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Grafting compatibility between gabiroba and yellow araçá

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Abstract: The propagation of gabirobeira by seeds is limited because its seeds are recalcitrant and present low germination and rapid loss of viability, and grafting is an alternative for propagation. Thus, the objective was to determine the compatibility of grafting between gabirobeira and yellow araçá rootstocks. The experimental design was completely randomized with 45 treatments and three replicates. Each experimental plot consisted of one genotype as rootstock and one genotype as scion cultivar, with three replicates. The grafting method adopted was the full-slit grafting method. Two species of gabirobeira were used to obtain scions: *Campomanesia adamantium* and *Campomanesia pubescens*, and yellow araçá used as rootstock. The characteristics evaluated were: diameter below and above the graft; plant height; graft survival index; rootstock survival index; total number of live grafts; callus formation and number of leaves. The results show lack of compatibility and survival of grafts in both gabirobeira species, demonstrating high incompatibility between the graft and rootstock tissues. A darkening was observed, indicating the production of phenolic compounds, which may have interfered with callus formation and tissue healing. Despite the lack of compatibility observed, this work provides support for future attempts at vegetative propagation of *Campomanesia adamantium* and *Campomanesia pubescens* species, highlighting the importance of strategies to minimize oxidation and promote grafting techniques for matrix plants for two gabirobeira species on the yellow araçá rootstock.

Index terms: *Campomanesia adamantium; campomanesia pubescens; psidium cattleyanum*; native fruit tree; incompatibility.

Compatibilidade de enxertia entre gabirobeira e araçazeiro-amarelo

Resumo: A propagação da gabirobeira por sementes é limitada, pois suas sementes são recalcitrantes e apresentam baixa germinação e rápida perda de viabilidade, sendo a enxertia uma alternativa para a propagação. Assim, objetivou-se determinar a compatibilidade da enxertia entre os porta-enxertos

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gabirobeira e araçá-amarelo. O delineamento experimental foi inteiramente casualizado, com 45 tratamentos e três repetições. Cada parcela experimental foi composta por um genótipo como porta-enxerto e um genótipo como cultivar-copa, com três repetições. O método de enxertia adotado foi o de garfagem em fenda cheia de topo. Foram utilizadas duas espécies de gabirobeira para obtenção de garfos usados como copa: *Campomanesia adamantium* e *Campomanesia pubescens*, e o araçazeiro-amarelo como porta-enxerto. As características avaliadas foram as variáveis: diâmetro abaixo e acima da enxertia; altura da planta; índice de sobrevivência do enxerto; índice de sobrevivência do porta-enxerto; número total de enxertos vivos; formação de calos e número de folhas. Os resultados mostram ausência de compatibilidade e de sobrevivência dos enxertos em ambas as espécies de gabirobeira, demonstrando alta incompatibilidade entre os tecidos do enxerto e do porta-enxerto. Observou-se um escurecimento indicando a produção de compostos fenólicos, que pode ter interferido na formação de calos e na cicatrização dos tecidos. Apesar da falta de compatibilidade observada, este trabalho oferece subsídios para futuras tentativas de propagação vegetativa das espécies de *Campomanesia adamantium* e *Campomanesia pubescens*, destacando a importância de estratégias para minimizar a oxidação e para promover a técnica de enxertia para as plantas-matrizes para duas espécies de gabirobeira sobre o porta-enxerto araçá-amarelo.

Termos para indexação: *Campomanesia adamantium; campomanesia pubescens; psidium cattleyanum;* fruteira nativa; incompatibilidade.

Introduction

Known as gabirobeiras, *Campomanesia* spp. are plants widely distributed in the Brazilian Cerrado, belonging to the Myrtaceae family, one of the main and richest botanical families in the Neotropical region (RICCI et al., 2024). Gabirobeiras have fruits with great potential for economic exploitation, being found in several regions of the country (ALVES et al., 2013). Their fruits can be consumed in natura or processed to compose desserts, ice cream or juices. This diversity of uses gives *Campomanesia* spp. plants a high economic potential that needs to be better explored and characterized for their domestication (ARAÚJO; SOUZA 2018).

