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FIRST REPORT OF WITCHES' BROOM AND DIEBACK OF *Tabebuia rosea* (TrWB) IN BELO HORIZONTE, MINAS GERAIS, BRAZIL

PRIMEIRO RELATO DE VASSOURA DE BRUXA EM Tabebuia rosea (TrWB) *EM BELO HORIZONTE, MINAS GERAIS, BRASIL*

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ABSTRACT

Tabebuia rosea is an exotic tree species widely used in Brazilian urban forests. The occurrence of overgrowth of mature branches, dwarfism and decline was noted in young and adult specimens of *T. rosea* found among street trees in the city of Belo Horizonte, MG state. This study reports reports on the identification of the causal agent of this disease and presents perspectives for the management, prevention and control of witches' broom of *T. rosea* in urban forest. Stem cuttings from symptomatic and asymptomatic trees were collected from public areas (streets and squares) in Belo Horizonte (MG) and subjected to Scanning Electron Microscopy (MEV) and nested-PCR tests to detect phytoplasmas. It was concluded that *Candidatus* Phytoplasma sp. is the etiological agent associated with *T. rosea* witches' broom (TrWB). It is proposed that integrated management measures to be adopted, such as restricting the planting of *T. rosea* seedlings in urban forests, inspecting forest nurseries to avoid using contaminated propagating material, establishing quarantine measures and eliminating diseased or symptomatic plants. New studies should be carried out with a view to identifying the species of insect vector of TrWB and aiming to obtain additional information on the distribution of this phytoplasmose in the municipality. The development of field tests for the detecting the TrWB-infected plants is a priority in order to avoid the spread of contaminated propagating material.

Keywords: Disease; Ornamental tree; Ipê-rosa; Phytoplasma.

RESUMO

Tabebuia rosea é uma espécie arbórea exótica amplamente utilizada na arborização urbana brasileira. Constatou-se a ocorrência de superbrotação de ramos maduros, nanismo e declínio em exemplares jovens e adultos de *T. rosea* existentes na arborização pública da cidade de Belo Horizonte, MG. Este trabalho relata a identificação do agente causal desta doença e apresenta perspectivas de manejo, prevenção e controle da vassoura de bruxa de *Tabebuia rosea* na arborização urbana. Estacas caulinares de árvores sintomáticas e assintomáticas foram coletadas em áreas públicas (ruas e praças) de Belo Horizonte, MG e submetidas a Microscopia Eletrônica de Varredura (MEV) e testes de nested-PCR para detecção de fitoplasmas. Concluiu-se que *Candidatus* Phytoplasma sp. é o agente etiológico associado à vassoura de bruxa de *T. rosea* (TrWB). Propõe-se a adoção de medidas de manejo integrado como a restrição do plantio de mudas de *T. rosea* na arborização urbana, inspeção de viveiros florestais para evitar uso de material propagativo contaminado, estabelecimento de medidas de quarentena e eliminação de plantas doentes ou sintomáticas. Novos estudos devem ser realizados com o objetivo de identificar as espécies de insetos vetores da TrWB e também obter informações adicionais sobre a distribuição dessa fitoplasmose no município. O desenvolvimento de testes de campo para a detecção de plantas infectadas com TrWB é uma prioridade para evitar a disseminação de material de propagação contaminado.

Palavras-chave: Doença; Árvore ornamental; Ipê-rosa; Fitoplasma.

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INTRODUÇÃO

The genera Tabebuia and Handroanthus comprise together species widely used in landscaping, due to the beauty of the canopy and flowers. *Tabebuia rosea* (Bertol.) Bertero ex A.DC (synonyms of *Tabebuia pentaphylla*) belongs to the family Bignoniaceae, and is a Caribbean native (FLORA DO BRASIL, 2025), very common in the forestation of streets, avenues, and gardens in Brazil because it is a rustic and ornamental species characterized by intense flowering and rapid growth (SILVA, 2017). The species is described as *T. rosea,* with *Tabebuia pentaphylla* Hemsl., being a synonymy (THE WORLD FLORA ONLINE, 2025).

Inspections carried out on urban trees in public places in Belo Horizonte, MG, revealed the occurrence of branch oversprouting and subsequent decline and death in specimens of *T. rosea* (ipê-rosa).

Similar symptoms in this species were first reported in Puerto Rico (CAICEDO *et al*., 2015), initially suggesting a virus as the infectious agent after reproducing the disease by grafting branches. Ciferri (1949) described the occurrence of 'witches' broom' in species of *Erytrina* and *Tabebuia rosea*, used as shade plants for cocoa trees in Venezuela.

The term “witches’ broom” refers to a type of plant disease or disease symptom in which there is an abnormal development of meristematic tissue or overgrowth that can be caused by different types of pathogens (viruses, phytoplasmas or fungi).

In Brazil, the witches’ broom of ipê-rosa is known since the 1980’s, in the city of Rio de Janeiro, RJ, and the symptoms were characterized by hypertrophy of terminal branches and buds, fasciations and oversprouting of branches, leaf chlorosis, presence of galls in some cases and, finally, dying of the affected branches. Years later, the identity of a phytoplasma as the causal agent of the disease was demonstrated through nested-PCR with universal primers (MAFIA *et al*., 2008; MONTANO, 2013).

