia sepium* (Guevarra *et al.*, 1978), cassava (Howeler, 2012) and baobab (Zakari *et al.*, 2025, 2026a). These studies revealed substantial differences in yield depending on the harvesting strategies adopted. For instance, cassava harvested only at the time of the tuberous root harvest, produces 0.71 t/ha of dry leaves, but this yield increases to 2.6 t/ha when the leaves are harvested five times during the same period (Howeler, 2012). These results suggest that optimal management of harvest frequency could significantly improve leaf productivity. At the same time, water availability is a determining factor in crop performance, as water deficit can occur at different stages of the plant's life cycle and is closely linked to the vegetative stage of development (Chaves *et al.*, 2002; Jaleel *et al.*, 2008). This water stress can negatively affect biomass yield and production quality

(Araus *et al.*, 2002; Tester and Bacic, 2005), hence the importance of developing appropriate irrigation strategies. Despite this established knowledge for other species, very few studies have focused specifically on the combined influence of leaf harvesting frequency and irrigation regime on soil moisture content, growth parameters, and biomass yield of *A. digitata* into a market gardening production system.

The present study evaluates the interrelationships between leaf harvesting intensity and irrigation frequency on the functional traits and agronomic performance of *A. digitata* in vegetable production systems. Specifically, it examines the influence of combined leaf harvesting intensity and irrigation frequency on soil water content, and growth parameters and biomass yield of Baobab seedlings. We also highlighted the links among these different management strategies to identify optimal cultural practices to maximize *A. digitata* leaf production while ensuring the sustainability of the cropping system. The findings provide practical guidance for smallholder farmers and market gardeners seeking to sustainably produce Baobab leaves, by identifying irrigation and harvesting strategies that optimize growth and biomass yield. These insights can help reduce pressure on natural populations while ensuring a reliable year-round supply of high-quality leaves for nutritional and economic purposes.

MATERIALS AND METHODS

Study environment

The study was conducted at the experimental site of the HydroModE-Lab laboratory, located at the University of Parakou (09°20.153′ N; 002°38.883′ E) (Fig. 1). The area dedicated to the trial covers approximately 48 m². The study area is characterized by a tropical climate marked by two distinct seasons: a dry season, from November to March, and a rainy season, from April to October. The dry season is characterized by high temperatures and water deficit conditions. The region records an average of 1150 mm of annual rainfall. The soil, with a light texture, belongs to the category of tropical ferruginous soils and is very thick, due to low erosion in the area.

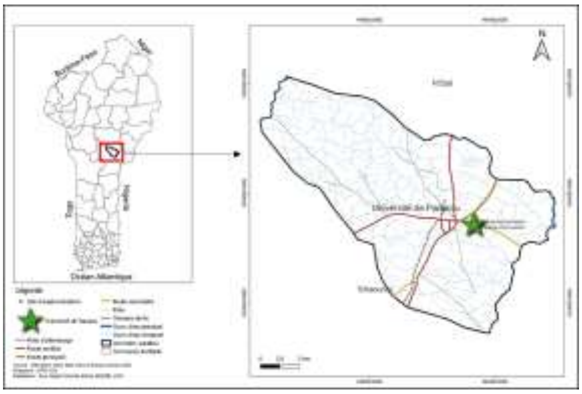

Fig. 1. Map of the study area

Experimental design

The experiment was conducted using a completely randomized block design, consisting of four blocks, each subdivided into seven elementary plots. Each plot contained four baobab seedlings, giving a total of 112 seedlings. Two experimental factors were evaluated, harvesting intensity and irrigation frequency.

Harvesting intensity was applied at two levels, I25% and I50%, corresponding to a removal of 25% and 50% of the total number of leaves, respectively. Irrigation frequency was tested at three levels, F0, F25, and F50, representing irrigation deficits of 0%, 25%, and 50% relative to the standard irrigation frequency.

Irrigation was scheduled for two consecutive days, and harvesting was performed at 21-days intervals. Crop water requirements were estimated using the FAO CROPWAT and CLIMWAT models (FAO, 2021), which indicated a daily water demand of 9.87 mm over the entire experimental period of 96 days, corresponding to an application rate of 500 ml per plant per day.

