UNIVERSIDADE ESTADUAL DE CAMPINAS
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TIAGO PEREIRA RIBEIRO DA GLORIA

COMO A VARIAÇÃO NO NÚMERO CROMOSSÔMICO PODE INDICAR RELAÇÕES EVOLUTIVAS ENTRE A CAATINGA, O CERRADO E A MATA ATLÂNTICA?

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Dissertação apresentada ao Instituto de Biologia da Universidade Estadual de Campinas como parte dos requisitos exigidos para a obtenção do título de Mestre em Biologia Vegetal.

Orientador: Prof. Dr. Fernando Roberto Martins

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Os membros da Comissão Examinadora acima assinaram a Ata de Defesa, que se encontra no processo de vida acadêmica do aluno.

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“Para onde vão os trens meu pai? Para Mahal, Tamí, para Camirí, espaços no mapa, e depois o pai ria: também pra lugar algum meu filho, tu pode ir e ainda que se mova o trem tu não te moves de ti.”

Hilda Hilst

RESUMO

Neste trabalho testamos as hipóteses de que 1) a alta frequência de poliploides em um bioma poderia indicar que esse bioma tem origem recente e 2) poliploides são mais bem adaptados do que diploides a ambientes severos, sendo, portanto, mais frequentes nesses ambientes. Usamos a Caatinga, o Cerrado e a Mata Atlântica como biomas-modelo para testarmos estas hipóteses. Comparamos o número cromossômico das espécies presentes em cada bioma e a origem de alterações no número cromossômico (*i.e.*, ocorrência de disploidia/aneuploidia e poliploidia) entre e dentro desses biomas. Esperamos que 1) se números cromossômicos mais altos e poliploides forem mais frequentes em ambientes severos, a Caatinga terá os maiores números de cromossomos e a maior proporção de poliploides, seguidos pelo Cerrado e pela Mata Atlântica; no entanto, 2) se números cromossômicos mais altos e poliploides forem mais frequentes em biomas mais recentes, o Cerrado terá os maiores números de cromossomos e a maior proporção de poliploides, seguidos pela Caatinga e pela Mata Atlântica. A partir de um extenso banco de dados florístico de espécies dicotiledôneas arbustivo-arbóreas que ocorrem em cada bioma, pesquisamos na literatura científica o número somático ($2n$) das espécies e o número base (x) de gêneros e famílias. Realizamos análises de distribuição de frequências (normalidade, assimetria e curtose) dos números cromossômicos em cada bioma, em espécies comuns aos três biomas e em espécies exclusivas de cada bioma; análise de variância (*One-Way* ANOVA) para comparar o número cromossômico médio entre cada bioma e entre espécies comuns e exclusivas; e análise de qui-quadrado de homogeneidade para comparar classes de número cromossômico entre biomas e entre espécies comuns e exclusivas e avaliar diferenças de origem das alterações do número cromossômico. Nosso banco de dados florístico contém 4092 espécies de dicotiledôneas arbustivo-arbóreas pertencentes a 826 gêneros e 126 famílias. Encontramos o número cromossômico de 965 espécies (23,6%) pertencentes a 412 gêneros e 82 famílias em publicações especializadas. Nossos dados revelaram que a distribuição da frequência dos números de cromossomos em todos os biomas e em espécies comuns e exclusivas era não-normal, leptocúrtica e moderadamente assimétrica para a direita. Entretanto, classes mais altas de números cromossômicos e poliploidia foram mais frequentes no Cerrado. Nossos resultados corroboram a hipótese de que a poliploidia pode indicar a origem mais recente de uma bioma.

Palavras-chave: evolução, floresta seca, floresta úmida, ploidia, savana, disploidia.

ABSTRACT

It has been hypothesized that 1) high polyploidy frequency in a biome could indicate its recent origin and 2) that polyploids are better adapted to harsh environments than diploids, therefore being more frequent in such environments. In this work we tested for those hypotheses using the Atlantic forest, the Caatinga and the Cerrado as model biomes. We compared the chromosome number of species in each biome and the origin of chromosome number alteration (*i.e*, the occurrence of dysploidy/aneuploidy and polyploidy) among and within those biomes. We expected that 1) if high chromosome numbers and polyploidy are more frequent in severe environments, the Caatinga will have the highest chromosome numbers and the highest proportion of polyploids, followed by the Cerrado and the Atlantic forest; however, 2) if high chromosome numbers and polyploidy are more frequent in more recent biomes, the Cerrado will have the highest chromosome numbers and the highest proportion of polyploids, followed by the Caatinga and the Atlantic forest. From a floristic database of dicotyledonous shrub-tree species that occur in each biome, we surveyed the scientific literature for the somatic number ($2n$) of species and base number (x) of genera and families. We conducted analyses of frequency distribution (normality, skewness and kurtosis) of the chromosome numbers in each biome, of species common to all biomes and of species exclusive to each biome; analysis of variance (One-Way ANOVA), to compare the mean chromosome number among biomes and between common and exclusive species; and the chi-square test of homogeneity, in order to compare classes of chromosome numbers among biomes and to assess differences among the origin of chromosome number alterations. Our floristic database contains 4092 dicotyledonous shrub-tree species belonging to 826 genera and 126 families. We found the chromosome number of 965 species (23.6%), belonging to 412 genera and 82 families in specialized literature. Our data revealed that the distribution of the frequency of chromosomes numbers was non-normal, leptokurtic and moderately skewed to the right for species in all biomes and for common and exclusive species. However, classes of high chromosome numbers and polyploidy were more frequent in the Cerrado. Our results corroborate the hypothesis that polyploidy can indicate a more recent biome origin.

Keywords: evolution, dry forest, wet forest, ploidy, savanna, dysploidy

SUMÁRIO

Introdução geral

Com o redescobrimento dos trabalhos de Mendel por de Vries, Correns e Tschermak em 1900, estabeleceu-se o papel do cromossomo como agente transportador das características genéticas hereditárias (Lacadena 1997). As obras seminais de Sutton (1902, 1903) traçaram um paralelo entre a meiose e a lei Mendeliana da hereditariedade (Lacadena 1997) que, em conjunto com o trabalho de Boveri (1902), constituem a base da teoria da herança cromossômica. Como uma nova explicação para a hereditariedade, Johannsen (1911) propôs a palavra “gene” para designar o que autores diferentes chamavam de fatores unitários ou elementos ou alelomorfos nos gametas. Em 1915, Thomas H. Morgan, Alfred H. Sturtevant, Hermann J. Muller e Calvin B. Bridges publicaram o livro “The Mechanism of Mendelian Heredity” (Morgan et al. 1915), no qual demonstraram que genes são entidades físicas organizadas num arranjo linear ao longo dos cromossomos que seguem a lei de segregação independente de Mendel (Bellen e Yamamoto 2015). Assim, Thomas H. Morgan é considerado o principal arquiteto da teoria da herança cromossômica (Gayon 2016).

Durante todo este período, acreditava-se que a informação genética fosse coordenada por proteínas. No entanto, em 1868, o médico suíço Johann Friedrich Miescher (Miescher 1871), estudando leucócitos, isolou um composto que não era nem um lipídio e nem proteína e batizou-o de “nuclein”, posto que o isolou do núcleo da célula (Dahm 2008). Apesar de sua importância, o trabalho de Miescher foi pouco divulgado na época, provavelmente devido a sua personalizade reclusa, sua dificuldade em se comunicar e a competição entre pesquisadores após a descoberta da “nuclein” (Dahm 2008). Os estudos das nucleínas culminaram com a descoberta de sua composição por Ludwig Karl Martin Leonhard Albrecht Kossel, que separou uma porção proteica e uma porção não proteica, esta constituída por ácidos compostos por cinco bases (adenina, citosina, guanina, timina e uracila), que ele chamou de ácidos nucleicos (Kossel 1881). Cerca de 75 anos mais tarde, o artigo publicado por Oswald T. Avery, Colin M. MacLeod, e Maclyn McCarty em 1944 (Avery et al. 1944) foi um marco na história da genética por sugerir que o DNA é o carreador de informações genéticas. Erwin Chargaff, no final da década de 1940, descobriu que as bases adenina, timina, guanina, citosina estão presentes em proporções fixas no

DNA (Chargaff et al. 1949; Chargaff 1951). A confirmação do DNA como material genético veio de Alfred Hershey e Martha Chase em 1952. No ano seguinte, a estrutura do DNA foi descrita por Rosalind Franklin e Maurice Wilkins, Francis Crick e James Watson (Watson e Crick 1953).

Concomitantemente, no início do século XX, a citogenética passou a ganhar forma. Inicialmente, os estudos citogenéticos eram principalmente descritivos, porém a citogenética moderna preocupa-se não apenas com a descrição da morfologia dos cromossomos, mas também com a análise de sua estrutura e função molecular (Lacadena 1997). Logo, a citogenética é a ciência que estuda a morfologia, organização, função, replicação, origem e evolução do cromossomo isolado ou em conjunto, tanto distendido quanto condensado (Guerra 1988). A citogenética de plantas tem sido amplamente aplicada na avaliação da relação genética entre espécies ou entre populações de espécies e na avaliação dos processos que permitiram que essas espécies ou populações divergissem (Guerra 2008). Desta forma, é possível identificar sinapomorfias e grupos irmãos entre táxons (Dobigny et al. 2004).

A caracterização do cariótipo de uma espécie, ou de uma população de uma espécie, é um dos trabalhos mais basais da citogenética. A característica cariotípica mais fácil e rapidamente identificável é o número de cromossomos. Plantas apresentam uma grande diversidade de números cromossômicos. Em gimnospermas, o número cromossômico somático varia entre $2n = 14$ (*Amentotaxus argotaenia* (Hance) Pilg., Taxaceae) e $2n = 66$ (*Sequoia sempervirens* (D. Don) Endl., Cupressaceae) (Murray 2013). Lycophyta e Monilophyta (Pteridófitas) tendem a ter números bem altos, com uma média de 57,05 cromossomos gaméticos (Barker 2013). Angiospermas possuem representantes com números cromossômicos muito baixos e muito altos, variando desde quatro cromossomos somáticos em *Brachyscome dichromosomatica* C.R.Carter, *Colpodium versicolor* (Steven) Schmalh., *Haplopappus gracilis* (Nutt.) A.Gray, *Ornithogalum tenuifolium* F.Delaroche e *Zingeria biebersteiniana* (Claus) P.A.Smirn. (Castiglione e Cremonini 2013), até 640 cromossomos somáticos em *Sedum suaveolens* Kimnach (Uhl 1978).

O número cromossômico encontrado nas células somáticas, *i.e.*, conjunto completo de cromossomos, é indicado por “$2n$”, enquanto que o número encontrado nas células gaméticas é indicado por “n” (Guerra 2008). Outro número cromossômico relevante é o número cromossômico básico, indicado por *"x"*. Recentemente, o símbolo usado para representá-lo foi alvo de discussão. Segundo Peruzzi (2013), "*x*" foi proposto por Darlington (1937) para indicar o número cromossômico monoploide básico de uma série poliploide, na qual $n = x$ ocorreria apenas em espécies diploides e $n > x$ em espécies poliploides. Por exemplo, diferentes citótipos da espécie *Senna gardneri* (Benth.) H.S.Irwin & Barneby apresentam $2n = 26$, 52 e 104 (Matos et al. 2011) e, respectivamente, $n = 13$, 26 e 52. Tendo em vista que o número básico da espécie é $x = 13$, *i. e.* o conjunto monoploide da espécie ancestral tem 13 cromossomos, os organismos resultantes são diploides ($2n = 2x$), tetraploides ($2n = 4x$) e octaploides ($2n = 8x$). Porém, em estudos evolutivos, o número cromossômico básico de interesse é o do ancestral do grupo. Historicamente, "*x*" tem sido utilizado como símbolo deste número, sendo definido como o número haploide observado num táxon que melhor explica a variação do número cromossômico dentro do grupo (Guerra 2012). No entanto, Peruzzi (2013) sugere que a letra grega ρ (rhô) seja a mais indicada para este fim, para evitar confusões com o "*x*" de número cromossômico básico monoploide. Apesar da recomendação de Peruzzi (2013), optamos por manter o "*x*" como símbolo representante do número cromossômico básico do ancestral e seguir a definição dada por Guerra (2012). Desta forma, este trabalho ficará alinhado com o que tem sido mais utilizado na literatura.

As alterações no número cromossômico podem se originar de aneuploidias, disploidias e poliploidias (Guerra 2008). Aneuploidias envolvem a perda ou ganho de um ou mais cromossomos por deleção ou adição (Guerra 2008). Em organismos diploides (ou seja, com dois conjuntos de cromossomos), a aneuploidia pode ser letal, mas organismos poliploides, por possuírem genoma redundante, são mais resistentes a deleções ou adições de cromossomos inteiros do que os organismos diploides (De Storme e Mason 2014; Van De Peer et al. 2017; Mandáková e Lysak 2018). A disploidia se assemelha à aneuploidia pelo fato de ambas envolverem mudanças numéricas de um ou poucos cromossomos (Guerra 2008). No entanto, a disploidia se dá por rearranjos via fusão ou fissão cromossômica, evento com pouca perda de material genético (Guerra 2008). Poliploidia, frequentemente chamada de duplicação total do genoma (do inglês, *whole genome duplication* ou *WGD*), é a duplicação ou multiplicação do conjunto cromossômico (Guerra 2008).

A poliploidia tem sido considerada a alteração numérica mais importante na evolução das plantas (Stebbins 1971; Soltis et al. 2015). Sua frequência varia muito, estando presente em 95% das pteridófitas (Grant 1981), mas muito pouco presente em briófitas (Averett 1980). Estima-se que de 35% (Stebbins 1950) a 70% (Masterson 1994) das angiospermas são poliploides, e que ao menos 15% dos eventos de especiação em angiospermas envolvem poliploidia (Wood et al. 2009). A poliploidia é considerada o principal gerador de novidades evolutivas em angiospermas devido à variedade genética que introduz (Levin 1983; Soltis et al. 2014; Soltis e Soltis 2016). Em alopoliploides, (poliploides formados por hibridização) essa variedade pode originar-se pela expressão de genes das espécies parentais e formação de novos alelos através da recombinação entre as cópias dos parentais (Roose and Gottlieb 1976; Soltis et al. 2014), enquanto em autopoliploides (poliploides formados dentro de uma mesma espécie) alguns genes do genoma duplicado podem adquirir novas funções (Spoelhof et al. 2017). Ademais, poliploides podem apresentar distribuição diferente da de seus progenitores devido à geração de novidade ecofisiológica, por exemplo, permitindo a colonização de novos habitats (Soltis et al. 2014). A variação genética e genômica dos poliploides leva à radiação adaptativa, acelerada pela rápida formação de barreiras de fluxo gênico entre populações (Soltis et al. 2014).

A formação de um indivíduo poliploide pode ocorrer devido à restituição meiótica (do inglês, *meiotic restitution*) ou à poliploidização somática (De Storme e Mason 2014). A restituição meiótica ocorre quando há um erro durante a meiose na gametogênese, levando à formação de gametas 2*n* (De Storme e Mason 2014). Desta forma, a união deste gameta 2*n* com um gameta *n* pode levar a formação de um indivíduo triploide (poliploidização sexual unilateral). Entretanto, caso a fertilização ocorra entre gametas 2*n*, um indivíduo tetraploide pode ser formado via poliploidização sexual bilateral (De Storme e Mason 2014). A formação de gametas diploides masculinos e femininos está associada a fatores abióticos, como variações na temperatura (De Storme e Mason 2014). Ademais, muitos poliploides são resultantes do cruzamento de espécies diferentes, levando à formação de linhagens alopoliploides, também chamadas de híbridos poliploides (Soltis et al. 2009; De Storme e Mason 2014). A formação de tais gametas não reduzidos garante a restauração da fertilidade desses híbridos e o estabelecimento das populações híbridas.

Em alguns casos, a poliploidização pode acontecer durante a divisão mitótica em tecidos somáticos que podem dar origem a células somáticas poliploides (poliploidização somática). Em plantas que se reproduzem vegetativamente, se a poliploidização somática ocorrer em tecidos de propagação vegetativa, como bulbos, estolões e rizomas, uma linhagem poliploide pode se formar (De Storme e Mason 2014). Assim, havendo a poliploidização em células meristemáticas da camada L2 de gemas que originam tecidos reprodutivos ou das células (pré-)meióticas ou gametofíticas, como megásporos e micrósporos, há a formação de gametas poliploides (De Storme e Mason 2014).

A disploidia também é muito frequente em angiospermas, em muitos casos ocorrendo associada à poliploidia (Escudero et al. 2014). A disploidia pode levar tanto à diminuição, *i.e.* disploidia descendente via fusão cêntrica, quanto ao aumento do número cromossômico, *i.e.*, disploidia ascendente via fissão cêntrica, (Perry et al. 2004; Lysák and Schubert 2013). Dados genômicos de grandes famílias de angiospermas, como Asteraceae, Brassicaceae, Poaceae e Solanaceae, sugerem que a disploidia descendente é muito mais frequente (Mandáková e Lysak 2018). Como os rearranjos estruturais não causam variação no conteúdo genético, a disploidia resultante levaria a linhagens mais persistentes que a poliploidia (Escudero et al. 2014).

Várias hipóteses sobre a ecologia dos poliploides têm sido propostas (Ramsey e Ramsey 2014). Hagerup (1931), ao estudar a distribuição de diploides e poliploides de vários gêneros, propôs que poliploides devem ser mais bem adaptados a ambientes extremos do que diploides. Essa hipótese foi confirmada por Johnson e Packer (1965), que observaram um aumento na frequência da poliploidia em angiospermas no noroeste do Alasca em gradientes edáficos e, posteriormente, por Brochmann et al. (2004), que notaram que o nível de poliploidia aumenta fortemente em direção ao norte no Ártico. Mas essa hipótese foi refutada por Löve (1953), que analisou a frequência da poliploidia na flora da Islândia, por Martin e Husband (2009), que analisaram espécies de 144 gêneros de angiospermas norte-americanas, por Glennon et al. (2014), ao compararem o nicho climático de poliploides e diploides na América do Norte, e por Pitrez et al. (2014), ao compararem a proporção de poliploides e diploides de espécies que ocorrem em inselbergs no nordeste brasileiro. Em uma análise da distribuição de poliploides em nível global, Rice et al. (2019) observaram que a frequência da poliploidia aumenta em direção a altas latitudes devido, principalmente, ao aumento de ervas perenes, que apresentam maior proporção de poliploides. Apesar de não haver um consenso entre os trabalhos que testaram essa hipótese, comparações entre diploides e poliploides naturais ou sintéticos mostram que poliploides são mais tolerantes à salinidade (Chao et al. 2013), a déficit hídrico (Li et al. 1996; Maherali et al. 2009; Deng et al. 2012; Hao et al. 2013), a ambientes xéricos (Ramsey 2011), extremamente frios (Johnson e Packer 1965; Brochmann et al. 2004; Deng et al. 2012) ou extremamente quentes (Zhang et al. 2010). Ademais, os citótipos poliploides tendem a apresentar maior tolerância ambiental e ocorrem em diferentes condições ambientais em comparação aos citótipos diplóides, como o mostra o trabalho conduzido por Silveira et al. (2016), no qual se analisaram as espécies do gênero *Eugenia* L. no Brasil.

Outra hipótese sobre a ecologia dos poliploides é a de que a alta frequência de poliploides em um bioma poderia ser um indicativo de sua história evolutiva. Morawetz (1990) comparou o número cromossômico de espécies que ocorrem no Cerrado e na Mata Atlântica, concluindo que, tendo em vista o maior número de espécies poliploides, o Cerrado teria uma origem mais recente e que sua flora teria evoluído a partir de espécies de florestas e/ou de savanas vizinhas. A hipótese de Morawetz (1990) concorda com outros trabalhos (Rizzini 1963; Heringer et al. 1977; Sarmiento 1983; Hoffmann et al. 2003; Simon et al. 2009). Ao analisar espécies arbóreas do Cerrado e da floresta, Forni-Martins e Martins (2000) observaram números cromossômicos similares entre o Cerrado e a Mata Atlântica. Assim, a hipótese de Morawetz (1990) foi contestada, e Forni-Martins e Martins (2000) postularam que a diversificação da flora do Cerrado ocorreu por fluxo gênico bidirecional entre a floresta e a savana, sendo a Mata Atlântica a maior contribuidora.

A Caatinga, o Cerrado e a Mata Atlântica são bons modelos para investigarmos a influência do tempo evolutivo e da severidade ambiental na evolução dos números cromossômicos. Primeiramente, são biomas que ocupam uma grande extensão do continente sul-americano: a Caatinga ocupa cerca de 912.529 km² (Silva et al. 2017), o Cerrado se estende por 2.000.000 km² (Durigan e Ratter 2006) e a Mata Atlântica cobre cerca de 1.500.000 km² (Ribeiro et al. 2009), totalizando 4.412.529 m², uma área muito maior que a Europa. A área total desses três biomas é representativa das principais formações tropicais, além de englobar características ambientais peculiares de cada bioma de forma marcante. Por exemplo, as taxas de precipitação dos três biomas são bastante constrastantes: a Caatinga passa por um longo período de seca, que pode chegar a 10 meses, chuvas escassas e imprevisíveis, temperaturas e radiação solar altas (Moro et al. 2015); o Cerrado pode ter uma estação seca de até oito meses e temperaturas altas, além de sofrer queimadas recorrentes (Simon et al. 2009); e a Mata Atlântica apresenta uma estação seca curta (30 dias) ou inexistente, mas que pode chegar a seis meses na floresta Atlântica estacional, temperaturas amenas e grande capacidade de armazenar água no solo (Colombo e Joly 2010; Eisenlohr e de Oliveira-Filho 2015). A época de origem dos três biomas também é marcadamente diferente: enquanto que a flora lenhosa do Cerrado se diversificou há 10 milhões de anos (Ma), no final do Mioceno, coincidindo com o surgimento das gramíneas C4 (Jacobs et al. 1999; Bredenkamp et al. 2002; Simon et al. 2009; Edwards e Smith 2010), a flora xerófila da Caatinga teve sua origem no Eoceno, entre 55-36 Ma (Barreda e Palazzesi 2007), e a flora higrófila da Mata Atlântica surgiu em quase toda a América do Sul há cerca de 60 Ma (Graham 2011) ou 100 Ma (Davis et al. 2005).

Com base nas hipóteses de adaptação diferencial entre poliploides, disploides e diploides e na hipótese de Morawetz (1990), aqui visamos revisitar ambas as hipóteses e verificar se há diferenças significativas na proporção de poliploides, disploides e diploides entre famílias, gêneros e espécies da Caatinga, do Cerrado e da Mata Atlântica. Segundo a hipótese de Morawetz (1990), o Cerrado, por ter uma origem mais recente, teria números cromossômicos mais altos e uma proporção maior de poliploides em comparação com a Caatinga e a Mata Atlântica. Entretanto, a Caatinga, por ser caracterizada por um ambiente mais severo, deve apresentar uma maior proporção de poliploides e números cromossômicos mais altos em comparação com o Cerrado e a Mata atlântica. Além disso, ao considerar o número $2n$ de cada espécie em relação ao número x de seu gênero, é possível investigar se aquele número se originou pela manutenção do x ($2n = 2x$, que aqui chamamos de euploidia), ou por outros tipos de alteração (disploidia ou poliploidia). A investigação da origem da ploidia das espécies permite saber se a origem das alterações numéricas foi diferente entre os biomas e discutir possíveis diferenças nas alterações que predominaram em cada bioma levando as essas diferentes ploidias, permitindo discutir se a especiação ocorreu com alteração no número cromossômico ou com estasia. Dessa forma, com base nas diferenças entre o número de cromossomos em cada bioma e entre as ploidias da flora dicotiledônea arbustivo-arbórea da Caatinga, do Cerrado e da Mata Atlântica, buscamos responder: 1) Há diferença entre o número cromossômico somático das espécies entre e dentro dos biomas? e 2) Há diferenças entre os tipos de alterações no número cromossômico (euploidia, poliploidia e disploidia) entre e dentro dos biomas?

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Chromosome number alteration, biome age, and environmental severity

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Abstract

Does high polyploidy frequency in a biome indicate its recent origin, or are polyploids more frequent in harsh environments? We sought to answer these questions by comparing chromosome numbers and proportions of euploidy ($2n$ = 2x), dysploidy/aneuploidy (2n = non-integer x), and polyploidy($2n \geq$ 3x) among and within three Brazilian biomes: the Atlantic forest, the Caatinga, and the Cerrado. If high chromosome numbers and polyploidy are more frequent in severe environments, the Caatinga should have the highest chromosome numbers and the highest proportion of polyploids; but if high chromosome numbers and polyploidy are more frequent in more recent biomes, the Cerrado should have the highest chromosome numbers and the highest proportion of polyploids. Our data revealed that chromosome number distribution was non-normal, leptokurtic and moderately skewed to the right in all biomes and for common and exclusive species. Euploidy predominated, but Caatinga exclusive species were predominantly dysploid, whereas polyploidy was significantly higher in the Cerrado exclusive species, which had more frequent classes of high chromosome numbers. Our results corroborate the hypothesis that polyploidy can indicate a more recent biome origin and that euploidy and dysploidy have a much more evolutive importance than usually thought.

Key-words: cytogeography, dry forest, Atlantic forest, Cerrado, euploidy, disploidy, polyploidy

1. Introduction

Polyploidy, the state of having more than two complete sets of chromosomes in the cell nucleus, is considered the main evolutionary force in angiosperm plant evolution (Stebbins 1971; Jiao et al. 2011; Soltis et al. 2015). Polyploidy results from the multiplication of the entire chromosome set, which can arise in a single species leading to autopolyploidy, or through interspecific hybridization leading to allopolyploidy (Soltis and Soltis 2009; Buggs et al. 2011). The frequency of polyploidy in plant groups varies greatly (Wood et al. 2009; Wang et al. 2019). Estimates are very low in bryophytes (Averett 1980), but very high in ferns, in which polyploidy is found in 95% of all species (Grant 1981; Pellicer et al. 2018). Though polyploidy has been estimated to occur between 35% (Stebbins 1950) to 70% (Masterson 1994) of the angiosperms, recent estimates are even higher, and nowadays all angiosperms are considered polyploid (Wood et al. 2009; Jiao et al. 2011; Magallon et al. 2019).

Polyploidy is considered a key driver of innovation in angiosperms (Soltis and Soltis 2016) since polyploidization events, especially allopolyploidy (Wang et al. 2019), have been associated with high rates of diversification in angiosperms (Landis et al. 2018; Magallon et al. 2019). Polyploids have also been hypothesized to be better adapted to harsh environments than diploids (Hagerup 1931). Comparisons between diploids and natural or synthetic polyploids have shown that polyploids are more tolerant to water deficit (Li et al. 1996; Maherali et al. 2009; Deng et al. 2012; Hao et al. 2013), salinity (Chao et al. 2013), environments that are xeric (Ramsey 2011), extremely cold (Johnson and Packer 1965; Brochmann et al. 2004; Deng et al. 2012) or extremely hot (Zhang et al. 2010; Thompson et al. 2014), have wider geographic ranges (Tuler et al. 2019; Via do Pico et al. 2019) and greater ecological plasticity and invasiveness (Rejlová et al. 2019). Polyploidy can also lead to flower morphological differentiation and alter plant-pollinator interactions (*e.g.*, Kennedy et al. 2006). Besides, species with both diploid and polyploid cytotypes have a broader tolerance and occur in different environmental conditions, as seen, for instance, in *Chamerion angustifolium* (L.) Holub (Thompson et al. 2014) and *Eugenia* species in Brazil (Silveira et al. 2016).

Several studies have compared the frequency of polyploids in natural angiosperm communities across environmental stress gradients in Europe (Löve 1953), North America (Johnson and Packer 1965; Martin and Husband 2009), Artic (Brochmann et al. 2004), inselbergs in northeastern Brazil (Pitrez et al. 2014), and the world flora (Rice et al. 2019). Johnson and Packer (1965) and Brochmann et al. (2004) have observed that polyploids were more frequent in harsh environments. On the other hand, Löve (1953), Martin and Husband (2009), Glennon et al. (2014) and Pitrez et al. (2014) have found no difference in polyploidy frequency between environments, whereas Nunvářová Kabátová et al. (2019) observed that tetraploids had a more restricted distribution in Europe than diploids. The question of whether there is a relation between polyploidy and stressful environments remains unclear, and comparative studies are needed to provide elucidation.

Besides polyploidy, additional chromosome number alterations play a role in angiosperm evolution. The changes caused in chromosome number by dysploidy (*i.e.*, gain or loss of a chromosome due to translocations, fusions, and fissions; Schubert and Lysak 2011; Márquez-Corro et al. 2019) and aneuploidy (gain or loss of chromosome material) are frequent, suggesting that both events could have a role in plant speciation (Rieseberg and Willis 2007; Faria and Navarro 2010; Schubert and Lysak 2011; De Storme and Mason 2014). Although the concepts are clearly defined, differentiating between both processes is very hard. For the sake of clarity, here, we use dysploidy as a general term for loss or gain of one chromosome, not taking into account if the loss or gain was due to *sensu stricto* dysploidy or aneuploidy.

The search for patterns of chromosome number variation across space is called cytogeography and has been widely applied to investigate possible evolutionary pathways of one or more taxa in Africa (e.g. Kissling et al. 2008), Asia (e.g. Liu et al. 2019), Europe (e.g. Bedini and Peruzzi 2015; Mráz and Ronikier 2016; Nunvářová Kabátová et al. 2019), North America (Gutiérrez-Flores et al. 2018), South America (e.g. Silveira et al. 2016; Morales et al. 2018) and other regions. But, could cytogeography be applied as an auxiliary to investigate the main evolutionary pathways of an entire flora to infer about the evolutionary history of a biome? In a lecture given at the Eighth Congress of the Botanical Society of São Paulo, Brazil, of which only an abstract was published (Morawetz 1990), Wilfried Morawetz reported the results of the incidence of polyploidy and high chromosome numbers in plants across two South American biomes, namely the Atlantic forest and Cerrado (savanna) (**Figure 1**). He observed that cerrado plants had the highest chromosome number in each family (such as Malvaceae and Clusiaceae) or genus (such as *Annona*, *Cochlospermum* and *Roupala*) among the ones studied and that cytotypes were polyploid in the cerrado (see Forni-Martins and Martins 2000). He concluded that the Cerrado flora evolved from species coming from the surrounding formations, therefore being younger than the forest. His hypothesis agrees with other authors who have attributed the origin of the Cerrado shrub-tree flora to Atlantic and Amazon forests and Caatinga (dry thorny forest) (Rizzini 1963; Heringer et al. 1977; Sarmiento 1983; Hoffmann et al. 2003; Simon et al. 2009).

Forni-Martins and Martins (2000) observed similar chromosome numbers between the Cerrado and forests when they analyzed a large sample of tree species. They contested Morawetz (1990) and postulated that diversification occurred through bidirectional gene flow between forests (Atlantic forest, especially) and the Cerrado. Also, Forni-Martins and Martins (2000) argued that Morawetz (1990) assumption could not be corroborated since high chromosome numbers occur in some families, such as Malvaceae, Meliaceae, and Malpighiaceae, which are also present in other plant formations. In addition, they argued that a high chromosome number does not always indicate derivation because other events can alter the chromosome number, so that neopolyploid species can be more basal than recently speciated diploids. Hence, according to Morawetz (1990) and Forni-Martins and Martins (2000), cytogeography can be an important auxiliary in the investigation of the evolution of entire biomes.

To investigate the evolutionary history of biomes, it is necessary to distinguish between species chromosome numbers and the processes that have led to those numbers, *i.e.*, how a given chromosome number originates. We consider chromosome number as the number of chromosomes that can be counted in cells, being either haploid (the gametic chromosome number represented by n counted in gametic cells) or diploid (the somatic chromosome number represented by $2n$ counted in a somatic cell). We consider ploidy as an indicative of the predominant processes that have originated a given chromosome number. We define the ploidy of a species in relation to the base chromosome number (x) of the genus which the species belongs to: euploid species have $2n = 2x$, polyploid species have $2n \geq 3x$, and dysploid species have $2n$ with non-integer multiples of x (see section 2.5). The base chromosome number (x) is the haploid chromosome number of the ancestor that originated a group of species and better explains the variation of the chromosome number within this group (Guerra 2012).

Therefore, investigating ploidy and species chromosome numbers can shed light on the predominant chromosome number alterations that occurred in a biome's present flora. When considering how species could evolve within a genus, there are three main pathways. Different ploidies arise from different processes that can yield stasis, dysploidy, or polyploidy. In stasis, speciation can occur without varying chromosome number, and, considering the genus base chromosome number, the species would evolve as an euploid species ($2n = 2x$). In dysploidy, one chromosome is added or deleted, thus originating dysploid species; whereas in polyploidy, the entire genome is multiplied, giving rise to polyploid species ($2n \geq 3x$).

Considering differently aged biomes across a gradient of severity, we aimed to investigate the following expectations. If species with higher chromosome numbers and higher frequency of polyploidy (a) are better adapted to harsher environments, we expect to find lower chromosome numbers and lower frequency of polyploidy in less severe environments (such as warm and humid conditions) when compared to harmful environments (such as hot and dry conditions); (b) are derived from other species and speciated *in situ*, we expect to find higher chromosome numbers and higher frequency of polyploidy in a younger biome; (c) have a wider geographic range and higher ecological plasticity, we expect to find higher chromosome numbers and higher frequency of polyploidy among species that are common to different biomes when compared to species that are exclusive (endemic) to a biome. If the environment plays an important role in conditioning ploidy and different present predominant environmental conditions have operated as an evolutionary driver in each biome and evolution occurred *in situ*, we expect different proportions of euploidy, dysploidy and polyploidy to occur in biomes with different environments.

For our tests, we used an extensive chromosome database with chromosome numbers of species occurring in three Brazilian large biomes. Then, we conducted analyses of descriptive statistics and analysis of variance and frequency distribution to compare the chromosome numbers and ploidy frequency among biomes and between common and exclusive species. This investigation can help us understand the role of chromosome number variation in the evolution of the biomes. Also, it adds novelty to the body of work on the role of chromosome number variation in the evolution of angiosperms by analyzing chromosome numbers on a large scale.

2. Material and Methods

2.1 Study area

The biomes of the Cerrado, Atlantic forest, and Caatinga in Brazil (**Figure 1**) are good models to investigate the distribution of chromosome numbers in environments with different ages and environmental severity for some reasons. These biomes occupy a huge extension of the South American continent: the Atlantic forest biome occupies 1,500,000 km^2 roughly parallel to the Brazilian coast (Ribeiro et al. 2009), the Caatinga occurs over 912,529 km^2 in northeastern Brazil (Silva et al. 2017), and the Cerrado spreads over 2,000,000 km^2 in Central Brazil (Durigan and Ratter 2006), totaling an area of 4,412,529 km^2, being representative of the main tropical formations. Each of these biomes has different vegetation types, with the predominance of rain and seasonal Atlantic forests (hereafter Atlantic forest) in the Atlantic forest biome, seasonally dry tropical forest (hereafter Caatinga) in the Caatinga biome, and savanna (hereafter Cerrado) in the Cerrado biome.

Besides, the Atlantic forest, Caatinga, and Cerrado biomes represent a diversity of environmental gradients. The dry season is weak (30 days or less) or absent in the Atlantic rainforest (**Figure 2A**), but can last up to six months in the Atlantic seasonal forest; temperatures are mild, whereas soil has great water storage capacity and a permanent water table (Colombo and Joly 2010; Eisenlohr and de Oliveira-Filho 2015). The dry season in the Cerrado (**Figure 2B**) can last up to eight months, temperatures are hot, fires are recurrent (Simon et al. 2009), but deep soil water is available since the water table lasts all year round. In the Caatinga (**Figure 2C and D**), the dry season can last up to ten months, rains are scarce, unpredictable and concentrated in few days a year, temperatures are even hotter with intense solar radiation all year long, there is no water table, the soil is shallow and has little water storage capacity – water availability depends on rainfall (Moro et al. 2015).

Such environmental conditions are considered to be the main evolutionary drivers in each of these biomes and seem to have predominated throughout their evolutionary history. In fact, it has been shown that speciation leading to the extant endemic species of these biomes has evolved *in situ* for the Cerrado (Simon et al. 2009), SDTF (de Souza et al. 2013), and forest (Molina-Henao et al. 2016). The tree hygrophilous flora (growing in, or adapted to, wet environments) was present in almost the whole South America since the Mid-Cretaceous around 105 million years ago (mya) according to (Davis et al. 2005) with fossils dating from about 60 million years ago (Graham 2011) and its extension was further south than the Atlantic forest current distribution (Bredenkamp et al. 2002). The South

American xerophilous flora (growing in, or adapted to, dry environments) had its origin in the Eocene, between 55-36 mya (Barreda and Palazzesi 2007) and it is similar across xerophilous biomes in South America, such as the Monte, Chaco, Caatinga, etc (Sarmiento 1975; López et al. 2006). Even when the whole set of tree floras of tropical regions is considered, the xerophilous flora emerges as a united block, while the hygrophilous flora is divided according to the continents (Dexter et al. 2015). The first South American savannas date from the upper Oligocene, about 28 mya (Wijmstra and van der Hammen 1966; Jacobs et al. 1999; Bredenkamp et al. 2002). At that time, C3 grasses were widespread and the tree species were few, a type of savanna called proto-cerrado (Sarmiento 1983). The diversification of the Cerrado woody flora coincided with the rise of C4 grasses about 10 mya, on the upper Miocene (Jacobs et al. 1999; Bredenkamp et al. 2002; Simon et al. 2009; Edwards and Smith 2010). Across the evolutive time, the interchange of lineages among these biomes has been intense, with niche shift and speciation *in situ* from Atlantic forest through Caatinga towards the Cerrado and vice-versa (Cássia-Silva et al. 2020).