Phytoplasmas are phloem-restricted plant-pathogenic bacteria transmitted by insects; belonging to the Mollicutes class, obligate parasites, devoid of cell walls and with high pleomorphism, non-cultivable *in vitro*, gram positive (WANG *et al*., 2024). Phytoplasmas reside in sieve elements and are mainly transmitted by phloem-feeding insects vectors belonging to the Cicadellidae (leafhoppers), Cixiidae (planthoppers) and Psyllidae (psyllids) (ASUDI *et al*., 2021; MONTANO *et al*., 2024).

Phytoplasmas secrete virulence proteins known as effectors, which interfere with host hormone signaling and cause abnormal plant morphologies such as phyllody, virescence, chlorosis, and witches’ broom, among other symptoms. The effectors are essential for the virulence of the pathogen, and also susceptible targets for the control of phytoplasma-associated diseases. They are also suitable tools for the identification of protein targets in the hosts, including the nucleotide-binding leucine-rich repeat (NLR) receptors (also called resistance proteins). Additionally, genetic engineering of NLR receptors can improve host recognition of pathogen effectors, enabling the production of resistant host lines (CARREÓN-ANGUIANO *et al*., 2023).

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Unique morphological changes induced by phytoplasmas, such as witches' broom and phyllody, increase the prevalence of multiple short branches and young leaves, favoring sap-feeding insects. Additionally, phyllody flowers remain green even when healthy flowers fade. These resources are likely to increase the attraction of insect vectors and, thus, the spread of phytoplasmas. Such manipulations of the morphology of host plants appear to be a common strategy for the survival of phytoplasmas, capable of manipulating various metabolic pathways of their hosts (BERTACCINI, 2022).

In Brazil, various cultivated plant species and weeds or wild plants are hosts to these phytopathogens. The phytoplasmas associated with the most important diseases detected in Brazil are '*Candidatus* Phytoplasma asteris' [16SrI-A and -B), 'Ca. P. tritici' (16SrI-C), and 'Ca. P. lycopersici' (16SrI-Y)]; 'Ca. P. aurantifolia = citri' and 'Ca. P. australasiae = australasiaticum' (16SrII phytoplasmas); 'Ca. P. pruni' (16SrIII phytoplasmas); 'Ca. P. ziziphi' (16SrV-B); 'Ca. P. sudamericanum' (16SrVI-I); 'Ca. P. fraxini' (16SrVII); 'Ca. P. phoenicium' (16SrIX); 'Ca. P. solani' (16SrXII); 'Ca. P. hispanicum' and 'Ca. P. meliae' (16SrXIII); 'Ca. P. brasiliense' (16SrXV) (MONTANO *et al.*, 2024).

The presence of phytoplasma strains closely related to 'Ca. P. aurantifolia = citri' was detected in the *Tabebuia pentaphylla* = rosea (Bertol.) DC. witches' broom disease (GenBank acc. no. EF647744) representative of the 16SrII group (MAFIA *et al.*, 2008).

Thus, this work reports the identification of the causal agent of the witches' broom and progressive death of *T. rosea* trees in Belo Horizonte, MG and present the perspectives on prevention, control and management of *Tabebuia rosea* witches' broom (TrWB) applicable to urban arborization.

MATERIAL AND METHODS

Samples of *T. rosea* were collected from both apparently healthy trees and those exhibiting symptoms of witches' broom, including branch deformities, stunting, decline, and eventual death. These samples were obtained from public areas such as streets and gardens in Belo Horizonte, Minas Gerais state, Brazil, in December 2022 and again in March, April, and May 2023, ensuring replication from the same plants. Sampling focused on branches from the basal and median portions of the trees, selecting symptomatic samples based on characteristic witches' broom symptoms (Figure 1), while asymptomatic samples were taken from branches with no visible signs of disease.

In the Electron Microscopy and Ultrastructural Analysis Laboratory at the Federal University of Lavras, the collected samples were analyzed using the following methodologies: 1) tissues from the bark, stem and buds were placed in Petri dishes, in a humid chamber for 48 h at a temperature of 25ºC and then slides were prepared from the microorganisms that showed growth and observed under light microscopes using objectives at various magnifications; 2) Peel, stem and bud tissues were superficially disinfected and placed in Petri dishes containing potato culture medium, dextrose and agar (PDA) and incubated for 48 h at a temperature of

25ºC. Slides were then prepared from the microorganisms that showing growth and observed under light microscopes at different magnifications; 3) Bark tissues, in the phloem region, were cut and prepared for analysis under scanning electron microscopes. The sample preparation methodology for Scanning Electron Microscopy was carried out as described by Alves *et al*. (2013). The specimens obtained were observed under scanning electron microscopes LEO EVO 40XVP and TESCAN – CLARA. Several images were digitally generated and recorded at variable magnifications for each sample, under operating conditions of 20 kV and a working distance of 9 mm.