Three irrigation frequency regimes were implemented, each supplying a total of 1000 ml over two days but differing in the temporal distribution of water application. Under the F0 treatment (control), irrigation was applied in four equal doses of 250 ml, delivered in the morning and evening over two days. The F25 treatment reduced irrigation frequency to three applications, consisting of 333.33 ml applied in the morning and evening of the first day and 333.33 ml applied in the morning of the second day. The F50 treatment further reduced irrigation frequency to two applications of 500 ml, applied in the morning on each of the two days. This approach allowed assessment of the effects of irrigation timing and spacing on plant growth while maintaining a constant total water volume.

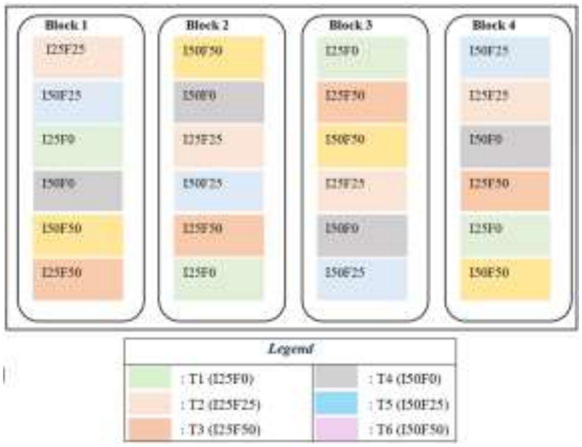

Fig. 2. Diagram of the experimental set-up

Data collection

Growth parameters

Plant growth was evaluated by height of the plants, the diameter of the stem and the number of leaves. The number of leaves was obtained by counting the total number of leaves present on each plant. The height of the plants was measured using a tape measure from the collar (on the ground) to the edge of the terminal bud of the plant. The diameter of the stem was measured at two levels: at the collar of the plant and at 10 cm from the ground. This growth data was collected at regular intervals of 21-days.

Yield parameters

Fresh and dry biomass were determined following Zakari *et al.* (2026b). Fresh biomass was determined by harvesting all leaves from each plant at the designated sampling time and immediately measuring their fresh weight using a precision balance. Following fresh weight determination, the harvested leaves were placed in labeled paper bags and dried in a forced air oven at 70°C for 72 h until a constant weight was achieved. The dry biomass was then recorded and used as an indicator of yield performance.

Soil moisture

Soil moisture was monitored at 7-day intervals and measured prior to irrigation, to minimize the immediate influence of water application. Soil moisture measurements were expressed as a percentage of field capacity, using a portable soil moisture meter. This non-destructive method allowed for repeated measurements throughout the experimental period.

Data analysis

All collected data were entered into Microsoft Excel and subsequently analyzed using RStudio software. Before analysis, the Shapiro-Wilk test and the Levene test were applied to assess the distribution of each response variable and their homogeneity of variance. Whenever this assumption was not met, data were transformed using either log or inverse transformation. An analysis of variance (ANOVA) was performed to assess the individual and interactive effects of irrigation frequency and harvesting intensity on baobab growth, yield, and soil moisture. When significant differences were detected, mean comparisons were performed using Tukey's honestly significant difference (HSD) test at 5% probability level.

RESULTS

Influence of the cutting intensity and irrigation frequency of Baobab seedlings on the soil water content

Soil water content differed significantly between DAT ($p < 0.001$). The soil water content varied from 10.29% (28 DAT) to 14.74% (14 DAT); and followed a 28 DAT= 35 DAT < 75 DAT ≤ 0 DAT ≤ 42 DAT < 21 DAT ≤ 7 DAT ≤ 14 DAT trend (Table 1). The soil water content was influenced by irrigation frequencies (($p < 0.001$). The soil water content was 8% and 14% lower under F25 and F50 compared to F0 (13.92%), respectively (Table 1). Conversely, the soil water content was not significantly affected by harvesting intensities (p= 0.687, Table 1). The soil water content was significantly influenced by the interaction between irrigation frequency and harvesting intensity (p = 0.001, Table 1). The soil water content was 13% lower at F25 compared to F0 under I25, whereas no significant difference between F25 and F0 was observed under I50 (Fig. 3).

