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Scientific Article

Micropropagation of *Vellozia pyrantha* A. A. Conc., an endemic species from Chapada Diamantina

Micropropagação de *Vellozia pyrantha* A. A. Conc., uma espécie endêmica da Chapada Diamantina

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ABSTRACT - Chapada Diamantina is mainly composed of campos rupestres (rupestrian grasslands), harboring endemic plants that contribute to the ornamentation of this landscape, such as species of the genus *Vellozia*. *Vellozia pyrantha* is commonly known as "candombá" and has cultural and economic importance to the local people. These plants exhibit unusual phenological aspects, due to their dependence on fire to flower, being able to regenerate after being burned. Given the phenological uniqueness of candombá, associated with the destruction arising from extractive exploitation and the lack of studies about its propagation, this study was conceived aiming to establish a micropropagation protocol for the species. *In vitro* establishment was carried out using disinfected seeds, inoculated in MS ⅓ medium, supplemented with 15 g L^{-1} of sucrose and 7 g L^{-1} of agar; the plantlets were transferred for *in vitro* multiplication, in a medium containing BAP (0.00; 4.44; 8.88 and 17.76 µM). The obtained shoots were subjected to *in vitro* rooting, testing the addition of activated charcoal to the medium and two types of container sealing (PVC or cotton plug). Rooted microplants were subjected to acclimatization in a greenhouse. About 9,35 shoots were obtained when inducing multiplication with 8.88 µM of BAP. In the rooting stage, charcoal favored the lengths of the aerial and root parts, whereas the use of cotton plug favored the number and length of roots. Acclimatized plants achieved a survival rate between 80 and 95% after 30 days of acclimatization, implying that micropropagation is an efficient technique to produce seedlings of *V. pyrantha*.

Keywords: Candombá. Velloziaceae. *In vitro* culture. Shoots. Sealing.

RESUMO - A Chapada Diamantina é composta majoritariamente pelos campos rupestres, apresentando plantas endêmicas que contribuem para a ornamentação desta paisagem, como as espécies do gênero *Vellozia*. *Vellozia pyrantha*, conhecida popularmente como "candombá", possui importância cultural e econômica para a comunidade local. Suas plantas apresentam aspectos fenológicos incomuns, pois necessitam do fogo para a floração, podendo regenerar após a queimada. Dada a peculiaridade fenológica do candombá, associada à devastação gerada pela exploração extrativista e à ausência de pesquisas sobre sua propagação, este estudo foi realizado visando estabelecer um protocolo de micropropagação para a espécie. O estabelecimento *in vitro* utilizou sementes desinfestadas, inoculadas em meio MS ⅓, 15 g L^{-1} de sacarose e 7 g L^{-1} de ágar; as plântulas foram transferidas para multiplicação *in vitro* em meio contendo BAP (0,00; 4,44; 8,88 e 17,76 µM). Os brotos obtidos foram submetidos ao enraizamento *in vitro,* sendo testadas a adição de carvão ativado ao meio e dois tipos de vedação dos recipientes (PVC ou algodão). As microplantas foram aclimatizadas em casas de vegetação. Obteve-se uma média de 9,35 brotos ao induzir a multiplicação usando 8,88 µM de BAP. Na etapa de enraizamento, o carvão favoreceu os comprimentos da parte aérea (CPA) e radicular (CPR), enquanto o número de raízes e CPR foram favorecidos pelo uso da rolha de algodão. Houve sobrevivência de 80 a 95% das plantas após 30 dias da aclimatização, permitindo inferir que a micropropagação é uma técnica eficiente para produção de mudas de *V. pyrantha.*

Palavras-chave: Candombá. Velloziaceae. Cultivo *in vitro*. Brotos. Vedação.

Conflict of interest: The authors declare no conflict of interest related to the publication of this manuscript.

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INTRODUCTION

Chapada Diamantina, located at the Espinhaço Mountain Range, is an area known as a biodiversity hotspot, but it lacks initiatives focused on habitat conservation and sustainable use of its species (PONTARA et al., 2018).

Campos rupestres (rupestrian grasslands) are one of the main components of the Chapada Diamantina landscape (BUGADO et al., 2025), being distributed over three phytogeographic domains, namely Caatinga, Cerrado and Atlantic Forest (FERNANDES et al., 2020), and are characterized by high rates of endemism and microendemism (BUGADO et al., 2025), including plants with ornamental potential, such as those in the Velloziaceae family.