Additionally, bark tissues from the phloem region were sent to the Molecular Phytovirology Laboratory for nested-PCR analysis. DNA extraction followed the 2% CTAB protocol with a sorbitol pre-wash, as described by Inglis *et al*. (2018). For amplification, universal primers were used (Table 1), and each PCR reaction was performed in a final volume of 25 µL, containing 1 µL of total extracted DNA (diluted 1:30), 2.5 µL of 10× Taq polymerase High Fidelity Hot Start buffer, 1 µL each of forward and reverse primers (GUNDERSEN; LEE, 1996; LEE *et al*., 1993) at 10 pM, 1 µL of 2 mM dNTPs, 0.25 µL of High Fidelity Hot Start Taq polymerase, and DEPC-treated ultrapure water to complete the volume. The amplification protocol consisted of an initial denaturation at 94°C for 3 min, followed by 35 cycles of denaturation at 94°C for 30 s, primer annealing at the respective temperature for 30 s, and extension at 72°C for 1 minute, concluding with a final extension at 72°C for 5 min (GUNDERSEN; LEE, 1996; LEE *et al*., 1993).

Table 1. Sequence of the oligonucleotides of the primers used for identifying the phytoplasmas in *Tabebuia rosea* sampled in Belo Horizonte public places.
Tabela 1. Sequência dos oligonucleotídeos dos primers utilizados para a identificação dos fitoplasmas em *Tabebuia rosea* amostradas em locais públicos de Belo Horizonte.

Method	Primer	Sequence (5’- 3’)	T (°C)	Reference
Conventional PCR	R16mF2/ R16mR1	Forward CATGCAAGTCGAACGGA Reverse CTTAACCCCAATCATCGAC	55	LEE *et al*., 1993.
Nested-PCR	R16F2n/ R16R2	Forward GAAACGACTGCTAAGACTGG Reverse TGACGGGCGGTGTGTACAAACCCCG	60	GUNDERSEN & LEE, 1996.

The products obtained by nested-PCR were subjected to analysis by electrophoresis in 1% agarose gel in 0.5X TBE buffer. The first-round PCR was performed using the primer pair R16mF2/R16mR1 (LEE *et al*., 1993), while the nested-PCR used the primer pair R16F2n/R16R2 (GUNDERSEN; LEE, 1996), resulting in an amplification of 1200 kb. The electrophoretic process was performed under a constant voltage of 85 V for 60 min. Subsequently, the results were visualized under ultraviolet (UV) light using a transilluminator.

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RESULTS AND DISCUSSION

Field findings - The symptoms observed in samples of *T. rosea* located in public places in Belo Horizonte-MG, indicated in the Figure 1, are consistent with those reported by Mafia *et al*. (2008) and Montano (2013). The Figure 2 shows symptoms of a possible attack by sap-sucking pests such as leafhoppers on *Tabebuia rosea* leaves (leaf chlorosis, feeding damage, and curling leaves). The leafhoppers are one of the phytoplasma vectors (MONTANO, *et al*., 2024). Details of the witches brooms are shown in Figure 3, evidencing the oversprouting, fasciations and hypertrophy of terminal branches and buds. It has been observed that affected branches have darkened internal tissues (Figure 4), initial bud dryout, foliar limb deformation and reduction, branch growth disruption and bud hypertrophy (Figure 5).

Figure 1. Symptoms observed in specimens of *Tabebuia rosea* sampled in Belo Horizonte streets: mild symptoms (A), prominent symptoms (B), severe symptoms (C) of 'witches' broom'.

Figura 1. Sintomas observados em espécimes de *Tabebuia rosea* amostrados em ruas de Belo Horizonte. (A) sintomas suaves (setas), (B) moderados (setas), (C) severos de vassoura-de-bruxa.

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Figure 2. Symptoms of damage caused by sap-sucking pests observed on *Tabebuia rosea* leaves in Belo Horizonte streets: Chlorosis, feeding damage (A) and curling warped leaves (A, B).

Figura 2. Sintomas de danos ocasionados por insetos sugadores, observados em folhas de *Tabebuia rosea* em ruas de Belo Horizonte. (A) clorose, dano por herbivoria e (A, B) folhas recurvadas e deformadas.