2.2 Data collection and chromosome database

We elaborated a floristic database from the Atlantic forest and Cerrado databases developed by other researchers of our team and used the Caatinga database published by Moro et al. (2016). The Atlantic forest database contains shrub-tree species from 395 floristic lists published up to December 2017, the Cerrado database was compiled from 168 lists, including the database assembled by Ratter et al. (2009), and the Caatinga database contains species from 73 sites. All data in the floristic databases are from Brazilian and international books, theses and published papers in which sampling procedures were clearly described, and geographic coordinates were provided. The species names in the database were updated by their synonyms (http://www.tropicos.org, http://www.reflora.jbrj.gov.br). Exotic and monocotyledonous taxa were removed (Moro et al. 2012).

The chromosome numbers in the database are primarily from the specialized literature, such as Bolkhoviskikh et al. (1969), Moore (1973, 1974, 1977), Goldblatt (1981, 1984, 1985, 1988) and Goldblatt & Johnson (1990, 1991, 1994, 1996, 1998). Also, the database contains data from the IOPB Chromosome Number Report series (1964 - 1988), the IAPT/IOPB series (from data 1 to data 26), the Chromosome Count Database (CCDB, Rice et al. 2014, http://ccdb.tau.ac.il/about), and more recent works from books, papers and theses published up to December 2017 (Table S1 and Table S2).

From now on, we refer to species somatic chromosome number ($2n$) as "chromosome numbers". Several species had different chromosome numbers (*i.e.*, different cytotypes), and all of them were included in our analyses. We used the base chromosome number (x) of genera in our database to define the ploidy (detailed in section 2.5). The base chromosome number has long been represented by "x" and defined as "one of the haploid numbers observed in the taxon that most parsimoniously explains the chromosomal variability of that group and shows a clear relationship with the base number of the closest related group" (Guerra 2000). More recently, Peruzzi (2013) proposed the use of x for base (monoploid) chromosome number and the Greek letter ρ (rhô) for inferred (hypothetical) ancestral base chromosome number(s) of a lineage. However, as x is far more frequent in the literature, and for the sake of clarity, we opt to use the symbol x throughout this work. The base chromosome number (x) of all genera was collected from specialized literature, books, theses, and published papers. When several studies have published the same base chromosome number (x) for the same genus, we opted for including in our analyses the number from the most recent publication. Whenever there was more than one base number for the same genus, we chose the one that provided the most parsimonious result (i. e., that did not result in species dysploidy). However, when there is no known base chromosome number for a genus, different methods can be used for defining it. Some methods are objective, such as the most frequent haploid chromosome number in a clade, while others are subjective, such as the algebraically discoverable highest common factor among the haploid numbers, methods based on the evolutionary maximum parsimony, and complex statistical models (Peruzzi 2013). Ideally, the best option for defining the base number would be through phylogenetic analyses, or the computation of the relative frequencies of different haploid numbers in various species groups, or performing cytogenetic work on closely related species (Cusimano et al. 2012). Since there is no phylogeny for all the genera in the biomes we studied, we are not allowed to know the relationship between genera for the calculation of x. In face of these constraints, we used the best method we had at hand: we took x as the most frequent haploid chromosome number of the species belonging to a genus whose base number was previously unknown. For that, we consulted the CCDB database and our databases.

2.3 Descriptive statistics

By counting the number of times a chromosome number appeared in the database, we built a frequency table of chromosome numbers of species in each biome and common and exclusive (endemic) species (i. e., species common to all three biomes, exclusive Atlantic forest species, exclusive Caatinga species, and exclusive Cerrado species). After descriptive statistical analyses, we assessed how the chromosome numbers were distributed among biomes and between exclusive and common species.

We performed analyses of normality and skewness to assess if the frequency distribution of the chromosome number was: 1) equally distributed around the head of the distribution (normal distribution, no skewness), 2) skewed to the left (not normally distributed, long tail to the left, i.e. towards low values), or 3) skewed to the right (not normally distributed, long tail to the right, i.e. towards high values) (Macerau 2012). We calculated the kurtosis of the frequency distribution of chromosome numbers to assess if its distribution was platykurtic (more items in the center and the tails of the distribution than in its shoulders), mesokurtic (the frequency distribution is bell-shaped) or leptokurtic (more items in the shoulders of the distribution than in its center and tails) (DeCarlo 1997; Sokal and Rohlf 2012). These analyses allowed us to estimate if the chromosome numbers in each biome were more frequent in smaller (skewed to the right) or higher (skewed to the left) values and if they concentrated on a narrow (leptokurtic) or broad (platykurtic) amplitude.

We assessed the normality of the distribution through the Lilliefors test in R Studio (R Studio Team 2016) using the *nortest* package in R (Gross and Ligges 2015). To estimate the skewness of the distribution, we used Pearson's First Coefficient of Skewness ($A_s^{(1p)}$) (Macerau 2012). If $A_s^{(1p)} < 0$, the distribution is skewed to the left (long tail to the left); if $A_s^{(1p)} = 0$, it is symmetric; and if $A_s^{(1p)} > 0$ it is skewed to the right (long tail to the right) (Macerau 2012). Pearson’s First Coefficient of Skewness also allows calculating the degree of asymmetry of the distribution. If the absolute value of the result is $|A_s^{(1p)}| < 0.15$, the asymmetry of the distribution is weak; if $0.15 \leq |A_s^{(1p)}| < 1$ the asymmetry is moderate; and if $|A_s^{(1p)}| \geq 1$, the asymmetry is strong (Macerau 2012).

The kurtosis of the distributions was estimated through Fisher's g2 coefficient (g_2), following Sokal and Rohlf (2012):

$$g_2 = \frac{(n+1)n\sum y^4}{(n-1)(n-2)(n-3)s^4} - \frac{2(n-1)^2}{(n-2)(n-3)}$$

Where n is the number of observed chromosome number frequencies, s is the standard deviation and $\sum y^4$ is the sum of the deviations to the power of four.

We tested if g_2 was significantly different from zero by dividing g^2 by its standard error (Sg_2). We calculate Sg_2 following Sokal and Rohlf (2012).

$$Sg_2 = \sqrt{\frac{24n(n-1)\text{^}2}{(n-3)(n-2)(n+3)(n+5)}}$$

If the result of g_2/Sg_2 is $\geq +1.96$, the curve is leptokurtic; if $g_2/Sg_2 \leq -1.96$, it is platykurtic; and if g_2/Sg_2 is between -1.96 and +1.96, it is mesokurtic. We calculated the skewness and kurtosis on Microsoft Excel (Microsoft Corp., Redmond, WA).

2.4 Chromosome number variation analysis

We conducted a One-Way Analysis of Variance (one-way ANOVA) to investigate chromosome number differences among the three biomes and between common and exclusive species. Since each biome has a different frequency of chromosome numbers, *i.e.*, each biome has a different number of species, we conducted a One-way ANOVA with type II sum of squares as suggested by Langsrud (2003) and Hector et al. (2010) for unbalanced data.

We checked if the data attended the one-way ANOVA assumptions. Since the data were not normal, we carried out the analysis with the type II sum of squares and log-transformed values. Also, the variances were not homoscedastic; therefore, we used a heteroscedasticity-corrected coefficient covariance matrix to make the ANOVA robust to the heteroscedastic variance (Long and Ervin, 2000). When the one-way ANOVA was significant ($P \leq 0.05$), Tukey's post hoc test was carried out. The one-way ANOVA and Tukey's tests were performed in R Studio (R Studio Team 2016) using the *car* (Fox and Weisberg 2011) and the *agricolae* (Mendiburu 2017) packages, respectively.

2.5 Classes of chromosome numbers and ploidy

We investigated if classes of chromosome numbers were different among biomes and between common and exclusive species. We also tested for differences of ploidies (euploidy, dysploidy and polyploidy) among the biomes. If differences were found, we could assume that the evolutionary processes were not similar in different environments. To assess these possibilities, we applied a chi-square test of homogeneity (Zar 1996) to the proportions of classes of chromosome numbers in each biome, classes of chromosome numbers of common and exclusive species, and proportions of euploidy, polyploidy, and dysploidy in each biome and common and exclusive species.

We calculated the number of chromosome number classes (k) by multiplying the decimal logarithm ($\log_{10}$) of the number of observations (n) by 3.3 and adding 1 to the result (Vieira 1980). The classes established were the same for all samples being analyzed, thus allowing comparisons. Whenever a class had empty cells, i.e. cells with a frequency of 0, or the mean expected frequency of any class was lower than six (Zar 1996), that class was summed with the class below until there were no empty cells or the mean expected frequency was six or greater.

To investigate the differences between the frequencies of ploidy between biomes, we calculated the ploidy of the species (P_s) by dividing the somatic number (2*n*) by the base number (*x*) of its genus (x_g):

$$P_s = \frac{2n}{x_g}$$

$P_s = 2$ indicates euploidy; if P_s is an integer greater than 2, it indicates polyploidy; and if P_s is not an integer, it indicates dysploidy. Since odd multiples of the base chromosome number are also part of our concept of polyploidy, we consider demi-polyploidization (Mayrose et al. 2010) as included in polyploidy. Then, we applied the chi-square test of homogeneity (Zar 1996) to the frequency of ploidy. First, we compared the frequency of ploidy among biomes. After that, we assessed if the frequency of ploidy differed between common and exclusive species.

When the chi-square test result was significant, we used the *post hoc* z-test with Bonferroni correction to compare the proportions between columns (Sharpe 2015). In other words, we assessed which class of chromosome number or which ploidy was statistically different between biomes or between common and exclusive species. We used the IBM SPSS Statistics for Windows (IBM Corp 2015) to run the chi-square test analysis and the *post hoc* z test with Bonferroni correction.

3 Results

Our database contained 4092 dicotyledonous shrub-tree species belonging to 826 genera and 126 families. The Atlantic forest had the highest number of species (3003) belonging to 669 genera and 116 families, while the Caatinga had 681 species belonging to 257 genera and 61 families, and the Cerrado had 1809 species belonging to 524 genera and 101 families (**Figure 3**). The Atlantic forest had the highest number of exclusive species (1978 species), followed by the Cerrado (819 species) and the Caatinga (194 species). The Atlantic forest had more species in common with the Cerrado (614) than with the Caatinga (111), and the Cerrado shared 76 species with the Caatinga (**Figure 3**). On the other hand, 300 species were common to all biomes (common species) (**Figure 3**).

Of all species in the database, 964 species (23.6%), representing 412 genera and 82 families) have a published chromosome number (Supporting information, Table S1;**Figure 4**). From all biomes, the Caatinga had the highest percentage of species with a known chromosome number (33.9%), while the Atlantic forest had the smallest percentage (22.5%; **Figure 4**A). With regards to exclusive species with at least one chromosome number known, the Atlantic forest had the smallest percentage (15.8%), while 43.3% of the common species had a published chromosome number (**Figure 4**B). Some species had different chromosome numbers (more than one cytotype), such as *Lantana camara* L. ($2n$ = 22, 28, 32, 33, 34, 36, 38, 44, 46, 55, 56, 66 and 77) and *Piper nigrum* L. ($2n$ = 26, 36, 48, 52, 53, 60, 65, 75, 78, 104, 128). Therefore, a total of 1332 cytotypes were analysed. When considering exclusive and common species and their cytotypes, the Atlantic forest had the highest number of exclusive species and cytotypes (406), the Caatinga had 67 exclusive species and cytotypes, and the Cerrado had 342 exclusive exclusive species and cytotypes.

The Atlantic forest shared more species and cytotypes with the Caatinga (34) than with the Cerrado (268), the Caatinga shared 37 cytotypes with the Cerrado, and 178 cytotypes were common to all biomes.

Fabaceae was the richest family in the database (629 spp.), followed by Myrtaceae (397), Rubiaceae (216), Asteraceae (193) and Melastomataceae (189) (Table S2). Of these most speciose families, Asteraceae is the most studied one, and 49.2% of its species (95 spp.) have at least one chromosome number count (Table S2). The other rich families have less than 50% of their species with a chromosome number count: 37.7% in Fabaceae (237 spp.), 17.6% in Rubiaceae (38 spp.), 17.5% in Melastomataceae (33 spp.), and 17.4% in Myrtaceae (69 spp.) (Table S2). Fabaceae was also the richest family in each biome: 392 species (40% with at least one chromosome number count) in the Atlantic forest, 180 species (44% with at least one chromosome number count) in the Caatinga, and 345 species (45% with at least one chromosome number count) in the Cerrado) (Table S2). Considering common and exclusive species, Fabaceae was the richest family in the Caatinga (47 species, 28% with a chromosome number count), in the Cerrado (161 species, 36% with a chromosome number count) and common species (80 species, 60% with a chromosome number count), while Myrtaceae was the richest family in the Atlantic forest (268 species, 11% with a chromosome number count, Table S2).

The frequency distribution of chromosome numbers was non-normal, leptokurtic and moderately skewed to the right for species and cytotypes in all biomes and common and exclusive species (**Table 1**). This means that low chromosome numbers ($2n = 10$ to 36) were more frequent, and the frequency decreased abruptly and spread towards high chromosome numbers. Since all distributions were leptokurtic and moderately skewed to the right, the boxplot showed that 50% of the central values (second and third quartiles) were represented by relatively small boxes with medians dislocated to the left (**Figure 5**); the first and the fourth quartiles were represented by a short dotted line at left and a longer dotted line at right, respectively; whereas the outliers extended further to the right (**Figure 5**).

After the descriptive analysis (**Table 1**), we performed the one-way ANOVA with the type II sum of squares and a heteroscedasticity-corrected coefficient covariance matrix. The analysis did not detect differences of mean chromosome number among biomes or between common and exclusive species (**Table 2**). This is likely to have occurred because the frequency distribution (leptokurtic and moderately skewed to the right) and the means (between 32.8 and 39.33) are similar in all three biomes, and the ranges overlap in most part (10-156 in the Atlantic forest, 12-134 in the Caatinga, and 10-276 in the Cerrado, **Table 1**).

When classes of chromosome numbers in each biome were compared, a significant difference was found between the Atlantic forest and the Cerrado (**Table 3**). The proportion of chromosome numbers in the class “118+” was significantly higher in the Cerrado than in the Atlantic forest (chi-square test of homogeneity with the post hoc z test with Bonferroni correction significant at $P \leq 0.05$, **Figure 6**). When comparing common and exclusive species, we found that the frequency of certain classes of chromosome number was different between the Atlantic forest exclusive species and the Cerrado exclusive species as well as between the Cerrado exclusive species and common species (**Table 4**). The Cerrado exclusive species had a higher frequency in the classes “70 to 99” and “100+” than the Atlantic forest exclusive species, and a higher frequency in the class “100+” than exclusive common species (post hoc z test with Bonferroni correction significant at $P \leq 0.05$,**Figure 7**).

Euploidy had the highest proportion in almost all biomes and situations, except for the Caatinga exclusive species (**Table 5**, Table S3). When different ploidies were compared among biomes, a significant difference was found only between the Atlantic forest and the Cerrado (**Table 6**). Euploidy was significantly higher in the Atlantic forest than in the Cerrado, whereas polyploidy was significantly higher in the Cerrado than in the Atlantic forest (*post-hoc* z test with Bonferroni correction and $P \leq 0.05$;**Figure 8**). When the ploidy of common and exclusive species were compared, a significant difference was found between exclusive Atlantic forest and exclusive Caatinga species, exclusive Atlantic forest and exclusive Cerrado species, exclusive Caatinga and common species, and exclusive Cerrado and common species (**Table 7**). By applying the post hoc Z test with Bonferroni correction at $P \leq 0.05$, we found that the proportion of euploidy was significantly higher in the common species and Atlantic forest exclusive species than in the exclusive species of the Cerrado and Caatinga; polyploidy was significantly higher in the Cerrado exclusive species than in the common and Atlantic forest exclusive species; and dysploidy was significantly higher in the Caatinga exclusive species than in the common and Atlantic forest exclusive species (**Figure 9**).

In short, the somatic chromosome numbers varied between 10 and 156 in the Atlantic forest, between 12 and 134 in the Caatinga, and between 10 and 276 in the Cerrado, with means between 33 and 39 for all the biomes and combinations of exclusive and common species. The frequency distribution peaked at 22-24 chromosomes in all biomes, but the frequencies of the classes with $2n \geq 70$ were significantly higher in the Cerrado. The proportion of euploidy was significantly higher in the Atlantic forest and common species, dysploidy was significantly higher in the Caatinga, and polyploidy was significantly higher in the Cerrado.

4 Discussion

Our analysis of frequency distribution showed that the chromosome numbers of dicotyledons shrub-tree in the Atlantic forest, Caatinga and Cerrado are more frequent in small values (2*n* = 22-24) and distributed over a broad amplitude, with a long tail towards higher numbers. Our findings are similar to those of Grant (1982), who analyzed the haploid chromosome number (*n*) of 2665 woody dicotyledonous species. Grant (1982) showed that chromosome numbers tend to small values, are skewed to the right and have *n* = 13 as the most frequent number, followed by *n* = 12, 11, 10 and 14. Similar results have been found by other authors (Bandel 1974; Coleman 1982; Gibbs and Ingram 1982; Forni-Martins et al. 1995; Forni-Martins and Martins 2000; Macerau 2012; Suda et al. 2015; Carta et al. 2020).Though the analysis of variance did not show significant differences in the mean chromosome number between biomes and between common and exclusive species (**Table 2**), other results support our hypothesis of a higher proportion of polyploids in recent biomes. First, the chi-square test of homogeneity showed that classes of high chromosome numbers are more frequent in the Cerrado than in the Atlantic forest (**Figure 6 and Figure 7A**). Second, the proportion of polyploidy was higher in the Cerrado than in the Atlantic forest (**Figure 8 and Figure 9B**). Since we found no difference between the somatic chromosome number (2*n*) of Caatinga species and the other two biomes (**Table 2** and **Table 3**), we suppose the Caatinga to have an intermediate age. Though there is no indication that polyploids are always more recent than diploids (Forni-Martins and Martins 2000), about 35% of the vascular plants are thought to be recent polyploids (Wood et al. 2009; Mayrose et al. 2011). Therefore, we can assume that the higher frequency of high chromosome numbers and the higher levels of polyploidy can be associated with a more recent origin of the Cerrado. Studies using phylogenetic analyses of shrub-tree species in the Atlantic forest and Caatinga are still insufficient in number (Hughes et al. 2013) to make it possible to explain the relationship between phylogeny and chromosome number evolution.

Morawetz (1990) suggested that the Cerrado species derive from forests or other formations because the Cerrado has more polyploid species and higher chromosome numbers than the surrounding vegetation. Our results only partially support this hypothesis. On the one hand, we found that polyploidy was significantly higher in the Cerrado than in the Atlantic forest (**Table 6**, **Figure 8** and **Figure 9B**) and that the Cerrado has a higher frequency of classes with 70 or more chromosomes than the Atlantic forest (**Figure 6** and **Figure 7**A). On the other hand, species with high chromosome numbers also occur in the Caatinga (for example, $2n = 134$ in *Sebastiania commersoniana* (Baill.) L.B.Sm. & Downs; Euphorbiaceae) and in the Atlantic forest (for example, $2n = 156$ in *Phyllanthus juglandifolius* Willd., Phyllanthaceae), and a high number of species is shared between the biomes (Figure 3), suggesting a long term interaction among them (Ab'Sáber 1977; Sarmiento 1983; Forni-Martins and Martins 2000; Simon et al. 2009; Cássia-Silva et al. 2020). Interaction among these biomes may have occurred during the Quaternary. Interglacial (hot and humid) and glacial (cold and dry) periods caused alternating expansion and contraction of the Atlantic forest, the Cerrado and the Caatinga (Ab'Sáber 1977; Sarmiento 1983). Such climate shifts would allow the (re)expansion and (re)colonization of areas previously occupied by these vegetation types, especially due to the presence of multiple-source populations that persisted in several putative refugia (Costa et al. 2017). Therefore, previously isolated populations could be connected again, and gene flow between them would (re)start. After observing the chromosome number variation between the Cerrado and the Atlantic forest, Forni-Martins and Martins (2000) suggested that the diversification of their floras occurred with a bidirectional gene flow. Hence, we propose that not only the flora of those two biomes, but also the Caatinga flora could have diversified through a multidirectional genetic flow, with the Atlantic forest providing most of the genetic material, thus corroborating Cássia-Silva et al. (2020).

Our results provide evidence that euploidy was the most frequent ploidy, except in the Caatinga exclusive species (Table 4). This is not surprising since only 2% (Otto and Whitton 2000) to 15% (Wood et al. 2009) of recent angiosperm speciation events involve ploidy alteration, and recent polyploids have slow evolution rates (Ehrendorfer 1970; Mayrose et al. 2011). Speciation can occur via three mechanisms that do not involve chromosome number alteration (Johnston et al. 2005; Hufton and Panopoulou 2009): 1) mechanisms that do not imply variation in the genome size, such as inversions and translocations (Sharma and Sen 2002; Butlin 2005); 2) mechanisms that alter the genome size, such as amplification due to accumulation of several repetitive sequences, mainly transposable DNA elements, and suppression due to the removal of DNA by unequal homologous recombination and/or illegitimate recombination (Bennetzen et al. 2005; Bennetzen and Wang 2014); and 3) mechanisms involving homoploid hybridization along with genetic drift and natural selection (McCarthy et al. 1995). Speciation by homoploid hybridization is defined as the origin of a new hybrid lineage without change in chromosome number (Rieseberg and Willis 2007). Though homoploid species are rare, speciation can take place due to reproductive isolation after karyotypic divergence and spatial isolation (Rieseberg and Willis 2007).

Different authors have reported that euploidy is frequent in oceanic islands and has been associated with the recent origin and narrow geographical range of oceanic island species (Weiss-Schneeweiss et al. 2007; Rosselló and Castro 2008; Mandáková et al. 2010; Molins et al. 2011; Chiarini and Gauthier 2016; Samad et al. 2016), but euploidy seems to be the rule in recent angiosperm speciation (Ehrendorfer 1970, Otto and Whitton 2000, Wood et al. 2009, Mayrose et al. 2011). Our results disagree with the association between euploidy and recent origin of species since we found that euploidy was more frequent in the common species and the Atlantic forest total and exclusive species, which are considered older than Caatinga and Cerrado species (e. g. Graham 2011). Besides, the tree species with widest ecological amplitudes, *i.e.*, the common species, are euploid and not polyploid as would be foreseen according to many authors (see review in Vamosi et al. 2018). Thus, euploidy seems to accompany aged, euryoecious tree species.

According to our analysis, dysploidy was more frequent than polyploidy in all three biomes, especially in the Caatinga exclusive species (Table 4), apparently pointing out to dysploidy, not polyploidy, as the most frequent process of chromosome number variation in the biomes we investigated. In fact, recent papers have pointed to dysploidy as the main evolutive mechanism in angiosperms (e.g. Cusimano et al. 2012; Chacón et al. 2014; Pellicer et al. 2014; Marinho et al. 2019), although some authors (e.g. Barber et al. 2000) have considered dysploidy to be rare in perennial taxa. However, we cannot reject polyploidy as playing a role in the speciation occurring in the biomes we investigated, since it is ubiquitous among angiosperms (Stebbins 1971; Guerra 2008; Soltis et al. 2015; Soltis and Soltis 2016). Dysploidy can arise both in euploid and polyploid karyotypes. The differentiation of a primary polyploid through a range of processes results in post-polyploid genome diploidization. Diploidization gradually reverts the polyploid genome to a functionally diploid-like genome, mainly through chromosomal rearrangements and elimination of genomic sequences (Ma and Gustafson 2005), which could result in dysploidy (Mandáková and Lysak 2018). So, some currently dysploid species could have been polyploids that have undergone diploidization (Mandáková and Lysak 2018). Considering that dysploidy can arise from both euploid and polyploid previous states, we propose that both dysploidy in euploid karyotypes and diploidization of polyploids are the main mechanism explaining why dysploidy was higher than polyploidy in all cases and especially high in the Caatinga exclusive species.

Polyploid formation may have become more frequent during the environmental upheaval in the Quaternary. Several authors argue that polyploidization events are more prone to occur in times of dramatic climate change, as in the Cretaceous/Paleogene boundary (Fawcett et al. 2009; Soltis and Burleigh 2009; Vanneste et al. 2014; Lohaus and Van de Peer 2016). Sexual polyploidization through unreduced gametes could have been a recurrent process during this period. Unreduced gametic cell formation, known as meiotic restitution, produces diploid spores out of a diploid mother cell (De Storme and Mason 2014). Meiotic restitution can be caused by alterations in the dividing cell spindle dynamics, defects in meiotic cell plate formation and omission of meiosis I or II (reviewed in Bretagnolle and Thompson 1995; Brownfield and Kohler 2011; De Storme and Geelen 2013). Temperature variations may potentially induce those alterations and defects during micro- or megasporegenesis (De Storme and Mason 2014). Endomitosis, a type of somatic polyploidization process that results from the loss of the M-phase during the mitotic cell cycle, could also contribute to sexual polyploidization (De Storme and Mason 2014). Endomitosis seems to be a stress-induced mechanism, being correlated with unfavorable climatic conditions (De Storme and Mason 2014). Since the evolution of the South American flora culminated in a period of great environmental change caused by the Andean orogeny and climate oscillations (Sarmiento 1983), it can be argued that climate change during the Quaternary could have led to an increase in polyploid formation frequency.

Nevertheless, polyploidy may be disadvantageous due to an increased cost of genome multiplication, aneuploid cell formation during meiosis and mitosis, and epigenetic instability (Comai 2005), but since polyploids are genetically redundant, they are possibly more resilient to DNA loss (Leitch and Bennett 2004; Leitch and Leitch 2012). Dysploidy is one of the outcomes of the diploidization process (Mandáková and Lysak 2018) and may lead to reproductive isolation in post-polyploidy progeny and contribute to speciation (Mandáková and Lysak 2018). Also, dysploidy seems to generate more long-term persisting lineages than polyploidy (Escudero et al. 2014). So, it is likely that, as the environments stabilized, polyploidization events have become less frequent. For instance, the southern sector of the Atlantic forest and parts of the Cerrado experienced 30,000 years of stability after the last glacial period in the Cenozoic, while the northern Cerrado and southeastern Atlantic forest had stable and unstable regions (Costa et al. 2017).

Our results seem to not support the hypothesis that polyploids and species with higher chromosome numbers are more frequent in severe environments or withstand a wider range of ecological conditions. We found polyploidy proportions even smaller than those calculated by Rice et al. (2019) for different vegetation formations worldwide. The proportions calculated by Rice et al. (2019) ranged from 30.05% in tropical and subtropical moist broadleaf forests to 38.28% in flooded grasslands and savannas, whereas we observed proportions varying from 16% in the Atlantic forest total and exclusive species to 25% in the Cerrado exclusive species. Although the polyploidy proportions that we found are smaller, our results agree with the conclusion of Rice et al. (2019) that polyploidy is less frequent in tropical regions. Other studies have come to similar conclusions (Martin and Husband 2009; Glennon et al. 2014; Pitrez et al. 2014; Visser and Molofsky 2015). After studying 13 species within the genus *Phalaris* (Poaceae), Visser and Molofsky (2015) found little evidence for the hypothesis that polyploidy allows species to occupy harsher environments. Similarly, Glennon et al. (2014) found that polyploids and their diploid progenitors did not occupy different niches. Also, Martin and Husband (2009) did not find evidence to support the hypothesis that polyploids have broader ecological tolerance. Pitrez et al. (2014) found no differences between chromosome numbers of angiosperms occurring in inselbergs and the surrounding vegetation in northeastern Brazil. Nunvářová Kabátová et al. (2019) found a much more restricted distribution in tetraploids than in diploids of *Minuartia verna* in Europe. These findings taken together with our results suggest a lack of relationship between polyploidy and environmental harshness. In our research, common species face very different environmental conditions by occurring in two or all the three biomes we investigated. If high chromosome numbers and polyploidy are thought to be associated with harsh environments, we should have found common species to show polyploidy, as they face all kinds of environments, but instead, they were predominantly euploid.

Even though our database is relatively large, we admit that there are some major gaps in our knowledge of Neotropical shrub-tree species chromosome numbers. Rich families (for example, Myrtaceae and Lauraceae) remain highly understudied, while, to our knowledge, there are no published chromosome numbers for shrub-tree species of Burseraceae, Symplocaceae, Araliaceae, Polygalaceae, Connaraceae, Hypericaceae, Elaeocarpaceae, and others occurring on the three biomes investigated. Also, chromosome numbers of Atlantic forest species are seldom known. About 85% of its species have unknown karyotypes.

We have shown that euploidy was the most frequent ploidy in most biomes and common species, except Caatinga exclusive species. This result suggests that the evolution of most dicotyledonous shrub-tree species occurred through mechanisms that do not involve chromosome number alteration. Furthermore, the present study demonstrates that dysploidy is more frequent than polyploidy, being the result of either dysploidy of euploidy karyotypes or diploidization of polyploid karyotypes. Finally, we argue that there is no association between polyploidy and harsh environments. However, our results corroborate the hypothesis that a young biome has a high proportion of polyploids since the Cerrado, whose origin dates from 10 mya, has a higher proportion of polyploids than the Atlantic forest, which has been present for about 105 mya.

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TABLES

Table 1. Descriptive statistics of somatic chromosome numbers (2n) of species in each biome and common and exclusive species. N = number of species, sd = standard deviation, D = test statistics, P = p-value, As(1p) = Pearson's first coefficient of skewness and |As(1p)| = absolute value of the Pearson's first coefficient of skewness. Significant results (P ≤ 0.05) are in bold. All kurtosis results were leptokurtic and all skewness results were moderate to the right.

Biome	N	Mean ± sd	Mode	Median	Amplitude (2n)	Normality	Kurtosis	Skewness
Total	1332	35.28 ± 23.48	24	28	10 – 276	D = 0.21156 P = **< 2.2e-16**	57.39	$As^{(1p)}$ = 0.481 $\|As^{(1p)}\|$ = 0.481
Atlantic forest	886	33.66 ± 19.13	22	26	10 – 156	D = 0.19307 *P* < **2.2e-16**	21.3	$As^{(1p)}$ = 0.610 $\|As^{(1p)}\|$ = 0.610
Caatinga	316	34.33 ± 19.09	24	26	12 – 134	D = 0.21194 *P* < **2.2e-16**	10.51	$As^{(1p)}$ = 0.541 $\|As^{(1p)}\|$ = 0.541
Cerrado	825	35.92 ± 25.23	22	28	10 – 276	D = 0.22108 ***P* < 2.2e-16**	49.51	$As^{(1p)}$ = 0.552 $\|As^{(1p)}\|$ = 0.552
Atlantic forest exclusive	406	33.66 ± 19.08	24	26	10 – 156	D = 0.20278 *P* < **2.2e-16**	15	$As^{(1p)}$ = 0.507 $\|As^{(1p)}\|$ = 0.507
Caatinga exclusive	67	36.79 ± 25.00	24	28	12 – 134	D = 0.24387 P = **1.05e-10**	4.65	$As^{(1p)}$ = 0.512 $\|As^{(1p)}\|$ = 0.512
Cerrado exclusive	342	39.33 ± 31.95	24	28	10 – 276	D = 0.24908 P **< 2.2e-16**	26.1	$As^{(1p)}$ = 0.480 $\|As^{(1p)}\|$ = 0.480
Common	178	33.10 ± 15.75	22	26	16 – 104	D = 0.20529 P **< 2.2e-16**	7.07	$As^{(1p)}$ = 0.705 $\|As^{(1p)}\|$ = 0.705

Table 2. Results of the one-way ANOVA with type II sum of squares of species somatic chromosome number (2*n*) among biomes, and between common and exclusive species. The inverse log of the mean and standard deviation (SD) of species somatic number (2n) are also shown. N = total number of chromosome counts, *F* = test statistics, Df = degrees of freedom, N/A = not applicable.

Comparison	Samples	Mean chromosome number ± SD	N	*F*	Df	*P*-value
Species in each biome	Atlantic forest	29.99 ± 1.57	2027	0.9143	2	0. 401
	Caatinga	30.69 ± 1.56				
	Cerrado	30.90 ± 1.66				
Common and exclusive species	Atlantic forest exclusive	29.99 ± 1.57	993	1.2905	3	0.2763
	Caatinga exclusive	31.19 ± 1.73				
	Cerrado exclusive	32.28 ± 1.78				
	Common	30.41 ± 1.48				

Table 3. Results of the chi-square test of homogeneity of somatic chromosome number (*2n*) of species in the Atlantic forest (Af), Cerrado (Ce) and Caatinga (Ca). Degrees of freedom = 2. Significant results are in bold. X^2 = 2-sided asymptotic significance.

Biomes	X^2	Total
Af x Ca	1.005 (0.908)	1202
Af x Ce	9.847 (**0.038**)	1711
Ca x Ce	3.399 (0.423)	1141

Table 4. Results of the chi-square test of homogeneity of somatic chromosome number (*2n*) of exclusive Atlantic forest species (Afx), exclusive Cerrado species (Cex), exclusive Caatinga species (Cax) and common species (Com). Degrees of freedom = 3. Significant results are in bold. X^2 = 2-sided asymptotic significance.

Biomes	X^2	Total
Afx x Cax	3.710 (0.382)	473
Afx x Cex	14.940 (**0.002**)	748
Afx x Com	0.319 (0.956)	584
Cax x Cex	0.310 (0.956)	409
Cax x Com	3.853 (0.320)	245
Cex x Com	10.199 (**0.009**)	520

Table 5. Proportion of species ploidy in each biome, in exclusive species in each biome and in common species .

	Ploidy		
	Dysploidy	Euploidy	Polyploidy
Atlantic forest	28.5%	55.2%	16.3%
Caatinga	29.2%	51.5%	19.3%
Cerrado	31.8%	47.3%	20.9%
Atlantic forest exclusive	28.2%	55.6%	16.2%
Caatinga exclusive	41.5%	37%	21.5%
Cerrado exclusive	34.2%	40.4%	25.4%
Common	26%	57.0%	17.0%

Table 6. Results of the chi-square test of homogeneity of ploidy between species in the Atlantic forest (Af), Cerrado (Ce), and Caatinga (Ca). Degrees of freedom = 2. Significant results are in bold. X^2 = 2-sided asymptotic significance.

Biomes	X^2	Total
Af x Ca	1.775 (0.412)	1137
Af x Ce	11.232 (**0.004**)	1631
Ca x Ce	1.555 (0460)	1084

Table 7. Results of the chi-square test of homogeneity of ploidy between exclusive Atlantic forest species (Afx), exclusive Cerrado species (Cex), exclusive Caatinga species (Cax) and common species (Com). Degrees of freedom = 2. Significant results are in bold. X^2 = 2-sided asymptotic significance.