Predatory exploitation, together with the expansion of new agricultural frontiers, causes genetic erosion and contributes to environmental degradation. This hinders the continuity of the evolutionary process and the implementation of initiatives for the pre-improvement of species. Therefore, actions aimed at plant propagation can allow the expansion of the genetic base, as well as the conservation and reproduction of plants (ALMEIDA et al., 2019).

The propagation of Cerrado species presents difficulties due to the limited knowledge available on their ecological, morphological and physiological characteristics. In order to evaluate the propagation method, it is necessary to intensify research into practical and effective methods, since one of the main problems encountered in the expansion of cultivation is the production of seedlings (HERZOG et al., 2012). Species of the genus *Campomanesia* are allogamous and generally propagated by seeds, which is the most widely used method for seedling production; however, they present high genetic variability due to sexual propagation and have recalcitrant seeds that do not tolerate storage, which makes uniform reproduction of progenies difficult (EMER et al., 2018).

Asexual propagation methods, such as cuttings, air layering, and grafting, allow for the production of individuals genetically identical to the mother plants. Air layering is an option for species that have limitations re-

garding root grafting, since rooting occurs while the propagules remain attached to the source plant (HARTMANN. et al., 2017).

For an ideal graft, the healing of the graft union is closely linked to compatibility, related to taxonomic proximity, where the more related the plants, the greater the chance of graft success (OLIVEIRA et al., 2013). However, the use of rootstocks from different botanical species is sometimes preferable, as it allows exploring the genetic diversity within a family, associating species with desirable characteristics (LEE et al., 2010).

In this sense, the objective of this study was to evaluate the compatibility between gabirobeira matrix plants with the yellow araçazeiro rootstock, in order to support the process of vegetative propagation via grafting for gabirobeira cultivation.

Material and Methods

The activities were carried out in the fruit orchard of the Federal University of Jataí - UFJ. This region has a tropical savanna climate (Aw), where the rainy season occurs from October to April, while the dry season extends from May to September. On average, annual precipitation is 1,541 mm and the average annual temperature is 23.3°C (MELO; DIAS, 2019).

The plant material used to obtain cuttings consisted of 45 matrix plants belonging to two species of gabirobeira, *Campomanesia adamantium* and *Campomanesia pubescens*, obtained from plants in different locations (Table 1). *C. pubescens* is a scarce species in the region, so few specimens were found for this study. The gabirobeira of the species *C. adamantium* prevails, and therefore the availability of material is greater.

Three cuttings were collected from each mother plant and stored in low-density polyethylene packaging to create a favorable humidity environment for the propagation material (PIO et al., 2008). They were then transported to the Federal University of Jataí.

Table 1. Location of *Campomanesia adamantium* and *Campomanesia pubescens* species in Jataí.