The genus *Vellozia* (Velloziaceae) is one of the main endemic groups from Chapada Diamantina and stands out in the landscape because of its desiccation tolerance, being able to extremely dry out during dry periods and rapidly rehydrate during rainy periods (ALCANTARA et al., 2015). Within this genus, there are species that also exhibit thermal tolerance, such as *Vellozia pyrantha* A. A. Conc. (CONCEIÇÃO, 2018).

Commonly known as "candombá", *V. pyrantha* is an ornamental species, endemic to Chapada Diamantina, which shows particularities in its morphology and physiology, being one of the rare plants whose flowering event depends on the passage of natural flames, and it is historically used by the local community,

as torch (whole plant) and as glue for tools (resin obtained from its stem) (OLIVEIRA et al., 2015; CONCEIÇÃO, 2018).

The reduction of the natural population of candombá is not solely due to extensive use by the local community, but also due to the slow plant growth and the occurrence of anthropogenic fires, because, even though these plants have strategies to deal with fire, the intensity of these flames is greater than that of natural flames, which may compromise their ability to regrow (OLIVEIRA et al., 2016; ABRAHÃO et al., 2020). The Chapada Diamantina National Park was delimited to manage and value its endemic species; however, there are no established management and/or propagation strategies to minimize the impacts historically suffered by the genus *Vellozia*.

The culture of ornamental plants is an activity that generates environmental benefits due to the biological interactions they provide, besides being responsible for income generation for producers, constituting a growing market in Brazil. Micropropagation is a technique of plant tissue culture employed for *in vitro* plant propagation, which optimizes seedling production through the high quantity of shoots generated; it requires adequate and controlled conditions of asepsis, nutrition, light and temperature (CARDOSO; SHENG GERALD; TEIXEIRA DA SILVA, 2018; SOARES; MENEZES-FILHO; VENTURA, 2023), being an advantageous technique, because its productivity does not depend on climatic conditions (LONE et al., 2020). Micropropagation generally comprises successive phases: *in vitro* establishment, *in vitro* multiplication, *in vitro* rooting and acclimatization (MOREIRA; LOPES; SILVA, 2023).

In vitro studies with propagation of species of the genus *Vellozia* report the induction of stresses or addition of plant growth regulators to the culture medium in the multiplication phase. Thermal stress, through fire, has been tested on *V. pyrantha* (BORGES et al., 2020), and water and thermal stresses have been tested on *Vellozia jolyi*, *Vellozia sincorana*, *Vellozia punctulata*, *Vellozia pyrantha* and *Vellozia seubertiana* (BORGES; LIMA-BRITO; CONCEIÇÃO, 2023). The use of the plant growth regulators auxins and cytokinins has been evaluated for the species *V. seubertiana* (PINTO; LIMA-BRITO, 2023). However, there is only one report in the literature of a complete micropropagation protocol for *V. seubertiana* (PINTO; LIMA -BRITO, 2023).

For the species *V. pyrantha*, only two *in vitro* studies have been conducted, both reporting the obtaining of approximately 2 shoots per explant, induced by thermal stress (BORGES et al., 2020) and water stress (BORGES; LIMA-BRITO; CONCEIÇÃO, 2023) at the multiplication phase.

Given the above, considering the hypothesis that tissue culture is efficient for producing seedlings of *Vellozia* sp., this study proposes to establish the first micropropagation protocol for *V. pyrantha*, aiming at the production of micropropagated seedlings for the ornamental market and *ex situ* conservation of the species.

MATERIAL AND METHODS

Seed Collection

V. pyrantha seeds were collected at Serra do Candombá (12°33'S 041°28'W), at Chapada Diamantina National Park, Palmeiras, Bahia. After collection, the seeds were removed from the capsules and stored in paper bags in the refrigerator at a temperature of 6 to 10 °C.

Seed Disinfestation

The disinfestation of *V. pyrantha* seeds was performed according to the protocol of Pinto and Lima-Brito (2023). Seeds were washed under running water for 5 minutes. Then, they were taken to the laminar flow cabinet, submerged in 70% alcohol for 1 min, and washed 3 times in autoclaved distilled water. Subsequently, the seeds were placed in a 2.0-2.5% sodium hypochlorite solution, with the addition of one drop of neutral detergent, being kept this way for 15 minutes. Following this, the seeds were subjected to triple washing, using autoclaved distilled water.

