



Original Paper

Diversity of *Croton* (Euphorbiaceae) in the Itatiaia National Park, Brazil

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Abstract

In this work, we provide a taxonomic treatment of *Croton* species from Itatiaia National Park - INP. The taxonomic study was based on herbarium collections, besides fieldwork to understand the morphological variability of the species. We have recorded seven species of *Croton* at the INP: *C. alchorneicarpus*, *C. campanulatus*, *C. dichrous*, *C. floribundus*, *C. lundianus*, *C. organensis* and *C. vulnerarius*, of which two are endemic of the Montane Ombrophilous Forests of Serra da Mantiqueira - *C. alchorneicarpus* and *C. campanulatus*.

Key words: Atlantic Forest, endemism, floristic, protected areas.

Resumo

Neste trabalho apresentamos o tratamento taxonômico das espécies do gênero *Croton* no Parque Nacional do Itatiaia - PNI. O estudo taxonômico foi realizado com base em coleções de herbário, além de trabalho de campo para entender a variabilidade morfológica das espécies. Encontramos sete espécies de *Croton* no PNI: *C. alchorneicarpus*, *C. campanulatus*, *C. dichrous*, *C. floribundus*, *C. lundianus*, *C. organensis* e *C. vulnerarius*, das quais duas são endêmicas de florestas ombrófilas montanas da Serra da Mantiqueira, *C. alchorneicarpus* e *C. campanulatus*.

Palavras-chave: Floresta Atlântica, endemismo, florística, unidades de conservação.

Introduction

Brazil has the greatest plant diversity in the world, with more than 46 thousand species already recorded (Forzza *et al.* 2012; BFG 2015; Flora do Brasil 2020). Among the Angiosperms, which account for more than 33 thousand species (BFG 2018), Euphorbiaceae is the ninth most species-rich plant family in the country (BFG 2015). *Croton* L. is a megadiverse genus, consisting of about 1,200 species worldwide (Govaerts *et al.* 2000; Berry *et al.* 2005), and it is considered one of the most abundant genera in secondary vegetation of South America (Gomez-Pompa 1971). In Brazil, *Croton* is the most representative genus of Euphorbiaceae with

300 species, which ranks it as the fourth largest among Brazilian Angiosperms (BFG 2015; Flora do Brasil 2020).

Even with its great morphological diversity (Caruzo *et al.* 2011), *Croton* is considered a monophyletic taxa and their species can be recognized in the field by a suite of characters including stellate or lepidote trichomes, thyrsoid inflorescences, with pistillate flowers in proximal cymules and staminate flowers in distal ones or both flowers in proximal cymules and staminate flowers in distal ones, clear or colored latex, frequent petiolar glands, and senescent orange leaves (Berry *et al.* 2005; Riina *et al.* 2009; van Ee *et al.* 2011).

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The Itatiaia National Park is the first national reserve in Brazil and studies conducted within the park indicate a great biodiversity and many endemic species, which highlights the importance of this reserve for conservation (e.g., Lima & Guedes-Bruni 2004; Morim 2006; Silva Neto & Ávila Júnior 2007; Necchi-Júnior *et al.* 2008; Pereira & Mansano 2008; Monteiro & Guimarães 2008, 2009; Barberena *et al.* 2008; Barros *et al.* 2010; Ramos & Sylvestre 2010; Mezabarba *et al.* 2013; Giannerini *et al.* 2015; Moura & Morim 2015; Rollim & Trovó 2016; Costa *et al.* 2017; Freitas *et al.* 2017; Freitas & Trovó 2017; Gonzaga *et al.* 2017; Gonçalves & Santos 2018). Therefore, the main goal of this study was to describe the diversity of *Croton* in the Itatiaia National Park.

This work includes brief morphological descriptions, identification key, taxonomic comments, conservation status (based on literature) and geographical distribution of *Croton* species found within the park. Thus, the present study increases the knowledge about the genus in Atlantic Rain Forest.

Material and Methods

The Itatiaia National Park (INP) is located in the states of Minas Gerais and Rio de Janeiro (Fig. 1) in Brazil, with 28,084.3 ha (MMA/ICMBIO 2013). It is totally included within the Atlantic Rain Forest Domain, in the highest part of Serra da Mantiqueira. The elevation in the park varies from 540 to 2,791 meters, which led the administration to functionally divide it into lower region and the 'plateau' (higher region) (Barreto *et al.* 2013). However, it is important to mention that this division it is not related to vegetation types (explained below) found within the park.

The four main vegetation types found in the park are classified according to variations in elevation, as following: i) Submontane Ombrophilous Dense Forest, located on the slopes of the plateaus up to 500 m in altitude; ii) Montane Ombrophilous Dense Forest, located high on the plateaus between 500 m and 1,500 m altitude; iii) High Montane Ombrophilous Dense Forest, located above 1,500 m, and iv) grasslands, found