Table 1. Variation in soil water content at different days after transplanting, irrigation frequencies, and harvesting intensity

Factors and levels	Soil water content
Days after transplanting (DAT)	
0	13.23bc
7	14.16ef
14	14.74f
21	13.6de
28	10.29a
35	11.09a
42	12.27c
75	12.95b
Irrigation frequency (F)	
F0	13.92c
F25	12.76b
F50	12.00a
Harvesting intensity (I)	
H25	13.01a
H50	12.78a
P value	
DAT	<0.001
F	<0.001
I	0.687
F * I	<0.001

Lower case letters represent the mean separation. Values with the same letters have no significant differences.

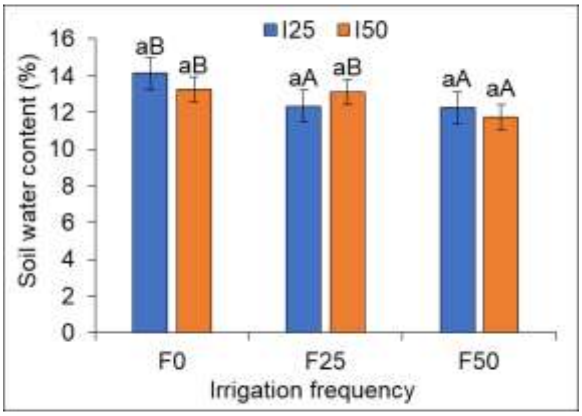

Fig. 3. Variation in soil water content at different irrigation frequencies and harvesting intensities

Lowercase letters represent the means comparisons for harvesting intensity withing each level of irrigation frequency. Uppercase letters represent the means comparison for irrigation frequency within each level of harvesting intensity. F0: 0% stress, F25: 25% stress, F50: 50% stress, H25: 25% harvesting intensity, H50: 50% harvesting intensity.

Influence of irrigation frequency and harvesting intensity on the growth parameters of baobab seedlings

Influence of irrigation frequency and harvesting intensity on height

Plant height differed significantly between DAT ($p < 0.001$). The plant height varied from 23.66 cm (0 DAT) to 66.86 cm (84 DAT); and followed a 0 DAT < 21 DAT < 42 DAT < 63 DAT < 84 DAT trend (Table 2). The plant height was affected by irrigation frequencies ($p < 0.001$). The plant height was 2% shorter under F25 than F0, and 5% higher under F50 than F0 (47.29 cm) (Table 2). The plant height also differed significantly between harvesting intensities ($p < 0.001$).

The plant height 4% shorter under I50 than I25 (46.73) (Table 2). The plant height was not significantly influenced by the interaction between irrigation frequency and harvesting intensity (p = 0.06, Table 2).

Influence of irrigation frequency and harvesting intensity on stem diameter

Baobab seedling's stem diameter differed significantly between DAT ($p < 0.001$). The stem diameter varied from 6.16 cm (0 DAT) to 15.37 cm (84 DAT); and followed a 0 DAT ≤ 21 DAT ≤ 42 DAT ≤ 63 DAT < 84 DAT trend (Table 2). The stem diameter was influenced by irrigation frequencies (p = 0.049). The stem diameter was 16% and 19% smaller under F25 and F50 compared to F0 (13.21 cm), respectively (Table 2). The stem diameter also differed significantly between harvesting intensities (p = 0.013). The stem diameter was 18% smaller under I50 than I25 (12.82) (Table 2). The stem diameter was not significantly influenced by the interaction between irrigation frequency and harvesting intensity (p = 0.06, Table 2).

Table 2. Variation in baobab seedling's height, diameter, leaf number, fresh and dry leaf yield at different days after transplanting, irrigation frequencies, and harvesting intensity

Factors and levels	Height	Diameter	Leaf number	Fresh yield	Dry yield
Days after transplanting (DAT)					
0	23.66a	6.16a	13a	-	-
21	35.74b	8.78ab	21b	5.94a	3.28a
42	51.23c	11.42abc	28c	10.71b	4.01b
63	61.04d	16.47bc	26c	13.66c	5.03c
84	66.86e	15.37c	32d	13.47c	4.66c
Irrigation frequency (F)					
F0	47.29c	13.21b	25b	16.62b	11.06b
F25	46.42a	11.03a	24a	15.06a	10.07b
F50	49.41b	10.67a	22a	13.79b	8.26a
Harvesting intensity (I)					
H25	48.68b	12.82b	27b	15.26b	10.76b
H50	46.73a	10.46a	21a	14.05a	8.83a
P value					
DAT	<0.001	<0.001	<0.001	0.090	0.281
F	<0.001	0.049	0.008	0.006	0.013
I	<0.001	0.013	<0.001	<0.001	<0.001
F × I	0.060	0.085	0.081	0.001	0.022

Lower case letters represent the mean separation. Values with the same letters have no significant differences.