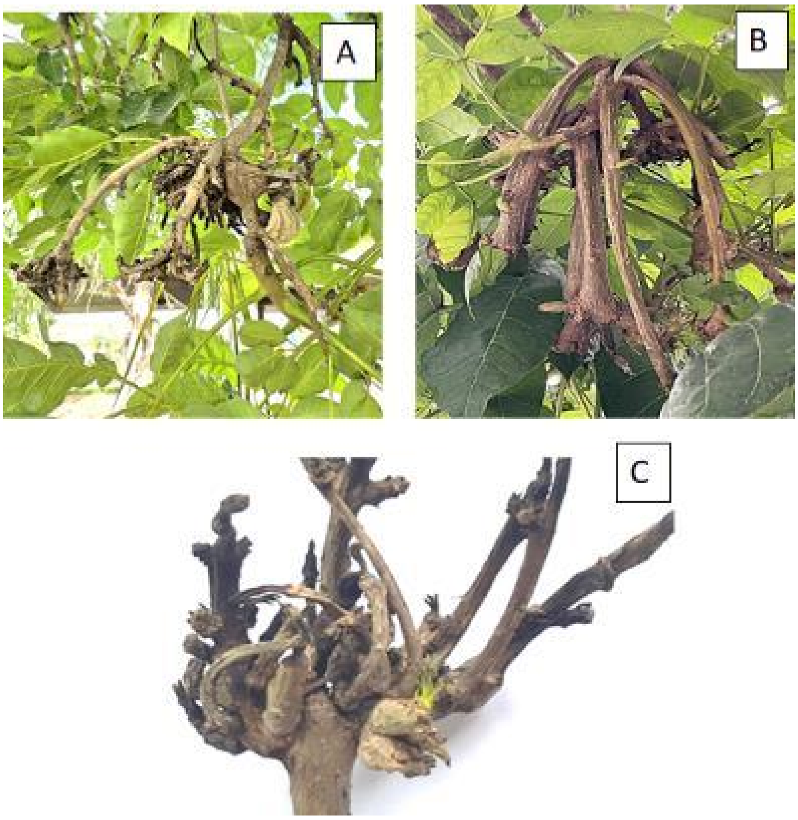

Figure 3. Symptoms of Witches' broom' on terminal branch of *T. rosea* (A, B). Detail of the symptoms (C).

Figura 3. Sintomas de 'vassouras-de-bruxa' em ramificações terminais de *T. rosea* (A, B). Vista em detalhes (C).

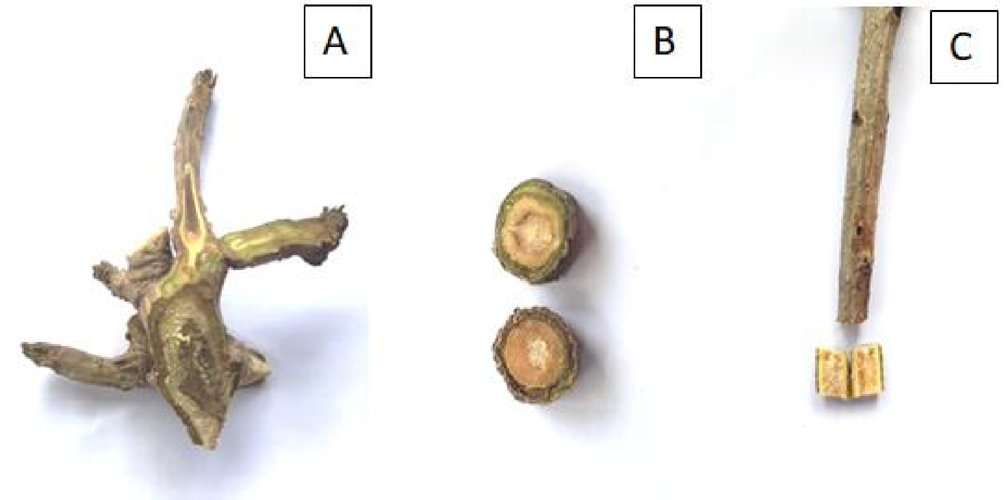

Figure 4. View of internal tissues of symptomatic trees – cross section of the witches' broom (A), cross section affected branch (B), longitudinal section of affected branch (C).

Figura 4. Detalhe dos tecidos internos de plantas sintomáticas – seção transversal de uma 'vassoura-de-bruxa' (A), seção transversal de um ramo afetado (B), seção longitudinal de um ramo afetado (C).

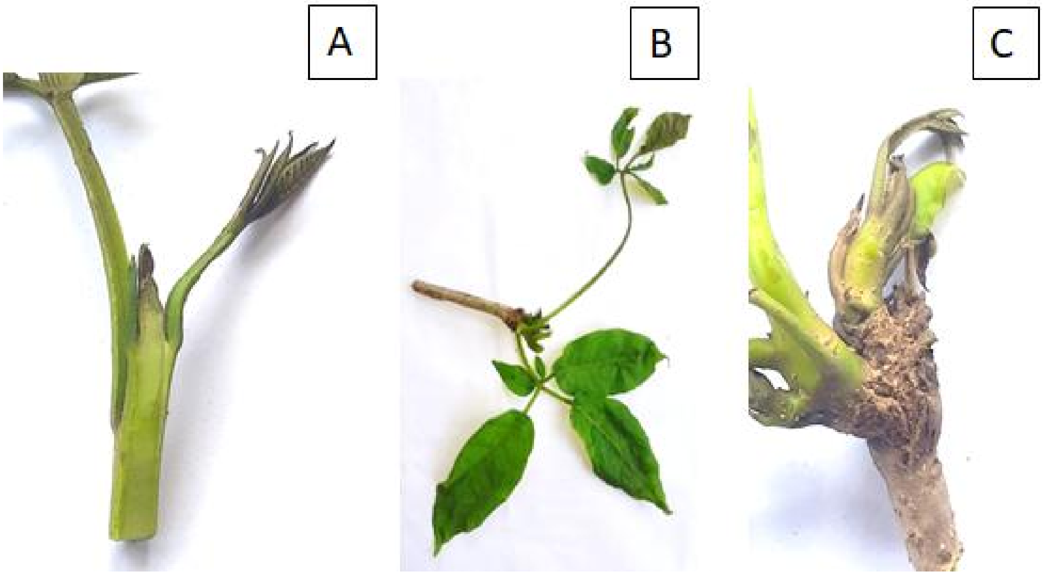

Figure 5. Detail view of terminal shoots of symptomatic trees – initial bud dryout (A), foliar limb deformation and reduction (B), branch growth disruption and bud hypertrophy (C).