Biomes	X^2	Total
Afx x Cax	7.906 (**0.019**)	459
Afx x Cex	18.110 (**0.000**)	728
Afx x Com	0.265 (0.876)	559
Cax x Cex	1.347 (0.510)	399
Cax x Com	7.856 (**0.020**)	230
Cex x Com	12.385 (**0.002**)	499

FIGURES

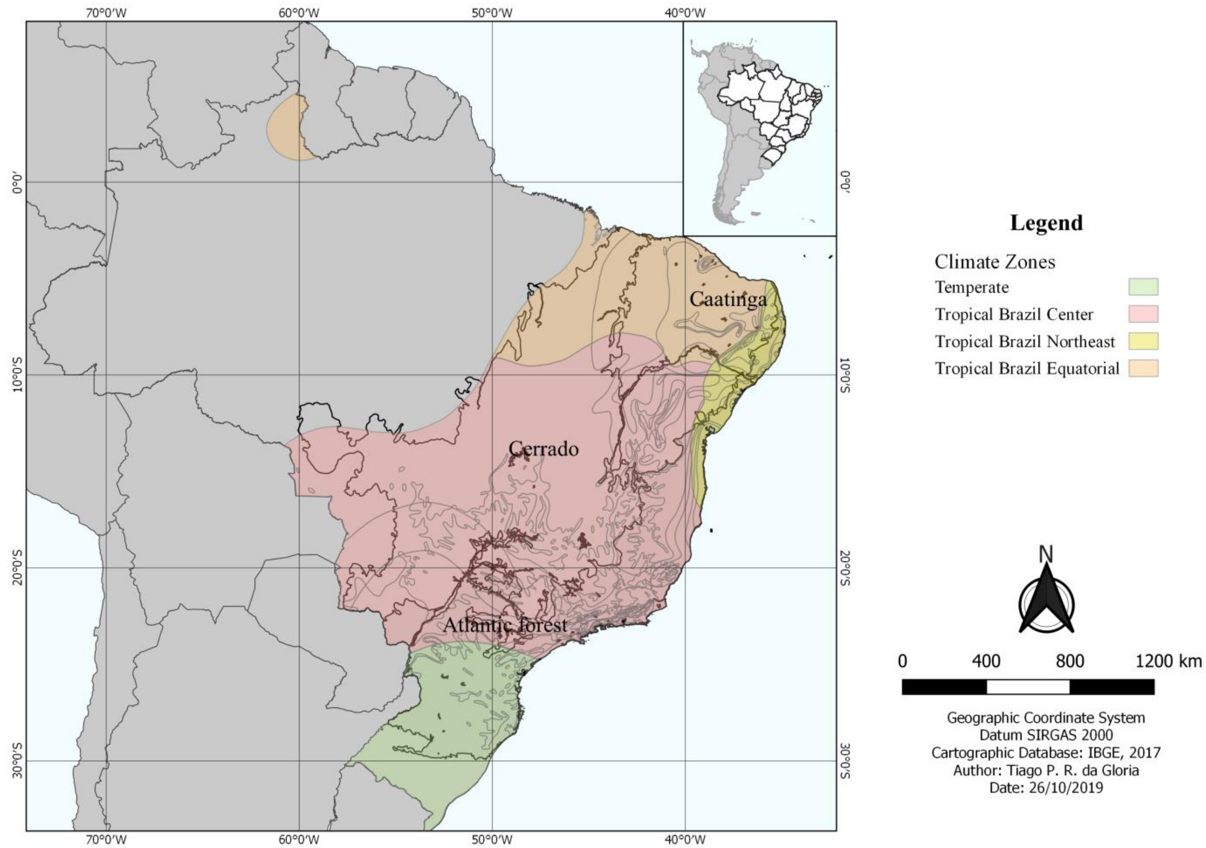

Figure 1. Distribution of biomes and climates of Brazil. Climate zones according to IBGE (Brazilian Institute of Geography and Statistics)

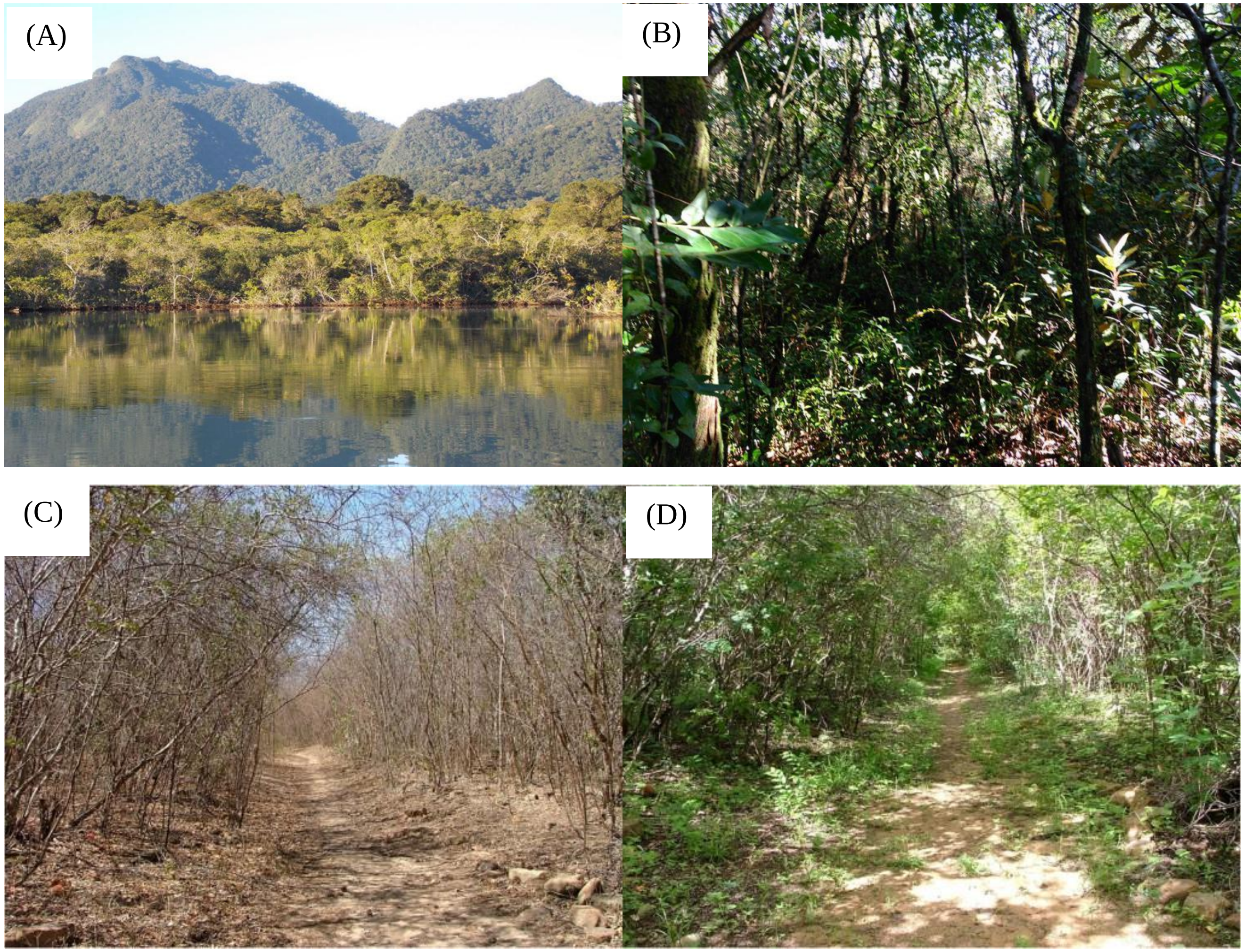

Figure 2. Some vegetations types of the biomes studied: (A) Atlantic forest (Ubatuba, SP); (B) Cerrado (Itirapina, SP); Caatinga in dry (C) and wet (D) seasons. Sources: (A) and (B), first author's personal archive; (C) and (D), available in http://tudosobreacaatinga.blogspot.com/2013/04/flora.html (access 05/11/2019)

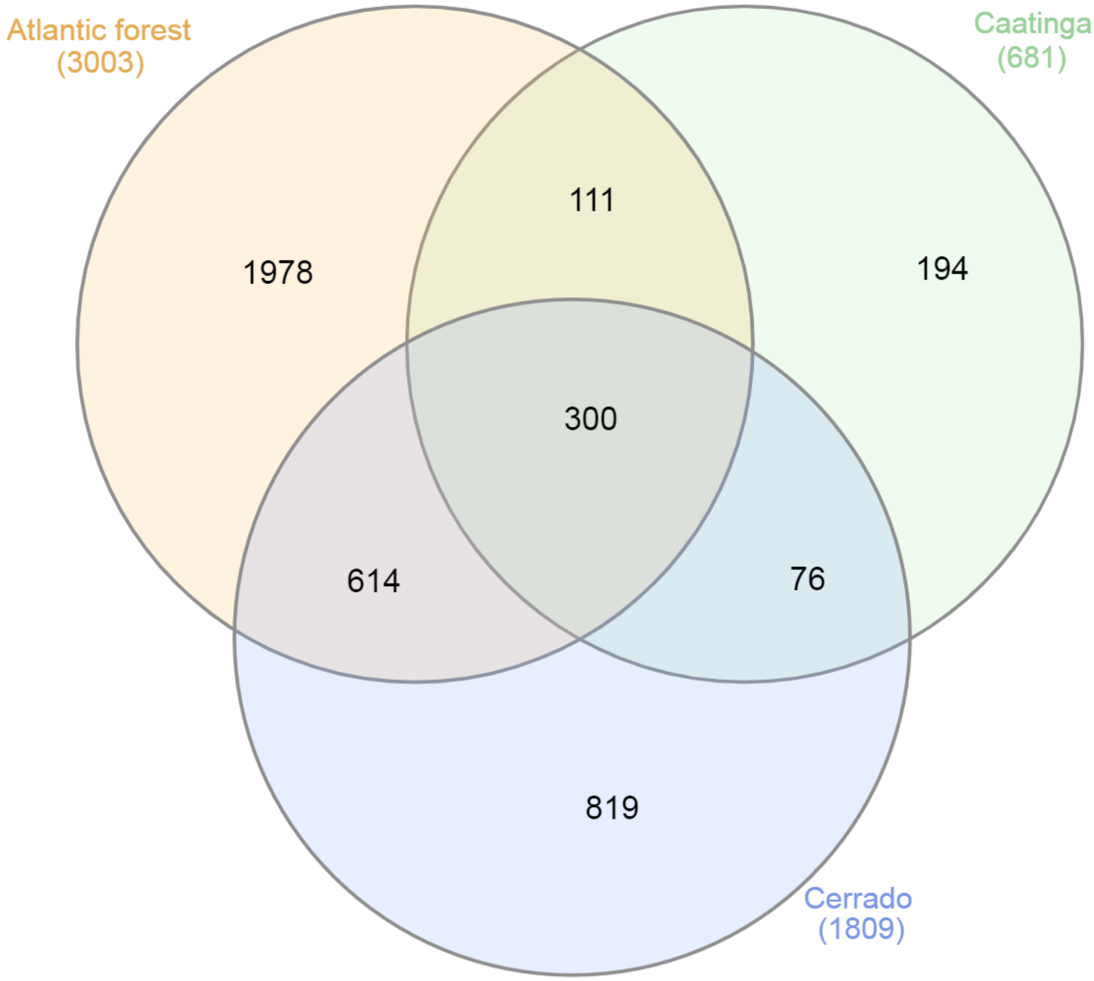

Figure 3. Venn diagram showing the number of species shared between the biomes. Diagram made with *InteractiVenn* (Heberle, H.; Meirelles, G. V.; da Silva, F. R.; Telles, G. P.; Minghim, R. *InteractiVenn: a web-based tool for the analysis of sets through Venn diagrams*. BMC Bioinformatics 16:169 (2015)

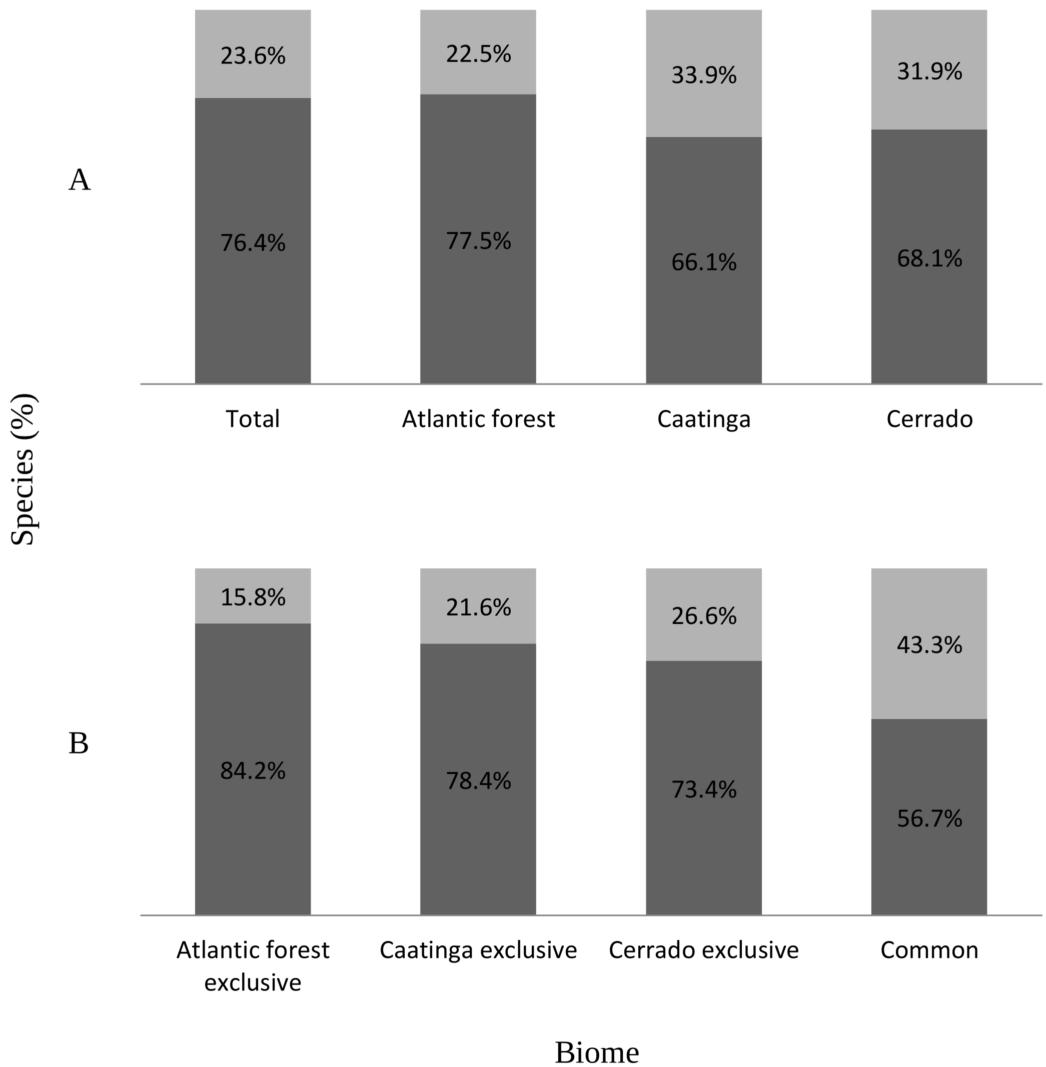

Figure 4. Percent-stacked barplot showing the proportion of species with (dark grey bars) and without (light grey bars) a chromosome number count in the whole database (total) and in each biome (A) and in common and exclusive species in each biome (B). Percentages were calculated in relation to the total number of species in the floristc database (4092), total number of species in the Atlantic forest (3003), total number of Caatinga species (681), total number of Cerrado species (1810), total number of Atlantic forest exclusive species (1978), total number of Caatinga exclusive species (194), total number of Cerrado exclusive species (819) and total number of species common to all biomes (300).

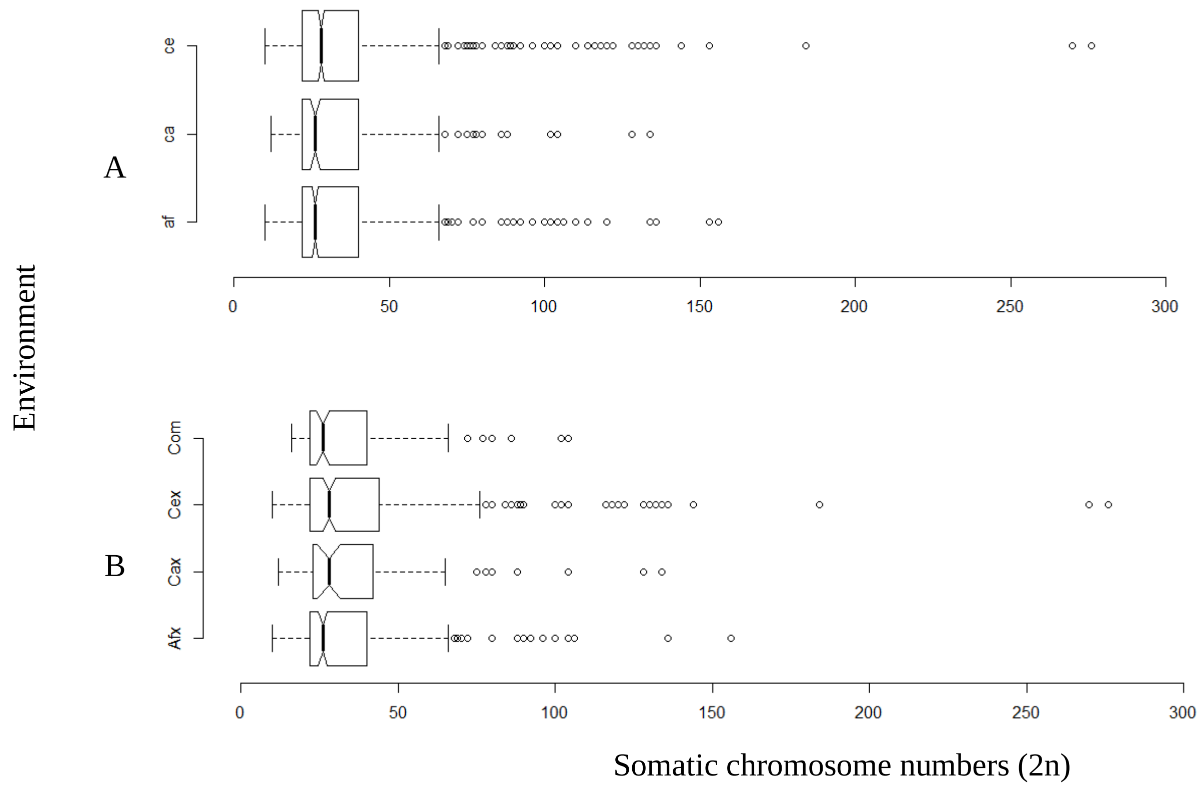

Figure 5. Notched boxplot chart of chromosome numbers A) species in the Atlantic forest (Af), Caatinga (ca), and Cerrado (Ce); and B) common (Com) and exclusive Atlantic forest (Afx), Caatinga (Cax), and Cerrado (Cex) species. The second and third quartiles (50% of the number of values) are contained in the boxes, in which the vertical bar indicates the median and the notch represents the 95% interval of confidence. The first quartile (25% of the number of values) and the fourth quartiles (25% of the number of values) are represented by the left and right dotted horizontal lines, respectively. Open circles indicate outliers.

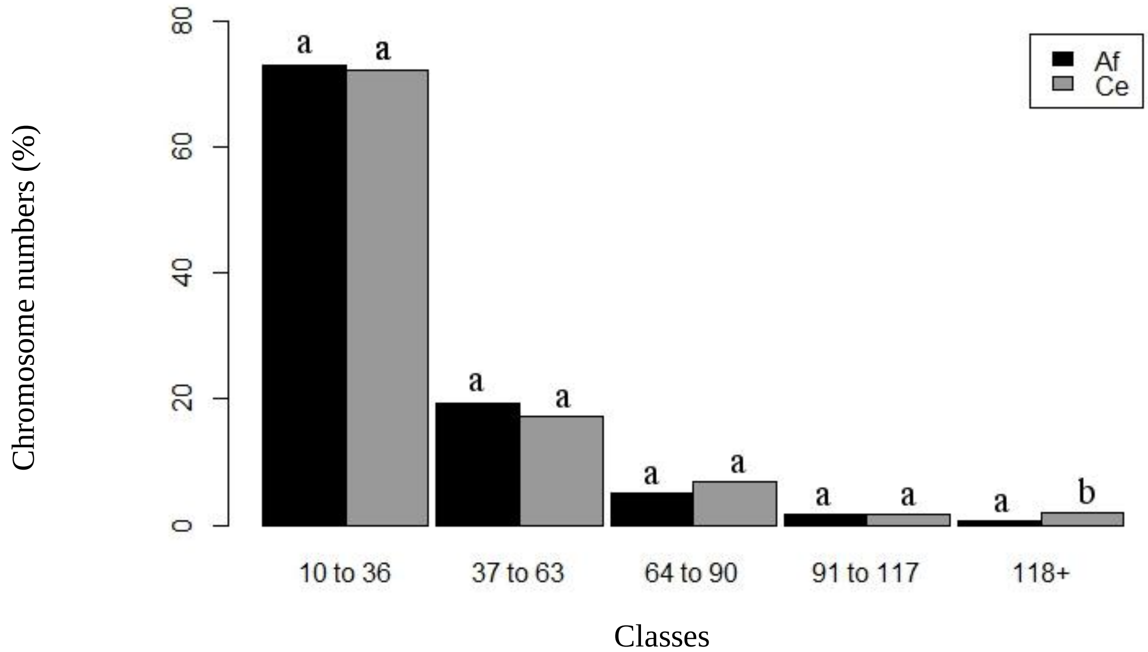

Figure 6. Result of the *post hoc* z test with Bonferroni correction applied to classes of species chromosome numbers in the Atlantic forest (Af) and Cerrado (Ce). Different letters indicate a significant result ($P \leq 0.05$).

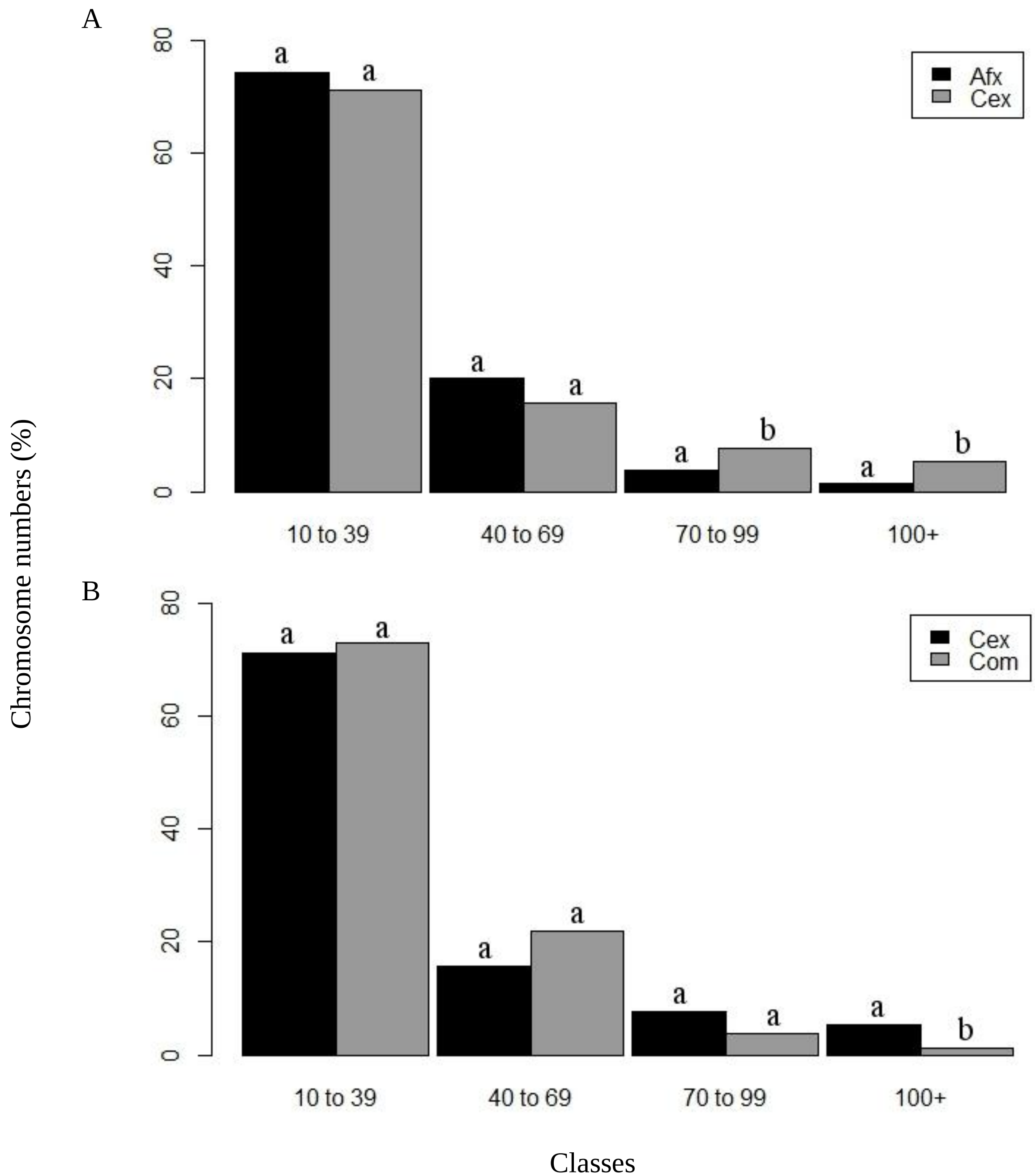

Figure 7. Result of the *post hoc* z test with Bonferroni correction applied to classes of species chromosome numbers. A) exclusive Atlantic forest (Afx) and exclusive Cerrado species (Cex); B) exclusive Cerrado and common (Com) species. Different letters indicate a significant result ($P \leq 0.05$).

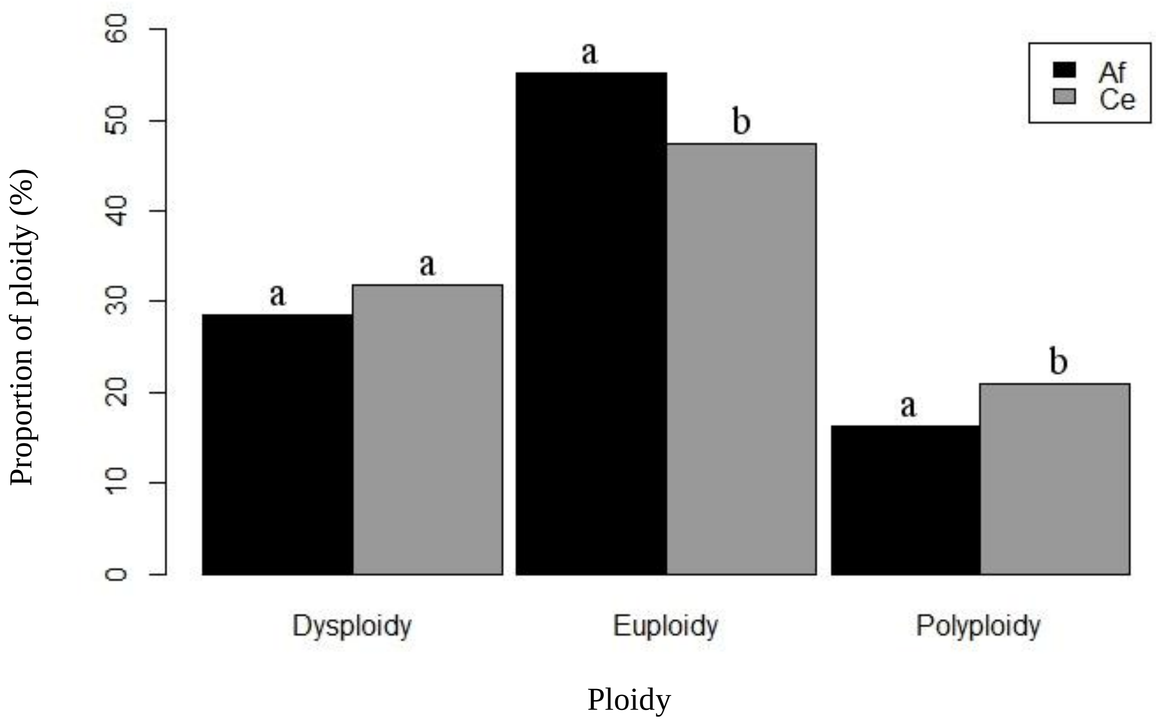

Figure 8. Results of the *post hoc* z test with Bonferroni correction applied to species ploidy between Atlantic forest (af in green) and Cerrado (ce in gray) species. Different letters indicate a significant result ($P \leq 0.05$).

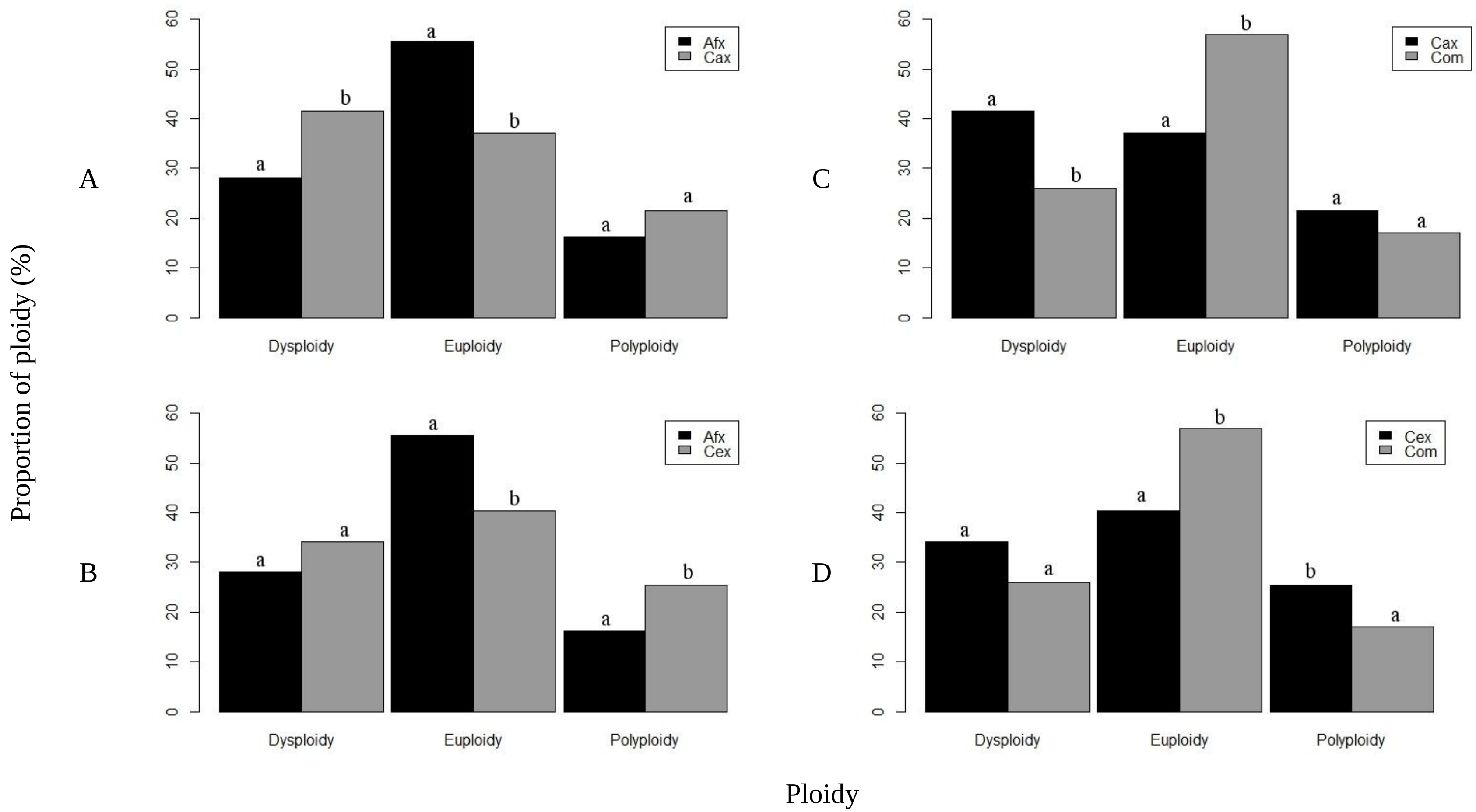

Figure 9. Results of the *post hoc* z test with Bonferroni correction applied to species ploidy between A) exclusive Atlantic forest (Afx) and exclusive Caatinga (Cax) species; B) exclusive Atlantic forest (Afx) and exclusive Cerrado (Cex) species; C) exclusive Caatinga (Cax) and common (Com) species; D) exclusive Cerrado (Cex) and common (Com) species. Different letters indicate a significant result.

SUPPLEMENTAL MATERIAL

Table S1. Base chromosome numbers (x) of genera included in our analyses. The asterisk (*) indicates the base chromosome number (x) defined upon the most frequent haploid numbers found in the CCDB website or available in our database. Af: Atlantic forest, Ca: Caatinga, Ce: Cerrado, refid = reference, NA = not applicable.

Family	Genera	X	Biome	RefID
Acanthaceae	*Justicia*	7	Common	Daniel & Chuang, 1998
	Ruellia	17	Common	Carvalheira et al., 1991
	Trema	10	Common	Gill & Obembe, 1991
Adoxaceae	*Sambucus*	18	Af	Ourecky, 1970
Anacardiaceae	*Anacardium*	20	Common	Guimarães, 2017
	Astronium	15	Common	Guimarães, 2017
	Lithraea	14	AfxCe	Guimarães, 2017
	Schinus	14	AfxCe	Guimarães, 2017

	Spondias	16	Common	Guimarães, 2017
Annonaceae	*Anaxagorea*	8	AfxCe	Okada & Ueda, 1984
	Annona	7	Common	Morawetz, 1986
	Cymbopetalum	9	Af	Morawetz, 1986
	Duguetia	8	Common	Maas et al., 2003
	Guatteria	14	AfxCe	Morawetz, 1986
	Unonopsis	7	AfxCe	Walker, 1972
	Xylopia	8	Common	Morawetz, 1986
Apocynaceae	*Allamanda*	9	AfxCe	Tapadar, 1964
	Aspidosperma	17	Common	Morawetz, 1986
	Calotropis	11	Ce	Raghavan, 1957
	Catharanthus	8	AfxCe	Van der Laan & Arends, 1985
	Forsteronia	9	Ce	Williams & Derr, 2007

	Hancornia	11*	AfxCe	NA
	Himatanthus	9*	AfxCe	NA
	Mandevilla	8	Af	Williams & Derr, 2007
	Nerium	11	Ce	Van der Laan & Arends, 1985
	Rauvolfia	11	AfxCe	Mathur et al., 1987
	Tabernaemontana	11	Common	Gill & Obembe, 1991
Aquifoliaceae	*Ilex*	20	Common	Rey et al., 2002
Asteraceae	*Achyrocline*	7	Ce	Galbany-Casals et al., 2014
	Acritopappus	9	Ce	Robinson et al., 1989
	Ageratum	10	Af	Turner et al., 1967
	Ambrosia	18	Ce	Payne, 1964
	Austrocritonia	10	Af	King et al., 1976
	Austroeupatorium	10	Af	Schmidt & Schilling, 2000

Baccharis	9	Common	Carr et al., 1999
Bidens	12	AfxCe	Turner et al., 1967
Calea	19	Ce	Pruski & Urbatsch, 1984
Campovassouria	10	Af	King et al., 1976
Centratherum	9	AfxCe	Salles-de-Melo et al., 2010
Chromolaena	10	AfxCe	Watanabe et al., 1995
Chrysolaena	10	Ce	Dematteis, 2007
Clibadium	16	Ce	Ito et al., 2000
Conyza	9	Af	Nelson, 1978
Critoniopsis	10	Af	do Pico & Dematteis, 2012
Cyanthillium	9	AfxCe	Salles-de-Melo et al. 2010
Cyrtocymura	10	Ce	Dematteis et al., 2007
Dasyphyllum	9	Common	Gruenstaeudl et al., 2009

Echinocoryne	15*	Ce	NA
Eremanthus	15	Common	Salles-de-Melo et al., 2010
Grazielia	10*	AfxCe	NA
Hatschbachiella	10	AfxCe	Robinson et al., 1989
Hebeclinium	10	Af	Watanabe et al., 1995
Jungia	7	Af	Coleman, 1982
Lepidaploa	16	AfxCe	Dematteis, 2002
Lessingianthus	16	Common	Angulo & Dematteis, 2012b
Lychnophora	18	Ce	Salles-de-Melo et al., 2010
Melampodium	10	AfxCe	Weiss-Schneeweiss et al., 2009
Paralychnophora	18	Af	Salles-de-Melo et al., 2010
Piptocarpha	17	AfxCe	Salles-de-Melo et al., 2010
Platypodanthera	10*	AfxCe	NA

Praxelis	10	Ce	Dematteis et al., 2007
Pseudobrickellia	10*	Ce	NA
Pterocaulon	10	AfxCe	Dematteis et al., 2007
Raulinoreitzia	10	Af	King et al., 1976
Rolandra	25	AfxCe	Salles-de-Melo et al., 2010
Senecio	10	Af	Barkley, 1985
Stifftia	9	Af	Semple & Watanabe, 2009
Stilpnopappus	12	Ce	Salles-de-Melo et al., 2010
Symphyopappus	10	AfxCe	King et al., 1976
Trixis	27	AfxCe	Turner et al., 1962
Verbesina	17	Common	Dematteis, 2007
Vernonanthura	17	AfxCe	Vega & Dematteis, 2012
Vernonia	9	Ce	Bala & Gupta, 2013

Bignoniaceae	*Anemopaegma*	20	CexCa	Firetti-Leggieri et al., 2011
	Callichlamys	20*	Af	NA
	Fridericia	20*	Common	NA
	Handroanthus	20	Common	Alves et al., 2013
	Jacaranda	18	Common	Costa & Forni-Martins, 2006
	Mansoa	7	Af	Gentry, 1980
	Tabebuia	20	Common	Alcorcés, 2012
	Tecoma	18	Af	Goldblatt & Gentry, 1979
Bixaceae	*Bixa*	7	AfxCe	Hanson et al., 2001
	Cochlospermum	6	Common	Forni-Martins et al., 1995
Boraginaceae	*Cordia*	8	Common	Gill & Obembe, 1991
	Myriopus	12	Ce	Marhold & Breitwieser, 2016
	Tournefortia	12	AfxCe	Luque, 1996

Calophyllaceae	*Calophyllum*	8	AfxCe	Robson & Adams, 1968
Canellaceae	*Cinnamodendron*	11	Af	Ehrendorfer & Lambrou, 2000
Cannabaceae	*Celtis*	10	Common	Oginuma et al., 1990
Capparaceae	*Crateva*	13*	Common	NA
	Cynophalla	14	Common	Iltis & Cornejo,2005
Caricaceae	*Jacaratia*	9*	Common	NA
	Vasconcellea	9	Af	Caetano et al., 2008
Caryocaraceae	*Caryocar*	23	AfxCe	Ehrendorfer et al., 1984
Celastraceae	*Hippocratea*	14	Af	Simmons & Hedin, 1999
Chloranthaceae	*Hedyosmum*	8	Af	Kong, 2000
Chrysobalanaceae	*Licania*	11*	Common	NA
	Parinari	10	AfxCe	Raven, 1975
Cleomaceae	*Tarenaya*	9	CexCa	Inda et al., 2008

Clusiaceae	*Clusia*	30	Common	da Cruz et al., 1990
Combretaceae	*Conocarpus*	12	Af	Gill et al., 1982
	Terminalia	12	Common	Singhal et al., 1985a
Convolvulaceae	*Evolvulus*	12	AfxCe	Gupta et al., 2016
	Ipomoea	15	Ca	Pitrez et al., 2008
Cunoniaceae	*Lamanonia*	16*	AfxCe	NA
Dilleniaceae	*Curatella*	12*	Common	NA
Ebenaceae	*Diospyros*	15	AfxCe	Sugiura et al., 2000
Erythroxylaceae	*Erythroxylum*	14	Common	Bittrich, 2014
Escalloniaceae	*Escallonia*	12	Af	Raven, 1975
Euphorbiaceae	*Acalypha*	10	Common	Hans, 1973
	Alchornea	9	AfxCe	Hans, 1973
	Astraea	9*	Ce	NA

	Cnidoscolus	9	Common	Hans, 1973
	Croton	7	Common	Porto, 2007
	Euphorbia	7	Af	Perry, 1943
	Jatropha	11	Common	Reddy et al., 2013
	Joannesia	11	Af	Wurdack et al., 2005
	Manihot	9	Common	Guerra, 2008
	Sapium	11	Common	Hans, 1973
	Sebastiania	6	Common	Goldblatt & Davidse, 1977
	Stillingia	15	AfXCa	Miller & Webster, 1966
Fabaceae	*Abarema*	14	AfxCe	Santos et al., 2012
	Abrus	11	Ce	Agbagwa & Okoli, 2005
	Acacia	13	Ce	Bedi, 1991
	Acosmium	9	AfXCa	Rodrigues et al., 2009