In vitro Establishment

Seeds were inoculated in 10 mL of MS culture medium (MURASHIGE; SKOOG, 1962), with one-third of salt concentrations (MS ⅓), supplemented with 15 g L^{-1} of sucrose and solidified with 7 g L^{-1} of agar (BORGES; LIMA-BRITO; CONCEIÇÃO, 2023). The pH of the medium was adjusted to 5.7 ± 1.0, before autoclaving, at 121 °C, for 15 minutes. After 90 days of germination, the obtained plantlets were used for the *in vitro* multiplication phase.

In vitro Multiplication

Explants from the aerial part of microplants, measuring ± 1 cm, were inoculated in test tubes containing 15 mL of MS ⅓ medium, supplemented with 15 g L^{-1} of sucrose, 7 g L^{-1} of agar, and different concentrations of 6-benzylaminopurine – BAP (0.00; 4.44; 8.88; 17.76 µM), composing a completely randomized design (CRD), formed by four treatments, with four replications and five samples per replication, totaling 20 tubes per treatment. The pH of the culture medium was adjusted to 5.7 ±1.0, before autoclaving at 121 °C for 15 minutes.

At 60 days after experiment setup, the following parameters were evaluated: explant survival (%SUR), percentage of explants with shoots (%EWS), number of shoots per explant (NS), and shoot length (SL).

In vitro Rooting

The shoots, obtained from the best treatment of the multiplication stage, measuring approximately 1 cm, were transferred to test tubes containing 15 mL of MS ⅓ culture medium, supplemented with 15 g L^{-1} of sucrose, 7 g L^{-1} of agar and activated charcoal (0.0 or 1.0 g L^{-1}).

The experimental design was completely randomized (CRD), following a factorial scheme (2 x 2) composed of two types of culture medium, without charcoal or with charcoal, and two types of test tube sealing, conventional (with PVC film) or alternative (with cotton plug). Each treatment consisted of four replications, with five samples per replication, totaling 20 tubes per treatment. After 60 days of *in vitro* culture, the following parameters were evaluated: survival percentage (%SUR), rooting percentage (%ROO), aerial part length (APL), root part length (RPL), number of

roots (NR), number of green leaves (GL) and number of senescent leaves (SL).

In vitro Culture Conditions

In vitro cultures were kept in a growth room with a temperature of 25 ± 3 °C, photoperiod of 16 hours and active photosynthetic radiation of 60 µmol m^{-2} s^{-1}. The pH of the culture medium was adjusted to 5.7 ± 0.1, before autoclaving at 121 °C for 15 minutes.

Acclimatization

Microplants were removed from the tube and washed with distilled water to eliminate culture medium residues. Subsequently, they were transferred to disposable cups (200 mL) containing autoclaved vermiculite and plant substrate (2:1), which were placed in trays with a water layer. Each cup had five holes at the base to enable irrigation. Another transparent cup was used as a cover, and they remained closed for 10 days. On the 10th day, holes were made in the upper cups to allow gradual air passage. The system remained this way until the 15th day, when the cover cups were removed. The acclimatized plants remained in a greenhouse, covered with 70% shading, until completing 30 days (LIMA; LIMA-BRITO; SANTANA, 2020; PINTO; LIMA-BRITO, 2023).

The experimental design was completely randomized (CRD), maintaining what was established in the *in vitro* rooting stage, since these microplants were transferred to the acclimatization system after their evaluation. A factorial scheme (2 x 2) was established, considering the interaction between types of culture medium (without charcoal and with charcoal) and types of sealing (PVC or cotton). Each treatment had four replications, with five samples per replication, totaling 20 tubes per treatment.

After 30 days of transferring, the following parameters were evaluated: survival percentage (%SUR), rooting percentage (%ROO), aerial and root part lengths (APL and RPL), number of roots (NR), number of green and senescent leaves (GL and SL), fresh and dry mass of aerial part (FMAP and DMAP), fresh and dry mass of root part (FMRP and DMRP) and number of shoots per plant (NS).