Influence of irrigation frequency and harvesting intensity on leaf number

Leaf number differed significantly between DAT ($p < 0.001$). The leaf number varied from 13 (0 DAT) to 32 (84 DAT); and followed a 0 DAT < 21 DAT < 42 DAT < 63 DAT < 84 DAT trend (Table 2). The leaf number was affected by irrigation frequencies ($p = 0.008$). The leaf number was 3% and 11% lower under F25 and F50 compared to F0 (25 cm), respectively (Table 2). The leaf number also differed significantly between harvesting intensities ($p < 0.001$). The leaf number 8% lower under I50 than I25 (46.73) (Table 2). The leaf number was not significantly influenced by the interaction between irrigation frequency and harvesting intensity ($p = 0.06$, Table 2).

Influence of irrigation frequency and harvesting intensity on leaf biomass yield

Fresh leaf yield differed significantly between DAT ($p < 0.001$). The fresh leaf yield varied from 5.94 g/plant (21 DAT) to 13.66 g/plant (84 DAT); and followed a 21DAT<42DAT<63DAT=84DAT trend (Table 2). The fresh leaf yield was not affected by irrigation frequencies ($p = 0.09$). The fresh leaf yield also differed significantly between harvesting intensities ($p < 0.001$, Table 2). The fresh leaf yield 8% lower under I50 than I25 (15.26 g/plant) (Table 2). The fresh leaf yield was significantly influenced by the interaction between irrigation frequency and harvesting intensity ($p = 0.001$, Table 2, Fig. 4). The fresh leaf yield was 37% and 51% higher at I50 than I25, under F0 and F50, but no significant difference was observed between I50 and I25 under F25 (Fig. 4). Furthermore, the fresh leaf yield was higher at F0 and F50, compared to F25 under I50, whereas, no differences were observed among F0, F25 and F50 under I25 (Fig. 4).

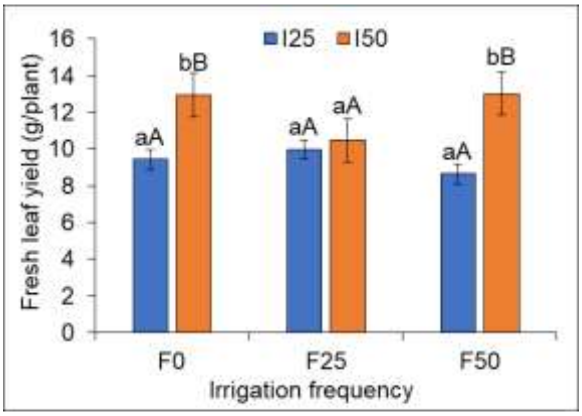

Fig. 4. Variation in fresh leaf yield of Baobab seedlings at different irrigation frequencies and harvesting intensities

Lowercase letters represent the means comparisons for harvesting intensity withing each level of irrigation frequency. Uppercase letters represent the means comparison for irrigation frequency within each level of harvesting intensity. F0: 0% stress, F25: 25% stress, F50: 50% stress, H25: 25% harvesting intensity, H50: 50% harvesting intensity.

Dry leaf yield followed the same trend as the fresh leaf yield differed. The dry leaf yield differed significantly between DAT ($p < 0.001$). The dry leaf yield varied from 3.28 g/plant (21 DAT) to 5.03 g/plant (84 DAT); and followed a 21DAT<42DAT<63DAT=84DAT trend (Table 2). The dry leaf yield was not affected by irrigation frequency ($p = 0.281$, Table 2). The dry leaf yield also differed significantly between harvesting intensities ($p < 0.001$). The dry leaf yield 18% lower under H50 than H25 (10.76 g/plant) (Table 2). The dry leaf yield was significantly influenced by the interaction between irrigation frequency and harvesting intensity ($p = 0.022$, Table 2, Fig. 5).

