

Efeitos do potássio em mudas de *Myracrodruon urundeuva*, *Libidibia ferrea* e *Mimosa tenuiflora* sob curto período de déficit hídrico

Effects of potassium in *Myracrodruon urundeuva*, *Libidibia ferrea* and *Mimosa tenuiflora* seedlings under a short-term water deficit

Efectos del potasio en las plántulas de *Myracrodruon urundeuva*, *Libidibia ferrea* y *Mimosa tenuiflora* con déficit hídrico a corto plazo

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Resumo

Esta pesquisa teve como objetivo avaliar os efeitos da adubação com potássio em mudas de *Myracrodruon urundeuva*, *Libidibia ferrea* e *Mimosa tenuiflora* submetidas a um curto período de déficit hídrico. Foram avaliadas três doses de K (0, 150 e 300 mg dm⁻³ KCl) e três regimes hídricos (sem déficit hídrico, déficit hídrico moderado e déficit hídrico severo). As plantas foram mantidas em sacos plásticos pretos contendo solo da Caatinga e, após 30 dias do início dos regimes hídricos, foram avaliados o Teor relativo de água, taxa de transpiração, condutância estomática e taxa de fotossíntese. Alto teor de umidade no solo foi desfavorável às plantas, causando redução no TRA e nas trocas gasosas. Verificou-se que o déficit hídrico promoveu aumento na taxa de transpiração, condutância estomática e na taxa de fotossíntese das plantas, porém a intensidade dessas respostas foi variável entre as espécies. O déficit hídrico favoreceu as plantas de jucá, com elevação no Teor relativo de água e pouca alteração nas trocas gasosas em relação aos níveis de déficit hídricos impostos, demonstrando sua maior tolerância em relação às outras, porém foi a espécie mais beneficiada pelo K. O fornecimento de 300 mg dm⁻³ de KCl influenciou positivamente o status hídrico e as trocas gasosas das espécies estudadas com o aumento do déficit hídrico. Sugere-se o desenvolvimento de pesquisas submetendo as plantas a um período de tempo maior, de forma a estabelecer uma melhor relação entre o potássio e o aumento da tolerância dessas plantas ao déficit hídrico.

Palavras-chave: Estresse hídrico; Caatinga; Trocas gasosas.

Abstract

This study aimed to evaluate the effects of potassium fertilization on *Myracrodruon urundeuva*, *Libidibia ferrea* and *Mimosa tenuiflora* seedlings submitted to a short period of water deficit. Three doses of K (0, 150 and 300 mg dm⁻³ KCl) and three water regimes (without water deficit, moderate water deficit and severe water deficit) were evaluated. The plants were kept in black plastic bags containing soil from the Caatinga and, 30 days after the beginning of the water regimes, the relative water content (*RWC*), transpiration (*E*), stomatal conductance (*gs*) and photosynthesis (*A*) were evaluated. High moisture content in the soil was unfavorable to plants, promoting reduction in *RWC* and gas exchange. The water deficit increase *E*, *gs* and *A*, but the intensity of these responses was variable between species. The water deficit favored *L. ferrea*, with elevated *RWC* and reduced alterations in gas exchange, demonstrating its greater tolerance in relation to the others species evaluated, however it was the species most benefited by K. The supply of 300 mg dm⁻³ of KCl positively influenced the water status and gas exchange of the studied species with an increase in the water deficit. We

suggest the development of research subjecting the plants to a longer period of time, in order to establish a better relationship between potassium and the increased tolerance of these plants to water deficit.

Keywords: Water stress; Caatinga; Gas exchange.