Matrix plant	Latitude	Longitude	Altitude	Species
1	18°5'44"	51°27'26"	690	*C. adamantium*
2	18°5'44"	51°27'25"	690	*C. adamantium*
3	18°5'44"	51°27'24"	690	*C. adamantium*
4	18°5'44"	51°27'24"	690	*C. adamantium*
5	18°5'44"	51°27'25"	670	*C. pubescens*
6	18°5'44"	51°27'24"	640	*C. pubescens*
7	18°5'44"	51°27'24"	640	*C. pubescens*
8	18°5'44"	51°27'24"	660	*C. pubescens*
9	18°5'44"	51°27'23"	660	*C. adamantium*
10	18°5'45"	51°27'24"	660	*C. adamantium*
11	18°5'45"	51°27'24"	650	*C. pubescens*
12	18°5'43"	51°27'24"	660	*C. adamantium*
13	18°5'43"	51°27'24"	680	*C. adamantium*
14	18°5'43"	51°27'24"	700	*C. adamantium*
15	18°5'43"	51°27'24"	640	*C. adamantium*
16	18°5'44"	51°27'24"	640	*C. adamantium*
17	18°5'44"	51°27'24"	640	*C. adamantium*
18	18°5'44"	51°27'24"	640	*C. adamantium*
19	18°5'43"	51°27'24"	660	*C. adamantium*
20	18°5'43"	51°27'23"	660	*C. adamantium*
21	18°5'43"	51°27'23"	660	*C. adamantium*
22	18°5'43"	51°27'23"	670	*C. adamantium*
23	18°5'43"	51°27'25"	680	*C. adamantium*
24	18°5'42"	51°27'25"	670	*C. adamantium*
25	18°5'42"	51°27'25"	640	*C. adamantium*
26	18°5'42"	51°27'24"	670	*C. adamantium*
27	18°5'42"	51°27'23"	660	*C. adamantium*
28	18°5'42"	51°27'24"	660	*C. adamantium*
29	18°5'41"	51°27'24"	630	*C. adamantium*
30	18°5'42"	51°27'23"	680	*C. adamantium*
31	18°5'41"	51°27'23"	680	*C. adamantium*
32	18°5'41"	51°27'23"	680	*C. adamantium*
33	18°5'41"	51°27'23"	680	*C. adamantium*
34	18°5'41"	51°27'23"	680	*C. adamantium*
35	18°5'42"	51°27'22"	610	*C. pubescens*
36	18°5'42"	51°27'22"	670	*C. adamantium*
37	18°5'42"	51°27'23"	640	*C. adamantium*
38	18°5'43"	51°27'22"	620	*C. adamantium*
39	18°5'43"	51°27'22"	390	*C. adamantium*
40	18°5'43"	51°27'22"	390	*C. adamantium*
41	18°5'43"	51°27'22"	390	*C. adamantium*
42	18°5'44"	51°27'23"	380	*C. adamantium*
43	18°5'45"	51°27'22"	340	*C. adamantium*
44	18°5'45"	51°27'23"	300	*C. adamantium*
45	18°5'44"	51°27'22"	740	*C. adamantium*

The grafting method adopted was the cleft grafting method, using araçá-amarelo (*Psidium cattleyanum*) as rootstock. This methodology was chosen because it presented viable results in grafting Surinam cherry on Surinam cherry, with a fruit set of 60%, a native herbaceous fruit tree of the Myrtaceae family, proving to be the most efficient method according to the research of the authors Lattuada et al. (2010). The experiment was then conducted in a protected environment.

Grafting was performed on August 20, 2021, and the evaluation was carried out on December 23, 2021. The diameter of the rootstock and scion were evaluated before grafting. The rootstock was decapitated at approximately 10 cm in height, from the plant's collar region, receiving a longitudinal cut, approximately 3.0 cm deep. The scion had its base prepared in the form of a double bevel (converging cuts), and was immediately inserted into the rootstock cleft, so that, on at least one side, there was a perfect fit between the cambial tissues. Once this was done, the graft was tied with a grafting twine, approximately 2.5 cm wide, in order to adjust the parts in contact. The graft was then covered with a transparent plastic bag, wrapping it around the propagule in such a way as to leave approximately 5 cm of excess above the apex of the fork, with this wrapping being tied loosely below the point of union. The purpose of this bag was to form a humid chamber, preventing the graft from drying out.

The grafted plants were transferred to a screened nursery with 60% light interception and a sprinkler irrigation system. The seedlings were periodically inspected for weed and pest control.

Vegetative development was evaluated using the following variables: diameter below the grafting point; diameter above the grafting point; height; graft survival index; rootstock survival index; total number of live grafts; callus formation and number of leaves. At 120 days after grafting, the percentage of grafting between gabirobeira and araçazeiro was evaluated regarding the graft survival index (SSI) characteristic. For this purpose, the total number of live grafts (with budding) was counted and divided by the total number of grafted plants per treatment.

The diameter below the grafting point (cm) and the diameter above the grafting point (cm) were measured five centimeters below and above the grafting point, respectively, using a digital caliper. The height (cm) was measured using a tape measure, from the soil to the top of the plant, and the number of leaves was also counted. The data obtained for the variables graft survival index; total number of live grafts; callus formation and number of leaves were not presented, as they obtained null values and could not be statistically analyzed.

Variables that presented a value equal to zero were not considered in the analyses, as they did not reflect the actual development of the graft or rootstock and could introduce statistical distortions in the results. This decision sought to ensure greater precision and reliability in the interpretation of the experimental data.