Aeschynomene	10	CexCa	Coleman, 1980
Albizia	13	Common	Rani et al., 2014
Amburana	22	Common	Goldblatt, 1981
Anadenanthera	14	Common	Goldblatt, 1981
Andira	10	Common	Goldblatt, 1989
Apuleia	12	Common	Bandel, 1974
Bauhinia	14	Common	Rani et al., 2014
Bowdichia	9	Common	Souza & Benko-Iseppon, 2004
Caesalpinia	12	Ce	Atchison, 1951
Calliandra	8	Common	Souza et al., 2013
Camptosema	11	Ce	Sede et al., 2012
Cassia	7	Common	Singhal et al., 1990
Centrolobium	10	Common	Dahmer et al., 2009

Centrosema	10	Af	Bairiganjan & Patnaik, 1989
Chamaecrista	7	Common	Biondo et al., 2006
Chloroleucon	13*	Common	NA
Clitoria	8	AfxCe	Lackey, 1980
Copaifera	12	Common	Turner & Fearing, 1959
Cratylia	11	CexCa	Vargas et al., 2007
Crotalaria	8	AfxCe	Palomino & Vazquez, 1991
Dahlstedtia	11	AfxCe	Teixeira et al., 2002
Dalbergia	10	Common	Rani et al., 2014
Delonix	14	Ce	Goldblatt & Davidse, 1977
Desmanthus	14	Ce	Santos et al., 2012
Desmodium	11	AfxCe	Adelanwa & Husaini, 2014
Dimorphandra	14	Common	Santos et al., 2012

Dioclea	11	AfxCe	Vargas et al., 2007
Dipteryx	16*	AfxCe	NA
Enterolobium	13	Common	Santos et al., 2012
Erythrina	21	Common	Singhal et al., 1990
Geoffroea	10	Ca	Burkart, 1949
Gleditsia	14*	Af	NA
Grazielodendron	10	Af	Wojciechowski et al., 2004
Holocalyx	22*	AfxCe	NA
Hymenaea	12	Common	Forni-Martins et al., 1995
Indigofera	8	AfxCe	Rani et al., 2014
Inga	13	Common	Figueiredo et al., 2014
Leptolobium	9	Common	Rodrigues et al., 2009
Leucaena	13	Af	Rani et al., 2014

Libidibia	12	Common	Borges et al., 2012
Lonchocarpus	11	Common	Singhal et al., 1990
Machaerium	10	Common	Polido et al., 2013
Macroptilium	11	Af	Bairiganjan & Patnaik, 1989
Microlobius	14	Af	Luckow et al., 2005
Mimosa	13	Common	Rani et al., 2014
Myroxylon	13	AfXCa	Goldblatt, 1981
Ormosia	9	Common	Pennington et al., 2001
Parapiptadenia	13	AfXCa	Santos et al., 2012
Parkia	13	Common	Santos et al., 2012
Parkinsonia	14	Ca	Jahan et al., 1994
Peltophorum	13	Common	Singhal et al., 1990
Periandra	11	Common	Lackey, 1980

Piptadenia	13	Common	Santos et al., 2012
Pithecellobium	13	AfXCa	Santos et al., 2012
Plathymenia	13	Common	Santos et al., 2012
Prosopis	14	Af	Rani et al., 2014
Pterocarpus	10	Common	Goldblatt, 1989
Pterodon	8	Common	Bandel, 1974
Samanea	7	AfxCe	Gill & Husaini, 1982
Schizolobium	12	Af	Biondo, 2005
Senegalia	13	Common	Santos et al., 2012
Senna	14	Common	Resende et al., 2013
Sesbania	6	Ca	Abou-EI-Enain et al., 1998
Sophora	9	Af	Jahan et al., 1994
Stryphnodendron	13	Common	Santos et al., 2012

	Stylosanthes	10	AfxCe	Goldblatt, 1989
	Swartzia	8	Common	Goldblatt & Davidse, 1977
	Tephrosia	11	Af	Rani et al., 2014
Gesneriaceae	*Paliavana*	14*	AfXCa	NA
Hernandiaceae	*Sparattanthelium*	15	Af	Oginuma & Tobe, 2006
Hydroleaceae	*Hydrolea*	10	Ce	Kadereit & Bittrich, 2011
Krameriaceae	*Krameria*	6	AfxCe	Turner, 1958
Lacistemataceae	*Lacistema*	11	AfxCe	Oginuma & Tobe, 2010
Lamiaceae	*Eriope*	20	Common	Coleman, 1982
	Leonotis	12	Ce	NA
	Ocimum	6	Af	Mukherjee & Datta, 2005
	Vitex	8	Common	Chatha & Bir, 1988
Lauraceae	*Aiouea*	12	AfxCe	Oginuma & Tobe, 2006

	Cryptocarya	12	Af	Oginuma & Tobe, 2006
	Ocotea	12*	Common	NA
	Persea	12	AfxCe	Oginuma & Tobe, 2006
Lecythidaceae	*Cariniana*	17	AfxCe	Morton et al., 1998
	Gustavia	17	Af	Morton et al., 1997
	Lecythis	17	AfxCe	Kowal, 1989
Loganiaceae	*Strychnos*	11	Common	Gadella, 1972
Lythraceae	*Adenaria*	8	Ce	Tobe et al., 1986
	Cuphea	8	Ce	Tobe et al., 1986
	Diplusodon	15	Ce	Graham, 1992
	Lafoensia	8	Common	Graham & Cavalcanti, 2001
	Physocalymma	8	AfxCe	Tobe et al., 1986
	Punica	8	Ce	Graham & Cavalcanti, 2001

Magnoliaceae	*Magnolia*	19	AfxCe	Ehrendorfer et al., 1968
Malpighiaceae	*Aspicarpa*	10	Ce	Jessup, 2002
	Banisteriopsis	5	CexCa	Lombello & Forni-Martins, 2001
	Barnebya	10	Common	Lombello & Forni-Martins, 2003
	Bunchosia	10	Common	Lombello & Forni-Martins, 2002
	Byrsonima	12	Common	Forni-Martins et al., 1995
	Camarea	17*	Ce	NA
	Diplopterys	10	AfxCe	Davis et al., 2001
	Heteropterys	5	Common	Lombello & Forni-Martins, 2002
	Malpighia	10	Ce	Singhal et al., 1985b
	Peixotoa	10	AfxCe	Lombello & Forni-Martins, 2003
	Stigmaphyllon	10	AfxCe	Lombello & Forni-Martins, 1998
Malvaceae	*Apeiba*	9	AfxCe	Bawa, 1973

Ayenia	10*	Ce	NA
Bastardiopsis	7	Af	Aguilar et al., 2003
Byttneria	13	AfXCa	Wilkins & Chappill, 2002
Ceiba	43*	Common	NA
Christiana	20*	Af	NA
Cienfuegosia	10	Ce	Wilson & Fryxell, 1970
Corchorus	9	Ca	Gupta & Kaur, 2016
Eriotheca	46	AfxCe	Marinho et al., 2014
Gossypium	13	Ce	Fryxell et al., 1992
Guazuma	8	Common	Wilkins & Chappill, 2002
Helicteres	9	Common	Ya, 1992
Herissantia	7*	Ca	NA
Hibiscus	18	Ce	Kachcheba, 1972

	Luehea	9	Common	Bawa, 1973
	Melochia	7	AfxCe	de Wet & Lewis, 1980
	Pachira	44*	AfXCa	NA
	Pavonia	7	Common	Fryxell, 1999
	Peltaea	25*	Ce	NA
	Pseudobombax	44	Common	Marinho et al., 2014
	Sida	7	Common	Hazra & Sharma, 1971
	Sterculia	20	Common	Singhal et al., 1985
	Triumfetta	16	Common	de Wet & Lewis, 1980
	Waltheria	7	Common	de Wet & Lewis, 1980
Melastomataceae	*Clidemia*	17	AfxCe	Almeda & Chuang, 1992
	Leandra	17	AfxCe	Almeda & Chuang, 1992
	Marcetia	12*	AfxCe	NA

	Miconia	17	Common	Almeda, 2013
	Nepsera	9*	Af	NA
	Rhynchanthera	10	Ce	Fritsch et al., 2004
	Tibouchina	9	Common	Almeda & Chuang, 1992
	Tococa	17	AfxCe	Almeda, 2013
	Trembleya	12	AfxCe	Almeda, 2001
Meliaceae	*Carapa*	29	Af	Guimarães, 2017
	Cedrela	28	Common	Guimarães, 2017
	Trichilia	23	Common	Guimarães, 2017
Monimiaceae	*Hennecartia*	19	Af	Oginuma & Tobe, 2006
Moraceae	*Artocarpus*	14	Af	Oginuma & Tobe, 1995
	Ficus	13	Common	Oginuma & Tobe, 1995
Myrtaceae	*Acca*	11	Af	Costa et al., 2008

	Blepharocalyx	11*	AfxCe	NA
	Calyptranthes	11	AfxCe	Costa et al., 2008
	Campomanesia	11	Common	Costa & Forni-Martins, 2006
	Eugenia	11	Common	Pedrosa et al., 1999
	Marlierea	11	Af	Costa & Forni-Martins, 2007
	Myrceugenia	11	Af	Sanders et al., 1983
	Myrcia	11	Common	Costa & Forni-Martins, 2006
	Myrciaria	11	Common	Costa et al., 2008
	Myrrhinium	11	Af	Rye, 1979
	Pimenta	11	AfxCe	Rye, 1979
	Psidium	11	Common	Souza et al., 2015
Nyctaginaceae	*Bougainvillea*	17*	Common	NA
Ochnaceae	*Ouratea*	12	Common	Gill & Obembe, 1991

	Sauvagesia	19	Af	Raven, 1975
Olacaceae	*Ximenia*	13	Common	Morawetz, 1986
Onagraceae	*Ludwigia*	8	AfxCe	Raven & Tai, 1979
Opiliaceae	*Agonandra*	10*	Common	NA
Oxalidaceae	*Oxalis*	6	Ce	Azkue, 2000
Phyllanthaceae	*Margaritaria*	13	AfxCe	Webster & Ellis, 1962
	Phyllanthus	13*	Common	NA
Phytolaccaceae	*Gallesia*	18*	Af	NA
	Phytolacca	9	Af	Grant, 1982
Piperaceae	*Piper*	13	Common	Samuel & Morawetz, 1989
Pittosporaceae	*Pittosporum*	6	Af	Kiehn, 2005
Plumbaginaceae	*Plumbago*	7*	Ce	NA
Polygonaceae	*Ruprechtia*	14	AfXCa	Pendry, 2004

	Triplaris	11	Common	Pendry, 2004
Primulaceae	*Clavija*	18	Af	Raven, 1975
	Myrsine	23*	Common	NA
Proteaceae	*Roupala*	7	AfxCe	Stace et al., 1998
Quillajaceae	*Quillaja*	14*	Af	NA
Rhamnaceae	*Colubrina*	12*	Common	NA
	Hovenia	12	Af	Richardson et al., 2000
	Rhamnidium	12	Common	Coleman, 1982
	Ziziphus	12	Common	Rani et al., 2014
Rhizophoraceae	*Rhizophora*	18*	Af	NA
Rubiaceae	*Alibertia*	11	Common	Forni-Martins, personal comunication
	Amaioua	11	AfxCe	Correa & Forni-Martins, 2004
	Borreria	14	Af	Lewis, 1962

Chiococca	11	Common	Kiehn & Lorence, 1996
Coccocypselum	10	Af	Kiehn, 2010
Cordiera	11*	Common	NA
Coussarea	11	AfxCe	Kiehn, 2010
Declieuxia	9	Ce	Kiehn, 2010
Genipa	10*	AfxCe	NA
Guettarda	11	Common	Puangsomlee & Puff, 2001
Hamelia	12	Af	Bedi et al., 1981
Ixora	11	Af	Puangsomlee & Puff, 2001
Palicourea	11	AfxCe	Kiehn, 2010
Posoqueria	17	Af	Andreasen & Bremer, 2000
Psychotria	11	AfxCe	Kiehn, 2010
Randia	11	Common	Owens et al., 1993

	Rosenbergiodendron	11*	Ce	NA
	Rudgea	11	AfxCe	Kiehn, 2010
	Stachyarrhena	11*	Af	NA
	Tocoyena	11	Common	Coleman, 1982
Rutaceae	*Erythrochiton*	58	Ce	Stace et al., 1993
	Esenbeckia	32	Common	Guimarães, 2017
	Pilocarpus	22	Common	Skorupa, 2000
	Zanthoxylum	18	Common	Stace et al., 1993
Salicaceae	*Prockia*	9	Common	Morawetz, 1980
	Salix	19	Af	Khalili et al., 2012
Sapindaceae	*Allophylus*	14	Common	Guimarães, 2017
	Cupania	16	Common	Guimarães, 2017
	Diatenopteryx	15	AfxCe	Guimarães, 2017

	Dodonaea	14	Common	Guimarães, 2017
	Magonia	15	Common	Forni-Martins et al., 1995
	Melicoccus	16	Af	Guimarães, 2017
	Paullinia	12	Af	Guimarães, 2017
	Sapindus	15	Common	Guimarães, 2017
	Serjania	12	AfxCe	Guimarães, 2017
	Talisia	16	Common	Guimarães, 2017
	Toulicia	14	AfxCe	Ferrucci & Urdampilleta, 2009
Sapotaceae	*Manilkara*	12*	Common	NA
	Pouteria	12	Common	Kiehn, 2005
Simaroubaceae	*Simarouba*	16	Common	Guimarães, 2017
Solanaceae	*Acnistus*	12*	Af	NA
	Brugmansia	12	Af	Eich, 2008

Brunfelsia	11	AfXCa	Olmstead et al., 2008
Calibrachoa	9*	Ce	NA
Capsicum	12	Common	Barboza et al., 2011
Cestrum	8	Common	Fregonezi et al., 2004
Dyssochroma	12	Af	Eich, 2008
Lycianthes	12	Af	Acosta et al., 2005
Metternichia	13	Af	Olmstead et al., 2008
Nicotiana	12	Ca	Badr et al., 1997
Physalis	12	AfxCe	Robledo-Torres et al., 2011
Schwenckia	10	AfxCe	Acosta et al., 2006
Sessea	8	Af	Penas et al., 2006
Solanum	12	Common	Jagatheeswari, 2014
Vassobia	12	AfxCe	Rego et al., 2009

Styracaceae	*Styrax*	8	AfxCe	Fritsch, 2004
Turneraceae	*Piriqueta*	7	AfxCe	Fernandez, 1987
	Turnera	13	AfxCe	Arbo, 2007
Ulmaceae	*Phyllostylon*	14	AfXCa	Oginuma et al., 1990
Urticaceae	*Boehmeria*	14	Af	Liang et al., 2009
	Cecropia	14	Common	Oginuma & Tobe, 1995
	Coussapoa	14	Af	Oginuma & Tobe, 1995
	Urera	13	Af	Sytsma et al., 2002
Verbenaceae	*Aloysia*	9	AfxCe	Sanders, 2001
	Citharexylum	9	Af	Yuyama et al., 2010
	Duranta	8	AfXCa	Viccini et al., 2006a
	Lantana	11	Common	Bala & Gupta, 2012
	Lippia	5	Common	Campos et al., 2011

	Stachytarpheta	9	Common	Viccini et al., 2006b
Vochysiaceae	*Callisthene*	11	Common	Yamagishi-Costa et a.l., 2017
	Qualea	11	Common	Yamagishi-Costa et a.l., 2017
	Salvertia	12	Common	Yamagishi-Costa et a.l., 2017
	Vochysia	12	AfxCe	Yamagishi-Costa et a.l., 2017
Winteraceae	*Drimys*	43	AfxCe	Ehrendorfer & Lambrou, 2000

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Yamagishi-Costa et a.l., 2017	Júlia Yamagishi-Costa 1 , Andréa Rodrigues Barbosa 2 , Gustavo Hiroaki Shimizu 2* , Kikyo Yamamoto 2 and Eliana Regina Forni-Martins. Chromosome numbers and the systematics of tribe Vochysieae (Vochysiaceae).
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Table S2. Somatic chromosome numbers (2n) of species included in our analyses. Af: Atlantic forest, Ca: Caatinga, Ce: Cerrado, refid = reference.

Family	Species	2n	Environment	RefID
Acanthaceae	*Justicia brasiliana* Roth	**28**	Af	CCDB
	Justicia pectoralis Jacq.	**22**	Ce	CCDB
	Ruellia asperula (Mart. & Nees) Lindau	**34**	Ca	CCDB
	Ruellia brevifolia (Pohl) C.Ezcurra	**34, 36**	Af	CCDB
	Ruellia incomta (Nees) Lindau	**22**	Ce	Lombello & Pinto-Maglio, 2004
	Trema micrantha (L.) Blume	**20**	Common	CCDB
Adoxaceae	*Sambucus australis* Cham. & Schltdl.	**37**	Af	CCDB
Anacardiaceae	*Anacardium occidentale* L.	**24, 40, 42**	Common	CCDB
	Astronium urundeuva Engl.	**30**	Ce	CCDB
	Lithraea brasiliensis Marchand	**28**	Af	CCDB

	Lithraea molleoides (Vell.) Engl.	**30**	AfxCe	CCDB
	Schinus molle L.	**28, 30**	Af	CCDB
	Schinus polygama (Cav.) Cabrera	**28**	Ce	CCDB
	Schinus terebinthifolia Raddi	**28, 60**	AfxCe	CCDB
	Spondias mombin L.	**32**	AfxCe	CCDB
	Spondias purpurea L.	**32**	Ce	de Souza Almeida et al., 2007
	Spondias tuberosa Arruda	**32**	Common	CCDB
	Spondias venulosa (Engl.) Engl.	**32**	Af	de Souza Almeida et al., 2007
Annonaceae	*Anaxagorea phaeocarpa* Mart.	**28**	Af	CCDB
	Annona cacans Warm.	**14**	AfxCe	CCDB
	Annona coriacea Mart.	**42**	Ce	Morawetz, 1984
	Annona dioica A.St.-Hil.	**14**	AfxCe	CCDB
	Annona glabra L.	**28**	AfxCa	CCDB

	Annona montana Macfad.	**16**	AfxCe	CCDB
	Annona squamosa L.	**16**	Ce	Bowden, 1945a
		14, 18, 28		CCDB
	Bocageopsis multiflora (Mart.) R.E.Fr.	**18**	Ce	CCDB
	Cymbopetalum brasiliense (Vell.) Benth. ex Baill.	**27**	Af	CCDB
	Duguetia furfuracea (A.St.-Hil.) Saff.	**16, 24,32**	AfxCe	Morawetz, 1984
	Guatteria blepharophylla Mart.	**28**	Ce	Morawetz & Waha, 1985
	Guatteria oligocarpa Mart.	**28**	Af	CCDB
	Unonopsis guatterioides (A.DC.) R.E.Fr.	**18**	AfxCe	Mass et al., 2007
	Xylopia aromatica (Lam.) Mart.	**16**	Common	CCDB
Apocynaceae	*Allamanda blanchetii* A.DC.	**18, 36**	Ce	CCDB
	Allamanda cathartica L.	**18, 22**	Af	CCDB
	Aspidosperma macrocarpon Mart.	**34**	AfxCe	CCDB

Aspidosperma pyrifolium Mart.	**34**	Common	Brito et al., 2014
Aspidosperma quebracho-blanco Schltdl.	**36**	Af	Piovano, 1987
Calotropis procera (Aiton) Dryand.	**22, 26**	Ce	CCDB
Catharanthus roseus (L.) G.Don	**16**	AfxCe	CCDB
Forsteronia pubescens A.DC.	**18**	Ce	CCDB
Hancornia speciosa Gomes	**22**	AfxCe	CCDB
Himatanthus bracteatus (A.DC.) Woodson	**18**	AfxCe	Brito et al., 2014
Mandevilla dardanoi M.F.Sales, Kin.-Gouv. & A.O.Simões	**20**	Af	Brito et al., 2014
Nerium oleander L.	**16, 22**	Ce	CCDB
Rauvolfia ligustrina Willd. ex Roem. & Schult.	**22, 44**	Ce	Pitrez et al., 2014
Tabernaemontana catharinensis A.DC.	**18, 22**	Common	Brito et al., 2014
Tabernaemontana divaricata (L.) R.Br. ex Roem. & Schult.	**16, 22, 23, 28, 32; 33;**	Af	CCDB

		34; 66		
	Tabernaemontana solanifolia A.DC.	**22**	Ce	Brito et al., 2014
Aquifoliaceae	*Ilex brevicuspis* Reissek	**40**	AfxCa	CCDB
	Ilex dumosa Reissek	**40**	Af	CCDB
	Ilex integerrima Reissek	**40**	Af	CCDB
	Ilex paraguariensis A.St.-Hil.	**40**	AfxCe	CCDB
	Ilex pseudobuxus Reissek	**40**	Af	CCDB
	Ilex taubertiana Loes.	**40**	Af	CCDB
	Ilex theezans Mart.	**40**	AfxCe	CCDB
Asteraceae	*Achyrocline satureioides* (Lam.) DC.	**28**	Ce	Pereira et al., 2006
	Acritopappus confertus (Gardner) R.M.King & H.Rob.	**19**	Ce	CCDB
	Ageratum conyzoides (L.) L.	**32, 36, 38**	Af	CCDB
		20, 40		Bala & Gupta, 2011

Ambrosia polystachya DC.	**36**	Ce	CCDB
Austrocritonia velutina (Gardner) R.M.King & H.Rob.	**20**	Af	CCDB
Austroeupatorium inulaefolium (Kunth) R.M.King & H.Rob.	**20, 40**	Af	CCDB
Baccharis articulata (Lam.) Pers.	**18**	Af	CCDB
Baccharis coridifolia DC.	**18**	Ce	CCDB
Baccharis crispa Spreng.	**18**	AfxCe	CCDB
Baccharis dracunculifolia DC.	**18**	AfxCe	CCDB
Baccharis inamoena Gardner	**18**	Ca	CCDB
Baccharis linearifolia (Lam.) Pers.	**18**	Ce	CCDB
Baccharis mesoneura DC.	**18**	Af	CCDB
Baccharis microdonta DC.	**18**	Af	CCDB
Baccharis montana DC.	**18**	Af	CCDB
Baccharis oblongifolia (Ruiz & Pav.) Pers.	**18**	Af	CCDB

Baccharis punctulata DC.	**18**	Af	CCDB
Baccharis subdentata DC.	**18**	Af	CCDB
Bidens graveolens Mart.	**48**	Ce	CCDB
Bidens pilosa L.	**24, 48, 70, 72, 80, 96**	Af	CCDB
Bidens riparia Kunth	**24, 72**	Ce	CCDB
Calea pilosa Baker	**26**	Ce	CCDB
Calea serrata Less.	**38**	Ce	CCDB
Campovassouria cruciata (Vell.) R.M.King & H.Rob.	**20, 30**	Af	CCDB
Centratherum punctatum Cass.	**32**	AfxCe	Carr et al., 1999
Chresta pacourinoides (Mart. ex DC.) Siniscalchi & Loeuille	**24**	Ce	Salles-de-Melo et al., 2010
Chromolaena horminoides DC.	**30**	Ce	CCDB
Chromolaena laevigata (Lam.) R.M.King & H.Rob.	**28, 40, 50,**	AfxCe	CCDB

	60, 62		
Chromolaena maximilianii (Schrad. ex DC.) R.M.King & H.Rob.	**60**	Ce	CCDB
Chromolaena odorata (L.) R.M.King & H.Rob.	**40, 51, 58, 60, 80, 120**	Ce	CCDB
Chromolaena squalida (DC.) R.M.King & H.Rob.	**30, 69**	Ce	CCDB
Chrysolaena cognata (Less.) Dematt.	**20, 34, 40, 50, 60, 64, 66, 78, 80, 84**	Ce	Dematteis, 1997
Chrysolaena platensis (Spreng.) H.Rob.	**20**	Ce	do Pico & Dematteis, 2012
Clibadium armani (Balb.) Sch.Bip. ex O.E.Schul	**32**	Ce	CCDB
Conocliniopsis prasiifolia (DC.) R.M.King & H.Rob.	**20, 22**	Af	Robinson et al., 1989
Conyza primulifolia (Lam.) Cuatrec. & Lourteig	**72**	Af	CCDB
Critoniopsis stellata (Spreng.) H.Rob.	**34**	Af	CCDB

Cyanthillium cinereum (L.) H.Rob.	**18**	AfxCe	CCDB
Cyrtocymura scorpioides (Lam.) H.Rob.	**30, 34, 56, 58, 66**	Ce	CCDB
Dasyphyllum brasiliense (Spreng.) Cabrera	**54**	Af	CCDB
Dasyphyllum spinescens (Less.) Cabrera	**54**	Af	CCDB
Echinocoryne schwenkiifolia (Mart. ex DC.) H. Rob.	**34**	Ce	de Oliveira et al., 2007
Eremanthus elaeagnus (Mart. ex DC.) Sch.Bip.	**30**	Ce	CCDB
Eremanthus erythropappus (DC.) MacLeis	**34**	AfxCe	Salles-de-Melo et al., 2010
Eremanthus glomerulatus Less.	**30**	AfxCe	MacLeish, 1987
Grazielia intermedia (DC.) R.M.King & H.Rob.	**20**	AfxCe	CCDB
Grazielia serrata (Spreng.) R.M.King & H.Rob.	**20**	Af	CCDB
Hatschbachiella tweedieana (Hook. ex Hook. & Arn.) R.M.King & H.Rob.	**20**	AfxCe	CCDB
Hebeclinium macrophyllum Lem.	**20**	Af	CCDB

Jungia floribunda Less.	**40**	Af	CCDB
Lepidaploa argyrotricha (Sch.Bip. ex Baker) H.Rob.	**34**	Af	CCDB
Lepidaploa aurea (Mart. ex DC.) H.Rob.	**32**	Ce	CCDB
Lepidaploa canescens (Kunth) Cass.	**16, 17, 18, 20, 24, 30, 34, 66, 68**	AfxCe	CCDB
Lepidaploa chalybaea (Mart. ex DC.) H.Rob.	**32**	Ce	CCDB
Lepidaploa cotoneaster (Willd. ex Spreng.) H.Rob.	**30, 32**	AfxCe	CCDB
Lepidaploa remotiflora (Rich.) H.Rob.	**28, 30, 34**	Ce	CCDB
Lepidaploa rufogrisea (A. St.-Hil.) H.Rob.	**32, 34**	AfxCe	CCDB
Lessingianthus bardanoides (Less.) H.Rob.	**32, 34, 68**	Ce	CCDB
Lessingianthus coriaceus (Less.) H.Rob.	**32**	Ce	CCDB
Lessingianthus glabratus (Less.) H.Rob.	**34, 64, 102, 104, 128, 134,**	Ce	CCDB

	136		
Lessingianthus grandiflorus Less.	**64**	Ce	CCDB
Lessingianthus obtusatus (Less.) H.Rob.	**64**	Ce	CCDB
Lychnophora ericoides Mart.	**34, 36**	Ce	CCDB
Lychnophora rosmarinifolia Mart.	**36**	Ce	CCDB
Lychnophora salicifolia Mart.	**36**	Ce	CCDB
Lychnophora uniflora Sch.Bip.	**36**	Ce	CCDB
Melampodium divaricatum (Rich. ex Rich.) DC.	**20, 24, 60**	AfxCe	CCDB
Paralychnophora harleyi (H.Rob.) D.J.N.Hind	**36**	Af	Mansanares et al., 2007
Piptocarpha axillaris (Less.) Baker	**34**	AfxCe	CCDB
Piptocarpha lundiana (Less.) Baker	**34**	Af	CCDB
Piptocarpha macropoda (DC.) Baker	**34**	AfxCe	CCDB
Piptocarpha rotundifolia (Less.) Baker	**34**	Ce	CCDB

Piptocarpha sellowii (Sch.Bip.) Baker	**34**	Af	CCDB
Platypodanthera melissifolia (DC.) R.M.King & H.Rob.	**20**	AfxCe	CCDB
Praxelis clematidea (Griseb.) R.M.King & H.Rob.	**20, 30, 40, 64**	Ce	CCDB
Pseudobrickellia brasiliensis (Spreng.) R.M.King & H.Rob.	**20**	Ce	CCDB
Pterocaulon alopecuroides (Lam.) DC.	**20**	Af	CCDB
Raulinoreitzia tremula (Hook. & Arn.) R.M.King & H.Rob.	**20**	Af	CCDB
Rolandra fruticosa Rottb.	**50**	AfxCe	CCDB
Senecio brasiliensis (Spreng.) Less.	**40**	Af	CCDB
Stifftia chrysantha J.C.Mikan	**54**	Af	CCDB
Stilpnopappus pratensis Mart. ex DC.	**24**	Ce	CCDB
Symphyopappus compressus (Gardner) B.L.Rob.	**22**	AfxCe	CCDB

	Tilesia baccata (L.) Pruski	**32, 50, 60**	Common	CCDB
	Trixis praestans (Vell.) Cabrera	**54**	Af	CCDB
	Verbesina macrophylla (Cass.) S.F.Blake	**68**	AfxCa	CCDB
	Vernonanthura brasiliana (L.) H.Rob.	**34**	AfxCe	CCDB
	Vernonanthura chamaedrys (Less.) H.Rob.	**34**	Ce	CCDB
	Vernonanthura discolor (Spreng.) H.Rob.	**34, 40, 60, 64**	Af	CCDB
	Vernonanthura divaricata (Spreng.) H.Rob.	**34, 36**	AfxCe	CCDB
	Vernonanthura ferruginea (Less.) H.Rob.	**34**	AfxCe	CCDB
	Vernonanthura membranacea (Gardner) H.Rob.	**34**	Ce	CCDB
	Vernonanthura montevidensis (Spreng.) H.Rob.	**34**	AfxCe	CCDB
	Vernonanthura polyanthes (Sprengel) Vega & Dematteis	**34, 36**	AfxCe	CCDB
	Vernonia rubriramea Mart. ex DC.	**32**	Ce	CCDB
Bignoniaceae	*Anemopaegma acutifolium* DC.	**80**	Ca	Firetti-Leggieri et al., 2011

Anemopaegma album Mart. ex DC.	**80**	Ce	Firetti-Leggieri et al., 2011
Anemopaegma arvense (Vell.) Stellfeld ex De Souza	**80**	Ce	Firetti-Leggieri et al., 2011
Anemopaegma glaucum Mart. ex DC.	**80**	Ce	Firetti-Leggieri et al., 2011
Anemopaegma scabriusculum Mart. ex DC.	**80**	Ce	Firetti-Leggieri et al., 2011
Callichlamys latifolia (Rich.) K. Schum.	**40**	Af	CCDB
Cybistax antisyphilitica (Mart.) Mart.	**40**	AfxCe	Ortolani, 2007
Fridericia dichotoma (Jacq.) L.G.Lohmann	**40**	Ce	Cordeiro et al., 2016
Fridericia platyphylla (Cham.) L.G.Lohmann	**40**	CexCa	Cordeiro et al., 2016
Handroanthus chrysotrichus (Mart. ex DC.) Mattos	**80**	Common	CCDB
Handroanthus heptaphyllus (Vell.) Mattos	**40**	Common	CCDB
Handroanthus impetiginosus (Mart. ex DC.) Mattos	**40**	Common	CCDB
Handroanthus ochraceus (Cham.) Mattos	**80**	Common	Melloni, 2010
Handroanthus pulcherrimus (Sandwith) S.O.Grose	**40**	Af	CCDB

	Handroanthus serratifolius (Vahl) S.O.Grose	**38, 40**	Common	CCDB
	Handroanthus vellosoi (Toledo) Mattos	**80**	AfxCe	Collevatti & Dornelas, 2016
	Jacaranda cuspidifolia Mart.	**36**	AfxCe	Collevatti & Dornelas, 2016
	Jacaranda micrantha Cham.	**36**	AfxCe	Collevatti & Dornelas, 2016
	Mansoa difficilis (Cham.) Bureau & K.Schum.	**36, 38**	Af	Goldblatt & Gentry, 1979
	Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore	**40**	Common	Melloni, 2010
	Tabebuia roseoalba (Ridl.) Sandwith	**40**	Common	Ortolani, 2007
	Tecoma stans (L.) Juss. ex Kunth	**36, 40**	Af	CCDB
	Zeyheria tuberculosa (Vell.) Bureau ex Verl.	**40**	Common	Ortolani, 2007
Bixaceae	*Bixa arborea* Huber	**14**	Af	CCDB
	Bixa orellana L.	**14, 16**	AfxCe	CCDB
	Cochlospermum orinocense (Kunth) Steud.	**18**	Ce	Morawetz, 1986
	Cochlospermum regium (Schrank) Pilg.	**36**	CexCa	CCDB

	Cochlospermum vitifolium (Willd.) Spreng.	**24**	Common	Morawetz, 1986
Boraginaceae	*Cordia alliodora* (Ruiz & Pav.) Oken	**30, 72**	Common	CCDB
	Cordia americana (L.) Gottschling & J.S.Mill.	**36, 38**	Af	CCDB
	Cordia bullata (L.) Roem. & Schult.	**16, 36**	Af	CCDB
	Cordia glabrata (Mart.) A.DC.	**52**	AfxCe	Vieira et al., 2016
	Cordia rufescens A.DC.	**28**	Common	Vieira et al., 2016
	Cordia toqueve Aubl.	**28**	Ce	CCDB
	Cordia trichotoma (Vell.) Arráb. ex Steud.	**72, 104**	Common	CCDB
	Myriopus rubicundus (Salzm. ex DC.) Luebert	**48**	Ce	Vieira et al., 2016
	Tournefortia paniculata var. austrina I.M.Johnst.	**24**	Ce	CCDB
	Varronia curassavica Jacq.	**18, 36**	Common	CCDB
	Varronia leucocephala (Moric.) J.S.Mill.	**18**	Ca	Vieira et al., 2016
	Varronia polycephala Lam.	**18, 36**	AfxCe	CCDB

Calophyllaceae	*Calophyllum brasiliense* Cambess.	**42**	AfxCe	CCDB
	Kielmeyera coriacea Mart.	**114, 153**	AfxCe	Silva & Davide, 1996
Canellaceae	*Cinnamodendron dinisii* Schwacke	**26**	Af	CCDB
Cannabaceae	*Celtis iguanaea* (Jacq.) Sarg.	**20**	AfxCa	CCDB
	Celtis spinosa Spreng.	**22**	AfxCe	CCDB
Capparaceae	*Colicodendron yco* (Mart.) Mart.	**16**	Ca	Iltis & Cornejo, 2010
	Crateva tapia L.	**26**	Common	Moore, 1977
	Cynophalla flexuosa (L.) J.Presl	**30**	Common	CCDB
	Neocalyptrocalyx longifolium (Mart.) Cornejo & Iltis	**16**	AfxCa	Cordeiro et al., 2017
Caricaceae	*Jacaratia spinosa* (Aubl.) A.DC.	**18**	AfxCe	Éder-Silva et al., 2007
	Vasconcellea quercifolia A. St.-Hil.	**18**	Af	Rockinger et al., 2016
Caryocaraceae	*Caryocar brasiliense* A.St.-Hil.	**46**	AfxCe	CCDB
	Caryocar villosum (Aubl.) Pers.	**46**	Ce	CCDB

Celastraceae	*Hippocratea volubilis* L.	**28**	Af	CCDB
	Maytenus ilicifolia Mart. ex Reissek	**64**	AfxCe	CCDB
Chloranthaceae	*Hedyosmum brasiliense* Mart.	**16**	Af	Morawetz, 1986
Chrysobalanaceae	*Chrysobalanus icaco* L.	**22**	Ce	CCDB
	Licania tomentosa (Benth.) Fritsch.	**22**	Af	CCDB
	Parinari excelsa Sabine	**20, 22**	Af	CCDB
Cleomaceae	*Tarenaya spinosa* (Jacq.) Raf.	**18, 20, 44**	CexCa	CCDB
Clusiaceae	*Clusia criuva* Cambess.	**56, 58, 62**	Af	CCDB
	Clusia hilariana Schltdl.	**60**	AfxCa	CCDB
	Clusia lanceolata Cambess.	**60**	Af	CCDB
	Clusia nemorosa G.Mey.	**60**	AfxCa	Pitrez et al., 2014
	Clusia organensis Planch. & Triana	**60**	Af	CCDB
Combretaceae	*Conocarpus erectus* L.	**24**	Af	CCDB

	Terminalia glabrescens Mart.	**36**	AfxCe	CCDB
Convolvulaceae	*Evolvulus elegans* Moric.	**52**	Ce	Pitrez et al., 2008
	Evolvulus glomeratus Nees & C. Mart.	**26**	Ce	Pitrez et al., 2008
	Ipomoea carnea Jacq.	**26, 30, 32**	Ca	CCDB
Cunoniaceae	*Lamanonia ternata* Vell.	**32**	AfxCe	CCDB
Dilleniaceae	*Curatella americana L.*	**24, 26**	Common	CCDB
Ebenaceae	*Diospyros ebenum* J.Koenig ex Retz.	**30, 90**	Af	CCDB
	Diospyros inconstans Jacq.	**30**	AfxCe	CCDB
Erythroxylaceae	*Erythroxylum campestre* A.St.-Hil.	**24**	AfxCe	CCDB
	Erythroxylum deciduum A.St.-Hil.	**24**	Common	CCDB
	Erythroxylum pelleterianum A.St.-Hil.	**24**	AfxCe	CCDB
Escalloniaceae	*Escallonia bifida* Link & Otto	**24**	Af	CCDB
	Acalypha multicaulis Müll.Arg.	**38**	CexCa	Pôrto et al., 2014