Resumen

Esta investigación tuvo como objetivo evaluar los efectos de la fertilización de potasio en las plántulas de *Myracrodruon urundeuva*, *Libidibia ferrea* y *Mimosa tenuiflora* sometidas a un corto período de déficit hídrico. Se evaluaron tres dosis de K (0, 150 y 300 mg dm⁻³ KCl) y tres regímenes de agua (sin déficit hídrico, déficit hídrico moderado y déficit hídrico grave). Las plantas se mantuvieron en bolsas de plástico negras que contenían tierra de Caatinga y, 30 días después del comienzo de los regímenes hídricos, se evaluó el contenido relativo de agua, la tasa de transpiración, la conductancia estomática y la tasa de fotosíntesis. El alto contenido de humedad en el suelo fue desfavorable para las plantas, lo que provocó una reducción en el TRA y el intercambio de gases. Se encontró que el déficit de agua aumentó la tasa de transpiración, la conductancia estomática y la tasa de fotosíntesis de las plantas, sin embargo, la intensidad de estas respuestas fue variable entre las especies. El déficit hídrico favoreció a las plantas de jucá, con un aumento en el contenido relativo de agua y un pequeño cambio en el intercambio de gases en relación con los niveles de déficit hídrico impuestos, lo que demuestra su mayor tolerancia en relación con los demás, sin embargo, fue la especie más beneficiada por K. O El suministro de 300 mg dm⁻³ de KCl influyó positivamente en el estado del agua y el intercambio de gases de las especies estudiadas con el aumento del déficit hídrico. Sugerimos el desarrollo de investigaciones que sometan a las plantas a un período de tiempo más largo, a fin de establecer una mayor relación entre el potasio y la mayor tolerancia de estas plantas al déficit hídrico.

Palabras clave: Estrés hídrico; Caatinga; Intercambio de gases.

1. Introduction

Caatinga, a predominant biome in semi-arid region of Brazil, with approximately 845,000 km² (MMA, 2011; Gusmão et al., 2016), is characterized by high temperatures and evapotranspiration rates, in addition to low rainfall, concentrated in three to five months (Maia, 2004; Queiroz, 2009). Its soils are predominantly stony, compacted and have a low water holding capacity (Alves et al., 2009), making the Caatinga highly susceptible to

degradation and desertification (Amaral et al., 2015). The vegetation is characterized by trees and branched underbrush, with the presence of thorns, having as main characteristic the deciduous during the dry period, besides the abundant presence of cactus (Prado, 2003; Queiroz et al., 2005).

The water, essential for maintaining cell turgor and elongation, and gas exchange between plant and environment (Souza, Soares & Regina, 2001; Flexas et al., 2004; Chaves et al., 2009), constitutes a limiting factor for growth and establishment of plants in the Caatinga. When its availability in soil becomes limiting, stomatal closure begins as a strategy to control water loss (Flexas et al., 2004; Reich, 2014), reducing leaf transpiration and preventing tissue death from dehydration (Peak et al., 2004). However, this stomatal closure decreases gas exchange between the leaf and the atmosphere, reducing the intercellular CO₂ concentration, with direct reflexes on photosynthesis (Chaves et al., 2002; Tang et al., 2002; Peeva; Cornic, 2009; Hu, Wang & Huang, 2010).

This stomatal control mechanism has been reported in several studies (Cakmak, 2005; Jin et al., 2011; Mendes et al. 2013; Wang et al., 2013; Shabala; Potossin, 2014) and is associated with the entry of potassium ions (K⁺) in guard cells (Marengo; Lopes, 2011). The K⁺ accumulation promotes changes in the cells osmotic potential, leading to water absorption and, consequently, changes in turgor pressure, resulting in the opening of stomata (Silveira, 2000; Mendes et al., 2013).

Extreme weather events, such as increased periods and drought cycles occurring more frequently, are expected as a result of climate change caused by anthropogenic actions (Easterling et al., 2000; IPCC, 2014), and how plants will behave in the face of this scenario the study has been the focus of several researchers (Fu et al., 2013; Silva, et al.; 2017; Ciemer et al., 2019). In these studies, strategies are being tested to mitigate the effects of drought in plants, increasing their tolerance, among them is the supplementary use of K, given its role as an osmotic agent (Kerbaui, 2013; Taiz; Zeiger, 2013; Martineau et al., 2017). Its accumulation in the cells vacuole, together with organics solutes such as sugars (Costa et al., 2015), amino acids (Oliveira et al., 2017) and proteins (Silva, 2011) aims to decrease the cellular water potential, promoting greater absorption of water and, consequently, maintenance of metabolic activities essential to plant growth, even under low water availability in the soil.

However, the use of K to increase the tolerance of plants to drought has been developed, mostly, in Eucalyptus (Silveira, 2000; Mendes et al., 2013; Christina et al., 2015; Franco, 2018), being nonexistent in the Caatinga plant species. Thus, this study aimed to

evaluate the reflexes of the use of K in *Myracrodruon urundeuva* Fr. Allem., *Libidibia ferrea* (Mart. Ex Tul), and *Mimosa tenuiflora* (Willd) Poiret seedlings under a short period of water deficit during the nursery phase.