Figura 5. Detalhe dos brotos terminais de árvores sintomáticas - Seca inicial do meristema apical (A); deformação e redução do limbo foliar (B), paralisação do crescimento dos ramos e hipertrofia de gemas (C).

Laboratory analyses - The results of the analysis of part of the material using the wet chamber and isolation methods in PDA medium did not reveal any phytopathogens, and the fungi observed were all saprophytes.

In Scanning Electron Microscope analyses, phytoplasmas were detected within phloem sieve-tube member cells in symptomatic *T. rosea* samples (Figure 6). In samples from asymptomatic plants, no phytoplasmas were found (Figure 6E). The phytoplasmas present in the phloem sieve-tubes member cells of symptomatic *T. rosea* plants had variable sizes and a spherical to ovoid shape, characteristics consistent with what was reported by Lebsky and Poghosyan (2014) in tomato plants.

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The presence of typical phytoplasmas (spherical to ovoid cells of variable sizes) in cells of diseased plants and the absence of this organism in a plant without symptoms are evidence that the disease is associated with a phytoplasma causing witches' broom and progressive death of *T. rosea*.

The molecular identification of phytoplasmas in *T. rosea* was carried out using nested-PCR tests, concluding that *Candidatus* Phytoplasma sp. is the etiological agent associated with the witches' broom of ipê-rosa (Figure 7).