Alchornea cordifolia (Schumach. & Thonn.) Müll.Arg.	**18**	Af	CCDB
Alchornea triplinervia (Spreng.) Müll.Arg.	**72**	AfxCe	Godoy et al., 2012
Astraea lobata (L.) Klotzsch	**18**	Ce	CCDB
Cnidoscolus urens (L.) Arthur	**36**	AfxCe	CCDB
Croton adenocalyx Baill.	**40**	Ca	Lira, 2011
Croton argyrophyllus Kunth	**20**	Ca	Pôrto et al., 2014
Croton blanchetianus Baill.	**20, 40**	Common	Mehra, 1976
Croton floribundus Spreng.	**56**	AfxCe	Silvestrini et al., 2013
Croton heliotropiifolius Kunth	**20, 40**	Common	Gusmão, 2000
Croton jacobinensis Baill.	**20**	AfxCa	Pôrto et al., 2014
Croton pedicellatus Kunth	**18**	CexCa	Pôrto et al., 2014
Croton pulegioides Müll.Arg.	**20**	Ca	Porto, 2007
Croton sonderianus Müll.Arg.	**20**	Common	Porto, 2007

Croton urticifolius Lam.	**20**	AfxCa	Pôrto et al., 2014
Euphorbia hyssopifolia L.	**12, 14**	Af	CCDB
Jatropha curcas L.	**22, 33, 44**	CexCa	CCDB
Jatropha gossypiifolia L.	**22**	Ce	CCDB
Joannesia princeps Vell.	**22**	Af	CCDB
Manihot anomala Pohl	**36**	Common	CCDB
Manihot carthaginensis (Jacq.) Müll.Arg.	**36**	AfxCe	CCDB
Manihot carthaginensis subsp. *glaziovii* (Müll.Arg.) Allem	**34, 36**	CexCa	CCDB
Manihot dichotoma Ule	**36**	Ca	CCDB
Manihot esculenta Crantz	**30, 32, 34, 36, 38, 54, 72, 144**	Ce	CCDB
Manihot grahamii Hook.	**36**	Af	CCDB

	Manihot palmata Müll.Arg.	**36**	Ca	CCDB
	Manihot tripartita (Spreng.) Müll.Arg.	**36**	Ce	CCDB
	Sapium haematospermum Müll.Arg.	**120**	AfxCe	CCDB
	Sebastiania brasiliensis Spreng.	**40**	Common	CCDB
	Sebastiania commersoniana (Baill.) L.B.Sm. & Downs	**134**	Ca	CCDB
	Stillingia trapezoidea Ule	**36**	Ca	Pitrez et al., 2014
Fabaceae	*Abarema filamentosa* (Benth.) Pittier	**26**	Af	Santos et al., 2012
	Abrus precatorius L.	**22**	Ce	CCDB
	Acacia suaveolens (Sm.) Willd.	**26**	Ce	CCDB
	Acosmium cardenasii H.S.Irwin & Arroyo	**18**	Af	Rodrigues et al., 2009
	Acosmium diffusissimum (Mohlenbr.) Yakovlev	**18, 24, 32**	Ca	Rodrigues et al., 2009
	Acosmium lentiscifolium Schott	**18**	Af	Rodrigues et al., 2009
	Aeschynomene paniculata Vogel	**20, 22**	Ce	Polido et al., 2015

Aeschynomene sensitiva Sw.	**20, 22**	Ce	CCDB
Albizia adianthifolia (Schum.) W.Wight	**26**	Af	CCDB
Albizia inundata (Mart.) Barneby & J.W.Grimes	**26, 52**	Ca	CCDB
Albizia lebbeck (L.) Benth.	**26**	Ce	CCDB
Albizia niopoides (Benth.) Burkart	**26**	AfxCe	CCDB
Albizia polycephala (Benth.) Killip	**52**	Common	Atchison, 1951
Amburana cearensis (Allemao) A.C.Sm.	**22**	Common	CCDB
Anadenanthera colubrina (Vell.) Brenan	**26**	Common	CCDB
Ancistrotropis peduncularis (Kunth) A. Delgado	**18**	Ce	Vanderborght et al., 1989
Andira anthelmia (Vell.) J.F.Macbr.	**21, 22**	AfxCe	Pennington, 2003
Andira fraxinifolia Benth.	**22**	AfxCe	Pennington, 2003
Andira humilis Mart. ex Benth.	**22**	Ce	CCDB
Andira inermis (Wright) DC.	**20,22**	AfxCe	CCDB

Apuleia leiocarpa (Vogel) J.F.Macbr.	**24, 28**	Common	CCDB
Bauhinia aculeata L.	**28**	Ce	CCDB
Bauhinia forficata Link	**28**	Common	CCDB
Bauhinia mollis (Bong.) D.Dietr.	**28**	AfxCe	CCDB
Bauhinia rufa (Bong.) Steud.	**28**	AfxCe	Turner & Irwin, 1961
Bauhinia ungulata L.	**28**	Common	CCDB
Bionia coriacea (Nees & Mart.) Benth.	**22**	Ce	Moore, 1971
Bionia pedicellata (Benth.) L.P. Queiroz	**22**	Ce	Varela et al., 2004
Bowdichia virgilioides Kunth	**18**	Common	CCDB
Caesalpinia pulcherrima (L.) Sw.	**22, 24, 28**	Ce	CCDB
Calliandra depauperata Benth.	**16, 26**	Ca	Santos et al., 2012
Calliandra leptopoda Benth.	**16**	Ca	Santos et al., 2012
Calliandra tweedii Benth.	**16**	Af	CCDB

Camptosema scarlatinum (Benth.) Burkart	**20**	Ce	CCDB
Cassia ferruginea (Schrad.) DC.	**28**	Common	Irwin & Turner, 1960
Cassia grandis L.f.	**28**	AfxCe	CCDB
Cassia leptophylla Vogel	**28**	Af	CCDB
Cassia moschata Kunth	**28**	Ce	CCDB
Cenostigma macrophyllum Tul.	**24**	Common	Rodrigues et al., 2014
Centrolobium tomentosum Benth.	**18**	AfxCe	CCDB
Centrosema arenarium Benth.	**22**	Af	CCDB
Chamaecrista cathartica (Mart.) H.S.Irwin & Barneby	**28**	Ce	Irwin & Turner, 1960
Chamaecrista desvauxii (Collad.) Killip	**14**	AfxCe	CCDB
Chamaecrista duckeana (P.Bezerra & Alf.Fern.) H.S.Irw	**16**	Af	CCDB
Chamaecrista flexuosa (L.) Greene	**16**	AfxCe	Biondo et al., 2005
Chamaecrista hispidula (Vahl) H.S.Irwin & Barneby	**14, 28**	Ce	CCDB

Chamaecrista mucronata (Spreng.) H.S.Irwin & Barneby	**16**	Ce	de Souza Conceição et al., 2009
Chamaecrista nictitans (L.) Moench	**48**	AfxCe	CCDB
Chamaecrista ramosa (Vogel) H.S.Irwin & Barneby	**14**	AfxCe	CCDB
Chamaecrista repens (Vogel) H.S.Irwin & Barneby	**16**	Ce	CCDB
Chamaecrista repens var. *multijuga* (Benth.) H.S.Irwin & Barneby	**16**	Ce	CCDB
Chamaecrista setosa (Vogel) H.S.Irwin & Barneby	**28**	Ce	de Souza Conceição et al., 2009
Chamaecrista trichopoda (Benth.) Britton & Killip	**16**	Ce	CCDB
Chamaecrista viscosa (Kunth) H.S.Irwin & Barneby	**42**	Ce	CCDB
Chloroleucon tenuiflorum (Benth.) Barneby & J.W.Grimes	**26**	Af	CCDB
Clitoria falcata Lam.	**22**	Af	CCDB
Copaifera langsdorffii Desf.	**24**	Common	CCDB
Copaifera martii Hayne	**24**	Common	CCDB

Cratylia argentea (Desv.) Kuntze	**22**	Ce	Varela et al., 2004
Cratylia mollis Benth.	**22**	CexCa	Vargas et al., 2007
Crotalaria holosericea Nees & Mart.	**16**	Ce	CCDB
Crotalaria incana L.	**14**	Af	CCDB
Crotalaria micans Link	**16**	Ce	CCDB
Crotalaria retusa L.	**14, 16**	Af	CCDB
Crotalaria stipularia Desv.	**32**	Ce	CCDB
Crotalaria vitellina Ker. Gawl.	**16**	Ce	CCDB
Dahlstedtia pinnata (Benth.) Malme	**22**	Af	CCDB
Dalbergia cearensis Ducke	**20**	Common	CCDB
Dalbergia ecastaphyllum (L.) Taub.	**20**	Af	Polido et al., 2015
Dalbergia frutescens (Vell.) Britton	**20**	AfxCa	Polido et al., 2015
Dalbergia miscolobium Benth.	**20**	AfxCe	CCDB

Dalbergia nigra (Vell.) Benth.	**20**	Af	CCDB
Delonix regia (Hook.) Raf.	**24,28**	Ce	CCDB
Desmanthus virgatus (L.) Willd.	**28**	Ce	CCDB
Desmodium barbatum (L.) Benth.	**22**	AfxCe	CCDB
Desmodium triflorum (L.) DC.	**18, 22**	Ce	CCDB
Dimorphandra mollis Benth.	**28**	AfxCe	CCDB
Dioclea megacarpa Rolfe	**22**	Af	Espert et al., 2008
Dipteryx odorata (Aubl.) Willd.	**32**	AfxCe	CCDB
Enterolobium contortisiliquum (Vell.) Morong	**26**	Common	CCDB
Enterolobium gummiferum (Mart.) J.F.Macbr.	**26**	Ce	CCDB
Enterolobium timbouva Mart.	**26**	AfxCa	CCDB
Erythrina crista-galli L.	**40, 42, 44**	Af	CCDB
Erythrina falcata Benth.	**42**	Af	Forni-Martins & Cruz, 1996

Erythrina speciosa Andrews	**42**	Af	Forni-Martins & Cruz, 1996
Erythrina velutina Willd.	**42**	Common	Forni-Martins & Cruz, 1996
Erythrina verna Vell.	**42**	Common	CCDB
Geoffroea spinosa Jacq.	**20**	Ca	Polido et al., 2015
Gleditsia amorphoides (Griseb.) Taub.	**28**	Af	Biondo et al., 2005
Grazielodendron rio-docensis H.C.Lima	**20**	Af	CCDB
Holocalyx balansae Micheli	**22**	AfxCe	CCDB
Hymenaea aurea Lee & Langenh.	**24**	AfxCa	CCDB
Hymenaea courbaril L.	**24**	Common	CCDB
Hymenaea courbaril var. *stilbocarpa* (Hayne) Lee & Langenh.	**24**	Ce	CCDB
Hymenaea eriogyne Benth.	**24**	Common	CCDB
Hymenaea martiana Hayne	**24**	Common	CCDB
Hymenaea oblongifolia Huber	**24**	Af	CCDB

Hymenaea parvifolia Huber	**24**	Ce	CCDB
Hymenaea rubriflora Ducke	**24**	Af	CCDB
Hymenaea stigonocarpa Hayne	**24**	Common	CCDB
Hymenaea stigonocarpa var. *pubescens* Benth.	**24**	Ce	CCDB
Hymenaea velutina Ducke	**24**	CexCa	CCDB
Indigofera hirsuta L.	**16**	Ce	CCDB
Indigofera microcarpa Desv.	**16**	Af	CCDB
Indigofera suffruticosa Mill.	**12, 16, 32**	AfxCe	CCDB
Inga edulis Mart.	**26**	AfxCe	CCDB
Inga heterophylla Willd.	**26**	AfxCe	CCDB
Inga laurina (Sw.) Willd.	**26, 52**	AfxCe	Cordeiro et al., 2017
Inga marginata Willd.	**26**	AfxCe	CCDB
Inga vera Willd.	**26**	Common	CCDB

Leptolobium dasycarpum Vogel	**18**	Common	CCDB
Leucaena leucocephala (Lam.) de Wit	**36, 52, 56, 96, 104, 106**	Af	CCDB
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz	**24, 48**	Common	CCDB
Lonchocarpus cultratus (Vell.) A.M.G. Azevedo & H.C. Lima	**22**	Af	CCDB
Lonchocarpus nitidus (Vogel) Benth.	**22**	Af	CCDB
Lonchocarpus sericeus (Poir.) DC.	**22**	Common	CCDB
Machaerium aculeatum Raddi	**20**	AfxCe	CCDB
Machaerium acutifolium Vogel	**20**	Common	CCDB
Machaerium brasiliense Vogel	**20**	Common	CCDB
Machaerium fulvovenosum H.C.Lima	**20**	Af	CCDB
Machaerium isadelphum (E.Mey.) Standl.	**20, 40**	Af	CCDB

Machaerium lanceolatum (Vell.) J.F.Macbr.	**20**	Af	CCDB
Machaerium nyctitans (Vell.) Benth.	**20, 40**	AfxCe	CCDB
Machaerium oblongifolium Vogel	**20**	Af	CCDB
Machaerium opacum Vogel	**20**	Common	CCDB
Machaerium pedicellatum Vogel	**20**	Af	CCDB
Machaerium scleroxylon Tul.	**20**	Common	CCDB
Machaerium stipitatum (DC.) Vogel	**20**	Common	CCDB
Machaerium vestitum Vogel	**20**	Ca	Polido et al., 2015
Machaerium villosum Vogel	**20**	Common	CCDB
Macroptilium lathyroides (L.) Urb.	**22**	Af	CCDB
Microlobius foetidus (Jacq.) M.Sousa & G.Andrade	**26**	Af	CCDB
Mimosa acutistipula Benth.	**52**	CexCa	Freire et al., 2013
Mimosa adenocarpa Benth.	**26**	Ce	Dahmer et al., 2011

Mimosa arenosa (Willd.) Poir.	**26**	Common	Santos et al., 2012
Mimosa artemisiana Heringer & Paula	**26**	Af	Dahmer et al., 2011
Mimosa bimucronata (DC.) Kuntze	**24, 26**	AfxCa	CCDB
Mimosa caesalpiniifolia Benth.	**26**	Common	CCDB
Mimosa claussenii Benth.	**26**	Ce	CCDB
Mimosa dolens Vell.	**104**	Ce	Seijo, 1993
Mimosa hirsutissima Mart.	**26, 52**	Ce	Seijo, 1999
Mimosa invisa Colla	**24, 26**	Ce	CCDB
Mimosa laticifera Rizzini & A.Mattos	**26**	Ce	CCDB
Mimosa lewisii Barneby	**26, 28**	AfxCa	Rodrigues et al., 2017
Mimosa ophthalmocentra Benth.	**26**	CexCa	Dahmer et al., 2011
Mimosa paraibana Barneby	**26**	Ca	Freire et al., 2013
Mimosa pigra L.	**26, 52**	Ca	Freire et al., 2013

Mimosa polycarpa Kunth	**26**	Ce	CCDB
Mimosa polydidyma Barneby	**26**	Ce	Santos et al., 2012
Mimosa pteridifolia Benth.	**26**	Ce	Dahmer et al., 2011
Mimosa pudica L.	**32, 48, 52, 78**	Ce	CCDB
Mimosa radula Benth.	**26**	Ce	Santos et al., 2012
Mimosa radula var. *imbricata* (Benth.) Barneby	**26**	Ce	Dahmer et al., 2011
Mimosa scabrella Benth.	**52**	Af	Dahmer et al., 2011
Mimosa sericantha Benth.	**26**	Ce	Dahmer et al., 2011
Mimosa setosissima Taub.	**26**	Ce	Santos et al., 2012
Mimosa somnians Willd.	**26, 52**	AfxCe	CCDB
Mimosa tenuiflora (Willd.) Poir.	**26**	Common	CCDB
Mimosa velloziana Mart.	**52**	Ce	CCDB
Mimosa verrucosa Benth.	**26**	CexCa	Dahmer et al., 2011

Muellera campestris (Mart. ex Benth.) M.J. Silva & A.M.G. Azevedo	**22**	Af	CCDB
Myroxylon balsamum (L.) Harms	**28**	Af	CCDB
Myroxylon peruiferum L.f.	**26**	AfxCa	Melloni, 2010
Ormosia arborea (Vell.) Harms	**16**	AfxCe	CCDB
Ormosia monosperma (Sw.) Urb.	**16**	Af	CCDB
Parapiptadenia rigida (Benth.) Brenan	**26**	Af	CCDB
Parkia pendula (Willd.) Walp.	**26**	AfxCe	Santos et al., 2012
Parkinsonia aculeata L.	**18, 28**	Ca	CCDB
Paubrasilia echinata (Lam.) Gagnon, H.C.Lima & G.P.Lewis	**24**	AfxCe	CCDB
Peltophorum dubium (Spreng.) Taub.	**26**	Common	CCDB
Periandra heterophylla Benth.	**22**	Ce	CCDB
Periandra mediterranea (Vell.) Taub.	**22**	Common	CCDB

Piptadenia obliqua (Pers.) J.F.Macbr.	**26**	Af	CCDB
Piptadenia stipulacea (Benth.) Ducke	**26**	Common	CCDB
Piptadenia viridiflora (Kunth) Benth.	**26**	Common	Santos et al., 2012
Pithecellobium dulce (Roxb.) Benth.	**26**	Af	CCDB
Pityrocarpa obliqua (Pers.) Brenan	**26**	Common	CCDB
Plathymenia reticulata Benth.	**26**	Common	CCDB
Poincianella bracteosa (Tul.) L.P.Queiroz	**48**	CexCa	CCDB
Poincianella microphylla (Mart. ex G.Don) L.P.Queiroz	**24**	AfxCa	CCDB
Poincianella pluviosa (DC.) L.P.Queiroz	**24**	AfxCa	CCDB
Poincianella pyramidalis (Tul.) L.P.Queiroz	**24**	Common	CCDB
Prosopis juliflora (Sw.) DC.	**26, 28, 52, 56**	Af	CCDB
Pterocarpus rohrii Vahl	**20**	Common	CCDB
Pterodon emarginatus Vogel	**16**	AfxCe	CCDB

Pterodon pubescens (Benth.) Benth.	**16**	AfxCe	CCDB
Pterogyne nitens Tul.	**20**	AfxCa	CCDB
Samanea saman (Jacq.) Merr.	**26, 28**	Af	CCDB
Schizolobium parahyba (Vell.) S.F.Blake	**24**	Af	CCDB
Senegalia bahiensis (Benth.) Seigler & Ebinger	**26**	AfxCa	Santos et al., 2012
Senegalia riparia (Kunth) Britton	**26**	Common	Santos et al., 2012
Senegalia tenuifolia (L.) Britton & Rose	**26**	Common	Santos et al., 2012
Senna acuruensis (Benth.) H.S.Irwin & Barneby	**28**	CexCa	Matos et al., 2011
Senna alata (L.) Roxb.	**24, 28**	Ce	CCDB
Senna angulata (Vogel) H.S.Irwin & Barneby	**26**	Ca	CCDB
Senna bicapsularis (L.) Roxb.	**28**	Ce	CCDB
Senna cana (Nees & Mart.) H.S.Irwin & Barn	**28**	Common	Matos et al., 2011
Senna cernua (Balb.) H.S.Irwin & Barneby	**28**	Af	CCDB

Senna chrysocarpa (Desv.) H.S.Irwin & Barneby	**24**	Ce	CCDB
Senna gardneri (Benth.) H.S.Irwin & Barneby	**26, 52, 104**	CexCa	Matos et al., 2011
Senna hirsuta (L.) H.S.Irwin & Barneby	**28, 32, 56**	Af	CCDB
Senna macranthera (Collad.) H.S.Irwin & Barneby	**24, 26**	Common	CCDB
Senna martiana (Benth.) H.S.Irwin & Barneby	**14**	Ca	Cordeiro & Felix, 2017
Senna multijuga (Rich.) H.S.Irwin & Barneby	**16, 24**	AfxCe	Gill & Husaini, 1981
Senna obtusifolia (L.) H.S.Irwin & Barneby	**24, 26, 28, 52, 56**	AfxCe	CCDB
Senna occidentalis (L.) Link	**24, 26, 28, 56**	Ce	CCDB
Senna pendula (Willd.) H.S.Irwin & Barneby	**28**	AfxCe	CCDB
Senna pilifera (Vogel) H.S.Irwin & Barneby	**22**	Ce	CCDB
Senna quinquangulata (Rich.) H.S.Irwin & Barneby	**26**	AfxCe	CCDB
Senna rugosa (G.Don) H.S.Irwin & Barneby	**28, 56**	CexCa	CCDB

Senna siamea (Lam.) H.S.Irwin & Barneby	**26, 28**	Ce	CCDB
Senna silvestris (Vell.) H.S.Irwin & Barneby	**28**	AfxCe	CCDB
Senna spectabilis (DC.) H.S.Irwin & Barneby	**26, 28**	Common	CCDB
Senna splendida (Vogel) H.S.Irwin & Barneby	**26, 52**	Common	CCDB
Sesbania exasperata Kunth	**12**	Ca	CCDB
Sesbania virgata (Cav.) Pers.	**12**	Ca	CCDB
Sophora tomentosa L.	**18**	Af	CCDB
Stryphnodendron adstringens (Mart.) Coville	**26**	AfxCe	CCDB
Stryphnodendron polyphyllum Mart.	**26**	AfxCe	Forni-Martins & Martins, 2000
Stylosanthes capitata Vogel	**40**	Ce	CCDB
Stylosanthes guianensis (Aubl.) Sw.	**20**	Ce	CCDB
Stylosanthes viscosa Sw.	**20**	AfxCe	CCDB
Swartzia acuminata Willd. ex Vogel	**26**	Af	Pinto et al., 2015

Swartzia apetala Raddi	**26**	AfxCe	CCDB
Swartzia jororii Harms	**26**	Af	CCDB
Swartzia langsdorffii Raddi	**26**	Af	Pinto et al., 2015
Swartzia linharensis Mansano	**26**	Af	Pinto et al., 2015
Swartzia multijuga Vogel	**26**	Af	Pinto et al., 2015
Swartzia myrtifolia Sm.	**26**	Af	Pinto et al., 2015
Swartzia oblata Cowan	**26**	Af	Pinto et al., 2015
Swartzia polyphylla DC.	**26**	Af	Pinto et al., 2015
Swartzia simplex (Sw.) Spreng.	**26**	Af	Pinto et al., 2015
Tachigali aurea Tul.	**24**	Common	CCDB
Tephrosia cinerea (L.) Pers.	**22**	Af	CCDB
Tephrosia noctiflora Baker	**22, 32**	Af	CCDB
Tephrosia purpurea (L.) Pers.	**16, 22, 24, 44**	Af	CCDB

	Vachellia farnesiana (L.) Wight & Arn	**26, 52, 102**	Common	CCDB
Gesneriaceae	*Paliavana tenuiflora* Mansf.	**28**	AfxCa	Pitrez et al., 2014
Hernandiaceae	*Sparattanthelium botocudorum* Mart.	**96**	Af	Morawetz, 1986
Hydroleaceae	*Hydrolea spinosa* L.	**32, 40**	Ce	CCDB
Krameriaceae	*Krameria tomentosa* A. St.-Hil.	**12**	AfxCe	Simpson, 1989
Lacistemataceae	*Lacistema aggregatum* (P.J.Bergius) Rusby	**44, 62**	AfxCe	Oginuma & Tobe, 2010
Lamiaceae	*Aegiphila integrifolia* (Jacq.) B.D.Jacks.	**42**	AfxCe	Yuyama et al., 2010
	Cantinoa mutabilis (Rich.) Harley & J.F.B.Pastore	**32**	Ce	CCDB
	Eriope crassipes Benth.	**40**	Ce	CCDB
	Leonotis nepetifolia (L.) R.Br.	**24, 26, 28**	Ce	CCDB
	Ocimum gratissimum L.	**32, 34, 38, 40, 48, 64**	Af	CCDB
	Vitex megapotamica (Spreng.) Moldenke	**40**	AfxCe	CCDB
	Vitex trifolia L.	**26, 32, 34**	Ce	CCDB

Lauraceae	*Aiouea costaricensis* (Mez) Kosterm.	**24**	Af	CCDB
	Cryptocarya moschata Nees & Mart.	**24**	Af	Moraes & Gardingo, 1996
	Ocotea lancifolia (Schott) Mez	**24**	AfxCe	CCDB
	Ocotea longifolia Kunth	**24**	Af	CCDB
	Persea major (Meisn.) L.E.Kopp	**24**	Af	CCDB
Lecythidaceae	*Cariniana estrellensis* (Raddi) Kuntze	**34**	AfxCe	CCDB
	Gustavia augusta L.	**36, 72**	Af	CCDB
	Lecythis lanceolata Poir.	**34**	Af	CCDB
Loganiaceae	*Strychnos brasiliensis* (Spreng.) Mart.	**110**	AfxCe	Gadella, 1980
Lythraceae	*Adenaria floribunda* Kunth	**32**	Ce	CCDB
	Cuphea antisyphilitica Kunth	**28, 32, 48**	Ce	CCDB
	Cuphea campestris Mart. ex Koehne	**16**	Ce	CCDB
	Cuphea ericoides Cham. & Schltdl.	**14, 24, 28, 48**	Ce	CCDB

	Cuphea melvilla Lindl.	**32**	Ce	CCDB
	Cuphea sessilifolia Mart.	**14, 16, 24**	Ce	CCDB
	Diplusodon virgatus Pohl	**30**	Ce	CCDB
	Lafoensia acuminata (Ruiz & Pav.) DC.	**16**	Af	CCDB
	Lafoensia nummularifolia A. St.-Hil.	**16**	Ce	CCDB
	Lafoensia pacari A. St.-Hil.	**16**	AfxCe	Graham & Cavalcanti, 2001
	Lafoensia vandelliana Cham. & Schltdl.	**16**	AfxCe	CCDB
	Physocalymma scaberrimum Pohl	**16**	AfxCe	CCDB
	Punica granatum L.	**14, 15, 16, 18, 19**	Ce	CCDB
Magnoliaceae	*Magnolia ovata* (A.St.-Hil.) Spreng.	**38**	AfxCe	CCDB
Malpighiaceae	*Aspicarpa pulchella* (Griseb.) O'Donell & Lourteig	**80**	Ce	CCDB
	Banisteriopsis angustifolia (A.Juss.) B.Gates	**20**	CexCa	CCDB
	Banisteriopsis campestris (A.Juss.) Little	**20**	Ce	CCDB

Banisteriopsis laevifolia (A.Juss.) B.Gates	**20, 40**	Ce	CCDB
Banisteriopsis oxyclada (A.Juss.) B.Gates	**20**	Ca	CCDB
Banisteriopsis stellaris (Griseb.) B.Gates	**80**	Ce	CCDB
Barnebya harleyi W.R.Anderson & B.Gates	**58, 60**	CexCa	CCDB
Bunchosia armeniaca (Cav.) DC.	**60**	Ce	CCDB
Byrsonima basiloba A.Juss.	**24**	AfxCe	CCDB
Byrsonima coccolobifolia Kunth	**24**	AfxCe	CCDB
Byrsonima crassifolia (L.) Kunth	**20, 24**	Common	CCDB
Byrsonima intermedia A.Juss.	**24**	AfxCe	CCDB
Byrsonima oblongifolia A.Juss.	**24**	Ce	CCDB
Byrsonima rigida A.Juss.	**24**	Ce	CCDB
Byrsonima sericea DC.	**24**	Common	CCDB
Byrsonima verbascifolia (L.) DC.	**24**	Ce	CCDB

	Camarea affinis A.St.-Hil.	**34**	Ce	CCDB
	Diplopterys pubipetala (A.Juss.) W.R.Anderson & C.Davis	**30**	Ce	CCDB
	Heteropterys byrsonimifolia A.Juss.	**20**	AfxCe	CCDB
	Heteropterys campestris A.Juss.	**20**	CexCa	CCDB
	Heteropterys coleoptera A.Juss.	**10, 20**	Af	CCDB
	Heteropterys eglandulosa A.Juss.	**20**	Ce	CCDB
	Heteropterys escalloniifolia A.Juss.	**20**	Ce	CCDB
	Heteropterys pteropetala A.Juss.	**20**	CexCa	CCDB
	Malpighia glabra L.	**20, 40**	Ce	CCDB
	Peixotoa reticulata Griseb.	**30**	Ce	CCDB
	Peixotoa tomentosa A. Juss.	**20**	Ce	CCDB
	Stigmaphyllon paralias A.Juss.	**10, 20**	AfxCe	CCDB
Malvaceae	*Apeiba tibourbou* Aubl.	**36**	AfxCe	CCDB

Ayenia angustifolia A.St.-Hil. & Naudin	**20**	Ce	CCDB
Bastardiopsis densiflora (Hook. & Arn.) Hassl.	**28**	Af	CCDB
Byttneria rhamnifolia Benth.	**28**	Af	CCDB
Ceiba erianthos (Cav.) K.Schum.	**86**	AfxCa	CCDB
Ceiba glaziovii (Kuntze) K.Schum.	**86**	AfxCa	CCDB
Ceiba pentandra (L.) Gaertn.	**72, 74, 75, 76, 80, 84, 86, 88**	Ce	CCDB
Ceiba pubiflora (A.St.-Hil.) K.Schum.	**86**	AfxCa	CCDB
Ceiba speciosa (A.St.-Hil.) Ravenna	**72, 86**	Common	CCDB
Christiana africana DC.	**40**	Af	CCDB
Cienfuegosia affinis (Kunth) Hochr.	**20**	Ce	CCDB
Corchorus orinocensis Kunth	**28**	Ca	CCDB
Eriotheca candolleana (K.Schum.) A.Robyns	**92**	Af	Marinho et al., 2014

Eriotheca gracilipes (K.Schum.) A.Robyns	**92, 96**	AfxCe	CCDB
Eriotheca pubescens (Mart. & Zucc.) Schott & Endl.	**184, 270, 276**	Ce	CCDB
Gossypium mustelinum Miers ex G.Watt	**26, 52**	Ce	CCDB
Guazuma ulmifolia Lam.	**16**	Common	CCDB
Helicteres brevispira A.Juss.	**18**	CexCa	CCDB
Helicteres guazumifolia Kunth	**18**	Common	CCDB
Helicteres lhotzkyana K.Schum.	**18**	AfxCe	CCDB
Helicteres ovata Lam.	**18**	Af	CCDB
Helicteres sacarolha A.Juss.	**18**	CexCa	CCDB
Helicteres velutina K.Schum.	**18**	AfxCa	CCDB
Herissantia tiubae (K.Schum.) Brizicky	**12**	Ca	CCDB
Hibiscus esculentus L.	**66, 72, 118, 120,**	Ce	CCDB

	122, 130, 132		
Hibiscus furcellatus Desr.	**36**	Ce	CCDB
Hibiscus peruvianus R.E.Fr.	**72**	Ce	CCDB
Luehea candicans Mart.	**36**	Common	CCDB
Luehea divaricata Mart.	**36**	Common	CCDB
Luehea ochrophylla Mart.	**36**	Af	IPCN online
Melochia tomentosa L.	**18**	Af	CCDB
Pachira aquatica Aubl.	**26, 88**	Af	CCDB
Pavonia cancellata (L.) Cav.	**56**	Af	CCDB
Pavonia sepium A.St.-Hil.	**56**	Af	CCDB
Pavonia sidifolia Kunth	**56**	Af	CCDB
Peltaea speciosa (Kunth) Standl.	**100**	Ce	CCDB
Pseudobombax longiflorum (Mart. & Zucc.) A.Robyns	**88**	AfxCe	Marinho et al., 2014

Pseudobombax simplicifolium A. Robyns	**88**	Ca	Costa et al., 2017
Pseudobombax tomentosum (Mart. & Zucc.) A.Robyns	**88**	AfxCe	Marinho et al., 2014
Sida acuta Burm.f.	**14, 28**	Ce	CCDB
Sida angustissima A.St.-Hil.	**14**	Ce	CCDB
Sida cerradoensis Krap.	**14**	Af	CCDB
Sida cordifolia L.	**16, 28, 32**	Ce	CCDB
Sida glomerata Cav.	**14**	AfxCe	CCDB
Sida linifolia Juss. ex Cav.	**14**	Af	CCDB
Sida rhombifolia L.	**14, 16, 28**	Ce	CCDB
Sida santaremensis Monteiro	**14**	Ce	CCDB
Sida urens L.	**32**	AfxCe	CCDB
Sida viarum A.St.-Hil.	**14**	Ce	CCDB
Sterculia apetala (Jacq.) H.Karst.	**40**	AfxCe	CCDB

	Sterculia striata A. St.-Hil. & Naudin	**40**	Common	CCDB
	Triumfetta semitriloba Jacq.	**32**	CexCa	CCDB
	Waltheria communis A.St.-Hil.	**12**	Ce	CCDB
	Waltheria indica L.	**14, 24, 40**	AfxCe	CCDB
Marcgraviaceae	*Schwartzia brasiliensis* (Choisy) Bedell ex Gir.-Cañas	**68, 70**	Af	Schneider et al., 2015
Melastomataceae	*Clidemia capitellata* (Bonpl.) D. Don	**34**	Af	CCDB
	Clidemia hirta (L.) D. Don	**34**	AfxCe	CCDB
	Clidemia sericea D. Don	**34**	Ce	CCDB
	Clidemia urceolata DC.	**34**	AfxCe	CCDB
	Leandra rufescens (DC.) Cogn.	**28, 30**	Af	CCDB
	Leandra solenifera Cogn.	**34**	Ce	CCDB
	Marcetia taxifolia (A. St.-Hil.) DC.	**24**	AfxCe	IPCN online
	Miconia affinis DC.	**34**	Af	CCDB

Miconia albicans (Sw.) Steud.	**34, 48**	Common	CCDB
Miconia calvescens DC.	**32**	Af	CCDB
Miconia ciliata (Rich.) DC.	**34**	Af	CCDB
Miconia dodecandra Cogn.	**68, 136**	Af	CCDB
Miconia fallax DC.	**34**	Ce	CCDB
Miconia ibaguensis (Bonpl.) Triana	**62**	Ce	CCDB
Miconia macrothyrsa Benth.	**34**	Ce	CCDB
Miconia minutiflora (Bonpl.) DC.	**34**	AfxCe	CCDB
Miconia mirabilis (Aubl.) L.O. Williams	**134**	AfxCe	CCDB
Miconia nervosa (Sm.) Triana	**34**	AfxCe	CCDB
Miconia prasina (Sw.) DC.	**48, 52**	AfxCe	CCDB
Miconia rubiginosa (Bonpl.) DC.	**50**	AfxCe	CCDB
Miconia stenostachya DC.	**52**	AfxCe	CCDB

	Miconia theizans (Bonpl.) Cogn.	**34**	AfxCe	CCDB
	Miconia tomentosa (Rich.) D. Don ex DC.	**34**	AfxCe	CCDB
	Nepsera aquatica (Aubl.) Naudin	**18**	Af	CCDB
	Pleroma candolleanum (Mart. ex DC.) Triana	**36**	AfxCe	CCDB
	Pleroma granulosum (Desr.) D. Don	**36**	AfxCe	CCDB
	Pleroma mutabile (Vell.) Triana	**36**	Af	CCDB
	Pleroma semidecandrum (Schrank et Mart. ex DC.) Triana	**56**	Af	CCDB
	Rhynchanthera grandiflora (Aubl.) DC.	**20**	Ce	CCDB
	Tibouchina mutabilis (Vell.) Cogn.	**36**	Ca	CCDB
	Tibouchina sellowiana Cogn.	**36**	AfxCe	CCDB
	Tococa guianensis Aubl.	**34**	AfxCe	CCDB
	Trembleya parviflora (D. Don) Cogn.	**22**	AfxCe	Goldblatt & Peter, 1984
Meliaceae	*Carapa guianensis* Aubl.	**58**	Af	CCDB

	Cedrela angustifolia DC.	**54**	Af	CCDB
	Cedrela fissilis Vell.	**56**	Common	Grossi et al., 2011
	Cedrela odorata L.	**50, 52, 56**	Common	CCDB
	Trichilia pallida Sw.	**48, 52**	AfxCe	CCDB
Monimiaceae	*Hennecartia omphalandra* Poiss.	**38**	Af	CCDB
Moraceae	*Artocarpus heterophyllus* Lam.	**28, 56**	Af	CCDB
	Artocarpus integer (Thunb.) Merr.	**56**	Af	CCDB
	Ficus citrifolia Mill.	**26**	AfxCe	CCDB
	Ficus hirsuta Schott	**26**	Af	CCDB
	Ficus insipida Willd.	**26**	AfxCe	Condit, 1933
	Ficus maxima Mill.	**26**	Af	CCDB
	Ficus nymphaeifolia Mill.	**26**	Af	Condit, 1964
	Ficus obtusifolia Kunth	**26**	AfxCe	CCDB

	Ficus pertusa L.f.	**26**	Af	Condit, 1964
	Ficus trigona L.f.	**26**	Af	CCDB
	Ficus villosa Blume	**26**	Af	CCDB
Myrtaceae	*Acca sellowiana* (O.Berg) Burret	**22**	Af	CCDB
	Blepharocalyx salicifolius (Kunth) O.Berg	**22**	AfxCe	Costa et al., 2008
	Calyptranthes brasiliensis Spreng.	**22**	Af	CCDB
	Calyptranthes dardanoi Mattos	**22**	Af	Amorim et al., 2012
	Calyptranthes grandiflora O.Berg	**22**	Af	Amorim et al., 2012
	Calyptranthes lucida Mart. ex DC.	**22**	AfxCe	CCDB
	Campomanesia adamantium (Cambess.) O.Berg	**22**	Ce	CCDB
	Campomanesia dichotoma (O.Berg) Mattos	**22**	Common	Amorim et al., 2012
	Campomanesia guaviroba (DC.) Kiaersk.	**22, 88**	AfxCe	CCDB
	Campomanesia guazumifolia (Cambess.) O.Berg	**22**	AfxCe	Costa et al., 2008