2. Methodology

Plant material and growth conditions

This field research, of quali-quantitative nature (Pereira et al. 2018), was conducted at the Forest Nursery of the Federal University of Campina Grande (UFCG), Patos Campus, Paraíba State, Brazil (7°03'34"S, 37°16'30" W), in a screened environment.

Seeds of *M. urundeuva*, *L. ferrea* and *M. tenuiflora* were collected at the Campus of the Federal University of Campina Grande (UFCG), Patos, Paraíba State, Brazil (7°03'34" S, 37°16'30" W), were placed to germinate in 28 cm deep and 15 cm diameter black plastic bags containing 5 kg of soil from Caatinga with the following chemical characteristics: pH (H₂O) 6.5; P 2.9 mg kg⁻¹; Ca 5.0 cmol_c dm⁻³ Mg 2.0 cmol_c dm⁻³; K 4.6 cmol_c dm⁻³; H + Al 0.22 cmol_c dm⁻³; and T 94.1 cmol_c dm⁻³. The soil fertilization was carried out with N and P, according to Furtini Neto et al. (1999) recommendation, while K was according to treatments.

Before sowing, the seeds of *M. tenuiflora* and *L. ferrea* were subjected integumentary breaking dormancy, respectively, by immersion in hot water (85 °C) during 30 seconds and later washing in running water during one minute (Bakke et al., 2006) and by acid scarification in concentrated sulfuric acid during 30 minutes and later washing in running water. The seedlings were irrigated daily (100% soil retention capacity (SC)), determined by weighing.

We subjected the seedlings to 3 different water treatments [well-irrigated WI (100% SC), moderate deficit MD (50% SC), and severe deficit SD (25% SC)] and 3 potassium levels [0, 150 and 300 mg/dm⁻³ KCl], with four replicates and two plants per plot. Water regimes started 45 days after emergence (DAE) and the experiment ended 30 days later (75 DAE).

Gas exchange

At the ended of experiment, transpiration (*E*), stomatal conductance (*g_s*) and photosynthesis (*A*) were determined in fully expanded sheets inserted in the second node from the apex of the plants, between 10:00 and 11:00 am, using the portable photosynthesis

analyzer LCpro-SD (ADC BioScientific Ltd.). Water use efficiency (*WUE*) was obtained by the ratio A/E . The photosynthetically active irradiance (*PAR*) was adjusted to $1200 \mu\text{mol m}^{-2} \text{s}^{-1}$.

Relative water content

Relative water content was assessed according to Barrs and Weatherley (1962). After stomatal evaluations, to determine the relative water content (*RWC*), four leaves per repetition were collected and subjected to weighing to determine the weight of fresh matter (*FM*). Then, they were floated in distilled water and, under a sheet of filter paper, placed in Petri dishes and kept in the refrigerator (5°C) for 72 h. After this period, leaf discs were weighed, to obtain the weight of the turgid mass (*TM*). Subsequently, they were dried in an oven at 65°C for 72 hours and weighing obtain the dry mass (*DM*). *RWC* was calculated according to equation: $\text{RWC} (\%) = [(FM-DM)/(TM-DM)] \times 100$.

Statistical analysis

All analyses were carried out using the SISVAR software, version 5.6 (FERREIRA, 2011). The data were submitted to analysis of variance (ANOVA). Tukey's HSD test was used, where applicable, to distinguish between treatment mean values. Differences were considered significant at $P < 0.05$.

3. Results and Discussion

Relative water content

There was a significant interaction of treatments on *RWC* in *M. urundeuva* and *M. tenuiflora*, while in *L. ferrea*, the effect was isolated from water treatments and potassium fertilization. In the *M. urundeuva* (Table 1), in potassium treatments, there was no statistical difference in the *RWC* between WI and MD treatments. In SD, the lowest *RWC* was verify in plants without K, indicating that this nutrient improved the water status of these plants when under severe water deficit.

Table 1 – Relative water content (*RWC*) in *M. urundeuva* seedlings under water treatments and potassium.