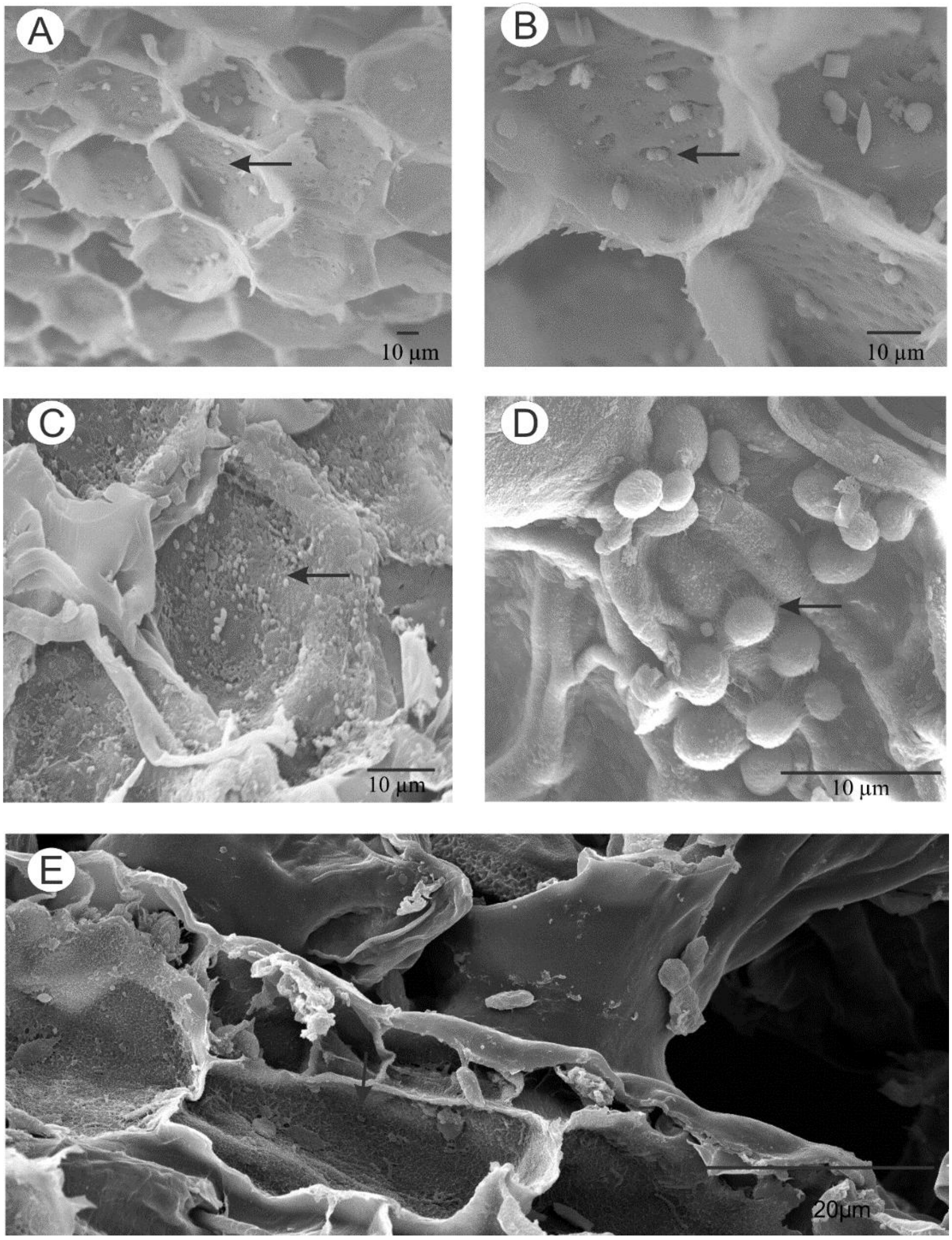

Figure 6. Scanning Electron Micrographs of phytoplasmas attached to plant bark tissue cells, in the phloem region of diseased ipê plant - *Tabebuia rosea*; (A) Overview of sieve-tube member cells of phloem with phytoplasmas adhered (arrow). (B) Magnification of phytoplasma in the cell of the image A (arrow). (C) High concentration of phytoplasmas cells in phloem (arrow) and (D) details of the phytoplasmas adhered to cell (arrow). (E) Phloem from health plant. No phytoplasmas.

Figura 6. Microscopia eletrônica de varredura de fitoplasmas aderidos à células de tecidos da casca na região do floema de ipês (*Tabebuia rosea*) doentes; (A) Visão de células membro dos tubos crivados do floema com fitoplasmas aderidos (seta). (B) Fotografia em detalhe do fitoplasma na célula da imagem A (seta). (C) Alta concentração de células de fitoplasmas no floema (seta) e (D) detalhes de um fitoplama aderido à célula (seta). (E) Floema de plantas sem sintomas sem fitoplasmas.

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Nested-PCR tests for *T. rosea* samples collected in December 2022 and May 2023 tested positive for the phytoplasma. However, this result was not repeated for samples of the same ipê-rosa specimens collected in March and April 2023. Several studies on woody plants have shown the seasonal detection of phytoplasmas, indicating that these microorganisms can migrate from the aerial part to the root of their host or overwinter in the phloem of any organ of the plant, informing the need for suitability of analysis of different types of plant tissue for reliable phytoplasma detection (GARCIA-CHAPA *et al*., 2003). We can infer that the experiment showed a seasonal fluctuation in the concentration of the phytoplasma, migration or overwintering of the *T. rosea* pathogen from the stem to another organ of the tree in the period from March to April, which made prevented detection of the microorganism through molecular testing.

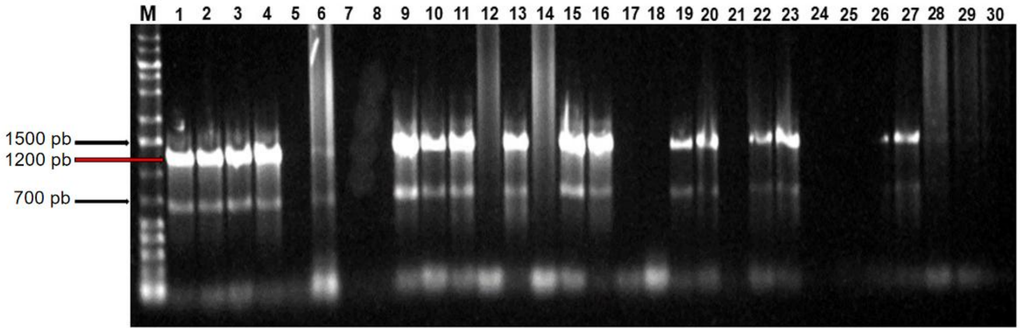

Figure 7. Agarose gel electrophoresis showing specific PCR products from nested-PCR reactions using primers for phytoplasma detection (R16F2n/R16R2 in the first reaction and R16mF2/R16mR1 in the second PCR reaction) in *Tabebuia rosea* samples collected from streets of Belo Horizonte. The first lane (M) corresponds to the 1 kb Plus DNA Ladder (MMK-130). The remaining lanes represent analyzed samples, where amplification resulted in a specific band at 1200 bp, as expected. Lanes without amplification correspond to samples from asymptomatic plant tissues. The 700 bp bands observed in some samples correspond to nonspecific amplification products.

Figura 7. Gel de agarose mostrando especifico produtos da PCR da reação de nested–PCR, usando o primer para detecção de fitoplasma (R16F2n/R16R2 na primeira reação e R16mF2/R16mR1 na segunda reação) em amostra de *Tabebuia rosea* de ruas de Belo Horizonte. Observe amplificação para amostras positivas para fitoplasma em 1200 bp.

Perspectives on prevention, control and management of *Tabebuia rosea* witches' broom (TrWB) on urban forest

The phytoplasma current prevention and control methods include disease quarantine, the removal of phytoplasma from asexual propagation materials, the creation of germ-free seedlings, the selection of resistant varieties, effective cultivation management, physical and chemical treatment, biological control and other measures (WANG *et al*., 2024).