Campomanesia laurifolia Gardner	**22**	Af	Costa et al., 2008
*Campomanesia ph*aea (O.Berg) Landrum	**22**	Af	Costa et al., 2008
Campomanesia pubescens (Mart. ex DC.) O.Berg	**22**	Common	Costa et al., 2008
Campomanesia schlechtendaliana (O.Berg) Nied.	**22**	Af	Costa et al., 2008
Eugenia aurata O.Berg	**22, 44**	Common	Forni-Martins & Martins, 2000
Eugenia bimarginata DC.	**32**	AfxCe	Forni-Martins & Martins, 2000
Eugenia brasiliensis Lam.	**22**	Af	Costa & Forni-Martins, 2004
Eugenia cerasiflora Miq.	**22**	AfxCe	Silveira et al., 2017
Eugenia crenata Vell.	**22**	Ca	CCDB
Eugenia dysenterica DC.	**33**	Common	Costa & Forni-Martins, 2004
Eugenia hiemalis Cambess.	**22, 44**	AfxCe	Costa & Forni-Martins, 2004
Eugenia hirta O.Berg	**44**	Af	Amorim et al., 2012
Eugenia involucrata DC.	**22**	Af	CCDB

Eugenia klotzschiana O.Berg	**22, 33**	AfxCe	Silveira et al., 2017
Eugenia luschnathiana (O.Berg) Klotzsch ex B.D.Jacks.	**22**	AfxCa	CCDB
Eugenia mosenii (Kausel) Sobral	**22, 44**	Af	Costa & Forni-Martins, 2004
Eugenia multicostata D.Legrand	**22**	Af	CCDB
Eugenia neomyrtifolia Sobral	**44**	Af	CCDB
Eugenia pitanga (O.Berg) Nied.	**22, 44**	AfxCe	Costa & Forni-Martins, 2004
Eugenia pluriflora DC.	**66**	AfxCe	Andrade & Forni-Martins, 1998
Eugenia punicifolia (Kunth) DC.	**22, 33, 44**	Common	Costa & Forni-Martins, 2004
Eugenia pyriformis Cambess.	**22, 33**	Common	Silveira et al., 2017
Eugenia stictopetala Mart. ex DC.	**22**	Common	Silveira et al., 2017
Eugenia stigmatosa DC.	**22**	Af	CCDB
Eugenia tumescens B.S.Amorim & M.Alves	**22**	Af	Amorim et al., 2012
Eugenia umbrosa O.Berg	**22**	Af	Amorim et al., 2012

Eugenia uniflora L.	**22, 33**	Common	Amorim et al., 2012
Eugenia uruguayensis Cambess.	**24, 44**	AfxCe	CCDB
Marlierea clausseniana (O.Berg) Kiaersk.	**22**	Af	Costa & Forni-Martins, 2007
Marlierea tomentosa Cambess.	**22**	Af	Costa & Forni-Martins, 2007
Myrceugenia bracteosa (DC.) D.Legrand & Kausel	**22**	Af	Landrum, 1981
Myrceugenia brevipedicellata (Burret) D.Legrand & Kausel	**22**	Af	Landrum, 1981
Myrceugenia euosma (O.Berg) D.Legrand	**22**	Af	Landrum, 1981
Myrceugenia miersiana (Gardner) D.Legrand & Kausel	**22**	Af	Landrum, 1981
Myrceugenia myrcioides (Cambess.) O.Berg	**22**	Af	Costa & Forni-Martins, 2007
Myrceugenia ovata (Hook. & Arn.) O.Berg	**22**	Af	Costa & Forni-Martins, 2007
Myrceugenia pilotantha (Kiaersk.) Landrum	**22**	Af	Landrum, 1981
Myrcia bella Cambess.	**22**	Ce	Costa & Forni-Martins, 2007
Myrcia brasiliensis Kiaersk.	**22**	Af	CCDB

Myrcia fallax (Rich.) DC.	**22**	Ce	Costa & Forni-Martins, 2007
Myrcia guianensis (Aubl.) DC.	**22**	Common	Amorim et al., 2012
Myrcia hebepetala DC.	**22**	AfxCe	CCDB
Myrcia laruotteana Cambess.	**22**	AfxCe	Costa & Forni-Martins, 2007
Myrcia multiflora (Lam.) DC.	**22**	Common	Costa & Forni-Martins, 2007
Myrcia splendens (Sw.) DC.	**22**	Common	Costa & Forni-Martins, 2007
Myrciaria delicatula (DC.) O.Berg	**22**	Af	Costa & Forni-Martins, 2007
Myrciaria dubia (Kunth) McVaugh	**22**	AfxCe	Costa & Forni-Martins, 2007
Myrciaria ferruginea O.Berg	**22**	AfxCa	Amorim et al., 2012
Myrciaria floribunda (H.West ex Willd.) O.Berg	**22**	AfxCe	Amorim et al., 2012
Myrciaria tenella (DC.) O.Berg	**22**	AfxCe	Costa & Forni-Martins, 2007
Myrrhinium atropurpureum Schott	**22**	Af	Bolkhovskikh et al., 1969
Pimenta pseudocaryophyllus (Gomes) Landrum	**22**	AfxCe	CCDB

	Plinia cauliflora (Mart.) Kausel	**22**	AfxCa	Costa & Forni-Martins, 2007
	Psidium acutangulum Mart. ex DC.	**44**	Common	CCDB
	Psidium australe Cambess.	**55**	Ce	Souza et al., 2014
	Psidium cattleianum Afzel. ex Sabine	**22, 44, 88**	Af	CCDB
	Psidium grandifolium Mart. ex DC.	**44**	AfxCe	CCDB
	Psidium guajava L.	**21, 22, 28, 30, 32, 33, 34, 44**	AfxCe	CCDB
	Psidium guineense Sw.	**22, 44, 55**	Common	Chakraborti et al., 2010
Nyctaginaceae	*Bougainvillea glabra* Choisy	**20, 34**	AfxCe	CCDB
	Bougainvillea spectabilis Willd.	**20, 32, 34, 48, 51**	Af	CCDB
Ochnaceae	*Ouratea castaneifolia* (DC.) Engl.	**26**	AfxCe	Forni-Martins & Martins, 2000
	Ouratea spectabilis (Mart. ex Engl.) Engl.	**104**	AfxCe	Forni-Martins & Martins, 2000

	Sauvagesia erecta L.	**38**	Af	CCDB
Olacaceae	*Ximenia americana* L.	**24, 26**	Common	CCDB
Onagraceae	*Ludwigia elegans* (Cambess.) H.Hara	**64**	Af	CCDB
	Ludwigia hyssopifolia (G.Don) Exell	**16**	Ce	CCDB
	Ludwigia longifolia (DC.) H.Hara	**16**	Af	CCDB
	Ludwigia multinervia (Hook. & Arn.) Ramamoorthy	**32**	Af	CCDB
	Ludwigia nervosa (Poir.) H.Hara	**16**	Ce	CCDB
	Ludwigia octovalvis (Jacq.) P.H.Raven	**16, 18, 32, 48**	Ce	CCDB
Opiliaceae	*Agonandra silvatica* Ducke	**40**	Ce	Hiepko, 2000
Oxalidaceae	*Oxalis grisea* A. St.-Hil. & Naudin	**12**	Ce	CCDB
Phyllanthaceae	*Margaritaria nobilis* L.f.	**26**	AfxCe	CCDB
	Phyllanthus acuminatus Vahl	**52**	Af	CCDB
	Phyllanthus brasiliensis (Aubl.) Poir.	**52**	Ce	CCDB

	Phyllanthus juglandifolius Willd.	**100, 156**	Af	CCDB
	Phyllanthus orbiculatus Rich.	**30**	Ce	CCDB
	Phyllanthus subemarginatus Müll.Arg.	**26**	Af	Pitrez et al., 2014
Phytolaccaceae	*Gallesia integrifolia* (Spreng.) Harms	**36**	Af	CCDB
	Phytolacca dioica L.	**36**	Af	CCDB
Piperaceae	*Piper amalago* L.	**28**	Af	CCDB
	Piper arboreum Aubl.	**26, 28**	AfxCe	CCDB
	Piper arboreum var. *arboreum* Aubl.	**28**	Af	CCDB
	Piper cernuum Vell.	**26**	Af	CCDB
	Piper hispidum Sw.	**24, 26**	Af	CCDB
	Piper nigrum L.	**26, 36, 48, 52, 53, 60, 65, 75, 78, 104, 128**	Ca	CCDB

	Piper obliquum Ruiz & Pav.	**52**	Af	CCDB
	Piper umbellatum L.	**24, 26, 28**	Af	CCDB
Pittosporaceae	*Pittosporum undulatum* Vent.	**24**	Af	CCDB
Plantaginaceae	*Scoparia dulcis* L.	**20, 40**	AfxCe	CCDB
Plumbaginaceae	*Plumbago scandens* L.	**14**	Ce	CCDB
Polygonaceae	*Ruprechtia laxiflora* Meisn.	**28**	AfxCa	CCDB
	Triplaris americana L.	**22**	AfxCe	CCDB
	Triplaris weigeltiana (Rchb.) Kuntze	**22**	Common	CCDB
Primulaceae	*Clavija macrophylla* (Link ex Roem. & Schult.) Miq.	**22**	Af	CCDB
	Clavija spinosa (Vell.) Mez	**36**	Af	CCDB
	Myrsine coriacea (Sw.) R.Br. ex Roem. & Schult.	**46, 48**	AfxCe	Carvalho et al., 2017
	Myrsine matensis (Mez) Otegui	**46**	Af	CCDB
	Myrsine parvifolia A. DC.	**45, 46**	Af	Carvalho et al., 2017

	Myrsine umbellata Mart.	**46**	AfxCe	Carvalho et al., 2017
Proteaceae	*Roupala montana* Aubl.	**28**	AfxCe	CCDB
Quillajaceae	*Quillaja brasiliensis* (A.St.-Hil. & Tul.) Mart.	**28, 34**	Af	CCDB
Rhamnaceae	*Colubrina glandulosa* G.Perkins	**48**	Common	CCDB
	Condalia buxifolia Reissek	**20, 24**	Af	CCDB
	Hovenia dulcis Thunb.	**24**	Af	CCDB
	Rhamnidium elaeocarpum Reissek	**24**	Common	CCDB
	Ziziphus joazeiro Mart.	**22**	Common	CCDB
Rhizophoraceae	*Rhizophora mangle* L.	**36**	Af	CCDB
Rubiaceae	*Alibertia edulis* (Rich.) A.Rich. ex DC.	**22**	Common	CCDB
	Amaioua intermedia Mart. ex Schult. & Schult.f.	**66**	AfxCe	Correa & Forni-Martins, 2004
	Borreria verticillata (L.) G.Mey.	**28**	Af	CCDB
	Chiococca alba (L.) Hitchc.	**24, 44**	Common	CCDB

Coccocypselum lanceolatum (Ruiz & Pav.) Pers.	**20**	Af	Correa & Forni-Martins, 2004
Cordiera concolor (Cham.) Kuntze	**22**	Common	CCDB
Cordiera sessilis (Vell.) Kuntze	**22**	Common	CCDB
Coussarea congestiflora Müll.Arg.	**22**	Af	Kiehn, 2010
Coussarea hydrangeifolia (Benth.) Benth. & Hook.f. ex Müll.Arg.	**22**	AfxCe	CCDB
Declieuxia fruticosa (Willd. ex Roem. & Schult.) Kuntze	**18, 20**	Ce	Kiehn, 2010
Genipa americana L.	**20, 22**	AfxCe	CCDB
Genipa infundibuliformis Zappi & Semir	**20**	Af	CCDB
Guettarda uruguensis Cham. & Schltdl.	**88**	Af	CCDB
Hamelia patens Jacq.	**24**	Af	CCDB
Hexasepalum radula (Willd.) Delprete & J.H. Kirkbr.	**14**	AfxCe	Fader & Cabral, 2011
Ixora gardneriana Benth.	**22**	Af	IPCN online
Palicourea crocea (Sw.) Schult.	**22**	Af	Kiehn, 2010

Palicourea guianensis Aubl.	**22**	Af	Kiehn, 2010
Palicourea marcgravii A.St.-Hil.	**22**	AfxCe	Correa & Forni-Martins, 2007
Palicourea rigida Kunth	**22**	Ce	CCDB
Posoqueria longiflora Aubl.	**34**	Af	CCDB
Psychotria brachyceras Müll.Arg.	**22**	Af	CCDB
Psychotria campyloneura Müll.Arg.	**32**	Af	Correa & Forni-Martins, 2004
Psychotria carthagenensis Jacq.	**22, 44**	AfxCe	Kiehn, 2010
Psychotria deflexa DC.	**32**	Af	CCDB
Psychotria hoffmannseggiana (Willd. ex Schult.) Müll.Arg.	**22**	AfxCe	CCDB
Psychotria leiocarpa Cham. & Schltdl.	**44**	Af	Kiehn, 2010
Psychotria mapourioides DC.	**40**	AfxCe	Correa et al., 2010
Psychotria mima Standl.	**22, 24**	Af	Kiehn, 2010
Psychotria nuda (Cham. & Schltdl.) Wawra	**22**	Af	CCDB

	Psychotria suterella Müll.Arg.	**44**	Af	Correa et al., 2010
	Psychotria vellosiana Benth.	**44**	AfxCe	Correa & Forni-Martins, 2007
	Psyllocarpus asparagoides Mart. & Zucc.	**28**	Ce	Nasário et al., 2017
	Randia aculeata L.	**22**	Ce	CCDB
	Rosenbergiodendron formosum (Jacq.) Fagerl.	**22**	Ce	CCDB
	Rudgea viburnoides (Cham.) Benth.	**44**	AfxCe	Correa & Forni-Martins, 2007
	Stachyarrhena spicata Hook.f.	**22**	Af	CCDB
	Tocoyena formosa (Cham. & Schltdl.) K.Schum.	**22**	Common	CCDB
Rutaceae	*Balfourodendron riedelianum* (Engl.) Engl.	**58**	Af	Melloni, 2010
	Erythrochiton brasiliensis Nees & Mart.	**89, 90, 116**	Ce	CCDB
	Esenbeckia febrifuga (A.St.-Hil.) A.Juss. ex Mart.	**64**	Common	CCDB
	Pilocarpus giganteus Engl.	**44**	Af	CCDB
	Pilocarpus microphyllus Stapf ex Wardleworth	**44**	Af	CCDB

	Pilocarpus pauciflorus A. St.-Hil.	**44**	Af	Skorupa, 2000
	Pilocarpus pennatifolius Lem.	**36, 44**	Af	CCDB
	Pilocarpus spicatus A. St.-Hil.	**88**	AfxCa	CCDB
	Pilocarpus trachylophus Holmes	**44**	Ce	CCDB
	Zanthoxylum petiolare A.St.-Hil. & Tul.	**72**	AfxCa	CCDB
Salicaceae	*Prockia crucis* P.Browne ex L.	**18**	Common	CCDB
	Salix humboldtiana Willd.	**38**	Af	CCDB
Sapindaceae	*Allophylus edulis* (A.St.-Hil., A.Juss. & Cambess.) Radlk.	**28**	Common	CCDB
	Allophylus guaraniticus (A.St.-Hil.) Radlk.	**56**	Af	CCDB
	Allophylus pauciflorus Radlk.	**28**	Af	CCDB
	Allophylus racemosus Sw.	**28**	AfxCa	Bawa, 1973
	Cupania vernalis Cambess.	**32**	Common	CCDB
	Diatenopteryx sorbifolia Radlk.	**30**	AfxCe	CCDB

	Dodonaea viscosa (L.) Jacq.	**28, 30, 32, 48**	Common	CCDB
	Magonia pubescens A. St.-Hil.	**30**	Common	CCDB
	Melicoccus lepidopetalus Radlk.	**96**	Af	CCDB
	Paullinia elegans Cambess.	**24**	Af	CCDB
	Sapindus saponaria L.	**28**	Common	CCDB
	Serjania caracasana (Jacq.) Willd.	**24**	Af	CCDB
	Serjania erecta Radlk.	**24**	Ce	CCDB
	Serjania glabrata Kunth	**24**	Af	CCDB
	Talisia esculenta (A. St.-Hil.) Radlk.	**32**	Common	CCDB
	Talisia obovata A.C.Sm.	**32**	Af	CCDB
	Toulicia crassifolia Radlk.	**28**	Ce	Ferrucci & Urdampilleta, 2009
Sapotaceae	*Manilkara zapota* (L.) P.Royen	**24, 26**	Af	CCDB
	Pouteria torta (Mart.) Radlk.	**28**	AfxCe	Forni-Martins & Martins, 2000

Simaroubaceae	*Simarouba amara* Aubl.	**32**	Common	CCDB
Solanaceae	*Acnistus arborescens* (L.) Schltdl.	**24**	Af	CCDB
	Aureliana fasciculata (Vell.) Sendtn.	**24**	AfxCe	Chiarini et al., 2017
	Brugmansia suaveolens (Humb. & Bonpl. ex Willd.) Bercht. & J.Presl	**24**	Af	CCDB
	Brunfelsia australis Benth.	**24**	Af	CCDB
	Calibrachoa ericifolia (R.E.Fr.) Wijsman	**18**	Ce	CCDB
	Capsicum annuum L.	**12, 22, 24, 25, 36, 48**	Ce	CCDB
	Capsicum baccatum L.	**24**	Af	CCDB
	Capsicum parvifolium Sendtn.	**24**	AfxCa	CCDB
	Cestrum corymbosum Schltdl.	**16, 32**	Af	CCDB
	Cestrum intermedium Sendtn.	**16**	Af	Fregonezi et al., 2006
	Cestrum schlechtendalii G.Don	**32**	AfxCe	CCDB

Cestrum strigilatum Ruiz & Pav.	**16**	Af	Berg & Greilhuber, 1993
Dyssochroma viridiflorum (Sims) Miers	**24**	Af	CCDB
Dyssochroma viridiflora Miers	**24**	Af	CCDB
Lycianthes rantonnei (Carrière) Bitter	**24**	Af	CCDB
Metternichia princeps Mik.	**26**	Af	CCDB
Nicotiana glauca Graham	**24, 26, 44, 46, 48**	Ca	CCDB
Physalis heterophylla Nees	**24**	Ce	CCDB
Physalis pubescens L.	**24, 48**	Af	CCDB
Schwenckia americana L.	**20**	AfxCe	CCDB
Sessea regnellii Taub.	**16**	Af	Urdampilleta et al., 2015
Solanum acerifolium Dunal	**24**	Af	CCDB
Solanum americanum Mill.	**12, 24, 36, 44, 48**	Af	CCDB

Solanum asperolanatum Ruiz & Pav.	**24**	Af	CCDB
Solanum asperum Rich.	**24**	Common	CCDB
Solanum bullatum Vell.	**30**	Af	CCDB
Solanum caavurana Vell.	**24**	Af	CCDB
Solanum capsicoides All.	**24**	Af	CCDB
Solanum cernuum Vell.	**24**	Af	CCDB
Solanum concinnum Sendtn.	**24**	Af	CCDB
Solanum crinitum Lam.	**24**	CexCa	Chiarini et al., 2017
Solanum diploconos (Mart.) Bohs	**24**	Af	CCDB
Solanum grandiflorum Ruiz & Pav.	**24**	Ce	CCDB
Solanum granulosoleprosum Dunal	**24**	AfxCe	CCDB
Solanum guaraniticum A. St.-Hil.	**24**	Af	CCDB
Solanum itatiaiae Glaz. ex Edmonds	**24**	Af	CCDB

Solanum jabrense Agra & M. Nee	**24**	Ca	Chiarini et al., 2017
Solanum jamaicense Mill.	**24**	Ce	CCDB
Solanum lycocarpum A. St.-Hil.	**24**	AfxCe	CCDB
Solanum mammosum L.	**22, 24**	Ce	CCDB
Solanum mauritianum Scop.	**24**	Af	CCDB
Solanum melissarum Bohs	**24**	Af	CCDB
Solanum palinacanthum Dunal	**24**	Ce	CCDB
Solanum paludosum Moric.	**24**	Common	CCDB
Solanum paniculatum L.	**24**	Common	CCDB
Solanum paranense Dusén	**48, 72**	Af	CCDB
Solanum polytrichum Sendtn.	**48**	Af	D'Amato & Bayliss, 1985
Solanum pseudocapsicum L.	**24**	Af	CCDB
Solanum pseudoquina A. St.-Hil.	**24**	Af	CCDB

	Solanum ramulosum Sendtn.	**24**	Af	Chiarini et al., 2017
	Solanum rufescens Sendtn.	**24**	Af	CCDB
	Solanum rugosum Dunal	**24**	Af	CCDB
	Solanum sisymbriifolium Lam.	**24, 72**	Ce	CCDB
	Solanum stramonifolium var. *stramonifolium* Jacq.	**24**	Ce	Bernardello et al., 1994
	Solanum sycocarpum Mart. & Sendtn.	**24**	Af	CCDB
	Solanum thomasiifolium Sendtn.	**24**	Ca	Chiarini et al., 2017
	Solanum valdiviense Dunal	**24**	Af	Chiarini et al., 2017
	Solanum variabile Mart.	**24**	Af	CCDB
	Vassobia breviflora (Sendtn.) Hunz.	**24**	Af	CCDB
Styracaceae	*Styrax camporum* Pohl	**16**	AfxCe	CCDB
	Styrax ferrugineus Nees & Mart.	**16**	AfxCe	CCDB
	Styrax martii Seub.	**16**	AfxCe	CCDB

Turneraceae	*Piriqueta racemosa* (Jacq.) Sweet	**14**	Af	CCDB
	Turnera calyptrocarpa Urb.	**14**	Af	Truyens et al., 2005
	Turnera subulata Sm.	**10, 15, 20, 40**	AfxCe	CCDB
	Turnera ulmifolia L.	**10, 20, 25, 28, 30, 32, 60**	Ce	CCDB
Ulmaceae	*Phyllostylon brasiliense* Capan. ex Benth. & Hook. f.	**28**	Ca	CCDB
Urticaceae	*Boehmeria caudata* Sw.	**68, 69**	Af	CCDB
	Boehmeria macrophylla Hornem.	**28, 42**	Af	CCDB
	Cecropia concolor Willd.	**28**	Ce	CCDB
	Cecropia palmata Willd.	**28**	Af	CCDB
	Cecropia peltata L.	**28**	Ca	CCDB
	Coussapoa microcarpa (Schott) Rizzini	**28**	Af	CCDB

	Urera baccifera (L.) Gaudich. ex Wedd.	**26**	Af	CCDB
	Urera caracasana (Jacq.) Gaudich. ex Griseb.	**32, 42**	Af	CCDB
Verbenaceae	*Aloysia gratissima* (Gillies & Hook.) Tronc.	**36**	Af	CCDB
	Aloysia virgata (Ruiz & Pav.) Juss.	**36, 54, 72**	AfxCe	Brandão et al., 2009
	Citharexylum myrianthum Cham.	**104**	Af	Yuyama et al., 2010
	Duranta erecta L.	**16, 24, 32, 34, 36**	Ca	CCDB
	Lantana camara L.	**22, 28, 32, 33, 34, 36, 38, 44, 46, 55, 56, 66, 77**	Common	CCDB
	Lantana canescens Kunth	**24**	CexCa	CCDB
	Lantana fucata Lindl.	**36**	Common	CCDB
	Lippia alba (Mill.) N.E.Br. ex Britton & P.Wilson	**30, 32**	CexCa	Bose & Choudhury, 1960

	Lippia brasiliensis (Link) T.R.S.Silva	**24**	Af	Campos et al., 2011
	Lippia corymbosa Cham.	**28**	AfxCe	Viccini et al., 2006a
	Lippia gracilis Schauer	**24**	Ca	Soares et al., 2011
	Lippia lacunosa Mart. & Schauer	**56**	Ce	CCDB
	Lippia lupulina Cham.	**28**	Ce	CCDB
	Lippia origanoides Kunth	**24**	CexCa	Campos et al., 2011
	Lippia pohliana Schauer	**24**	Ca	CCDB
	Lippia sidoides Cham.	**24**	Ca	CCDB
	Stachytarpheta angustifolia (Mill.) Vahl	**56**	Ce	CCDB
	Stachytarpheta cayennensis (Rich.) Vahl	**48**	Af	CCDB
Violaceae	*Pombalia atropurpurea* (A.St.-Hil.) Paula-Souza	**16**	Af	CCDB
	Pombalia communis (A.St.-Hil.) Paula-Souza	**32**	Af	CCDB
Vochysiaceae	*Callisthene fasciculata* Mart.	**22**	Common	Yamagishi-Costa et a.l., 2017

Callisthene major Mart.	**22**	Common	Yamagishi-Costa et a.l., 2017
Qualea cordata Spreng.	**22**	AfxCe	Yamagishi-Costa et a.l., 2017
Qualea grandiflora Mart.	**22**	Common	Yamagishi-Costa et a.l., 2017
Qualea multiflora Mart.	**22**	AfxCe	Yamagishi-Costa et a.l., 2017
Qualea parviflora Mart.	**22**	Common	Yamagishi-Costa et a.l., 2017
Salvertia convallariodora A. St.-Hil.	**24**	Common	Yamagishi-Costa et a.l., 2017
Vochysia bifalcata Warm.	**24**	Af	Yamagishi-Costa et a.l., 2017
Vochysia cinnamomea Pohl	**24**	Ce	Barbosa, 1999
Vochysia elliptica Mart.	**24**	Ce	Yamagishi-Costa et a.l., 2017
Vochysia ferruginea Mart.	**24**	Ce	Yamagishi-Costa et a.l., 2017
Vochysia haenkeana Mart.	**24**	AfxCe	Yamagishi-Costa et a.l., 2017
Vochysia rufa Mart.	**24**	AfxCe	Yamagishi-Costa et a.l., 2017
Vochysia selloi Warm.	**24**	Af	Yamagishi-Costa et a.l., 2017

	Vochysia tucanorum Mart.	**24**	AfxCe	Barbosa, 1999
Winteraceae	*Drimys brasiliensis* Miers	**86**	AfxCe	Morawetz, 1984

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Table S3. Result of the ploidy (P_S) of the species. SCN = somatic chromosome number (2*n*) of species, GBCN: genus base chromosome number (*x*), Af: Atlantic forest, Ca: Caatinga, Ce: Cerrado.

Species	Biome	SCN	GBCN	Ploidy	
Abarema filamentosa	Af	26	14	1.86	Dysploid

Abrus precatorius	Ce	22	11	2.00	Euploid
Acacia suaveolens	Ce	26	13	2.00	Euploid
Acalypha multicaulis	CexCa	38	10	3.80	Dysploid
Acca sellowiana	Af	22	11	2.00	Euploid
Achyrocline satureioides	Ce	28	7	4.00	Polyploid
Acnistus arborescens	Af	24	12	2.00	Euploid
Acosmium diffusissimum	Ca	18	9	2.00	Euploid
Acosmium diffusissimum	Ca	24	9	2.67	Dysploid
Acosmium diffusissimum	Ca	32	9	3.56	Dysploid
Acosmium cardenasii	Af	18	9	2.00	Euploid
Acosmium lentiscifolium	Af	18	9	2.00	Euploid
Acritopappus confertus	Ce	19	9	2.11	Dysploid
Adenaria floribunda	Ce	32	8	4.00	Polyploid

Aeschynomene paniculata	Ce	20	10	2.00	Euploid
Aeschynomene sensitiva	Ce	20	10	2.00	Euploid
Aeschynomene paniculata	Ce	22	10	2.20	Dysploid
Aeschynomene sensitiva	Ce	22	10	2.20	Dysploid
Ageratum conyzoides	Af	20	10	2.00	Euploid
Ageratum conyzoides	Af	32	10	3.20	Dysploid
Ageratum conyzoides	Af	36	10	3.60	Dysploid
Ageratum conyzoides	Af	38	10	3.80	Dysploid
Ageratum conyzoides	Af	40	10	4.00	Polyploid
Agonandra silvatica	Ce	40	10	4.00	Polyploid
Aiouea costaricensis	Af	24	12	2.00	Euploid
Albizia inundata	Ca	26	13	2.00	Euploid
Albizia inundata	Ca	52	13	4.00	Polyploid

Albizia lebbeck	Ce	26	13	2.00	Euploid
Albizia polycephala	Common	52	13	4.00	Polyploid
Albizia adianthifolia	Af	26	13	2.00	Euploid
Albizia niopoides	AfxCe	26	13	2.00	Euploid
Alchornea cordifolia	Af	18	9	2.00	Euploid
Alchornea triplinervia	AfxCe	72	9	8.00	Polyploid
Alibertia edulis	Common	22	11	2.00	Euploid
Allamanda blanchetii	Ce	18	9	2.00	Euploid
Allamanda blanchetii	Ce	36	9	4.00	Polyploid
Allamanda cathartica	Af	18	9	2.00	Euploid
Allamanda cathartica	Af	22	9	2.44	Dysploid
Allophylus edulis	Common	28	14	2.00	Euploid
Allophylus pauciflorus	Af	28	14	2.00	Euploid

Allophylus guaraniticus	Af	56	14	4.00	Polyploid
Allophylus racemosus	AfxCa	28	14	2.00	Euploid
Aloysia gratissima	Af	36	9	4.00	Polyploid
Aloysia virgata	AfxCe	36	9	4.00	Polyploid
Aloysia virgata	AfxCe	54	9	6.00	Polyploid
Aloysia virgata	AfxCe	72	9	8.00	Polyploid
Amaioua intermedia	AfxCe	66	11	6.00	Polyploid
Ambrosia polystachya	Ce	36	18	2.00	Euploid
Amburana cearensis	Common	22	22	1.00	Dysploid
Anacardium occidentale	Common	24	20	1.20	Dysploid
Anacardium occidentale	Common	40	20	2.00	Euploid
Anacardium occidentale	Common	42	20	2.10	Dysploid
Anadenanthera colubrina	Common	26	14	1.86	Dysploid

Anaxagorea phaeocarpa	Af	28	8	3.50	Dysploid
Andira humilis	Ce	22	10	2.20	Dysploid
Andira inermis	AfxCe	20	10	2.00	Euploid
Andira anthelmia	AfxCe	21	10	2.10	Dysploid
Andira anthelmia	AfxCe	22	10	2.20	Dysploid
Andira fraxinifolia	AfxCe	22	10	2.20	Dysploid
Andira inermis	AfxCe	22	10	2.20	Dysploid
Anemopaegma acutifolium	Ca	80	20	4.00	Polyploid
Anemopaegma album	Ce	80	20	4.00	Polyploid
Anemopaegma arvense	Ce	80	20	4.00	Polyploid
Anemopaegma glaucum	Ce	80	20	4.00	Polyploid
Anemopaegma scabriusculum	Ce	80	20	4.00	Polyploid
Annona squamosa	Ce	14	7	2.00	Euploid

Annona squamosa	Ce	16	7	2.29	Dysploid
Annona squamosa	Ce	18	7	2.57	Dysploid
Annona squamosa	Ce	28	7	4.00	Polyploid
Annona coriacea	Ce	42	7	6.00	Polyploid
Annona glabra	AfxCa	28	7	4.00	Polyploid
Annona cacans	AfxCe	14	7	2.00	Euploid
Annona dioica	AfxCe	14	7	2.00	Euploid
Annona montana	AfxCe	16	7	2.29	Dysploid
Apeiba tibourbou	AfxCe	36	9	4.00	Polyploid
Apuleia leiocarpa	Common	24	12	2.00	Euploid
Apuleia leiocarpa	Common	28	12	2.33	Dysploid
Artocarpus heterophyllus	Af	28	14	2.00	Euploid
Artocarpus heterophyllus	Af	56	14	4.00	Polyploid

Artocarpus integer	Af	56	14	4.00	Polyploid
Aspicarpa pulchella	Ce	80	10	8.00	Polyploid
Aspidosperma pyrifolium	Common	34	17	2.00	Euploid
Aspidosperma quebracho-blanco	Af	36	17	2.12	Dysploid
Aspidosperma macrocarpon	AfxCe	34	17	2.00	Euploid
Astraea lobata	Ce	18	9	2.00	Euploid
Astronium urundeuva	Ce	30	15	2.00	Euploid
Austrocritonia velutina	Af	20	10	2.00	Euploid
Austroeupatorium inulaefolium	Af	20	10	2.00	Euploid
Austroeupatorium inulaefolium	Af	40	10	4.00	Polyploid
Ayenia angustifolia	Ce	20	10	2.00	Euploid
Baccharis inamoena	Ca	18	9	2.00	Euploid
Baccharis coridifolia	Ce	18	9	2.00	Euploid

Baccharis linearifolia	Ce	18	9	2.00	Euploid
Baccharis articulata	Af	18	9	2.00	Euploid
Baccharis mesoneura	Af	18	9	2.00	Euploid
Baccharis microdonta	Af	18	9	2.00	Euploid
Baccharis montana	Af	18	9	2.00	Euploid
Baccharis oblongifolia	Af	18	9	2.00	Euploid
Baccharis punctulata	Af	18	9	2.00	Euploid
Baccharis subdentata	Af	18	9	2.00	Euploid
Baccharis crispa	AfxCe	18	9	2.00	Euploid
Baccharis dracunculifolia	AfxCe	18	9	2.00	Euploid
Banisteriopsis oxyclada	Ca	20	5	4.00	Polyploid
Banisteriopsis campestris	Ce	20	5	4.00	Polyploid
Banisteriopsis laevifolia	Ce	20	5	4.00	Polyploid

Banisteriopsis laevifolia	Ce	40	5	8.00	Polyploid
Banisteriopsis stellaris	Ce	80	5	16.00	Polyploid
Banisteriopsis angustifolia	CexCa	20	5	4.00	Polyploid
Barnebya harleyi	CexCa	58	10	5.80	Dysploid
Barnebya harleyi	CexCa	60	10	6.00	Polyploid
Bastardiopsis densiflora	Af	28	7	4.00	Polyploid
Bauhinia aculeata	Ce	28	14	2.00	Euploid
Bauhinia forficata	Common	28	14	2.00	Euploid
Bauhinia ungulata	Common	28	14	2.00	Euploid
Bauhinia mollis	AfxCe	28	14	2.00	Euploid
Bauhinia rufa	AfxCe	28	14	2.00	Euploid
Bidens riparia	Ce	24	12	2.00	Euploid
Bidens graveolens	Ce	48	12	4.00	Polyploid

Bidens riparia	Ce	72	12	6.00	Polyploid
Bidens pilosa	Af	24	12	2.00	Euploid
Bidens pilosa	Af	48	12	4.00	Polyploid
Bidens pilosa	Af	70	12	5.83	Dysploid
Bidens pilosa	Af	72	12	6.00	Polyploid
Bidens pilosa	Af	80	12	6.67	Dysploid
Bidens pilosa	Af	96	12	8.00	Polyploid
Bixa arborea	Af	14	7	2.00	Euploid
Bixa orellana	AfxCe	14	7	2.00	Euploid
Bixa orellana	AfxCe	16	7	2.29	Dysploid
Blepharocalyx salicifolius	AfxCe	22	11	2.00	Euploid
Boehmeria macrophylla	Af	28	14	2.00	Euploid
Boehmeria macrophylla	Af	42	14	3.00	Polyploid

Boehmeria caudata	Af	68	14	4.86	Dysploid
Boehmeria caudata	Af	69	14	4.93	Dysploid
Borreria verticillata	Af	28	14	2.00	Euploid
Bougainvillea spectabilis	Af	20	17	1.18	Dysploid
Bougainvillea spectabilis	Af	32	17	1.88	Dysploid
Bougainvillea spectabilis	Af	34	17	2.00	Euploid
Bougainvillea spectabilis	Af	48	17	2.82	Dysploid
Bougainvillea spectabilis	Af	51	17	3.00	Polyploid
Bougainvillea glabra	AfxCe	20	17	1.18	Dysploid
Bougainvillea glabra	AfxCe	34	17	2.00	Euploid
Bowdichia virgilioides	Common	18	9	2.00	Euploid
Brugmansia suaveolens	Af	24	12	2.00	Euploid
Brunfelsia australis	Af	24	11	2.18	Dysploid

Bunchosia armeniaca	Ce	60	10	6.00	Polyploid
Byrsonima oblongifolia	Ce	24	12	2.00	Euploid
Byrsonima rigida	Ce	24	12	2.00	Euploid
Byrsonima verbascifolia	Ce	24	12	2.00	Euploid
Byrsonima crassifolia	Common	20	12	1.67	Dysploid
Byrsonima crassifolia	Common	24	12	2.00	Euploid
Byrsonima sericea	Common	24	12	2.00	Euploid
Byrsonima basiloba	AfxCe	24	12	2.00	Euploid
Byrsonima coccolobifolia	AfxCe	24	12	2.00	Euploid
Byrsonima intermedia	AfxCe	24	12	2.00	Euploid
Byttneria rhamnifolia	Af	28	13	2.15	Dysploid
Caesalpinia pulcherrima	Ce	22	12	1.83	Dysploid
Caesalpinia pulcherrima	Ce	24	12	2.00	Euploid

Caesalpinia pulcherrima	Ce	28	12	2.33	Dysploid
Calea pilosa	Ce	26	19	1.37	Dysploid
Calea serrata	Ce	38	19	2.00	Euploid
Calibrachoa ericifolia	Ce	18	9	2.00	Euploid
Calliandra depauperata	Ca	16	8	2.00	Euploid
Calliandra leptopoda	Ca	16	8	2.00	Euploid
Calliandra depauperata	Ca	26	8	3.25	Dysploid
Calliandra tweedii	Af	16	8	2.00	Euploid
Callichlamys latifolia	Af	40	20	2.00	Euploid
Callisthene fasciculata	Common	22	11	2.00	Euploid
Callisthene major	Common	22	11	2.00	Euploid
Calophyllum brasiliense	AfxCe	42	8	5.25	Dysploid
Calotropis procera	Ce	22	11	2.00	Euploid

Calotropis procera	Ce	26	11	2.36	Dysploid
Calyptranthes brasiliensis	Af	22	11	2.00	Euploid
Calyptranthes dardanoi	Af	22	11	2.00	Euploid
Calyptranthes grandiflora	Af	22	11	2.00	Euploid
Calyptranthes lucida	AfxCe	22	11	2.00	Euploid
Camarea affinis	Ce	34	17	2.00	Euploid
Campomanesia adamantium	Ce	22	11	2.00	Euploid
Campomanesia dichotoma	Common	22	11	2.00	Euploid
Campomanesia pubescens	Common	22	11	2.00	Euploid
Campomanesia laurifolia	Af	22	11	2.00	Euploid
Campomanesia phaea	Af	22	11	2.00	Euploid
Campomanesia schlechtendaliana	Af	22	11	2.00	Euploid
Campomanesia guaviroba	AfxCe	22	11	2.00	Euploid