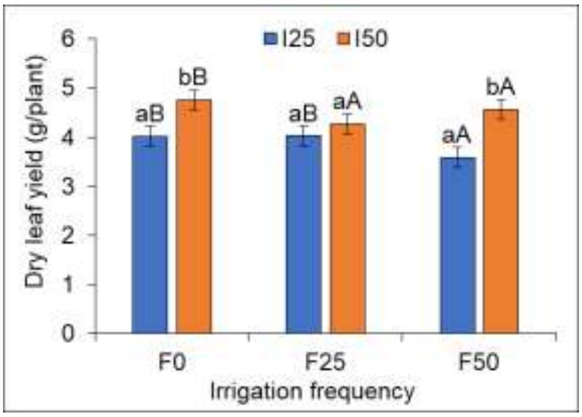

Fig. 5. Variation in dry leaf yield of Baobab seedlings at different irrigation frequencies and harvesting intensities

Lowercase letters represent the means comparisons for harvesting intensity withing each level of irrigation frequency. Uppercase letters represent the means comparison for irrigation frequency within each level of harvesting intensity. F0: 0% stress, F25: 25% stress, F50: 50% stress, H25: 25% harvesting intensity, H50: 50% harvesting intensity.

The dry leaf yield was 18% and 27% higher at I50 than I25, under F0 and F50, but no significant difference was observed between I50 and I25 under F25 (Fig. 4). Furthermore, the dry leaf yield was higher at F0 and F25, compared to F50 under I25, whereas, it was at F0, and lower at F25 and F50 under I50 (Fig. 4).

DISCUSSION

Response of soil moisture content to different irrigation frequencies and harvest intensities

Analysis of variance reveals that irrigation frequencies significantly control the temporal variability of soil moisture. This variability can be attributed to deep percolation processes and to a feedback mechanism whereby drier soil conditions reduce evapotranspiration, leading to increased surface temperature and further soil drying (Fu *et al.*, 2024). For baobab specifically, seedlings under drought conditions show a strong reduction in stomatal conductance (about 85%) and significant leaf loss (Van den Bilcke *et al.*, 2013). This species uses a stomatal closure drought avoidance strategy, reducing transpiration by up to 90% (Chapotin *et al.*, 2006).

The variation in soil humidity at different days after transplanting can be explained by the variable climatic conditions during the trial. In regions with a dry climate, a high vapor pressure deficit caused by high temperatures increases atmospheric water demand (Fu *et al.*, 2022). Warmer temperatures intensify drought conditions by increasing evaporative demand (Williams and Abatzoglou, 2025), creating accelerated soil water depletion over time.

Soil moisture content varied significantly depending on the interaction between harvesting intensity and irrigation frequency. The combined effects of defoliation and water deficit can be additive, synergistic or antagonistic (Condon *et al.*, 2020). In our study, the I50F50 treatment combining severe harvesting and maximum water deficit produced the lowest soil moisture, demonstrating an additive effect of both stresses. Drought and defoliation affect root biomass more than above-ground biomass (Batbaatar *et al.*, 2023), which explains why water absorption is particularly compromised under combined stress.

Response of Baobab growth to different irrigation frequencies and harvest intensities

Growth parameters, including height, diameter and number of leaves, were all significantly influenced by the irrigation frequency. Generally, baobab had higher growth under F0 than F25 and F50, confirming the negative effect of water deficit on vegetative growth. Plants that received full irrigation have higher stem height and diameter, with increases of 95% and 47.7%, respectively, compared to plants with severe water deficit (Nawaz *et al.*, 2024). Deficit irrigation reduces plant height, leaf area index and dry matter accumulation (Jiao *et al.*, 2024). A study conducted by (Albouchi *et al.*, 2003) examining the effects of moderate and severe water stress on the growth of young Casuarina glauca Sieb. Plants showed that water deficit reduced relative water content, limited height growth and total dry biomass, and promoted greater biomass allocation to roots.

Baobab growth was significantly influenced by the harvesting intensity, with the highest growth observed under H25. This indicates a negative effect of defoliation intensity on growth.

Defoliation stimulates a double increase in the development of lateral branches, and the individual leaves developed after defoliation can be up to 43% larger (Bassman and Dickmann, 1982). A 25% and 50% defoliation intensity increased leaf length and leaf area, but further 75% defoliation decreased most growth parameters (Su *et al.*, 2023). The absence of a significant effect of the interaction between cutting intensity and irrigation frequency on growth parameters suggests that these two factors act independently on the plant.