The variables minimum value, maximum value, mean and standard deviation were subjected to descriptive analyses using the statistical software R Matlab and Selegen (CRUZ, 2016).

Results and Discussion

The 45 matrix plants of the species *C. adamantium* and *C. pubescens* grafted onto the yellow araça rootstock did not show graft budding or graft survival rate, which is why it was not possible to present statistical analyses for these variables. A high degree of darkening was observed at the grafting point, which may indicate the presence of phenols, which may have contributed to the non-survival of the graft. According to Everette et al. (2010), plants of the Myrtaceae family release high concentrations of phenolic compounds, mainly as protection for the plant, conferring high resistance to microor-

ganisms and pests. Furthermore, most plants that constitute antioxidants in large quantities are prone to releasing phenolic compounds, hindering the process of callus formation and healing (EVERETTE et al., 2010). In these cases, excessive phenol oxidation, combined with the formation of lignified barriers, can compromise vascular continuity and hinder graft development (HUDINA et al., 2014; ERREA, 1998).

Grafting is a vegetative propagation technique that consists of joining tissues from the same individual, or from different individuals belonging to the same species (intraspecific) or not (interspecific), constituting a single individual. The expected performance of the scion depends on the efficiency of the rootstock used and the affinity of the tissues of both. This compatibility is essential for the success of a commercial orchard over time, therefore it is important that the graft and the rootstock are of the same species (LATTUADA et al., 2010). In the present study, gabirobeira plants grafted onto yellow araçá showed a high degree of incompatibility, as there was no sprouting of the graft and no survival rate of the graft.

Robaina et al. (2012) observed low grafting rates between 'Paluma' guava trees on *P. cattleianum* (araçazeiro) rootstock, suggesting that there is incompatibility between the tissues of the guava tree and the sweet araçazeiro. According to these authors, the disorganized junction of the tissues with penetration of the bark into other tissues of the plant stem, the marked hypertrophy and necrosis in the grafted region affected the development of the guava tree grafted onto sweet araçazeiro.

Hypertrophy in the grafted region occurs due to different cell division rates in the cambium of the rootstock and the scion, which slows the transport of nutrients, impairing the development of the plant (TOMAZ et al., 2009). This fact was observed in the present study for the *Campomanesia* species used on the sweet araçazeiro rootstock, with no grafting success observed in any of the species used.

Robaina et al. (2012) evaluated the subgrafting between 'Paluma' guava and araçazeiros and obtained 45% of the guava subgrafts taking place on guava (control) and 0 to 20% of the subgrafts of *P. cattleianum* accessions (araçazeiro) taking place on guava. Results similar to those found in the present study, where no take place was observed with the two *Campomanesia* species on araçazeiros.

According to Hartmann et al. (2002), these symptoms of graft incompatibility occur when the connection of the conducting vessels (xylem and phloem) is poorly established due to a lack of affinity between the tissues of the scion and the rootstock. According to the authors, among the main causes of incompatibility, it is possible to mention the use of a vigorous rootstock in combination with a graft that is not very vigorous. The araçazeiro rootstock used is extremely vigorous, while the *Campomanesia* species used as graft are not very vigorous. Therefore, as it is a biological process, the incompatibility reaction is difficult to study due to the breadth of interactions between scion and rootstock (PINA et al., 2012).

The diameter 5 mm below the graft for matrix plant 20 showed values of 5.49 ± 0.35 mm, for mother plant 25 it presented a value of 4.9 ± 0.5 mm, for the diameter 5 mm above the graft, mother plant 20 obtained a value of 4.85 ± 0.05 and for plant 25 a value of 3.83 ± 0.30, indicating that the diameter of the graft and rootstock are similar in relation to the diameter (Table 2). The affinity between graft and rootstock includes morphological and physiological aspects of the plants. The morphological, anatomical and tissue constitution affinity refers to the fact that the conducting vessels of the two plants that join have similar diameters (PEIL et al., 2003). It is observed in the present work that there is affinity in relation to the diameter of the graft and rootstock, demonstrating that for this characteristic there was perfect harmony between graft and rootstock, however there was no adhesion.