Water treatments	<i>RWC</i> (%)		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	71,3 aA	75,3 aA	72,8 aA
Moderate deficit (MD)	78,3 aA	71,0 aA	67,3 aA
Severe deficit (SD)	56,5 bB	75,0 aA	69,5 aA

Means followed by same letters, uppercase in the lines and lowercase in the columns, do not differ by the Tukey test ($P \leq 0,05$).

Source: Almeida et al. (2020).

Decrease in plants water status is one of the main reflexes of reduction in water availability, and decreases in water potential (Ψ_w) have been reported in several species of the Caatinga, such as *Schinopsis brasiliensis* Engl., *Amburana cearenses* (Allem.) AC Smith, *Capparys cynophallophora* L., *Anadenanthera colubrina* (Vell.) Brenan. var. *cebil* (Gris.) Alts., *Pseudobombax* sp, *Commiphora leptophloeos* (Mart.) J. B., *Ziziphus joazeiro* Mart. *Bumelia sartorum*, *Caesalpinia ferrea* Mart ex Tul, *Maytenus rigida* Mart. (TROVÃO et al., 2007). Regarding *RWC*, Wang (2014) and Cândido Neto et al. (2018) observed decreases in *Hevea brasiliensis* Muell. Arg. and *Tachigali vulgaris* L.G. Silva & H.C. Lima, respectively.

In *L. ferrea* (Table 2) there was an increase in the *RWC* with decrease in amount of water supplied, with no statistical difference between MD and SD treatments, and increase with elevation in K, showing your positive effect in water status of this plants.

Table 2 – Relative water content (*RWC*) of *L. ferrea* seedlings under water treatments and potassium.

Water treatments	<i>RWC</i> (%)
Well-irrigated (WI)	65,2 b
Moderate deficit (MD)	82,9 a
Severe deficit (SD)	83,4 a
KCl (mg dm ⁻³)	<i>RWC</i> (%)
0	62,1 c
150	69,8 b
300	78,1 a

Means followed by same letters do not differ by the Tukey test ($P \leq 0,05$).

Source: Almeida et al. (2020).

In *M. tenuiflora*, there was no statistical difference between K treatments at MD, while in WI and SD treatments, *RWC* decreased with increase of K provided (Table 3). Probably the amount of potassium in the substrate (4.0 cmol_c dm⁻³ K) may have been sufficient for the

plants kept at WI conditions, and the increase in this nutrient in the soil resulted in a decrease in the availability of water to the plants.

Tabel 3 - Relative water content (*RWC*) of *M. tenuiflora* seedlings under water treatments and potassium.

Water treatments	<i>RWC</i> (%)		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	84,8 aA	75,2 bB	60,5 cC
Moderate deficit (MD)	89,0 aA	89,8 aA	91,0 aA
Severe deficit (SD)	92,0 aA	88,3 aA	74,8 bB

Means followed by same letters, uppercase in the lines and lowercase in the columns, do not differ by the Tukey test ($P \leq 0,05$).

Source: Almeida et al. (2020).

The lower *RWC* in well-irrigated plants may have been due to the excess water, reducing the roots O₂ availability, demonstrating the low tolerance of species to high levels of soil water. This was also reported by Santos et al. (2010) in *Piptadenia moniliformes* (Benth.) and *Trischidium molle* (Benth.) H. E. Ireland. Water stress is not caused only by water deficiency, but also by excess (Fernandes, 2012), because in saturated environments there is less diffusion of O₂, lead to low ATP production and the accumulation of toxic substances under these anaerobic conditions (Drew; Lynch, 1980), resulting in less water absorption by plants (Oliveira; Gualtiere, 2017).

In relation of potassium, its role in cell osmotic regulation is very known, helping photosynthesis and also the transport of carbohydrates from the leaves to the roots (Martineau et al., 2017) which, together with the possible roots K accumulation, may have exerted osmotic effect on the vacuole, favoring water absorption (Premachandra et al., 1992). Such factors provide conditions for the plants to maintain their physiological activities under limited water availability, thus making it possible to increase the plants' tolerance to drought.