These results corroborate the observations of Bouzidi *et al.* (2019) on black spruce, which have shown that both defoliation and water deficit reduce growth, but that their effects are not additive. Similarly, Jacquet *et al.* (2014) reported additive rather than interactive effects of defoliation and water stress on the growth of maritime pine, noting that partial defoliation does not limit the impact of water stress through reduced transpiration. However, different irrigation frequencies can exert significant effects on crop growth and yield even when considered independently, as demonstrated by recent studies across diverse crop species (Alves Souza *et al.*, 2020; Liu *et al.*, 2019). The independence of effects observed in our study could be explained by the fact that the physiological mechanisms regulating the response to cutting (allocation of carbon reserves, activation of meristems) and those involved in adjustment to the water regime (stomatal regulation, osmotic adjustment) operate on distinct pathways without significant synergistic or antagonistic interactions.

Influence of cutting intensity and irrigation frequency on biomass yield

The yield of fresh and dry biomass was not significantly affected by irrigation frequency ($p > 0.05$). This lack of significant difference suggests a significant tolerance of baobab to moderate water deficit. Studies confirm that deficit irrigation treatments cannot significantly affect the yield and yield components of some crops compared to full irrigation (Teshome *et al.*, 2023).

Full irrigation may produce the highest seed yield, although not significantly different from no irrigation during the vegetative phase (Singh *et al.*, 2024). Some plants exhibit photosynthetic pathway changes under water stress, allowing for improved transpiratory efficiency and sustained biomass production under limited water conditions (Lai *et al.*, 2023). Plants in naturally arid conditions retain large amounts of biomass through drought tolerance mechanisms, including morphological and physiological adaptations (Schwalbe, 2017). The baobab is among plant species adapted to semi-arid environments and has tolerance mechanisms that allow it to maintain relatively stable biomass production even under moderate to severe water stress.

The results show that 25% harvesting intensity maximizes the production of fresh and dry biomass compared to other treatments. These observations corroborate a recent review of compensatory plant growth that demonstrated that physiological and morphological responses to defoliation allow plants to counteract the negative consequences of herbivorous damage (Zhao, 2024). Studies on woody species have also confirmed that moderate defoliation (50-66%) does not negatively affect total growth, indicating an equivalent compensation mechanism (Wang *et al.*, 2020). The higher performance of the 25% intensity compared to 50% could be explained by a stimulation of compensatory photosynthesis of residual leaves and an increase in the relative growth rate (Zhao *et al.*, 2008).

The fresh and dry leaf yield were significantly influenced by the interaction between harvesting intensity and irrigation frequency. The reduced leaf biomass decreases transpiratory flux, making the stem water reservoir and root uptake more suited to the water demand during the drought event (Batbaatar *et al.*, 2023). Defoliated trees exhibit higher stomatal conductance compared to non-defoliated trees even under water stress conditions (Gieger and Thomas, 2002).

This response suggests that 50% defoliation combined with the maximum water deficit (F50) creates a favorable balance where the reduction of the transpiring surface decreases water requirements while maintaining an effective compensatory photosynthetic activity of the remaining leaves.

CONCLUSION

The present study evaluates the effects of different irrigation frequencies and harvesting intensities on soil water content, growth parameters, and leaf yield of *Adansonia digitata* L. in vegetable farming. The results reveal that irrigation frequency and harvesting intensity exert independent effects on growth, with no significant interaction between these two factors. On the other hand, soil moisture and biomass production were significantly influenced by the interaction between cutting intensity and irrigation frequency. Moderate harvesting intensity (50% of the leaves) combined with a reduced irrigation frequency (F50) is the optimal strategy to maximize the production of fresh and dry leaf biomass. This strategy can potentially reduce water and labor costs for irrigation by 50% while maintaining high yields, thus contributing to a rational use of water resources in semi-arid areas where baobab is grown. Moderate harvesting preserves the physiological integrity of the plants and promotes their longevity, allowing multiple harvests over an extended period of time and avoiding frequent replanting. Farmers may adopt regular cutting schedules, implement plant marking to monitor harvest intensity, and adjust management strategies in response to seasonal rainfall patterns. Further long-term studies across multiple cropping cycles are needed to confirm the sustainability of this practice under specific pedoclimatic conditions.

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