Table 2. Average data for diameter 5 mm below the graft, diameter 5 mm above the graft, for plants of two species of Gabirobeiras grafted via full cleft on yellow araçá. Jataí-GO, Brazil.

Matrix plant	Species	Ø 5mm below the graft			Ø 5mm above the graft		
		Average	Min - Max	SD	Average	Min - Max	SD
1	*C. adamantium*	3.33	3.1 - 3.5	0.20	3.08	2.96 - 3.2	0.12
2	*C. adamantium*	3.50	3.3 - 3.6	0.14	2.73	2.54 - 3.1	0.25
3	*C. adamantium*	4.17	4.03 - 4.3	0.13	3.46	3.5 - 3.4	0.05
4	*C. pubescens*	3.23	3.19 - 3.3	0.06	3.19	3.07 - 3.3	0.11
5	*C. pubescens*	3.28	3.14 - 3.5	0.19	2.76	2.68 - 2.9	0.12
6	*C. pubescens*	3.49	3.4 - 3.6	0.10	2.77	2.63 - 2.8	0.13
7	*C. pubescens*	3.29	3.18 - 3.5	0.17	2.58	2.44 - 2.8	0.19
8	*C. adamantium*	2.95	2.8 – 3.1	0.15	3.1	3.0 - 3.2	0.1
9	*C. adamantium*	4.08	3.9 – 4.2	0.15	3.37	3.32 - 3.4	0.04
10	*C. pubescens*	3.50	3.4 - 3.61	0.10	3.01	2.8 - 3.3	0.25
11	*C. adamantium*	2.82	2.7 - 2.9	0.10	3.33	3.29 - 3.4	0.06
12	*C. adamantium*	4.19	3.97- 4.4	0.21	3.16	3.1 - 3.2	0.05
13	*C. adamantium*	4.50	4.41 - 4.6	0.90	3.33	3.2 - 3.4	0.11
14	*C. adamantium*	3.52	3.36 - 3.8	0.24	3.38	3.26 - 3.5	0.12
15	*C. adamantium*	3.58	3.7 - 3.7	0.01	3.59	3.4 - 3.77	0.18
16	*C. adamantium*	4.14	4.03 - 4.3	0.01	3.59	3.4 - 3.77	0.18
17	*C. adamantium*	4.25	4.05 - 4.5	0.22	3.40	3.32 - 3.5	0.09
18	*C. adamantium*	3.63	3.5 - 3.8	0.02	3.73	3.6 - 3.8	0.11
19	*C. adamantium*	4.12	3.9 - 4.3	0.20	3.40	3.3 - 3.52	0.11
20	*C. adamantium*	5.49	5.1 - 5.8	0.35	4.85	4.8 - 4.9	0.05
21	*C. adamantium*	3.27	3.12 - 3.5	0.20	3.21	2.85 - 3.6	0.37
22	*C. adamantium*	4.23	4.1 - 4.3	0.11	3.74	3.7 - 3.8	0.05
23	*C. adamantium*	4.78	4.7 - 4.9	0.10	3.52	3.4 - 3.6	0.11
24	*C. adamantium*	3.28	3.2 - 3.36	0.08	3.10	3.02 - 3.2	0.09
25	*C. adamantium*	4.94	4.8 - 5.12	0.16	3.83	3.5 - 4.1	0.30
26	*C. adamantium*	3.74	3.64 - 3.9	0.13	3.28	3.16 - 3.5	0.18
27	*C. adamantium*	3.72	3.47 - 3.9	0.22	3.27	3.11 - 3.4	0.14
28	*C. adamantium*	4.54	4.13 - 4.8	0.36	2.67	2.4 - 2.9	0.25
29	*C. adamantium*	3.67	3.51 - 3.8	0.14	3.38	3.25 - 3.6	0.18
30	*C. adamantium*	4.64	4.42 - 4.9	0.24	3.78	3.65 - 3.9	0.12
31	*C. adamantium*	4.51	4.43 - 4.6	0.08	3.6	3.5 - 3.7	0.1
32	*C. adamantium*	4.09	3.99 - 4.22	0.10	3.29	3.17 - 3.4	0.11
33	*C. pubescens*	3.22	2.98 – 3.5	0.26	2.68	2.55 - 2.8	0.12
34	*C. adamantium*	3.79	3.6 - 3.9	0.16	3.38	3.2 - 3.56	0.18
35	*C. adamantium*	3.71	3.6 - 3.8	0.10	2.82	2.77 - 2.9	0.06
36	*C. adamantium*	3.15	3.07 - 3.2	0.07	2.76	2.6 - 2.99	0.20
37	*C. adamantium*	3.69	3.3 - 3.97	0.34	3.39	3.28 - 3.5	0.11
38	*C. adamantium*	3.46	3.4 - 3.5	0.05	2.81	2.7 - 2.9	0.10
39	*C. adamantium*	3.46	3.3 - 3.6	0.15	2.79	2.6 - 2.9	0.16
40	*C. adamantium*	3.33	3.1 - 3.5	0.20	2.68	2.68 - 2.86	0.18
41	*C. adamantium*	3.21	3.14 - 3.3	0.08	2.19	2.09 - 2.3	0.10
42	*C. adamantium*	3.49	3.4 - 3.59	0.13	3.32	3.24 - 3.4	0.11
43	*C. adamantium*	3.22	3.18 - 3.3	0.06	2.73	2.5 - 2.9	0.20
44	*C. pubescens*	3.81	3.7 - 3.9	0.10	2.95	2.8 - 3.1	0.15
45	*C. pubescens*	3.41	3.3 - 3.5	0.10	3.30	3.11 - 3.5	0.19