The prevention approach on urban forest should include inspecting all forest seedling nurseries in order to prevent the use of contaminated stock plants, as well as the dissemination of forest seedlings derived from them. In this sense, early detection of seedlings affected by TrWB is critical. Although, host plants sometimes do not show typical symptoms after phytoplasma infection and sometimes show symptoms that are difficult to distinguish from viral or physiological diseases. Phytoplasmas are mostly detected through symptom observation, electron microscopy, histochemical staining, serological detection and molecular biological

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detection (BERTACCINI, 2007). The histochemical staining method can be used for early detection of infection (AKHTAR *et al*., 2009). However, these histochemical staining methods are prone to false-positive results (WANG *et al*., 2024).

The field tests for detecting the TrWB infected plants are not yet available, and their development could be enable actions to be taken to exclude the pathogen and prevent its spread, making it possible to identify contaminated seedlings and stock plants suppliers of propagative material (sexual or asexual propagules). It was found that propagation by grafting, cuttings, tubers, rhizomes and seeds can spread phytoplasmas (SATTA *et al*., 2019). Thus, detection techniques are needed, and if a disease has been detected, the diseased plants need to be eradicated quickly to reduce the source of infection.

Disease quarantine is the main method to prevent the easy spread of phytoplasmas through vegetative propagation material (WANG *et al*., 2024). Thus, the receipt and planting of new *T. rosea* seedlings must be preceded by quarantine measures and tests to detect phytoplasmas in this species, which are not yet available to seedling nurseries in Brazil. In this sense, the most effective action would be to restrict the adoption of *T. rosea* in landscaping and urban arborization, aiming to prevent contaminated seedlings from entering the municipality.

The most promising strategy for controlling phytoplasma diseases is based on selection of natural resistant or tolerant plant varieties. The selection and use of resistant plants seem to be the best approach for preventing phytoplasma diseases. Cultivars that are genetically resistant to phytoplasmas offer the best method of phytoplasma control. However, natural resistance is rare (CAGLAYAN; TULUM, 2023). Furthermore, the breeding resistant cultivars are time-consuming and may not be successful.

Another cultivation management measure to prevent phytoplasma diseases is the pruning techniques. Local pruning of diseased trees can also reduce the source of infestation, as asymptomatic tissues have lower phytoplasma content, and in some cases, trees can recover after pruning (WANG et al., 2024). However, pruned trees remain a source of disease inoculum for healthy trees and should be adopted together with control of insect vectors.

In Belo Horizonte-MG, observations after fifteen months on severely affected *T. rosea* trees subjected to pruning showed no recovery (Figure 8). In this case, the tree did not recover and remained a source of phytoplasma inoculum.

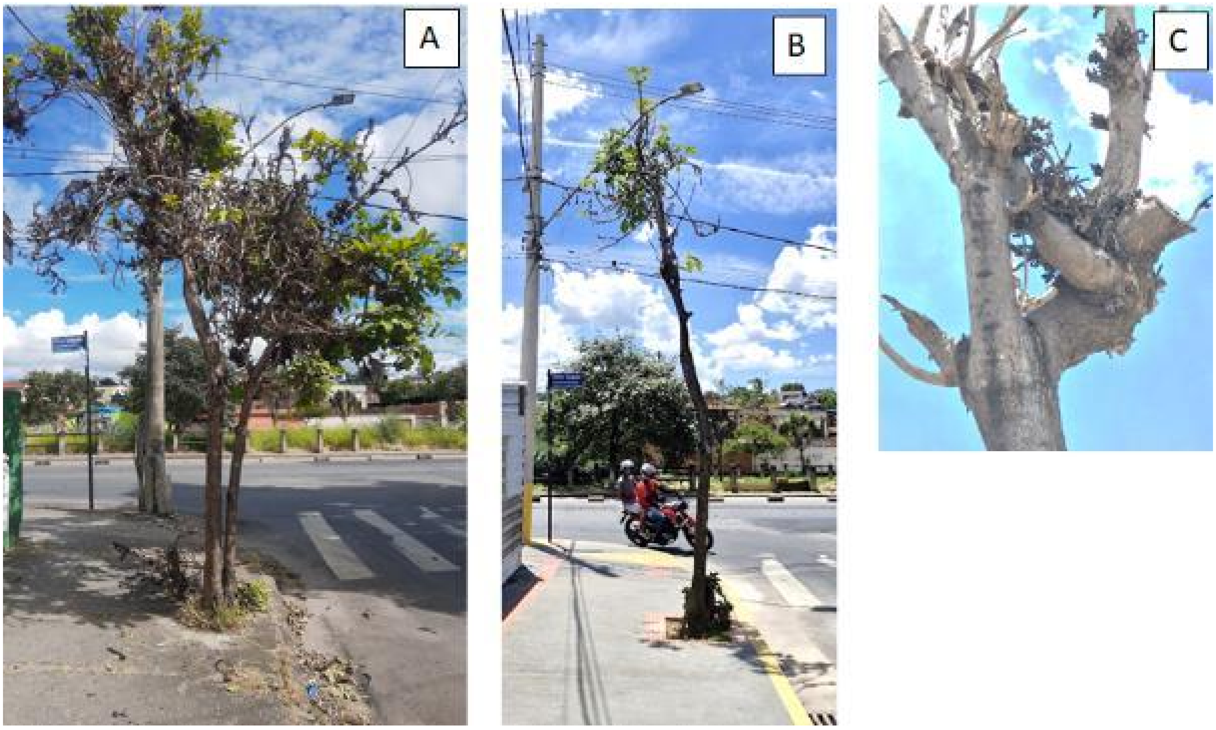

Figure 8. General view of *Tabebuia rosea* tree before (A) and fifteen months after pruning (B). Severe pruning of affected branches did not promote regrowth of branches (C).