Statistical Analysis

The results were analyzed for normality using the Shapiro-Wilk Test and no rejection was found. The data were analyzed considering a 5% significance level, through analysis of variance (ANOVA), applying the Scott-Knott test, using SISVAR 5.6 software (FERREIRA, 2019).

RESULTS AND DISCUSSION

At the *in vitro* establishment phase, there was no contamination of *Vellozia pyrantha* seeds, and the plantlets obtained in this stage showed a high survival rate, between 90 and 100%.

The use of the BAP regulator, at all tested concentrations, resulted in statistically superior means compared to the control regarding the percentage of explants with shoots (%EWS); regarding the average number of shoots per plant (NS), the quantity produced using concentrations of 8.88 and 17.76 µM was statistically superior compared to the average quantity obtained in the control (0 µM) and at the concentration of 4.44 µM, which did not differ from each other (Figure 1). The effect of BAP as a promoter of *in vitro* shoot regeneration in species of the genus *Vellozia* was also observed by Pinto and Lima-Brito (2023) in *V. seubertiana*, which indicates the efficiency of this cytokinin in stimulating multiplication for species of the genus *Vellozia*.

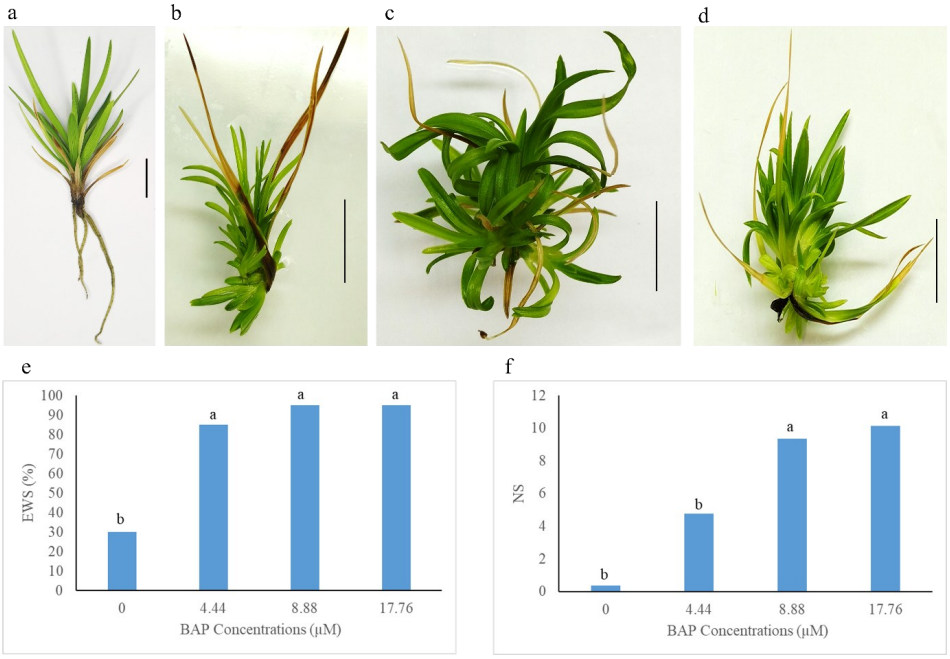


Figure 1. *In vitro* multiplication of *Vellozia pyrantha*, at different concentrations of BAP: (a) control; (b) 4.44 µM; (c) 8.88 µM; (d) 17.76 µM after 60 days of *in vitro* cultivation; (e) percentage of explants whit shoots - %EWS and (f) number of shoots - NS. The vertical bar indicates 1 cm (a - d).

Until the present study, *in vitro* multiplication of *V. pyrantha* had been induced through the application of two distinct stress approaches: thermal stress and water stress (BORGES et al., 2020; BORGES; LIMA-BRITO; CONCEIÇÃO, 2023) with the obtaining of less than two shoots per explant in both cases. Furthermore, in the study by Borges et al. (2020), which used thermal stress, there was high mortality of explants, culminating in an average survival of 30% of samples. The present study, which explored *in vitro* multiplication of *V. pyrantha* using the plant growth regulator BAP, shows that this is a safe approach to multiply *V. pyrantha* explants, compared to the aforementioned study. Moreover, the present study also obtained a higher number of shoots and high survival of explants, which allows the transfer of these explants to new regeneration cycles in an *in vitro* environment.