Campomanesia guazumifolia	AfxCe	22	11	2.00	Euploid
Campomanesia guaviroba	AfxCe	88	11	8.00	Polyploid
Campovassouria cruciata	Af	20	10	2.00	Euploid
Campovassouria cruciata	Af	30	10	3.00	Polyploid
Camptosema scarlatinum	Ce	20	11	1.82	Dysploid
Capsicum annuum	Ce	12	12	1.00	Dysploid
Capsicum annuum	Ce	22	12	1.83	Dysploid
Capsicum annuum	Ce	24	12	2.00	Euploid
Capsicum annuum	Ce	25	12	2.08	Dysploid
Capsicum annuum	Ce	26	12	2.17	Dysploid
Capsicum annuum	Ce	36	12	3.00	Polyploid
Capsicum annuum	Ce	48	12	4.00	Polyploid
Capsicum baccatum	Af	24	12	2.00	Euploid

Capsicum parvifolium	AfxCa	24	12	2.00	Euploid
Carapa guianensis	Af	58	29	2.00	Euploid
Cariniana estrellensis	AfxCe	34	17	2.00	Euploid
Caryocar villosum	Ce	46	23	2.00	Euploid
Caryocar brasiliense	AfxCe	46	23	2.00	Euploid
Cassia moschata	Ce	28	7	4.00	Polyploid
Cassia ferruginea	Common	28	7	4.00	Polyploid
Cassia leptophylla	Af	28	7	4.00	Polyploid
Cassia grandis	AfxCe	28	7	4.00	Polyploid
Catharanthus roseus	AfxCe	16	8	2.00	Euploid
Cecropia peltata	Ca	28	14	2.00	Euploid
Cecropia concolor	Ce	28	14	2.00	Euploid
Cecropia palmata	Af	28	14	2.00	Euploid

Cedrela odorata	Common	50	28	1.79	Dysploid
Cedrela odorata	Common	52	28	1.86	Dysploid
Cedrela fissilis	Common	56	28	2.00	Euploid
Cedrela odorata	Common	56	28	2.00	Euploid
Cedrela angustifolia	Af	54	28	1.93	Dysploid
Ceiba pentandra	Ce	72	43	1.67	Dysploid
Ceiba pentandra	Ce	74	43	1.72	Dysploid
Ceiba pentandra	Ce	75	43	1.74	Dysploid
Ceiba pentandra	Ce	76	43	1.77	Dysploid
Ceiba pentandra	Ce	80	43	1.86	Dysploid
Ceiba pentandra	Ce	84	43	1.95	Dysploid
Ceiba pentandra	Ce	86	43	2.00	Euploid
Ceiba pentandra	Ce	88	43	2.05	Dysploid

Ceiba speciosa	Common	72	43	1.67	Dysploid
Ceiba speciosa	Common	86	43	2.00	Euploid
Ceiba erianthos	AfxCa	86	43	2.00	Euploid
Ceiba glaziovii	AfxCa	86	43	2.00	Euploid
Ceiba pubiflora	AfxCa	86	43	2.00	Euploid
Celtis iguanaea	AfxCa	20	10	2.00	Euploid
Celtis spinosa	AfxCe	22	10	2.20	Dysploid
Centratherum punctatum	AfxCe	32	9	3.56	Dysploid
Centrolobium tomentosum	AfxCe	18	10	1.80	Dysploid
Centrosema arenarium	Af	22	10	2.20	Dysploid
Cestrum corymbosum	Af	16	8	2.00	Euploid
Cestrum intermedium	Af	16	8	2.00	Euploid
Cestrum strigilatum	Af	16	8	2.00	Euploid

Cestrum corymbosum	Af	32	8	4.00	Polyploid
Cestrum schlechtendalii	AfxCe	32	8	4.00	Polyploid
Chamaecrista hispidula	Ce	14	7	2.00	Euploid
Chamaecrista mucronata	Ce	16	7	2.29	Dysploid
Chamaecrista repens	Ce	16	7	2.29	Dysploid
Chamaecrista repens var. multijuga	Ce	16	7	2.29	Dysploid
Chamaecrista trichopoda	Ce	16	7	2.29	Dysploid
Chamaecrista cathartica	Ce	28	7	4.00	Polyploid
Chamaecrista hispidula	Ce	28	7	4.00	Polyploid
Chamaecrista setosa	Ce	28	7	4.00	Polyploid
Chamaecrista viscosa	Ce	42	7	6.00	Polyploid
Chamaecrista duckeana	Af	16	7	2.29	Dysploid
Chamaecrista desvauxii	AfxCe	14	7	2.00	Euploid

Chamaecrista ramosa	AfxCe	14	7	2.00	Euploid
Chamaecrista flexuosa	AfxCe	16	7	2.29	Dysploid
Chamaecrista nictitans	AfxCe	48	7	6.86	Dysploid
Chiococca alba	Common	24	11	2.18	Dysploid
Chiococca alba	Common	44	11	4.00	Polyploid
Chloroleucon tenuiflorum	Af	26	13	2.00	Euploid
Christiana africana	Af	40	20	2.00	Euploid
Chromolaena horminoides	Ce	30	10	3.00	Polyploid
Chromolaena squalida	Ce	30	10	3.00	Polyploid
Chromolaena odorata	Ce	40	10	4.00	Polyploid
Chromolaena odorata	Ce	51	10	5.10	Dysploid
Chromolaena odorata	Ce	58	10	5.80	Dysploid
Chromolaena maximilianii	Ce	60	10	6.00	Polyploid

Chromolaena odorata	Ce	60	10	6.00	Polyploid
Chromolaena squalida	Ce	69	10	6.90	Dysploid
Chromolaena odorata	Ce	80	10	8.00	Polyploid
Chromolaena odorata	Ce	120	10	12.00	Polyploid
Chromolaena laevigata	AfxCe	28	10	2.80	Dysploid
Chromolaena laevigata	AfxCe	40	10	4.00	Polyploid
Chromolaena laevigata	AfxCe	50	10	5.00	Polyploid
Chromolaena laevigata	AfxCe	60	10	6.00	Polyploid
Chromolaena laevigata	AfxCe	62	10	6.20	Dysploid
Chrysolaena cognata	Ce	20	10	2.00	Euploid
Chrysolaena platensis	Ce	20	10	2.00	Euploid
Chrysolaena cognata	Ce	34	10	3.40	Dysploid
Chrysolaena cognata	Ce	40	10	4.00	Polyploid

Chrysolaena cognata	Ce	50	10	5.00	Polyploid
Chrysolaena cognata	Ce	60	10	6.00	Polyploid
Chrysolaena cognata	Ce	64	10	6.40	Dysploid
Chrysolaena cognata	Ce	66	10	6.60	Dysploid
Chrysolaena cognata	Ce	78	10	7.80	Dysploid
Chrysolaena cognata	Ce	80	10	8.00	Polyploid
Chrysolaena cognata	Ce	84	10	8.40	Dysploid
Cienfuegosia affinis	Ce	20	10	2.00	Euploid
Cinnamodendron dinisii	Af	26	11	2.36	Dysploid
Citharexylum myrianthum	Af	104	9	11.56	Dysploid
Clavija macrophylla	Af	22	18	1.22	Dysploid
Clavija spinosa	Af	36	18	2.00	Euploid
Clibadium armani	Ce	32	16	2.00	Euploid

Clidemia sericea	Ce	34	17	2.00	Euploid
Clidemia capitellata	Af	34	17	2.00	Euploid
Clidemia hirta	AfxCe	34	17	2.00	Euploid
Clidemia urceolata	AfxCe	34	17	2.00	Euploid
Clitoria falcata	Af	22	8	2.75	Dysploid
Clusia criuva	Af	56	30	1.87	Dysploid
Clusia criuva	Af	58	30	1.93	Dysploid
Clusia lanceolata	Af	60	30	2.00	Euploid
Clusia organensis	Af	60	30	2.00	Euploid
Clusia criuva	Af	62	30	2.07	Dysploid
Clusia hilariana	AfxCa	60	30	2.00	Euploid
Clusia nemorosa	AfxCa	60	30	2.00	Euploid
Cnidoscolus urens	AfxCe	36	9	4.00	Polyploid

Coccocypselum lanceolatum	Af	20	10	2.00	Euploid
Cochlospermum orinocense	Ce	18	6	3.00	Polyploid
Cochlospermum regium	CexCa	36	6	6.00	Polyploid
Cochlospermum vitifolium	Common	24	6	4.00	Polyploid
Colubrina glandulosa	Common	48	12	4.00	Polyploid
Conocarpus erectus	Af	24	12	2.00	Euploid
Conyza primulifolia	Af	72	9	8.00	Polyploid
Copaifera langsdorffii	Common	24	12	2.00	Euploid
Copaifera martii	Common	24	12	2.00	Euploid
Corchorus orinocensis	Ca	28	9	3.11	Dysploid
Cordia toqueve	Ce	28	8	3.50	Dysploid
Cordia rufescens	Common	28	8	3.50	Dysploid
Cordia alliodora	Common	30	8	3.75	Dysploid

Cordia alliodora	Common	72	8	9.00	Polyploid
Cordia trichotoma	Common	72	8	9.00	Polyploid
Cordia trichotoma	Common	104	8	13.00	Polyploid
Cordia bullata	Af	16	8	2.00	Euploid
Cordia bullata	Af	18	8	2.25	Dysploid
Cordia americana	Af	36	8	4.50	Dysploid
Cordia bullata	Af	36	8	4.50	Dysploid
Cordia americana	Af	38	8	4.75	Dysploid
Cordia glabrata	AfxCe	52	8	6.50	Dysploid
Cordiera concolor	Common	22	11	2.00	Euploid
Cordiera sessilis	Common	22	11	2.00	Euploid
Coussapoa microcarpa	Af	28	14	2.00	Euploid
Coussarea congestiflora	Af	22	11	2.00	Euploid

Coussarea hydrangeifolia	AfxCe	22	11	2.00	Euploid
Crateva tapia	Common	26	13	2.00	Euploid
Cratylia argentea	Ce	22	11	2.00	Euploid
Cratylia mollis	CexCa	22	11	2.00	Euploid
Critoniopsis stellata	Af	34	10	3.40	Dysploid
Crotalaria holosericea	Ce	16	8	2.00	Euploid
Crotalaria micans	Ce	16	8	2.00	Euploid
Crotalaria vitellina	Ce	16	8	2.00	Euploid
Crotalaria stipularia	Ce	32	8	4.00	Polyploid
Crotalaria incana	Af	14	8	1.75	Dysploid
Crotalaria retusa	Af	14	8	1.75	Dysploid
Crotalaria retusa	Af	16	8	2.00	Euploid
Croton argyrophyllus	Ca	20	7	2.86	Dysploid

Croton pulegioides	Ca	20	7	2.86	Dysploid
Croton adenocalyx	Ca	40	7	5.71	Dysploid
Croton pedicellatus	CexCa	18	7	2.57	Dysploid
Croton blanchetianus	Common	20	7	2.86	Dysploid
Croton heliotropiifolius	Common	20	7	2.86	Dysploid
Croton sonderianus	Common	20	7	2.86	Dysploid
Croton blanchetianus	Common	40	7	5.71	Dysploid
Croton heliotropiifolius	Common	40	7	5.71	Dysploid
Croton jacobinensis	AfxCa	20	7	2.86	Dysploid
Croton urticifolius	AfxCa	20	7	2.86	Dysploid
Croton floribundus	AfxCe	56	7	8.00	Polyploid
Cryptocarya moschata	Af	24	12	2.00	Euploid
Cupania vernalis	Common	32	16	2.00	Euploid

Cuphea ericoides	Ce	14	8	1.75	Dysploid
Cuphea sessilifolia	Ce	14	8	1.75	Dysploid
Cuphea campestris	Ce	16	8	2.00	Euploid
Cuphea sessilifolia	Ce	16	8	2.00	Euploid
Cuphea ericoides	Ce	24	8	3.00	Polyploid
Cuphea sessilifolia	Ce	24	8	3.00	Polyploid
Cuphea antisyphilitica	Ce	28	8	3.50	Dysploid
Cuphea ericoides	Ce	28	8	3.50	Dysploid
Cuphea antisyphilitica	Ce	32	8	4.00	Polyploid
Cuphea melvilla	Ce	32	8	4.00	Polyploid
Cuphea antisyphilitica	Ce	48	8	6.00	Polyploid
Cuphea ericoides	Ce	48	8	6.00	Polyploid
Curatella americana	Common	24	12	2.00	Euploid

Curatella americana	Common	26	12	2.17	Dysploid
Cyanthillium cinereum	AfxCe	18	9	2.00	Euploid
Cymbopetalum brasiliense	Af	27	9	3.00	Polyploid
Cynophalla flexuosa	Common	30	14	2.14	Dysploid
Cyrtocymura scorpioides	Ce	30	10	3.00	Polyploid
Cyrtocymura scorpioides	Ce	34	10	3.40	Dysploid
Cyrtocymura scorpioides	Ce	56	10	5.60	Dysploid
Cyrtocymura scorpioides	Ce	58	10	5.80	Dysploid
Cyrtocymura scorpioides	Ce	66	10	6.60	Dysploid
Dahlstedtia pinnata	Af	22	11	2.00	Euploid
Dalbergia cearensis	Common	20	10	2.00	Euploid
Dalbergia ecastaphyllum	Af	20	10	2.00	Euploid
Dalbergia nigra	Af	20	10	2.00	Euploid

Dalbergia frutescens	AfxCa	20	10	2.00	Euploid
Dalbergia miscolobium	AfxCe	20	10	2.00	Euploid
Dasyphyllum brasiliense	Af	54	9	6.00	Polyploid
Dasyphyllum spinescens	Af	54	9	6.00	Polyploid
Declieuxia fruticosa	Ce	18	9	2.00	Euploid
Declieuxia fruticosa	Ce	20	9	2.22	Dysploid
Delonix regia	Ce	24	14	1.71	Dysploid
Delonix regia	Ce	28	14	2.00	Euploid
Desmanthus virgatus	Ce	28	14	2.00	Euploid
Desmodium triflorum	Ce	18	11	1.64	Dysploid
Desmodium triflorum	Ce	22	11	2.00	Euploid
Desmodium barbatum	AfxCe	22	11	2.00	Euploid
Diatenopteryx sorbifolia	AfxCe	30	15	2.00	Euploid

Dimorphandra mollis	AfxCe	28	14	2.00	Euploid
Dioclea megacarpa	Af	22	11	2.00	Euploid
Diospyros ebenum	Af	30	15	2.00	Euploid
Diospyros ebenum	Af	90	15	6.00	Polyploid
Diospyros inconstans	AfxCe	30	15	2.00	Euploid
Diplopterys pubipetala	Ce	30	10	3.00	Polyploid
Diplusodon virgatus	Ce	30	15	2.00	Euploid
Dipteryx odorata	AfxCe	32	16	2.00	Euploid
Dodonaea viscosa	Common	28	14	2.00	Euploid
Dodonaea viscosa	Common	30	14	2.14	Dysploid
Dodonaea viscosa	Common	32	14	2.29	Dysploid
Dodonaea viscosa	Common	48	14	3.43	Dysploid
Drimys brasiliensis	AfxCe	86	43	2.00	Euploid

Duguetia furfuracea	AfxCe	16	8	2.00	Euploid
Duguetia furfuracea	AfxCe	24	8	3.00	Polyploid
Duguetia furfuracea	AfxCe	32	8	4.00	Polyploid
Duranta erecta	Ca	16	8	2.00	Euploid
Duranta erecta	Ca	24	8	3.00	Polyploid
Duranta erecta	Ca	32	8	4.00	Polyploid
Duranta erecta	Ca	34	8	4.25	Dysploid
Duranta erecta	Ca	36	8	4.50	Dysploid
Dyssochroma viridiflora	Af	24	12	2.00	Euploid
Dyssochroma viridiflorum	Af	24	12	2.00	Euploid
Echinocoryne schwenkiifolia	Ce	34	15	2.27	Dysploid
Enterolobium gummiferum	Ce	26	13	2.00	Euploid
Enterolobium contortisiliquum	Common	26	13	2.00	Euploid

Enterolobium timbouva	AfxCa	26	13	2.00	Euploid
Eremanthus elaeagnus	Ce	30	15	2.00	Euploid
Eremanthus glomerulatus	AfxCe	30	15	2.00	Euploid
Eremanthus erythropappus	AfxCe	34	15	2.27	Dysploid
Eriope crassipes	Ce	40	20	2.00	Euploid
Eriotheca pubescens	Ce	184	46	4.00	Polyploid
Eriotheca pubescens	Ce	270	46	5.87	Dysploid
Eriotheca pubescens	Ce	276	46	6.00	Polyploid
Eriotheca candolleana	Af	92	46	2.00	Euploid
Eriotheca gracilipes	AfxCe	92	46	2.00	Euploid
Eriotheca gracilipes	AfxCe	96	46	2.09	Dysploid
Erythrina velutina	Common	42	21	2.00	Euploid
Erythrina verna	Common	42	21	2.00	Euploid

Erythrina crista-galli	Af	40	21	1.90	Dysploid
Erythrina crista-galli	Af	42	21	2.00	Euploid
Erythrina falcata	Af	42	21	2.00	Euploid
Erythrina speciosa	Af	42	21	2.00	Euploid
Erythrina crista-galli	Af	44	21	2.10	Dysploid
Erythrochiton brasiliensis	Ce	89	58	1.53	Dysploid
Erythrochiton brasiliensis	Ce	90	58	1.55	Dysploid
Erythrochiton brasiliensis	Ce	116	58	2.00	Euploid
Erythroxylum deciduum	Common	24	14	1.71	Dysploid
Erythroxylum campestre	AfxCe	24	14	1.71	Dysploid
Erythroxylum pelleterianum	AfxCe	24	14	1.71	Dysploid
Escallonia bifida	Af	24	12	2.00	Euploid
Esenbeckia febrifuga	Common	64	32	2.00	Euploid

Eugenia crenata	Ca	22	11	2.00	Euploid
Eugenia aurata	Common	22	11	2.00	Euploid
Eugenia punicifolia	Common	22	11	2.00	Euploid
Eugenia pyriformis	Common	22	11	2.00	Euploid
Eugenia stictopetala	Common	22	11	2.00	Euploid
Eugenia uniflora	Common	22	11	2.00	Euploid
Eugenia dysenterica	Common	33	11	3.00	Polyploid
Eugenia punicifolia	Common	33	11	3.00	Polyploid
Eugenia pyriformis	Common	33	11	3.00	Polyploid
Eugenia uniflora	Common	33	11	3.00	Polyploid
Eugenia aurata	Common	44	11	4.00	Polyploid
Eugenia punicifolia	Common	44	11	4.00	Polyploid
Eugenia brasiliensis	Af	22	11	2.00	Euploid

Eugenia involucrata	Af	22	11	2.00	Euploid
Eugenia mosenii	Af	22	11	2.00	Euploid
Eugenia multicostata	Af	22	11	2.00	Euploid
Eugenia stigmatosa	Af	22	11	2.00	Euploid
Eugenia tumescens	Af	22	11	2.00	Euploid
Eugenia umbrosa	Af	22	11	2.00	Euploid
Eugenia hirta	Af	44	11	4.00	Polyploid
Eugenia mosenii	Af	44	11	4.00	Polyploid
Eugenia neomyrtifolia	Af	44	11	4.00	Polyploid
Eugenia luschnathiana	AfxCa	22	11	2.00	Euploid
Eugenia cerasiflora	AfxCe	22	11	2.00	Euploid
Eugenia hiemalis	AfxCe	22	11	2.00	Euploid
Eugenia klotzschiana	AfxCe	22	11	2.00	Euploid

Eugenia pitanga	AfxCe	22	11	2.00	Euploid
Eugenia uruguayensis	AfxCe	24	11	2.18	Dysploid
Eugenia bimarginata	AfxCe	32	11	2.91	Dysploid
Eugenia klotzschiana	AfxCe	33	11	3.00	Polyploid
Eugenia hiemalis	AfxCe	44	11	4.00	Polyploid
Eugenia pitanga	AfxCe	44	11	4.00	Polyploid
Eugenia uruguayensis	AfxCe	44	11	4.00	Polyploid
Eugenia pluriflora	AfxCe	66	11	6.00	Polyploid
Euphorbia hyssopifolia	Af	12	7	1.71	Dysploid
Euphorbia hyssopifolia	Af	14	7	2.00	Euploid
Evolvulus glomeratus	Ce	26	12	2.17	Dysploid
Evolvulus elegans	Ce	52	12	4.33	Dysploid
Ficus hirsuta	Af	26	13	2.00	Euploid

Ficus maxima	Af	26	13	2.00	Euploid
Ficus nymphaeifolia	Af	26	13	2.00	Euploid
Ficus pertusa	Af	26	13	2.00	Euploid
Ficus trigona	Af	26	13	2.00	Euploid
Ficus villosa	Af	26	13	2.00	Euploid
Ficus citrifolia	AfxCe	26	13	2.00	Euploid
Ficus insipida	AfxCe	26	13	2.00	Euploid
Ficus obtusifolia	AfxCe	26	13	2.00	Euploid
Forsteronia pubescens	Ce	18	9	2.00	Euploid
Fridericia dichotoma	Ce	40	20	2.00	Euploid
Fridericia platyphylla	CexCa	40	20	2.00	Euploid
Gallesia integrifolia	Af	36	18	2.00	Euploid
Genipa infundibuliformis	Af	20	10	2.00	Euploid

Genipa americana	AfxCe	20	10	2.00	Euploid
Genipa americana	AfxCe	22	10	2.20	Dysploid
Geoffroea spinosa	Ca	20	10	2.00	Euploid
Gleditsia amorphoides	Af	28	14	2.00	Euploid
Gossypium mustelinum	Ce	26	13	2.00	Euploid
Gossypium mustelinum	Ce	52	13	4.00	Polyploid
Grazielia serrata	Af	20	10	2.00	Euploid
Grazielia intermedia	AfxCe	20	10	2.00	Euploid
Grazielodendron rio-docensis	Af	20	10	2.00	Euploid
Guatteria blepharophylla	Ce	28	14	2.00	Euploid
Guatteria oligocarpa	Af	28	14	2.00	Euploid
Guazuma ulmifolia	Common	16	8	2.00	Euploid
Guettarda uruguensis	Af	88	11	8.00	Polyploid

Gustavia augusta	Af	36	17	2.12	Dysploid
Gustavia augusta	Af	72	17	4.24	Dysploid
Hamelia patens	Af	24	12	2.00	Euploid
Hancornia speciosa	AfxCe	22	11	2.00	Euploid
Handroanthus serratifolius	Common	38	20	1.90	Dysploid
Handroanthus heptaphyllus	Common	40	20	2.00	Euploid
Handroanthus impetiginosus	Common	40	20	2.00	Euploid
Handroanthus serratifolius	Common	40	20	2.00	Euploid
Handroanthus chrysotrichus	Common	80	20	4.00	Polyploid
Handroanthus ochraceus	Common	80	20	4.00	Polyploid
Handroanthus pulcherrimus	Af	40	20	2.00	Euploid
Handroanthus vellosoi	AfxCe	80	20	4.00	Polyploid
Hatschbachiella tweedieana	AfxCe	20	10	2.00	Euploid

Hebeclinium macrophyllum	Af	20	10	2.00	Euploid
Hedyosmum brasiliense	Af	16	8	2.00	Euploid
Helicteres brevispira	CexCa	18	9	2.00	Euploid
Helicteres sacarolha	CexCa	18	9	2.00	Euploid
Helicteres guazumifolia	Common	18	9	2.00	Euploid
Helicteres ovata	Af	18	9	2.00	Euploid
Helicteres velutina	AfxCa	18	9	2.00	Euploid
Helicteres lhotzkyana	AfxCe	18	9	2.00	Euploid
Hennecartia omphalandra	Af	38	19	2.00	Euploid
Herissantia tiubae	Ca	12	7	1.71	Dysploid
Heteropterys eglandulosa	Ce	20	5	4.00	Polyploid
Heteropterys escalloniifolia	Ce	20	5	4.00	Polyploid
Heteropterys campestris	CexCa	20	5	4.00	Polyploid

Heteropterys pteropetala	CexCa	20	5	4.00	Polyploid
Heteropterys coleoptera	Af	10	5	2.00	Euploid
Heteropterys coleoptera	Af	20	5	4.00	Polyploid
Heteropterys byrsonimifolia	AfxCe	20	5	4.00	Polyploid
Hibiscus furcellatus	Ce	36	18	2.00	Euploid
Hibiscus esculentus	Ce	66	18	3.67	Dysploid
Hibiscus esculentus	Ce	72	18	4.00	Polyploid
Hibiscus peruvianus	Ce	72	18	4.00	Polyploid
Hibiscus esculentus	Ce	118	18	6.56	Dysploid
Hibiscus esculentus	Ce	120	18	6.67	Dysploid
Hibiscus esculentus	Ce	122	18	6.78	Dysploid
Hibiscus esculentus	Ce	130	18	7.22	Dysploid
Hibiscus esculentus	Ce	132	18	7.33	Dysploid

Himatanthus bracteatus	AfxCe	18	9	2.00	Euploid
Hippocratea volubilis	Af	28	14	2.00	Euploid
Holocalyx balansae	AfxCe	22	22	1.00	Dysploid
Hovenia dulcis	Af	24	12	2.00	Euploid
Hydrolea spinosa	Ce	32	10	3.20	Dysploid
Hydrolea spinosa	Ce	40	10	4.00	Polyploid
Hymenaea courbaril var. stilbocarpa	Ce	24	12	2.00	Euploid
Hymenaea parvifolia	Ce	24	12	2.00	Euploid
Hymenaea stigonocarpa var. pubescens	Ce	24	12	2.00	Euploid
Hymenaea velutina	CexCa	24	12	2.00	Euploid
Hymenaea courbaril	Common	24	12	2.00	Euploid
Hymenaea eriogyne	Common	24	12	2.00	Euploid
Hymenaea martiana	Common	24	12	2.00	Euploid

Hymenaea stigonocarpa	Common	24	12	2.00	Euploid
Hymenaea oblongifolia	Af	24	12	2.00	Euploid
Hymenaea rubriflora	Af	24	12	2.00	Euploid
Hymenaea aurea	AfxCa	24	12	2.00	Euploid
Ilex dumosa	Af	40	20	2.00	Euploid
Ilex integerrima	Af	40	20	2.00	Euploid
Ilex pseudobuxus	Af	40	20	2.00	Euploid
Ilex taubertiana	Af	40	20	2.00	Euploid
Ilex brevicuspis	AfxCa	40	20	2.00	Euploid
Ilex paraguariensis	AfxCe	40	20	2.00	Euploid
Ilex theezans	AfxCe	40	20	2.00	Euploid
Indigofera hirsuta	Ce	16	8	2.00	Euploid
Indigofera microcarpa	Af	16	8	2.00	Euploid

Indigofera suffruticosa	AfxCe	12	8	1.50	Dysploid
Indigofera suffruticosa	AfxCe	16	8	2.00	Euploid
Indigofera suffruticosa	AfxCe	32	8	4.00	Polyploid
Inga vera	Common	26	13	2.00	Euploid
Inga edulis	AfxCe	26	13	2.00	Euploid
Inga heterophylla	AfxCe	26	13	2.00	Euploid
Inga laurina	AfxCe	26	13	2.00	Euploid
Inga marginata	AfxCe	26	13	2.00	Euploid
Inga laurina	AfxCe	52	13	4.00	Polyploid
Ipomoea carnea	Ca	30	15	2.00	Euploid
Ipomoea carnea	Ca	32	15	2.13	Dysploid
Ixora gardneriana	Af	22	11	2.00	Euploid
Jacaranda cuspidifolia	AfxCe	36	18	2.00	Euploid

Jacaranda micrantha	AfxCe	36	18	2.00	Euploid
Jacaratia spinosa	AfxCe	18	9	2.00	Euploid
Jatropha gossypiifolia	Ce	22	11	2.00	Euploid
Jatropha curcas	CexCa	22	11	2.00	Euploid
Jatropha curcas	CexCa	33	11	3.00	Polyploid
Jatropha curcas	CexCa	44	11	4.00	Polyploid
Joannesia princeps	Af	22	11	2.00	Euploid
Jungia floribunda	Af	40	7	5.71	Dysploid
Justicia pectoralis	Ce	22	7	3.14	Dysploid
Justicia brasiliana	Af	28	7	4.00	Polyploid
Krameria tomentosa	AfxCe	12	6	2.00	Euploid
Lacistema aggregatum	AfxCe	44	11	4.00	Polyploid
Lacistema aggregatum	AfxCe	62	11	5.64	Dysploid

Lafoensia nummularifolia	Ce	16	8	2.00	Euploid
Lafoensia acuminata	Af	16	8	2.00	Euploid
Lafoensia pacari	AfxCe	16	8	2.00	Euploid
Lafoensia vandelliana	AfxCe	16	8	2.00	Euploid
Lamanonia ternata	AfxCe	32	16	2.00	Euploid
Lantana canescens	CexCa	24	11	2.18	Dysploid
Lantana camara	Common	22	11	2.00	Euploid
Lantana camara	Common	28	11	2.55	Dysploid
Lantana camara	Common	32	11	2.91	Dysploid
Lantana camara	Common	33	11	3.00	Polyploid
Lantana camara	Common	34	11	3.09	Dysploid
Lantana camara	Common	36	11	3.27	Dysploid
Lantana fucata	Common	36	11	3.27	Dysploid

Lantana camara	Common	38	11	3.45	Dysploid
Lantana camara	Common	44	11	4.00	Polyploid
Lantana camara	Common	46	11	4.18	Dysploid
Lantana camara	Common	55	11	5.00	Polyploid
Lantana camara	Common	56	11	5.09	Dysploid
Lantana camara	Common	66	11	6.00	Polyploid
Lantana camara	Common	77	11	7.00	Polyploid
Leandra solenifera	Ce	34	17	2.00	Euploid
Leandra rufescens	Af	28	17	1.65	Dysploid
Leandra rufescens	Af	30	17	1.76	Dysploid
Lecythis lanceolata	Af	34	17	2.00	Euploid
Leonotis nepetifolia	Ce	24	12	2.00	Euploid
Leonotis nepetifolia	Ce	26	12	2.17	Dysploid

Leonotis nepetifolia	Ce	28	12	2.33	Dysploid
Lepidaploa remotiflora	Ce	28	16	1.75	Dysploid
Lepidaploa remotiflora	Ce	30	16	1.88	Dysploid
Lepidaploa aurea	Ce	32	16	2.00	Euploid
Lepidaploa chalybaea	Ce	32	16	2.00	Euploid
Lepidaploa remotiflora	Ce	34	16	2.13	Dysploid
Lepidaploa argyrotricha	Af	34	16	2.13	Dysploid
Lepidaploa canescens	AfxCe	16	16	1.00	Dysploid
Lepidaploa canescens	AfxCe	17	16	1.06	Dysploid
Lepidaploa canescens	AfxCe	18	16	1.13	Dysploid
Lepidaploa canescens	AfxCe	20	16	1.25	Dysploid
Lepidaploa canescens	AfxCe	24	16	1.50	Dysploid
Lepidaploa canescens	AfxCe	30	16	1.88	Dysploid

Lepidaploa cotoneaster	AfxCe	30	16	1.88	Dysploid
Lepidaploa cotoneaster	AfxCe	32	16	2.00	Euploid
Lepidaploa rufogrisea	AfxCe	32	16	2.00	Euploid
Lepidaploa canescens	AfxCe	34	16	2.13	Dysploid
Lepidaploa rufogrisea	AfxCe	34	16	2.13	Dysploid
Lepidaploa canescens	AfxCe	66	16	4.13	Dysploid
Lepidaploa canescens	AfxCe	68	16	4.25	Dysploid
Leptolobium dasycarpum	Common	18	9	2.00	Euploid
Lessingianthus bardanoides	Ce	32	16	2.00	Euploid
Lessingianthus coriaceus	Ce	32	16	2.00	Euploid
Lessingianthus bardanoides	Ce	34	16	2.13	Dysploid
Lessingianthus glabratus	Ce	34	16	2.13	Dysploid
Lessingianthus glabratus	Ce	64	16	4.00	Polyploid

Lessingianthus grandiflorus	Ce	64	16	4.00	Polyploid
Lessingianthus obtusatus	Ce	64	16	4.00	Polyploid
Lessingianthus bardanoides	Ce	68	16	4.25	Dysploid
Lessingianthus glabratus	Ce	102	16	6.38	Dysploid
Lessingianthus glabratus	Ce	104	16	6.50	Dysploid
Lessingianthus glabratus	Ce	128	16	8.00	Polyploid
Lessingianthus glabratus	Ce	134	16	8.38	Dysploid
Lessingianthus glabratus	Ce	136	16	8.50	Dysploid
Leucaena leucocephala	Af	36	13	2.77	Dysploid
Leucaena leucocephala	Af	52	13	4.00	Polyploid
Leucaena leucocephala	Af	56	13	4.31	Dysploid
Leucaena leucocephala	Af	96	13	7.38	Dysploid
Leucaena leucocephala	Af	104	13	8.00	Polyploid

Leucaena leucocephala	Af	106	13	8.15	Dysploid
Libidibia ferrea	Common	24	12	2.00	Euploid
Libidibia ferrea	Common	48	12	4.00	Polyploid
Licania tomentosa	Af	22	11	2.00	Euploid
Lippia gracilis	Ca	24	5	4.80	Dysploid
Lippia pohliana	Ca	24	5	4.80	Dysploid
Lippia sidoides	Ca	24	5	4.80	Dysploid
Lippia lupulina	Ce	28	5	5.60	Dysploid
Lippia lacunosa	Ce	56	5	11.20	Dysploid
Lippia origanoides	CexCa	24	5	4.80	Dysploid
Lippia alba	CexCa	30	5	6.00	Polyploid
Lippia alba	CexCa	32	5	6.40	Dysploid
Lippia brasiliensis	Af	24	5	4.80	Dysploid

Lippia corymbosa	AfxCe	28	5	5.60	Dysploid
Lithraea brasiliensis	Af	28	14	2.00	Euploid
Lithraea molleoides	AfxCe	30	14	2.14	Dysploid
Lonchocarpus sericeus	Common	22	11	2.00	Euploid
Lonchocarpus cultratus	Af	22	11	2.00	Euploid
Lonchocarpus nitidus	Af	22	11	2.00	Euploid
Ludwigia hyssopifolia	Ce	16	8	2.00	Euploid
Ludwigia nervosa	Ce	16	8	2.00	Euploid
Ludwigia octovalvis	Ce	16	8	2.00	Euploid
Ludwigia octovalvis	Ce	18	8	2.25	Dysploid
Ludwigia octovalvis	Ce	32	8	4.00	Polyploid
Ludwigia octovalvis	Ce	48	8	6.00	Polyploid
Ludwigia longifolia	Af	16	8	2.00	Euploid

Ludwigia multinervia	Af	32	8	4.00	Polyploid
Ludwigia elegans	Af	64	8	8.00	Polyploid
Luehea candicans	Common	36	9	4.00	Polyploid
Luehea divaricata	Common	36	9	4.00	Polyploid
Luehea ochrophylla	Af	36	9	4.00	Polyploid
Lychnophora ericoides	Ce	34	18	1.89	Dysploid
Lychnophora ericoides	Ce	36	18	2.00	Euploid
Lychnophora rosmarinifolia	Ce	36	18	2.00	Euploid
Lychnophora salicifolia	Ce	36	18	2.00	Euploid
Lychnophora uniflora	Ce	36	18	2.00	Euploid
Lycianthes rantonnei	Af	24	12	2.00	Euploid
Machaerium vestitum	Ca	20	10	2.00	Euploid
Machaerium acutifolium	Common	20	10	2.00	Euploid

Machaerium brasiliense	Common	20	10	2.00	Euploid
Machaerium opacum	Common	20	10	2.00	Euploid
Machaerium scleroxylon	Common	20	10	2.00	Euploid
Machaerium stipitatum	Common	20	10	2.00	Euploid
Machaerium villosum	Common	20	10	2.00	Euploid
Machaerium fulvovenosum	Af	20	10	2.00	Euploid
Machaerium isadelphum	Af	20	10	2.00	Euploid
Machaerium lanceolatum	Af	20	10	2.00	Euploid
Machaerium oblongifolium	Af	20	10	2.00	Euploid
Machaerium pedicellatum	Af	20	10	2.00	Euploid
Machaerium isadelphum	Af	40	10	4.00	Polyploid
Machaerium aculeatum	AfxCe	20	10	2.00	Euploid
Machaerium nyctitans	AfxCe	20	10	2.00	Euploid

Machaerium nyctitans	AfxCe	40	10	4.00	Polyploid
Macroptilium lathyroides	Af	22	11	2.00	Euploid
Magnolia ovata	AfxCe	38	19	2.00	Euploid
Magonia pubescens	Common	30	15	2.00	Euploid
Malpighia glabra	Ce	20	10	2.00	Euploid
Malpighia glabra	Ce	40	10	4.00	Polyploid
Mandevilla dardanoi	Af	20	8	2.50	Dysploid
Manihot dichotoma	Ca	36	9	4.00	Polyploid
Manihot palmata	Ca	36	9	4.00	Polyploid
Manihot esculenta	Ce	30	9	3.33	Dysploid
Manihot esculenta	Ce	32	9	3.56	Dysploid
Manihot esculenta	Ce	34	9	3.78	Dysploid
Manihot esculenta	Ce	36	9	4.00	Polyploid