*SD = standard deviation.

Espíndola et al. (2004), with the aim of verifying the effect of stem diameter on the formation of umbu seedlings, conducted an experiment with rootstocks of two diameter classes (4–6 mm and 7–9 mm). Rootstocks with diameters between 7 and 9 mm proved to be more efficient, because they provided better development of the shoots and also because they facilitated the grafting technique. According to the authors, it is believed that the low percentages found for these genotypes are related to the quality of the scions used, which may not have been sufficiently mature (lignified) to allow for grafting. Or, even, to the fact that the rootstocks used came from seeds, which would produce a certain genetic variability in them.

Fachinello et al. (2004) evaluated the different combinations of grafting compatibility of *Prunus* sp. by measuring the growth in diameter of the plants. For these authors, seedlings with a difference in values between the scion and rootstock of less than 4.0 mm obtained for some combinations demonstrate high compatibility. These data were based on the Norms and Standards for the Production of Fruit Tree Seedlings for the State of Rio Grande do Sul, established for the commercial acceptance of plum, nectarine and peach tree seedlings. According to the standards, seedlings cannot present a difference greater than 6.0 mm between the diameter of the graft and the rootstock (CESM/RS, 1998). Thus, the differences in diameter between the graft and the rootstock in the present study are within the established standards, both for high compatibility and for commercial acceptance.

Robaina et al. (2015), studying the vigor and compatibility of 'Paluma' guava grafted onto *Meloidogyne enterolobii*-resistant araça trees, found grafting incompatibility between two accessions of *P. cattleianum* araça trees and 'Paluma' guava. Results similar to those found in the present study, where no grafting compatibility was observed between the material under study.

Plant height is considered one of the most important parameters for estimating seedling growth. However, due to variations depending on the species and production methods, it must be combined with other parameters, such as diameter (EMER et al., 2020). For the mother plants grafted onto the yellow araçá rootstock, the height recorded among the plants ranged from 18.94 to 46.83, with the matrix plants obtaining the highest values. It was observed that plant 23 had a height ranged from 46.83 ± 1.60 cm, and also for plant 43 the recorded height was 46.66 ± 0.45 cm, showing values for the most advantageous plants in relation to height, with the highest height averages (Table 3). Factors related to the behavior of non-domesticated species may occur, as there are few studies, since these plants can behave in different ways in response to the diversity of diverse habitats, and which often cannot be controlled in plants in the field (GUIMARÃES et al., 2019).

For the survival rate variable, the data indicate that mother plants 3, 5, 28 and 43 achieved 100% success (Table 3). This demonstrates that mother plants have advantages in terms of survival rate, which is promising for vegetative propagation.