Gas exchange

Transpiration (*E*) in *M. urundeuva* increase when the amount of water supplied decreased (Table 4), with a positive influence of potassium fertilization. Analyzing the plants that did not receive K, the values of *E* increase from 11.7 μmol H₂O m⁻² s⁻¹ (WI) to 14 μmol H₂O m⁻² s⁻¹ (SD), equivalent to increment of 20%, while in the treatment 150 mg dm⁻³ KCl, this increase was only 12%. The highest rate of transpiration was found in plants at 50% cv

and 300 mg dm⁻³ KCl, with an increase of 33%, going from 11.1 μmol H₂O m⁻² s⁻¹ (0 mg dm⁻³ KCl) to 14.8 μmol H₂O m⁻² s⁻¹ (300 mg dm⁻³ KCl).

Tabel 4 - Transpiration (*E*) of *M. urundeuva*, *L. ferrea* and *M. tenuiflora* seedlings under water treatments and potassium.

Water treatments	<i>M. urundeuva</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	11,69 bB	12,40 cA	11,67 cB
Moderate deficit (MD)	11,08 cC	12,82 bB	14,78 aA
Severe deficit (SD)	13,94 aA	13,89 aB	11,78 bC
Water treatments	<i>L. ferrea</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	6,73 cC	9,77 cB	11,87 aA
Moderate deficit (MD)	8,15 aC	11,13 aB	14,11 aA
Severe deficit (SD)	7,38 bC	10,15 bB	12,15 bA
Water treatments	<i>M. tenuiflora</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	5,77 cC	6,53 cB	7,70 bA
Moderate deficit (MD)	8,67 bC	10,94 bB	14,94 aA
Severe deficit (SD)	14,82 aC	16,99 aA	14,94 aB

Means followed by same letters, uppercase in the lines and lowercase in the columns, do not differ by the Tukey test ($P \leq 0,05$).

Source: Almeida et al. (2020).

In *L. ferrea* and *M. tenuiflora* (Table 4), the differences in *E* became more evident, and in *L. ferrea*, plants maintained at MD showed the highest *E* in relation to other water treatments. As for potassium fertilization, within the water treatments, as the K increased, there was an increase in *E*, corresponding to 76% (WI), 73% (MD) and 64% (SD), comparing 0 and 300 mg dm⁻³ KCl treatments. In *M. tenuiflora*, there was a progressive increase in *E* when the water availability decreased in all fertilization treatments. The most pronounced positive effect of K supply was found in plants at MD, in which plants that received 150 and 300 mg dm⁻³ KCl showed, respectively, 64% and 72% greater transpiration than plants that did not receive K.

There was a decrease in stomatal conductance (*gs*) (Table 5) in *M. urundeuva*, at WI and SD, when K was supplied, in contrast to what was verified in plants at MD, in which the addition of 150 and 300 mg dm⁻³ KCl provided an increase of 42% and 69% in *gs*, respectively. In contrast, in *L. ferrea*, an increase in K provided an elevation in *gs* in all water treatments. In *M. tenuiflora*, plants kept under SD showed higher *gs* and, similar to what was

verified in *E* (Table 4), plants that received 300 mg dm⁻³ KCl, in WI and MD treatments, the *gs* was higher, while at SD, the 150 mg dm⁻³ KCl treatment provided the highest *gs*.

Tabel 5 – Stomatal conductance (*gs*) of *M. urundeuva*, *L. ferrea* and *M. tenuiflora* seedlings under water treatments and potassium.

Water treatments	<i>M. urundeuva</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	0,64 aA	0,62 bB	0,61 bB
Moderate deficit (MD)	0,48 bC	0,68 aB	0,81 aA
Severe deficit (SD)	0,65 aA	0,64 bA	0,50 cB
Water treatments	<i>L. ferrea</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	0,16 aC	0,29 bB	0,53 bA
Moderate deficit (MD)	0,17 aC	0,35 bB	0,59 aA
Severe deficit (SD)	0,17 aC	0,29 bB	0,32 cA
Water treatments	<i>M. tenuiflora</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	0,21 cB	0,21 cB	0,27 bA
Moderate deficit (MD)	0,32 bC	0,60 bB	0,97 aA
Severe deficit (SD)	0,94 aB	1,32 aA	0,96 aB

Means followed by same letters, uppercase in the lines and lowercase in the columns, do not differ by the Tukey test ($P \leq 0,05$).

Source: Almeida et al. (2020).