Shoot length showed no averages that allowed significant distinction between treatments, and there were shoots with size varying from 0.66 cm in the control, up to 1.14 cm, obtained using 4.44 µM of BAP. These results corroborate those obtained by Pinto and Lima-Brito (2023), who also observed no significant differences for the same variable when evaluating shoot regeneration from aerial part explants subjected to different concentrations of BAP and naphthaleneacetic acid (NAA). The results of both studies demonstrate that, although BAP is efficient for shoot induction, it does not promote shoot elongation. On the other hand, the results obtained by Borges, Lima-Brito and Conceição (2023) demonstrated the positive effect of sucrose on the elongation of *V. pyrantha* shoots obtained by water stress in a medium supplemented with sucrose and mannitol. Thus, while BAP can be indicated for shoot production, sucrose should be tested for shoot elongation.

The conditions proposed for *in vitro* rooting of *V. pyrantha*, involving the addition of charcoal to the basic culture medium and the use of cotton plug for tube sealing, led to high rates for survival and rooting of these shoots, between 90 and 95% for both variables, with no significant difference observed between the tested treatments (Figure 2).



Figure 2. *In vitro* rooting of *Vellozia pyrantha*: (a) medium without charcoal and sealed with PVC, (b) medium without charcoal and sealed with cotton plug, (c) medium with charcoal and sealed with PVC and (d) medium with charcoal and sealed with cotton plug. The black arrows indicate secondary roots found during evaluations. The vertical bar indicates 1 cm.

According to ANOVA, for the morphometric parameters evaluated in the *in vitro* rooting stage, there was only a significant effect ($p < 0.05$) considering the individual sources of variation. Therefore, significance was obtained for aerial part length (APL) in relation to the presence or absence of charcoal in the culture medium, and for the number of roots (NR) in relation to the type of sealing. Root part length (RPL) was influenced by both sources of variation tested individually.

The culture medium with the addition of charcoal produced statistically superior means to those obtained in medium without charcoal for the APL and RPL parameters (Figures 3a, 3b). Activated charcoal is a substance that is usually applied in plant tissue culture, especially for its adsorption capacity, in addition to also promoting darkening of the culture medium (SIPAYUNG et al., 2018), which can provide improvement in the *in vitro* rooting of previously multiplied shoots. The effect of charcoal for promoting growth of aerial and root parts has also been recorded as positive during *in vitro* rooting of *Vellozia seubertiana* (PINTO; LIMA-BRITO, 2023).