Manihot tripartita	Ce	36	9	4.00	Polyploid
Manihot esculenta	Ce	38	9	4.22	Dysploid
Manihot esculenta	Ce	54	9	6.00	Polyploid
Manihot esculenta	Ce	72	9	8.00	Polyploid
Manihot esculenta	Ce	144	9	16.00	Polyploid
Manihot carthaginensis subsp. glaziovii	CexCa	34	9	3.78	Dysploid
Manihot carthaginensis subsp. glaziovii	CexCa	36	9	4.00	Polyploid
Manihot anomala	Common	36	9	4.00	Polyploid
Manihot grahamii	Af	36	9	4.00	Polyploid
Manihot carthaginensis	AfxCe	36	9	4.00	Polyploid
Manilkara zapota	Af	24	12	2.00	Euploid
Manilkara zapota	Af	26	12	2.17	Dysploid
Mansoa difficilis	Af	36	7	5.14	Dysploid

Mansoa difficilis	Af	38	7	5.43	Dysploid
Marcetia taxifolia	AfxCe	24	12	2.00	Euploid
Margaritaria nobilis	AfxCe	26	13	2.00	Euploid
Marlierea clausseniana	Af	22	11	2.00	Euploid
Marlierea tomentosa	Af	22	11	2.00	Euploid
Melampodium divaricatum	AfxCe	20	10	2.00	Euploid
Melampodium divaricatum	AfxCe	24	10	2.40	Dysploid
Melampodium divaricatum	AfxCe	60	10	6.00	Polyploid
Melicoccus lepidopetalus	Af	96	16	6.00	Polyploid
Melochia tomentosa	Af	18	7	2.57	Dysploid
Metternichia princeps	Af	26	13	2.00	Euploid
Miconia fallax	Ce	34	17	2.00	Euploid
Miconia macrothyrsa	Ce	34	17	2.00	Euploid

Miconia ibaguensis	Ce	62	17	3.65	Dysploid
Miconia albicans	Common	34	17	2.00	Euploid
Miconia albicans	Common	48	17	2.82	Dysploid
Miconia calvescens	Af	32	17	1.88	Dysploid
Miconia affinis	Af	34	17	2.00	Euploid
Miconia ciliata	Af	34	17	2.00	Euploid
Miconia dodecandra	Af	68	17	4.00	Polyploid
Miconia dodecandra	Af	136	17	8.00	Polyploid
Miconia minutiflora	AfxCe	34	17	2.00	Euploid
Miconia nervosa	AfxCe	34	17	2.00	Euploid
Miconia theizans	AfxCe	34	17	2.00	Euploid
Miconia tomentosa	AfxCe	34	17	2.00	Euploid
Miconia prasina	AfxCe	48	17	2.82	Dysploid

Miconia rubiginosa	AfxCe	50	17	2.94	Dysploid
Miconia prasina	AfxCe	52	17	3.06	Dysploid
Miconia stenostachya	AfxCe	52	17	3.06	Dysploid
Miconia mirabilis	AfxCe	134	17	7.88	Dysploid
Microlobius foetidus	Af	26	14	1.86	Dysploid
Mimosa paraibana	Ca	26	13	2.00	Euploid
Mimosa pigra	Ca	26	13	2.00	Euploid
Mimosa pigra	Ca	52	13	4.00	Polyploid
Mimosa invisa	Ce	24	13	1.85	Dysploid
Mimosa adenocarpa	Ce	26	13	2.00	Euploid
Mimosa claussenii	Ce	26	13	2.00	Euploid
Mimosa hirsutissima	Ce	26	13	2.00	Euploid
Mimosa invisa	Ce	26	13	2.00	Euploid

Mimosa laticifera	Ce	26	13	2.00	Euploid
Mimosa polycarpa	Ce	26	13	2.00	Euploid
Mimosa polydidyma	Ce	26	13	2.00	Euploid
Mimosa pteridifolia	Ce	26	13	2.00	Euploid
Mimosa radula	Ce	26	13	2.00	Euploid
Mimosa radula var. imbricata	Ce	26	13	2.00	Euploid
Mimosa sericantha	Ce	26	13	2.00	Euploid
Mimosa setosissima	Ce	26	13	2.00	Euploid
Mimosa pudica	Ce	32	13	2.46	Dysploid
Mimosa pudica	Ce	48	13	3.69	Dysploid
Mimosa hirsutissima	Ce	52	13	4.00	Polyploid
Mimosa pudica	Ce	52	13	4.00	Polyploid
Mimosa velloziana	Ce	52	13	4.00	Polyploid

Mimosa pudica	Ce	78	13	6.00	Polyploid
Mimosa dolens	Ce	104	13	8.00	Polyploid
Mimosa ophthalmocentra	CexCa	26	13	2.00	Euploid
Mimosa verrucosa	CexCa	26	13	2.00	Euploid
Mimosa acutistipula	CexCa	52	13	4.00	Polyploid
Mimosa arenosa	Common	26	13	2.00	Euploid
Mimosa caesalpiniifolia	Common	26	13	2.00	Euploid
Mimosa tenuiflora	Common	26	13	2.00	Euploid
Mimosa artemisiana	Af	26	13	2.00	Euploid
Mimosa scabrella	Af	52	13	4.00	Polyploid
Mimosa bimucronata	AfxCa	24	13	1.85	Dysploid
Mimosa bimucronata	AfxCa	26	13	2.00	Euploid
Mimosa lewisii	AfxCa	26	13	2.00	Euploid

Mimosa lewisii	AfxCa	28	13	2.15	Dysploid
Mimosa somnians	AfxCe	26	13	2.00	Euploid
Mimosa somnians	AfxCe	52	13	4.00	Polyploid
Myrceugenia bracteosa	Af	22	11	2.00	Euploid
Myrceugenia brevipedicellata	Af	22	11	2.00	Euploid
Myrceugenia euosma	Af	22	11	2.00	Euploid
Myrceugenia miersiana	Af	22	11	2.00	Euploid
Myrceugenia myrcioides	Af	22	11	2.00	Euploid
Myrceugenia ovata	Af	22	11	2.00	Euploid
Myrceugenia pilotantha	Af	22	11	2.00	Euploid
Myrcia bella	Ce	22	11	2.00	Euploid
Myrcia fallax	Ce	22	11	2.00	Euploid
Myrcia guianensis	Common	22	11	2.00	Euploid

Myrcia multiflora	Common	22	11	2.00	Euploid
Myrcia splendens	Common	22	11	2.00	Euploid
Myrcia brasiliensis	Af	22	11	2.00	Euploid
Myrcia hebepetala	AfxCe	22	11	2.00	Euploid
Myrcia laruotteana	AfxCe	22	11	2.00	Euploid
Myrciaria delicatula	Af	22	11	2.00	Euploid
Myrciaria ferruginea	AfxCa	22	11	2.00	Euploid
Myrciaria dubia	AfxCe	22	11	2.00	Euploid
Myrciaria floribunda	AfxCe	22	11	2.00	Euploid
Myrciaria tenella	AfxCe	22	11	2.00	Euploid
Myriopus rubicundus	Ce	48	12	4.00	Polyploid
Myroxylon balsamum	Af	28	13	2.15	Dysploid
Myroxylon peruiferum	AfxCa	26	13	2.00	Euploid

Myrrhinium atropurpureum	Af	22	11	2.00	Euploid
Myrsine parvifolia	Af	45	23	1.96	Dysploid
Myrsine matensis	Af	46	23	2.00	Euploid
Myrsine parvifolia	Af	46	23	2.00	Euploid
Myrsine coriacea	AfxCe	46	23	2.00	Euploid
Myrsine umbellata	AfxCe	46	23	2.00	Euploid
Myrsine coriacea	AfxCe	48	23	2.09	Dysploid
Nepsera aquatica	Af	18	9	2.00	Euploid
Nerium oleander	Ce	16	11	1.45	Dysploid
Nerium oleander	Ce	22	11	2.00	Euploid
Nicotiana glauca	Ca	24	12	2.00	Euploid
Nicotiana glauca	Ca	26	12	2.17	Dysploid
Nicotiana glauca	Ca	44	12	3.67	Dysploid

Nicotiana glauca	Ca	46	12	3.83	Dysploid
Nicotiana glauca	Ca	48	12	4.00	Polyploid
Ocimum gratissimum	Af	32	6	5.33	Dysploid
Ocimum gratissimum	Af	34	6	5.67	Dysploid
Ocimum gratissimum	Af	38	6	6.33	Dysploid
Ocimum gratissimum	Af	40	6	6.67	Dysploid
Ocimum gratissimum	Af	48	6	8.00	Polyploid
Ocimum gratissimum	Af	64	6	10.67	Dysploid
Ocotea longifolia	Af	24	12	2.00	Euploid
Ocotea lancifolia	AfxCe	24	12	2.00	Euploid
Ormosia monosperma	Af	16	9	1.78	Dysploid
Ormosia arborea	AfxCe	16	9	1.78	Dysploid
Ouratea castaneifolia	AfxCe	26	12	2.17	Dysploid

Ouratea spectabilis	AfxCe	104	12	8.67	Dysploid
Oxalis grisea	Ce	12	6	2.00	Euploid
Pachira aquatica	Af	26	44	0.59	Dysploid
Pachira aquatica	Af	88	44	2.00	Euploid
Paliavana tenuiflora	AfxCa	28	14	2.00	Euploid
Palicourea rigida	Ce	22	11	2.00	Euploid
Palicourea crocea	Af	22	11	2.00	Euploid
Palicourea guianensis	Af	22	11	2.00	Euploid
Palicourea marcgravii	AfxCe	22	11	2.00	Euploid
Paralychnophora harleyi	Af	36	18	2.00	Euploid
Parapiptadenia rigida	Af	26	13	2.00	Euploid
Parinari excelsa	Af	20	10	2.00	Euploid
Parinari excelsa	Af	22	10	2.20	Dysploid

Parkia pendula	AfxCe	26	13	2.00	Euploid
Parkinsonia aculeata	Ca	18	14	1.29	Dysploid
Parkinsonia aculeata	Ca	28	14	2.00	Euploid
Paullinia elegans	Af	24	12	2.00	Euploid
Pavonia cancellata	Af	56	7	8.00	Polyploid
Pavonia sepium	Af	56	7	8.00	Polyploid
Pavonia sidifolia	Af	56	7	8.00	Polyploid
Peixotoa tomentosa	Ce	20	10	2.00	Euploid
Peixotoa reticulata	Ce	30	10	3.00	Polyploid
Peltaea speciosa	Ce	100	25	4.00	Polyploid
Peltophorum dubium	Common	26	13	2.00	Euploid
Periandra heterophylla	Ce	22	11	2.00	Euploid
Periandra mediterranea	Common	22	11	2.00	Euploid

Persea major	Af	24	12	2.00	Euploid
Phyllanthus orbiculatus	Ce	30	13	2.31	Dysploid
Phyllanthus brasiliensis	Ce	52	13	4.00	Polyploid
Phyllanthus subemarginatus	Af	26	13	2.00	Euploid
Phyllanthus acuminatus	Af	52	13	4.00	Polyploid
Phyllanthus juglandifolius	Af	100	13	7.69	Dysploid
Phyllanthus juglandifolius	Af	156	13	12.00	Polyploid
Phyllostylon brasiliense	Ca	28	14	2.00	Euploid
Physalis heterophylla	Ce	24	12	2.00	Euploid
Physalis pubescens	Af	24	12	2.00	Euploid
Physalis pubescens	Af	48	12	4.00	Polyploid
Physocalymma scaberrimum	AfxCe	16	8	2.00	Euploid
Phytolacca dioica	Af	36	9	4.00	Polyploid

Pilocarpus trachylophus	Ce	44	22	2.00	Euploid
Pilocarpus pennatifolius	Af	36	22	1.64	Dysploid
Pilocarpus giganteus	Af	44	22	2.00	Euploid
Pilocarpus microphyllus	Af	44	22	2.00	Euploid
Pilocarpus pauciflorus	Af	44	22	2.00	Euploid
Pilocarpus pennatifolius	Af	44	22	2.00	Euploid
Pilocarpus spicatus	AfxCa	88	22	4.00	Polyploid
Pimenta pseudocaryophyllus	AfxCe	22	11	2.00	Euploid
Piper nigrum	Ca	26	13	2.00	Euploid
Piper nigrum	Ca	36	13	2.77	Dysploid
Piper nigrum	Ca	48	13	3.69	Dysploid
Piper nigrum	Ca	52	13	4.00	Polyploid
Piper nigrum	Ca	53	13	4.08	Dysploid

Piper nigrum	Ca	60	13	4.62	Dysploid
Piper nigrum	Ca	65	13	5.00	Polyploid
Piper nigrum	Ca	75	13	5.77	Dysploid
Piper nigrum	Ca	78	13	6.00	Polyploid
Piper nigrum	Ca	104	13	8.00	Polyploid
Piper nigrum	Ca	128	13	9.85	Dysploid
Piper hispidum	Af	24	13	1.85	Dysploid
Piper umbellatum	Af	24	13	1.85	Dysploid
Piper cernuum	Af	26	13	2.00	Euploid
Piper hispidum	Af	26	13	2.00	Euploid
Piper umbellatum	Af	26	13	2.00	Euploid
Piper amalago	Af	28	13	2.15	Dysploid
Piper arboreum Aubl. var. arboreum	Af	28	13	2.15	Dysploid

Piper umbellatum	Af	28	13	2.15	Dysploid
Piper obliquum	Af	52	13	4.00	Polyploid
Piper arboreum	AfxCe	26	13	2.00	Euploid
Piper arboreum	AfxCe	28	13	2.15	Dysploid
Piptadenia stipulacea	Common	26	13	2.00	Euploid
Piptadenia viridiflora	Common	26	13	2.00	Euploid
Piptadenia obliqua	Af	26	13	2.00	Euploid
Piptocarpha rotundifolia	Ce	34	17	2.00	Euploid
Piptocarpha lundiana	Af	34	17	2.00	Euploid
Piptocarpha sellowii	Af	34	17	2.00	Euploid
Piptocarpha axillaris	AfxCe	34	17	2.00	Euploid
Piptocarpha macropoda	AfxCe	34	17	2.00	Euploid
Piriqueta racemosa	Af	14	7	2.00	Euploid

Pithecellobium dulce	Af	26	13	2.00	Euploid
Pittosporum undulatum	Af	24	6	4.00	Polyploid
Plathymenia reticulata	Common	26	13	2.00	Euploid
Platypodanthera melissifolia	AfxCe	20	10	2.00	Euploid
Plumbago scandens	Ce	14	7	2.00	Euploid
Posoqueria longiflora	Af	34	17	2.00	Euploid
Pouteria torta	AfxCe	28	12	2.33	Dysploid
Praxelis clematidea	Ce	20	10	2.00	Euploid
Praxelis clematidea	Ce	30	10	3.00	Polyploid
Praxelis clematidea	Ce	40	10	4.00	Polyploid
Praxelis clematidea	Ce	64	10	6.40	Dysploid
Prockia crucis	Common	18	9	2.00	Euploid
Prosopis juliflora	Af	26	14	1.86	Dysploid

Prosopis juliflora	Af	28	14	2.00	Euploid
Prosopis juliflora	Af	52	14	3.71	Dysploid
Prosopis juliflora	Af	56	14	4.00	Polyploid
Pseudobombax simplicifolium	Ca	88	44	2.00	Euploid
Pseudobombax longiflorum	AfxCe	88	44	2.00	Euploid
Pseudobombax tomentosum	AfxCe	88	44	2.00	Euploid
Pseudobrickellia brasiliensis	Ce	20	10	2.00	Euploid
Psidium australe	Ce	55	11	5.00	Polyploid
Psidium guineense	Common	22	11	2.00	Euploid
Psidium acutangulum	Common	44	11	4.00	Polyploid
Psidium guineense	Common	44	11	4.00	Polyploid
Psidium guineense	Common	55	11	5.00	Polyploid
Psidium cattleianum	Af	22	11	2.00	Euploid

Psidium cattleianum	Af	44	11	4.00	Polyploid
Psidium cattleianum	Af	88	11	8.00	Polyploid
Psidium guajava	AfxCe	21	11	1.91	Dysploid
Psidium guajava	AfxCe	22	11	2.00	Euploid
Psidium guajava	AfxCe	28	11	2.55	Dysploid
Psidium guajava	AfxCe	30	11	2.73	Dysploid
Psidium guajava	AfxCe	32	11	2.91	Dysploid
Psidium guajava	AfxCe	33	11	3.00	Polyploid
Psidium guajava	AfxCe	34	11	3.09	Dysploid
Psidium grandifolium	AfxCe	44	11	4.00	Polyploid
Psidium guajava	AfxCe	44	11	4.00	Polyploid
Psychotria brachyceras	Af	22	11	2.00	Euploid
Psychotria mima	Af	22	11	2.00	Euploid

Psychotria nuda	Af	22	11	2.00	Euploid
Psychotria mima	Af	24	11	2.18	Dysploid
Psychotria campyloneura	Af	32	11	2.91	Dysploid
Psychotria deflexa	Af	32	11	2.91	Dysploid
Psychotria leiocarpa	Af	44	11	4.00	Polyploid
Psychotria suterella	Af	44	11	4.00	Polyploid
Psychotria carthagenensis	AfxCe	22	11	2.00	Euploid
Psychotria hoffmannseggiana	AfxCe	22	11	2.00	Euploid
Psychotria mapourioides	AfxCe	40	11	3.64	Dysploid
Psychotria carthagenensis	AfxCe	44	11	4.00	Polyploid
Psychotria vellosiana	AfxCe	44	11	4.00	Polyploid
Pterocarpus rohrii	Common	20	10	2.00	Euploid
Pterocaulon alopecuroides	Af	20	10	2.00	Euploid

Pterodon emarginatus	AfxCe	16	8	2.00	Euploid
Pterodon pubescens	AfxCe	16	8	2.00	Euploid
Punica granatum	Ce	14	8	1.75	Dysploid
Punica granatum	Ce	15	8	1.88	Dysploid
Punica granatum	Ce	16	8	2.00	Euploid
Punica granatum	Ce	18	8	2.25	Dysploid
Punica granatum	Ce	19	8	2.38	Dysploid
Qualea grandiflora	Common	22	11	2.00	Euploid
Qualea parviflora	Common	22	11	2.00	Euploid
Qualea cordata	AfxCe	22	11	2.00	Euploid
Qualea multiflora	AfxCe	22	11	2.00	Euploid
Quillaja brasiliensis	Af	28	14	2.00	Euploid
Quillaja brasiliensis	Af	34	14	2.43	Dysploid

Randia aculeata	Ce	22	11	2.00	Euploid
Raulinoreitzia tremula	Af	20	10	2.00	Euploid
Rauvolfia ligustrina	Ce	22	11	2.00	Euploid
Rauvolfia ligustrina	Ce	44	11	4.00	Polyploid
Rhamnidium elaeocarpum	Common	24	12	2.00	Euploid
Rhizophora mangle	Af	36	18	2.00	Euploid
Rhynchanthera grandiflora	Ce	20	10	2.00	Euploid
Rolandra fruticosa	AfxCe	50	25	2.00	Euploid
Rosenbergiodendron formosum	Ce	22	11	2.00	Euploid
Roupala montana	AfxCe	28	7	4.00	Polyploid
Rudgea viburnoides	AfxCe	44	11	4.00	Polyploid
Ruellia asperula	Ca	34	17	2.00	Euploid
Ruellia incomta	Ce	22	17	1.29	Dysploid

Ruellia brevifolia	Af	34	17	2.00	Euploid
Ruellia brevifolia	Af	36	17	2.12	Dysploid
Ruprechtia laxiflora	AfxCa	28	14	2.00	Euploid
Salix humboldtiana	Af	38	19	2.00	Euploid
Salvertia convallariodora	Common	24	12	2.00	Euploid
Samanea saman	Af	26	7	3.71	Dysploid
Samanea saman	Af	28	7	4.00	Polyploid
Sambucus australis	Af	37	18	2.06	Dysploid
Sapindus saponaria	Common	28	15	1.87	Dysploid
Sapium haematospermum	AfxCe	120	11	10.91	Dysploid
Sauvagesia erecta	Af	38	19	2.00	Euploid
Schinus polygama	Ce	28	14	2.00	Euploid
Schinus molle	Af	28	14	2.00	Euploid

Schinus molle	Af	30	14	2.14	Dysploid
Schinus terebinthifolia	AfxCe	28	14	2.00	Euploid
Schinus terebinthifolia	AfxCe	60	14	4.29	Dysploid
Schizolobium parahyba	Af	24	12	2.00	Euploid
Schwenckia americana	AfxCe	20	10	2.00	Euploid
Sebastiania commersoniana	Ca	134	6	22.33	Dysploid
Sebastiania brasiliensis	Common	40	6	6.67	Dysploid
Senecio brasiliensis	Af	40	10	4.00	Polyploid
Senegalia riparia	Common	26	13	2.00	Euploid
Senegalia tenuifolia	Common	26	13	2.00	Euploid
Senegalia bahiensis	AfxCa	26	13	2.00	Euploid
Senna angulata	Ca	26	14	1.86	Dysploid
Senna martiana	Ca	28	14	2.00	Euploid

Senna pilifera	Ce	22	14	1.57	Dysploid
Senna alata	Ce	24	14	1.71	Dysploid
Senna chrysocarpa	Ce	24	14	1.71	Dysploid
Senna occidentalis	Ce	24	14	1.71	Dysploid
Senna occidentalis	Ce	26	14	1.86	Dysploid
Senna siamea	Ce	26	14	1.86	Dysploid
Senna alata	Ce	28	14	2.00	Euploid
Senna bicapsularis	Ce	28	14	2.00	Euploid
Senna occidentalis	Ce	28	14	2.00	Euploid
Senna siamea	Ce	28	14	2.00	Euploid
Senna occidentalis	Ce	56	14	4.00	Polyploid
Senna gardneri	CexCa	26	14	1.86	Dysploid
Senna acuruensis	CexCa	28	14	2.00	Euploid

Senna rugosa	CexCa	28	14	2.00	Euploid
Senna gardneri	CexCa	52	14	3.71	Dysploid
Senna rugosa	CexCa	56	14	4.00	Polyploid
Senna gardneri	CexCa	104	14	7.43	Dysploid
Senna macranthera	Common	24	14	1.71	Dysploid
Senna macranthera	Common	26	14	1.86	Dysploid
Senna spectabilis	Common	26	14	1.86	Dysploid
Senna splendida	Common	26	14	1.86	Dysploid
Senna cana	Common	28	14	2.00	Euploid
Senna spectabilis	Common	28	14	2.00	Euploid
Senna splendida	Common	52	14	3.71	Dysploid
Senna cernua	Af	28	14	2.00	Euploid
Senna hirsuta	Af	28	14	2.00	Euploid

Senna hirsuta	Af	32	14	2.29	Dysploid
Senna hirsuta	Af	56	14	4.00	Polyploid
Senna multijuga	AfxCe	16	14	1.14	Dysploid
Senna multijuga	AfxCe	24	14	1.71	Dysploid
Senna obtusifolia	AfxCe	24	14	1.71	Dysploid
Senna obtusifolia	AfxCe	26	14	1.86	Dysploid
Senna quinquangulata	AfxCe	26	14	1.86	Dysploid
Senna obtusifolia	AfxCe	28	14	2.00	Euploid
Senna pendula	AfxCe	28	14	2.00	Euploid
Senna silvestris	AfxCe	28	14	2.00	Euploid
Senna obtusifolia	AfxCe	52	14	3.71	Dysploid
Senna obtusifolia	AfxCe	56	14	4.00	Polyploid
Serjania erecta	Ce	24	12	2.00	Euploid

Serjania caracasana	Af	24	12	2.00	Euploid
Serjania glabrata	Af	24	12	2.00	Euploid
Sesbania exasperata	Ca	12	6	2.00	Euploid
Sesbania virgata	Ca	12	6	2.00	Euploid
Sessea regnellii	Af	16	8	2.00	Euploid
Sida acuta	Ce	14	7	2.00	Euploid
Sida angustissima	Ce	14	7	2.00	Euploid
Sida rhombifolia	Ce	14	7	2.00	Euploid
Sida santaremensis	Ce	14	7	2.00	Euploid
Sida viarum	Ce	14	7	2.00	Euploid
Sida cordifolia	Ce	16	7	2.29	Dysploid
Sida rhombifolia	Ce	16	7	2.29	Dysploid
Sida acuta	Ce	28	7	4.00	Polyploid

Sida cordifolia	Ce	28	7	4.00	Polyploid
Sida rhombifolia	Ce	28	7	4.00	Polyploid
Sida cordifolia	Ce	32	7	4.57	Dysploid
Sida cerradoensis	Af	14	7	2.00	Euploid
Sida linifolia	Af	14	7	2.00	Euploid
Sida glomerata	AfxCe	14	7	2.00	Euploid
Sida urens	AfxCe	32	7	4.57	Dysploid
Simarouba amara	Common	32	16	2.00	Euploid
Solanum jabrense	Ca	24	12	2.00	Euploid
Solanum thomasiifolium	Ca	24	12	2.00	Euploid
Solanum mammosum	Ce	22	12	1.83	Dysploid
Solanum grandiflorum	Ce	24	12	2.00	Euploid
Solanum jamaicense	Ce	24	12	2.00	Euploid

Solanum mammosum	Ce	24	12	2.00	Euploid
Solanum palinacanthum	Ce	24	12	2.00	Euploid
Solanum sisymbriifolium	Ce	24	12	2.00	Euploid
Solanum stramonifolium var. stramonifolium	Ce	24	12	2.00	Euploid
Solanum sisymbriifolium	Ce	72	12	6.00	Polyploid
Solanum crinitum	CexCa	24	12	2.00	Euploid
Solanum asperum	Common	24	12	2.00	Euploid
Solanum paludosum	Common	24	12	2.00	Euploid
Solanum paniculatum	Common	24	12	2.00	Euploid
Solanum americanum	Af	12	12	1.00	Dysploid
Solanum acerifolium	Af	24	12	2.00	Euploid
Solanum americanum	Af	24	12	2.00	Euploid
Solanum asperolanatum	Af	24	12	2.00	Euploid

Solanum caavurana	Af	24	12	2.00	Euploid
Solanum capsicoides	Af	24	12	2.00	Euploid
Solanum cernuum	Af	24	12	2.00	Euploid
Solanum concinnum	Af	24	12	2.00	Euploid
Solanum diploconos	Af	24	12	2.00	Euploid
Solanum guaraniticum	Af	24	12	2.00	Euploid
Solanum itatiaiae	Af	24	12	2.00	Euploid
Solanum mauritianum	Af	24	12	2.00	Euploid
Solanum melissarum	Af	24	12	2.00	Euploid
Solanum pseudocapsicum	Af	24	12	2.00	Euploid
Solanum pseudoquina	Af	24	12	2.00	Euploid
Solanum ramulosum	Af	24	12	2.00	Euploid
Solanum rufescens	Af	24	12	2.00	Euploid

Solanum rugosum	Af	24	12	2.00	Euploid
Solanum sycocarpum	Af	24	12	2.00	Euploid
Solanum valdiviense	Af	24	12	2.00	Euploid
Solanum variabile	Af	24	12	2.00	Euploid
Solanum bullatum	Af	30	12	2.50	Dysploid
Solanum americanum	Af	36	12	3.00	Polyploid
Solanum americanum	Af	44	12	3.67	Dysploid
Solanum americanum	Af	48	12	4.00	Polyploid
Solanum paranense	Af	48	12	4.00	Polyploid
Solanum polytrichum	Af	48	12	4.00	Polyploid
Solanum paranense	Af	72	12	6.00	Polyploid
Solanum granulosoleprosum	AfxCe	24	12	2.00	Euploid
Solanum lycocarpum	AfxCe	24	12	2.00	Euploid

Sophora tomentosa	Af	18	9	2.00	Euploid
Sparattanthelium botocudorum	Af	96	15	6.40	Dysploid
Spondias purpurea	Ce	32	16	2.00	Euploid
Spondias tuberosa	Common	32	16	2.00	Euploid
Spondias venulosa	Af	32	16	2.00	Euploid
Spondias mombin	AfxCe	32	16	2.00	Euploid
Stachyarrhena spicata	Af	22	11	2.00	Euploid
Stachytarpheta angustifolia	Ce	56	9	6.22	Dysploid
Stachytarpheta cayennensis	Af	48	9	5.33	Dysploid
Sterculia striata	Common	40	20	2.00	Euploid
Sterculia apetala	AfxCe	40	20	2.00	Euploid
Stifftia chrysantha	Af	54	9	6.00	Polyploid
Stigmaphyllon paralias	AfxCe	10	10	1.00	Dysploid

Stigmaphyllon paralias	AfxCe	20	10	2.00	Euploid
Stillingia trapezoidea	Ca	36	15	2.40	Dysploid
Stilpnopappus pratensis	Ce	24	12	2.00	Euploid
Strychnos brasiliensis	AfxCe	110	11	10.00	Polyploid
Stryphnodendron adstringens	AfxCe	26	13	2.00	Euploid
Stryphnodendron polyphyllum	AfxCe	26	13	2.00	Euploid
Stylosanthes guianensis	Ce	20	10	2.00	Euploid
Stylosanthes capitata	Ce	40	10	4.00	Polyploid
Stylosanthes viscosa	AfxCe	20	10	2.00	Euploid
Styrax camporum	AfxCe	16	8	2.00	Euploid
Styrax ferrugineus	AfxCe	16	8	2.00	Euploid
Styrax martii	AfxCe	16	8	2.00	Euploid
Swartzia acuminata	Af	26	8	3.25	Dysploid

Swartzia jororii	Af	26	8	3.25	Dysploid
Swartzia langsdorffii	Af	26	8	3.25	Dysploid
Swartzia linharensis	Af	26	8	3.25	Dysploid
Swartzia multijuga	Af	26	8	3.25	Dysploid
Swartzia myrtifolia	Af	26	8	3.25	Dysploid
Swartzia oblata	Af	26	8	3.25	Dysploid
Swartzia polyphylla	Af	26	8	3.25	Dysploid
Swartzia simplex	Af	26	8	3.25	Dysploid
Swartzia apetala	AfxCe	26	8	3.25	Dysploid
Symphyopappus compressus	AfxCe	22	10	2.20	Dysploid
Tabebuia aurea	Common	40	20	2.00	Euploid
Tabebuia roseoalba	Common	40	20	2.00	Euploid
Tabernaemontana solanifolia	Ce	22	11	2.00	Euploid

Tabernaemontana catharinensis	Common	18	11	1.64	Dysploid
Tabernaemontana catharinensis	Common	22	11	2.00	Euploid
Tabernaemontana divaricata	Af	16	11	1.45	Dysploid
Tabernaemontana divaricata	Af	22	11	2.00	Euploid
Tabernaemontana divaricata	Af	23	11	2.09	Dysploid
Tabernaemontana divaricata	Af	28	11	2.55	Dysploid
Tabernaemontana divaricata	Af	32	11	2.91	Dysploid
Tabernaemontana divaricata	Af	33	11	3.00	Polyploid
Tabernaemontana divaricata	Af	34	11	3.09	Dysploid
Tabernaemontana divaricata	Af	66	11	6.00	Polyploid
Talisia esculenta	Common	32	16	2.00	Euploid
Talisia obovata	Af	32	16	2.00	Euploid
Tarenaya spinosa	CexCa	18	9	2.00	Euploid

Tarenaya spinosa	CexCa	20	9	2.22	Dysploid
Tarenaya spinosa	CexCa	44	9	4.89	Dysploid
Tecoma stans	Af	36	18	2.00	Euploid
Tecoma stans	Af	40	18	2.22	Dysploid
Tephrosia purpurea	Af	16	11	1.45	Dysploid
Tephrosia cinerea	Af	22	11	2.00	Euploid
Tephrosia noctiflora	Af	22	11	2.00	Euploid
Tephrosia purpurea	Af	22	11	2.00	Euploid
Tephrosia purpurea	Af	24	11	2.18	Dysploid
Tephrosia noctiflora	Af	32	11	2.91	Dysploid
Tephrosia purpurea	Af	44	11	4.00	Polyploid
Terminalia glabrescens	AfxCe	36	12	3.00	Polyploid
Tibouchina mutabilis	Ca	36	9	4.00	Polyploid

Tibouchina sellowiana	AfxCe	36	9	4.00	Polyploid
Tococa guianensis	AfxCe	34	17	2.00	Euploid
Tocoyena formosa	Common	22	11	2.00	Euploid
Toulicia crassifolia	Ce	28	14	2.00	Euploid
Tournefortia paniculata var. austrina	Ce	24	12	2.00	Euploid
Trema micrantha	Common	20	10	2.00	Euploid
Trembleya parviflora	AfxCe	22	12	1.83	Dysploid
Trichilia pallida	AfxCe	48	23	2.09	Dysploid
Trichilia pallida	AfxCe	52	23	2.26	Dysploid
Triplaris weigeltiana	Common	22	11	2.00	Euploid
Triplaris americana	AfxCe	22	11	2.00	Euploid
Triumfetta semitriloba	CexCa	32	16	2.00	Euploid
Trixis praestans	Af	54	27	2.00	Euploid

Turnera ulmifolia	Ce	10	13	0.77	Dysploid
Turnera ulmifolia	Ce	20	13	1.54	Dysploid
Turnera ulmifolia	Ce	25	13	1.92	Dysploid
Turnera ulmifolia	Ce	28	13	2.15	Dysploid
Turnera ulmifolia	Ce	30	13	2.31	Dysploid
Turnera ulmifolia	Ce	32	13	2.46	Dysploid
Turnera ulmifolia	Ce	60	13	4.62	Dysploid
Turnera calyptrocarpa	Af	14	13	1.08	Dysploid
Turnera subulata	AfxCe	10	13	0.77	Dysploid
Turnera subulata	AfxCe	15	13	1.15	Dysploid
Turnera subulata	AfxCe	20	13	1.54	Dysploid
Turnera subulata	AfxCe	40	13	3.08	Dysploid
Unonopsis guatterioides	AfxCe	18	7	2.57	Dysploid

Urera baccifera	Af	26	13	2.00	Euploid
Urera caracasana	Af	32	13	2.46	Dysploid
Urera caracasana	Af	42	13	3.23	Dysploid
Vasconcellea quercifolia	Af	18	9	2.00	Euploid
Vassobia breviflora	Af	24	12	2.00	Euploid
Verbesina macrophylla	AfxCa	68	17	4.00	Polyploid
Vernonanthura chamaedrys	Ce	34	17	2.00	Euploid
Vernonanthura membranacea	Ce	34	17	2.00	Euploid
Vernonanthura discolor	Af	34	17	2.00	Euploid
Vernonanthura discolor	Af	40	17	2.35	Dysploid
Vernonanthura discolor	Af	60	17	3.53	Dysploid
Vernonanthura discolor	Af	64	17	3.76	Dysploid
Vernonanthura brasiliana	AfxCe	34	17	2.00	Euploid

Vernonanthura divaricata	AfxCe	34	17	2.00	Euploid
Vernonanthura ferruginea	AfxCe	34	17	2.00	Euploid
Vernonanthura montevidensis	AfxCe	34	17	2.00	Euploid
Vernonanthura polyanthes	AfxCe	34	17	2.00	Euploid
Vernonanthura divaricata	AfxCe	36	17	2.12	Dysploid
Vernonanthura polyanthes	AfxCe	36	17	2.12	Dysploid
Vernonia rubriramea	Ce	32	9	3.56	Dysploid
Vitex trifolia	Ce	26	13	2.00	Euploid
Vitex trifolia	Ce	32	13	2.46	Dysploid
Vitex trifolia	Ce	34	13	2.62	Dysploid
Vitex megapotamica	AfxCe	40	13	3.08	Dysploid
Vochysia cinnamomea	Ce	24	12	2.00	Euploid
Vochysia elliptica	Ce	24	12	2.00	Euploid

Vochysia ferruginea	Ce	24	12	2.00	Euploid
Vochysia bifalcata	Af	24	12	2.00	Euploid
Vochysia selloi	Af	24	12	2.00	Euploid
Vochysia haenkeana	AfxCe	24	12	2.00	Euploid
Vochysia rufa	AfxCe	24	12	2.00	Euploid
Vochysia tucanorum	AfxCe	24	12	2.00	Euploid
Waltheria communis	Ce	12	7	1.71	Dysploid
Waltheria indica	AfxCe	14	7	2.00	Euploid
Waltheria indica	AfxCe	24	7	3.43	Dysploid
Waltheria indica	AfxCe	40	7	5.71	Dysploid
Ximenia americana	Common	24	13	1.85	Dysploid
Ximenia americana	Common	26	13	2.00	Euploid
Xylopia aromatica	Common	16	8	2.00	Euploid

Zanthoxylum petiolare	AfxCa	72	18	4.00	Polyploid
Ziziphus joazeiro	Common	22	12	1.83	Dysploid

ANEXOS

ANEXO 1: Declaração de Bioética e Biossegurança

COORDENADORIA DE PÓS-GRADUAÇÃO
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DECLARAÇÃO

Em observância ao **§5º do Artigo 1º da Informação CCPG-UNICAMP/001/15**, referente a Bioética e Biossegurança, declaro que o conteúdo de minha Dissertação de Mestrado, intitulada "***como a variação no número cromossômico pode indicar relações evolutivas entre a Caatinga, o Cerrado e a Mata Atlântica?***", desenvolvida no Programa de Pós-Graduação em Biologia Vegetal do Instituto de Biologia da Unicamp, não versa sobre pesquisa envolvendo seres humanos, animais ou temas afetos a Biossegurança.

Assinatura: Tiago P. R. da Gloria
Nome do(a) aluno(a): Tiago Pereira Ribeiro da Gloria

Assinatura: Fernando R. Martins
Nome do(a) orientador(a): Fernando Roberto Martins

ANEXO 2: declaração de Direitos Autorais

Declaração

As cópias de artigos de minha autoria ou de minha co-autoria, já publicados ou submetidos para publicação em revistas científicas ou anais de congressos sujeitos a arbitragem, que constam da minha Dissertação/Tese de Mestrado/Doutorado, intitulada **como a variação no número cromossômico pode indicar relações evolutivas entre a Caatinga, o Cerrado e a Mata Atlântica?**, não infringem os dispositivos da Lei n.° 9.610/98, nem o direito autoral de qualquer editora.

Campinas, 22 de Abril de 2020

Assinatura : Tiago P. R. da Gloria
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