Therefore, for the graft sprouting characteristic, there were no graft sprouts for the two species under study. Likewise, for both species, the graft leaf number and callus formation characteristics could not be analyzed, since there was no leaf emission and no callus formation was observed. Symptoms of incompatibility (failure to take root, premature death, yellowing and premature leaf fall, among others) can occur at the beginning or even one to two years after the graft is made, depending on the species (MORAES et al., 2013).

Table 3. Average data for graft survival index, plant height, for plants of two species of gabirobeiras grafted via full cleft on araçazeiro-amarelo. Jataí-GO, Brazil.

Matrix Plant	Species(cm)	Height(cm)			Survival index		
		Average	Min – Max	SD	Average	Min - Max	SD
1	*C. adamantium*	34.0	33.0 - 35.0	1.0	0.0	0.0	0.0
2	*C. adamantium*	29.37	28.0 - 31.0	1.25	25.0	0.0 - 100.0	50.0
3	*C. adamantium*	32.27	31.83 - 31.0	0.63	100.0	100.0 - 100.0	0.0
4	*C. pubescens*	27.22	26.0 - 28.0	1.07	66.66	0.0 -100.0	57.73
5	*C. pubescens*	32.61	32.0 - 33.0	0.53	100.0	100.0 - 100.0	0.0
6	*C. pubescens*	32.72	32.0 - 34.0	1.10	66.66	0.0 -100.0	57.73
7	*C. pubescens*	33.05	32.17 - 34.0	0.91	66.66	0.0 -100.0	57.73
8	*C. adamantium*	33.11	32.0 - 34.0	1.01	33.33	0.0 -100.0	57.73
9	*C. adamantium*	39.61	39.0 - 40.0	0.53	33.33	0.0 -100.0	57.73
10	*C. pubescens*	28.61	28.0 - 29.0	0.53	33.33	0.0 -100.0	57.73
11	*C. adamantium*	20.55	20.0 - 21.0	0.50	33.33	0.0 -100.0	57.73
12	*C. adamantium*	29.69	28.07 – 32.0	2.05	33.33	0.0 -100.0	57.73
13	*C. adamantium*	39.44	38.33 - 41.0	1.38	66.66	0.0 -100.0	57.73
14	*C. adamantium*	32.61	32.0 - 33.0	0.53	33.33	0.0 -100.0	57.73
15	*C. adamantium*	29.72	29.0 - 31.0	1.10	66.66	0.0 -100.0	57.73
16	*C. adamantium*	37.66	37.0 - 38.0	0.57	33.33	0.0 -100.0	57.73
17	*C. adamantium*	40.94	39.83 - 42.0	1.08	33.33	0.0 -100.0	57.73
18	*C. adamantium*	34.22	33.0 - 36.0	1.57	33.33	0.0 -100.0	57.73
19	*C. adamantium*	31.5	29.5 - 34.0	2.29	33.33	0.0 -100.0	57.73
20	*C. adamantium*	34.16	32.0 - 36.0	2.02	33.33	0.0 -100.0	57.73
21	*C. adamantium*	24.0	23.0 - 25.0	1.0	33.33	0.0 -100.0	57.73
22	*C. adamantium*	25.22	24.0 - 26.0	1.07	66.66	0.0 -100.0	57.73
23	*C. adamantium*	46.83	45.0 - 48.0	1.60	33.33	0.0 -100.0	57.73
24	*C. adamantium*	43.72	42.0 - 45.17	1.60	66.66	0.0 -100.0	57.73
25	*C. adamantium*	37.66	34.0 - 40.0	3.21	33.33	0.0 -100.0	57.73
26	*C. adamantium*	26.31	23.0 - 28.0	2.86	33.33	0.0 -100.0	57.73
27	*C. adamantium*	38.55	37.0 - 39.67	1.38	0.0	0.0 - 0.0	0.0
28	*C. adamantium*	26.83	25.0 - 28.5	1.75	100.0	100.0 - 100.0	0.0
29	*C. adamantium*	26.22	24.0 - 28.0	2.03	33.33	0.0 - 100.0	57.73
30	*C. adamantium*	29.5	28.5 – 32.0	1.32	0.0	0.0 - 0.0	0.0
31	*C. adamantium*	27.83	27.0 - 28.5	0.76	33.33	0.0 -100.0	57.73
32	*C. adamantium*	21.27	20.82 - 22.0	0.63	33.33	0.0 -100.0	57.73
33	*C. pubescens*	28.23	27.0 - 29.7	1.36	33.33	0.0 -100.0	57.73
34	*C. adamantium*	31.16	30.0 - 32.0	1.04	33.33	0.0 -100.0	57.73
35	*C. adamantium*	34.11	33.33 - 35.0	0.84	33.33	0.0 -100.0	57.73
36	*C. adamantium*	27.39	27.0 - 28.0	0.53	33.33	0.0 -100.0	57.73
37	*C. adamantium*	32.94	32.0 - 34.0	1.00	33.33	0.0 -100.0	57.73
38	*C. adamantium*	32.22	31.67 - 33.0	0.69	33.33	0.0 -100.0	57.73
39	*C. adamantium*	24.5	23.0 - 26.0	1.32	33.33	0.0 -100.0	57.73
40	*C. adamantium*	18.94	17.83 - 21.0	1.78	66.66	0.0 -100.0	57.73
41	*C. adamantium*	23.65	21.67 - 26.0	2.09	66.66	0.0 -100.0	57.73
42	*C. adamantium*	27.66	27.0 - 28.33	0.94	0.0	0.0 - 0.0	0.0
43	*C. adamantium*	46.66	45.0 - 48.0	1.52	100.0	100.0 - 100.0	0.0
44	*C. pubescens*	31.16	30.5 - 32.0	0.76	33.33	0.0 - 100.0	57.73
45	*C. pubescens*	27.05	26.17 - 28.0	0.91	66.66	0.0 - 100.0	57.73