Figura 8. Vista geral de arvores de *Tabebuia rosea* antes (A) e 15 meses após a poda (B). Poda severa de ramos afetados não promove a rebrota dos ramos (C).

The cultivation management approach must include the elimination of sources of phytoplasmas and on the control of insect vectors. In addition, global warming and climate change are urging problems against phytoplasma insect vector management. Vectors that are adapted to warmer climates and warmer winters may facilitate the worldwide spread of phytoplasma diseases. In the inspections carried out on urban arborization in Belo Horizonte-MG, no specific insect vectors were found in the *T. rosea* street trees. Investigations should be carried out to identify and associate possible insect vectors to TrWB. Indeed, in forest trees, little is known about the exact species of the insect vectors (MARCONE *et al*. 2021). The planthoppers families are widely cited as capable of transmitting disease-causing phytoplasma (PASSOS *et al*., 2022), but the lack of information about phytoplasma vectors in *T. rosea*, has been a limiting factor in understanding and controlling diseases associated with these pathogens.

One of the control methods for phytoplasma diseases include infusion treatment of tree trunks with tetracycline hydrochloride, oxytetracycline and compound agents, which are mainly applied to some high-value plants. There are also numerous plant-derived agents and nontoxic compounds, such as *Tripterygium wilfordii* hook. f., sterol, indole-3-butyric acid (IBA), 1-naphthaleneacetic acid (NAA), microfertilizers, inducers and resistors, with potential development value that needs to be explored (WANG *et al*., 2024). For perennials in gardens, which tend to be highly valuable and few in number, approved antibiotics, hormones and so on can be injected directly into the phloem of the tree trunk to delay the development of disease symptoms and prolong the life of the plant (WANG *et al*., 2024). However, the chemical treatment is unfeasible or not recommended on urban tree conditions in Brazil.

The use of antibiotics can prevent or control phytoplasma infection in individual host plants. To get better results, antibiotics must be used bi-weekly for four months by systemic treatment. This method is costly and cannot be used in commercial production; however, it can be applied for beneficial and decorative palms in hotels or tourist sites. However, the use of antibiotics is forbidden in developed countries. Because of the perceived health risks and cost of this approach, antibiotics can be used to protect cherished ornamental trees but have never been considered as a continuous way of management (HEMMATI *et al*., 2020).

Biological control measures mostly include the use of predatory natural enemies, parasitoid natural enemies and insecticidal microorganisms to reduce the density of vector insects. Other biological control measures, such as endophytic bacteria, cross-protection of nontoxic or attenuated strains to inhibit the damage caused by pathogen infection, have not been applied to phytoplasma diseases at present and could be studied in the future (WANG *et al*., 2024).

Alternative and environmentally friendly methods aimed at eliminating the phytoplasma by inducing plant resistance have shown an increase in host performance, but have not eliminated the pathogen, possibly due to the ability of this microorganism to manipulate various metabolic pathways of its hosts (BERTACCINI, 2022; OSHIMA *et al*., 2011; RIBEIRO; BEDENDO, 2006).

Due to the lack of treatments for the control of diseases caused by phytoplasmas, preventive measures are the main means of combating and eliminating them. Periodic inspections should be carried out in green areas to check the presence of young and adult specimens of *T. rosea* with symptoms of overgrowth of branches, stunting and tree dieback and arrange for the elimination of the infected tree in a timely manner.

Finally, we suggest the gradually replace exotic tree species in urban afforestation with species native to the region, which can be more resistant to exotic pests, increasing biodiversity and natural ecosystems.

CONCLUSIONS

This is the first record of *Tabebuia rosea* witches' broom (TrWB) in Belo Horizonte, Minas Gerais; the *Candidatus* Phytoplasma sp. it is the etiological agent associated with the witches' broom of *T. rosea* (ipê-rosa).

Since there are still no recommended control measures, it is suggested the adoption of integrated management measures for *T. rosea* trees in urban arborization, such as:

a) Restricting the planting of *T. rosea* tree on the public areas, and simultaneously increase the use of native tree species;
b) Inspecting all forest seedling nurseries in order to prevent the use of contaminated stock plants;

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c) The establishment of quarantine measures;
d) Eradicate the diseased and symptomatic plants;

New studies should be carried out with a view to identifying the species of insect vector of TrWB and aiming to obtain additional information on the distribution of this phytoplasmosis in the Municipality. The development of field tests for detecting the TrWB infected plants is a priority in order to avoid the spread of contaminated propagating material.

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