Increase in *A* in *M. urundeuva* was observed when the water availability decreased, which was favored by the addition of K (Tabel 6). This also was observed in *L. ferrea*, in which under water deficit, when 150 mg dm⁻³ KCl was supplied, *A* increase 50% and 46% under MD and SD treatments, when compared to WI. When the amount of K was doubled (300 mg dm⁻³ KCl), the increments were 66% and 60% in the same line of comparison. In relation to *M. tenuiflora*, the behavior was also similar, except in plants under severe deficit, in which the addition of 150 mg dm⁻³ KCl provided the highest *A*.

The *RWC* decrease in *M. urundeuva* (Table 1), when the water added to the substrate decreased, resulted in stomatal closure, reducing *E* (Table 4), *gs* (Table 5) and *A* (Table 6). This closure is due to the production of abscisic acid (ABA) in roots and subsequent transport to the guard cells (Inácio et al., 2011; Moraes, 2011). Under water deficit, stomatal regulation is a strategy to limit water loss by plants and prevent tissue dehydration and consequent plant death (Chaves et al., 2002; Chaves et al., 2016).

Tabel 6 - Photosynthesis (A) of *M. urundeuva*, *L. ferrea* and *M. tenuiflora* seedlings under water treatments and potassium.

Water treatments	<i>M. urundeuva</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	16,21 cC	21,79 bB	22,40 cA
Moderate deficit (MD)	17,62 bC	19,99 cB	23,35 aA
Severe deficit (SD)	21,49 aC	23,72 aA	23,19 bB
Water treatments	<i>L. ferrea</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	13,18 cC	20,24 bB	23,54 bA
Moderate deficit (MD)	14,89 aC	22,40 aB	24,74 aA
Severe deficit (SD)	13,82 bC	20,12 cA	22,11 cA
Water treatments	<i>M. tenuiflora</i>		
	KCl (mg dm ⁻³)		
	0	150	300
Well-irrigated (WI)	13,82 cC	15,28 cB	18,40 cA
Moderate deficit (MD)	19,58 bC	24,18 bB	28,94 aA
Severe deficit (SD)	27,13 aB	31,59 aA	26,20 bC

Means followed by same letters, uppercase in the lines and lowercase in the columns, do not differ by the Tukey test ($P \leq 0,05$).

Source: Almeida et al. (2020).

According Souza et al. (2010), g_s control is a major mechanism of tolerance to water deficit in Caatinga, since g_s controls the levels of gas exchange, and under regular hydration conditions, open stomata permit higher gas exchange, thus enabling efficient vegetative and reproductive development during the rainy season.

Stomatal closure, reducing E , g_s and A under water deficit found in this study are similar to those reported for other species (Albuquerque et al., 2013; Campelo et al., 2015; França et al., 2017; Candido Neto et al., 2018; Nascimento, Nascimento & Gonçalves, 2019).

Potassium, being essential in cell turgor and osmoregulation (Marenco; Lopes, 2011; Battie-Laclau et al., 2014), participates in stomatal regulation (Pasquini; Santiago, 2011; Zahoor et al., 2017), promoting openness stomata and gas exchange under water deficit (Tables 4, 5, 6) and elimination of reactive oxygen species (ROS) (Christina et al., 2015). Its role in increasing plant tolerance has been reported, contributing to mitigate the effects caused by drought (Cakmak, 2005; Mendes et al., 2013; Dias et al., 2019).

In genotypes of *Eucalyptus grandis* x *E. urophylla* under water deficit, Mendes et al. (2013) found that K favored A and E . In *Cnidioscolus quercifolius* Pohl, Ramos and Freire (2019) found an increase in g_s with increase of K supply.

4. Final Considerations

High moisture content in the soil was unfavorable to plants, promoting reduction in *RWC* and gas exchange.

The water deficit increase *E*, *g_s* and *A*, but the intensity of these responses was variable between species.

The water deficit favored *L. ferrea*, with elevated *RWC* and reduced alterations in gas exchange, demonstrating its greater tolerance in relation to the others species evaluated, however it was the species most benefited by K.

The supply of 300 mg dm⁻³ of KCl positively influenced the water status and gas exchange of the studied species with an increase in the water deficit.

We suggest the development of research subjecting the plants to a longer period of time, in order to establish a greater relationship between potassium and the increased tolerance of these plants to the water deficit.

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