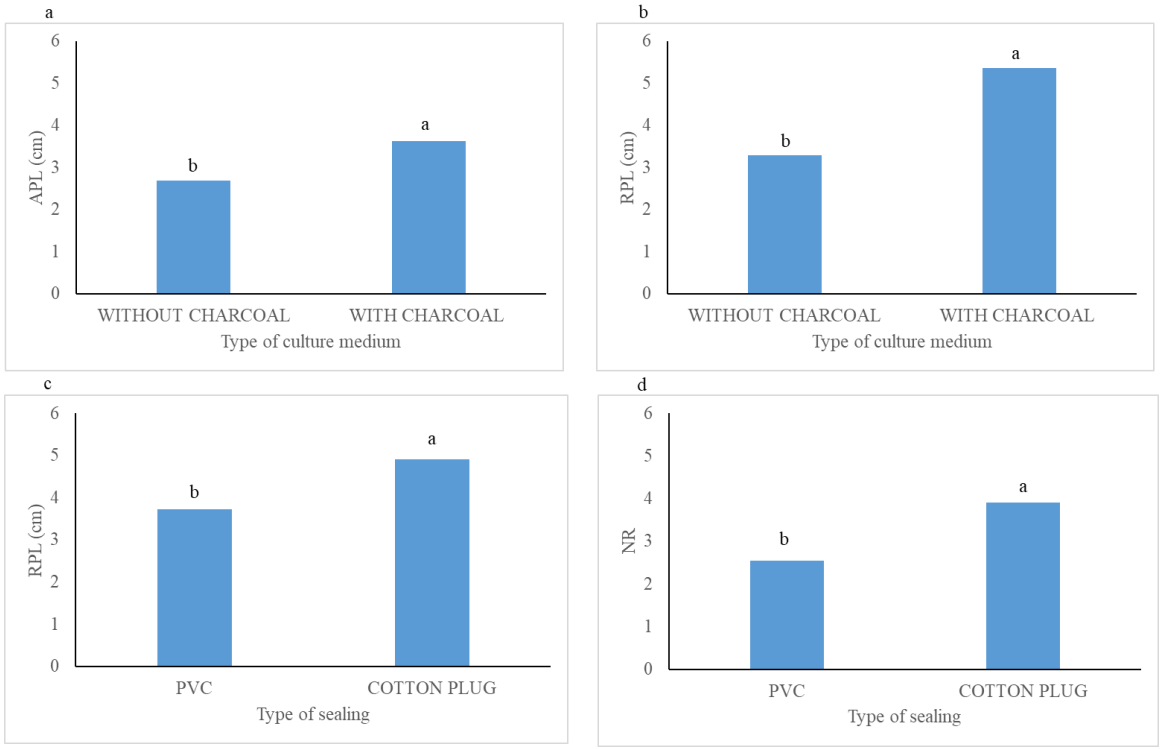


Figure 3. *In vitro* rooting of *Vellozia pyrantha*: (a, b) individual effect of the type of culture medium, (c, d) individual effect of the type of sealing, on the parameters APL (aerial part length), RPL (root part length) and NR (number of roots).

Considering the types of sealing presented here, the results achieved regarding RPL and NR were statistically superior when using cotton to seal the tubes (Figures 3c, 3d). It is possible to apply permeable materials in sealing the containers of *in vitro* plant culture, a technique called rustification, in order to allow the microplant to be exposed to gas exchange, with release of ethylene and reduction of humidity, which are retained when using PVC or plastic lids to seal the *in vitro* environment (CARDOSO; SHENG GERALD; TEIXEIRA DA SILVA, 2018).

The addition of activated charcoal to the culture medium promoted the emergence of secondary roots during *in vitro* rooting of *V. pyrantha* shoots, and this occurred regardless of the type of sealing associated (Figures 2c, 2d). Taiz et al. (2017) explain the importance of secondary root formation, since root branching increases the contact surface of the root system, which optimizes water and nutrient uptake for the plant. Possibly, by supplementing the basic culture medium with activated charcoal, a more favorable microenvironment was provided for rooting and there must also have been adsorption of toxic substances that were possibly diffused in the medium. A study conducted with *Comanthera mucugensis* (LIMA et al., 2022) demonstrated that, in addition to charcoal being effective in the *in vitro* rooting of its microplants, it also generated longer roots than those obtained using the regulator indolebutyric acid (IBA), a type of auxin. When combining charcoal with auxin during *in vitro* rooting of *V. seubertiana*, it was possible to observe that the dark microenvironment provided by charcoal acted favorably for rooting, contrary to the use of auxin (PINTO; LIMA-BRITO, 2023). Thus, the use of activated charcoal for *in vitro* rooting enables economic savings for application of the technique as compared to the use of auxins, as it has lower cost since it was not necessary to associate auxin in the production of microplants (LIMA; LIMA-BRITO; SANTANA, 2024).

The roots obtained in *V. pyrantha* in treatments that used cotton plugs resemble "vellozioid roots", a term coined to refer to the strategies that these roots employ to survive in the shallow and nutritionally poor soils of campos rupestres, such as the ability to mobilize phosphorus through carboxylation of quartzite rocks, which makes it possible to state that, during *in vitro* culture of *V. pyrantha*, as gas exchange was enabled through cotton, there was a similar behavior in the development of branched roots, just as occurs in its natural habitat (TEODORO et al., 2019).

As in the rooting stage, no significant interactions were observed between the sources of variation with the morphometric parameters evaluated in acclimatized plants, according to ANOVA ($p < 0.05$). There was an individual effect of the type of sealing for the parameters RPL, NR and fresh and dry masses of aerial (FMAP and DMAP) and root (FMRP and DMRP) parts and an individual effect of the type of medium only for APL.

Microplants from the medium with activated charcoal exhibited, after acclimatization, significantly superior APL compared to that of microplants that came from the medium without the use of charcoal (Figure 4a). Similarly, the growth of the aerial part of *Vellozia seubertiana* was favored by charcoal, indicating that the use of this substance in the rooting stage is beneficial for the development of the aerial part of species of the genus *Vellozia*, besides favoring their plants after transferring for acclimatization (PINTO; LIMA-BRITO, 2023).