*SD = standard deviation.

Both matrices showed potential to be used as rootstocks, with a more consistent performance in terms of survival, showing greater variability in both height and survival. The matrices 3, 5, 28 and 43 are the most promising for the rootstock selection process due to their high survival rate. These results suggest that these specific combinations of gabirobeira and araçazeiro-amarelo rootstock have a high compatibility and result in robust and healthy seedlings. The matrices 1, 27, 30 and 42 are the least promising due to their 0% survival rate. These results indicate that these specific combinations are not compatible and do not result in viable seedlings. These rootstocks should be avoided in the selection process.

The scion cultivar and the rootstock generally belong to the same species or to very closely related species within a botanical genus (ZARROUK et al., 2010). However, the evolution of fruit growing and its growing importance in the world economy has led to this activity spreading to marginal regions. This situation has led to adaptation problems, which in turn result in unsatisfactory productivity and low-quality fruit. As a result of these problems, grafting between increasingly taxonomically distinct genotypes has become more frequent, with the aim of finding a way to overcome such difficulties (PEREIRA et al., 2017).

For species of the *Campomanesia* genus, different responses may occur, attributed to different factors such as concentrations of growth regulators, difficulty in applying the technique due to the oxidation of phenolic compounds in the cut region, which may hinder the establishment of a protocol for seedling production on a commercial scale, and the regulator used and its purpose (DIAS et al., 2012). When the plants to be grafted are from the same family but of different genera, the chances of a successful union become more remote (HARTMANN et al., 2002). For Fachinello et al., (2005) incompatibility may arise due to differences in growth periods, physiological and biochemical differences between the graft and rootstock, and due to some toxic substance produced by the graft. Furthermore, grafting failures are related to anatomical differences between plants, low manual skills of grafters, adverse environmental conditions and diseases (HARTMANN et al., 2002).

Conclusions

Given the observed lack of compatibility, this study provides a basis for future attempts at vegetative propagation of *Campomanesia adamantium* and *Campomanesia pubescens*, highlighting the relevance of strategies to reduce oxidation and improve grafting success of mother plants of these two gabirobeira species onto yellow guava rootstocks. For future research, we recommend testing complementary approaches, such as the application of antioxidants (e.g., ascorbic acid) or other substances that can increase tissue viability and promote better graft consolidation.

Data Availability

The data that support the findings of this study are available from the corresponding author, Silveira, K.M., upon reasonable request.

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