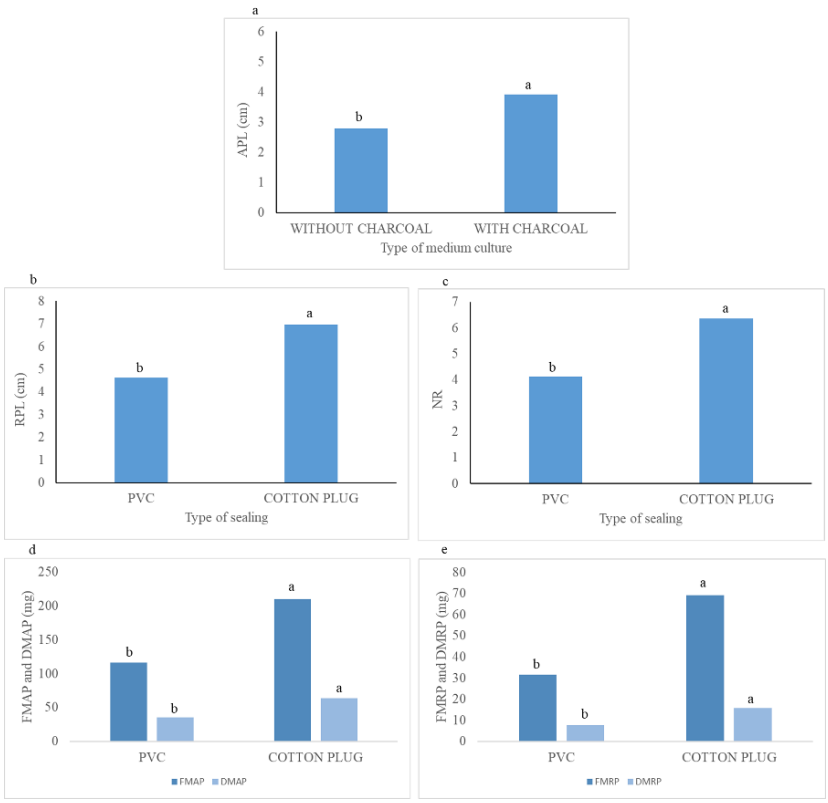


Figure 4. Morphometric parameters from acclimatized microplants of *Vellozia pyrantha* after 30 days of transferring to the *ex vitro* environment: (a) aerial part length - APL, (b) root part length - RPL, (c) number of roots - NR, (d) fresh mass of aerial part and root part - FMAP and FMRP, (e) dry mass of aerial part and root part - DMAP and DMRP.

Similar to the rooting stage, in acclimatization, the use of tube sealing with cotton resulted in statistically superior means, compared to the means obtained by plants grown from rooting using PVC as sealing, for RPL and NR, as well as for FMAP, DMAP, FMRP and DMRP (Figures 4b, 4c).

As observed in rooting, the development of the aerial and root parts of acclimatized *V. pyrantha* plants was favored by rustification in tubes sealed with cotton plugs. When evaluating the plants 30 days after transferring to the *ex vitro* environment, it was observed that the values of fresh and dry masses of both the aerial part and the root system were statistically superior to those obtained with plants grown from rooting with PVC sealing (Figures 4d, 4e). In pre-acclimatized caroá (*Neoglaziovia variegata* (Arruda) Mez) microplants, cultivated using cotton plugs to seal the tubes, there was an increase of almost 40% in the aerial part length of their microplants (SILVEIRA et al., 2013), confirming that there is benefit with ventilation of the *in vitro* microhabitat for the growth and development of some species cultivated *in vitro*.

The *in vitro* environment limits cuticle deposition on leaves and leads to transpiration rates lower than those obtained by plants exposed to the external environment, as observed in *Vellozia squamata*, cultivated *in vitro*, *ex situ* and in a greenhouse (CALAZANS JÚNIOR et al., 2022). In Velloziaceae, the existence of transfusion tracheids in their leaves and stems has been described, with tracheids being vessel elements related to structure and resistance to cavitation and drought (MELLO-SILVA et al., 2011). Thus, in addition to the presence of tracheids in Velloziaceae, the ventilation promoted through the cotton plug possibly had a positive effect on increasing plant length by facilitating gas exchange in *V. pyrantha* microplants and on the development of thickening of their cuticle, preventing water loss to the environment.

The survival of *V. pyrantha* explants during acclimatization resulted in means that indicate a high survival rate, between 80 and 95%. However, there was no significant difference that allowed distinguishing the effect between the proposed treatments. When acclimatizing *V. seubertiana* microplants, Pinto and Lima-Brito (2023) reported an average survival rate ranging from 50 to 75%, even when adding indolebutyric acid and charcoal before transferring to the *ex situ* environment. It is necessary to test, during pre-acclimatization, substances or environmental conditions that may favor the survival of microplants after being transferred out of the tube, since each species has peculiarities that may or may not optimize its cultivation.

Thus, the acclimatization of *V. pyrantha* promoted satisfactory survival rates, and its microplants that were cultivated *in vitro* in medium with charcoal and tubes with cotton plugs developed better morphologically (Figure 5). Calazans Júnior et al. (2022) indicate that during acclimatization of *V. squamata* there would be an "immaturity in the photosynthetic apparatus", compared to the photosynthetic conditions of plants cultivated *in vivo*, due to stomatal dysfunction; however, when acclimatized, anatomical modifications are acquired that allow advantages for adaptation to the *ex vitro* environment in relation to water stresses, since there would be improvements in leaf transpiration rate. When acclimatizing *V. pyrantha*, the high

survival rates indicate that, upon transfer of microplants from the *in vitro* to the *ex vitro* environment, there were probably anatomical and functional adaptations, possibly linked to the phenotypic plasticity of this species.

Micropropagated seedlings of *V. pyrantha* were obtained within a period of 240 days of cultivation, having been promoted from establishment through seeds, using the direct organogenesis pathway, to *ex situ* acclimatization of the species in a greenhouse (Figure 6). The period for obtaining these micropropagated seedlings is similar to that reported by Pinto and Lima-Brito (2023) for *V. seubertiana*, 230 days.

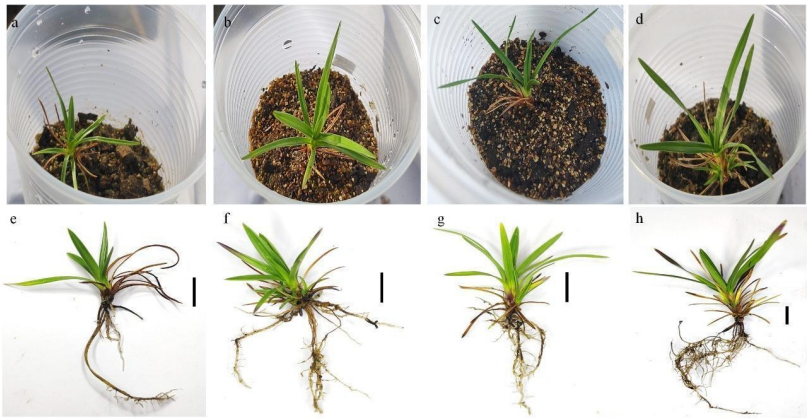


Figure 5. Acclimatization of *Vellozia pyrantha*, obtained from the treatments at rooting stage: (a, e) without charcoal and with PVC sealing, (b, f) without charcoal and with cotton plug sealing, (c, g) with charcoal and PVC sealing, (d, h) with charcoal and cotton plug sealing. The vertical bar indicates 1 cm.



Figure 6. Micropropagation of *Vellozia pyrantha* and its successive stages: (a; b) *in vitro* establishment through *in vitro* germination, (c; d) *in vitro* multiplication, using 8.88 µM of BAP, (e) *in vitro* rooting, (f) sequence performed during acclimatization: 10th first days with upper cup closed, (g) hole in upper cup, made at 10th day, (h) removal of upper cups, at 15th day. The vertical bar indicates 2 cm (a) and 1 cm (c-h).

CONCLUSIONS

This study proves the efficiency of micropropagation of *Vellozia pyrantha*, a technique that allows producing microplants in 240 days, from seed germination. MS ⅓ culture medium, supplemented with 15 g L^{-1} of sucrose, 7 g L^{-1} of agar and 8.88 µM of the cytokinin BAP, is indicated for the multiplication phase. For rooting, the addition of activated charcoal to the medium is suggested, as well as sealing the tubes with cotton plugs, aiming to promote high survival rates in the acclimatization phase.

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