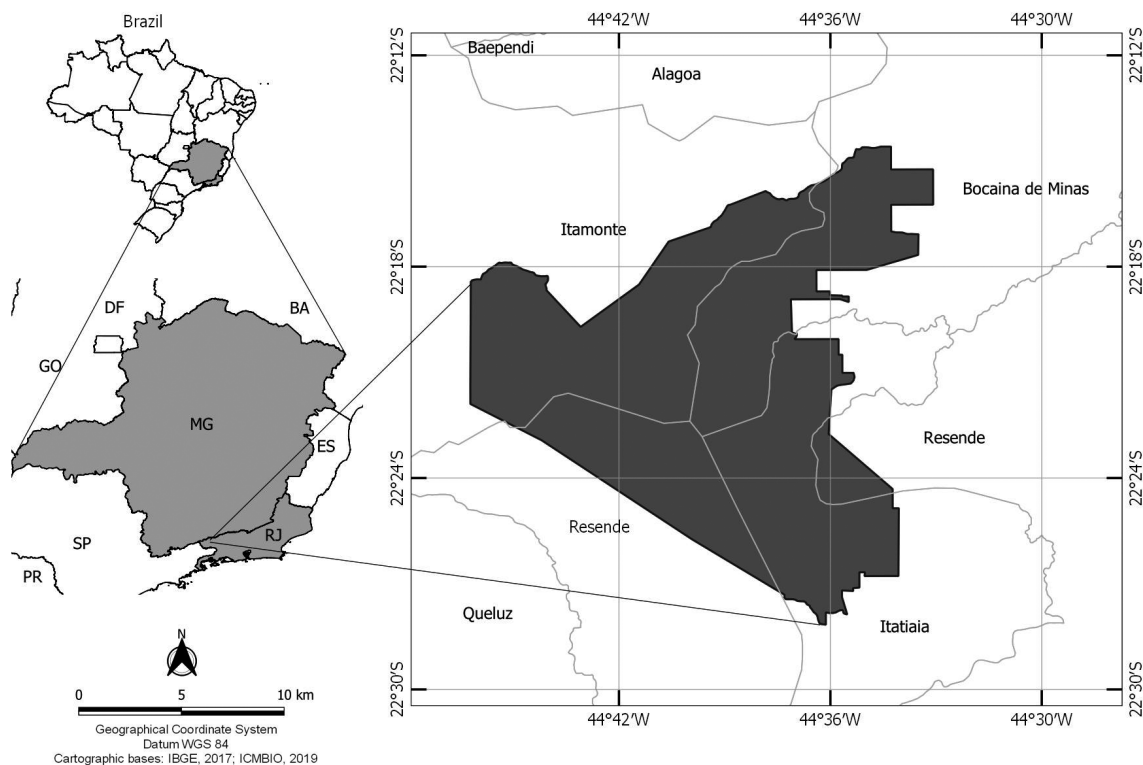


Figure 1 – Location of the Itatiaia National Park.

in the highest regions of the park (Barreto *et al.* 2013; IBGE 2012).

This study was based on field observations and analysis of collections from the following herbaria: HRJ, HUFSP, MBM, RB, R, SP, SPF, SPSF and RFA (abbreviations according to Thiers, continuously updated). In addition, online databases with relevant information and images of herbarium collections were consulted for types and regular specimens: Reflora - Herbário Virtual (<<http://floradobrasil.jbrj.gov.br/reflora/herbarioVirtual/>>), Global Plants (<<https://plants.jstor.org/>>), CRIA (<<http://smlink.cria.org.br/>>), and TROPICOS (<<https://www.tropicos.org/home>>).

Morphological features were analyzed under stereomicroscope and the terms used in the key and descriptions of the species followed Hickey (1973), Radford *et al.* (1974), Webster (1993), and Webster *et al.* (1996). Phenology data and descriptions were based on all material examined (data of the material examined available at Tab. S1, on supplementary material <<https://doi.org/10.6084/m9.figshare.14699733.v1>>).

During field expeditions (16-20.X.2017 and 19-22.XI.2018), we adopted the “hiking” method (Filgueiras *et al.* 1994) and all materials were herborized following traditional technics as described in Mori *et al.* (1989). Specimens collected were included in the herbarium of Universidade Federal de São Paulo (HUFSP).

Geographical coordinates of specimens were obtained in the field with a handle held Global Positioning System (GPS) receiver and from herbaria collections. Distribution maps were

created using QGIS version 3.6.2-Noosa (QGIS Development Team 2019).

Results and Discussion

We found seven species of *Croton* in the INP, as listed in Table 1. Almost all arborescent species occur in the lower region of the park, in Submontane and Montane Ombrophilous Dense Forest, except *C. alchorneicarpus* Croizat, which is only found in the ‘plateau’ in Montane and High Montane Ombrophilous Dense Forest. *Croton lundianus* (Didr.) Müll. Arg., an ruderal species, was found only along the edges of Montane Ombrophilous Forest in the lower part of the INP, while the other shrubby species, *C. dichrous* Müll. Arg., occurs exclusively in the higher region of the park, in high elevation grasslands (Figs. 2; 3).

Croton L., Sp. Pl. 2: 1004. 1753.

Subshrubs to trees, monoecious; covered by simple, stellate, stellate-porrect, dendritic, dendritic-porrect or lepidote trichomes. Leaves alternate, simple, entire, margin entire to serrate, usually with 1(2) pair(s) of acropetiole or basilaminar glands, sessile to stipitate, stipules persistent or deciduous. Tyrses terminal; pistillate flowers in proximal cymules, staminate flowers more often in distal ones or rarely in every cymule of the inflorescence. Staminate flowers dichlamydeous, with 7–120 stamens, inflexed in bud. Pistillate flowers monochlamydeous or rarely dichlamydeous (in this case, the petals are extremely reduced); ovary with 3 carpels, 3-locular, locules 1-ovulate; styles 3, bifid to multifid, free

Table 1 – *Croton* species from Itatiaia National Park and its distribution within the reserve.

Species	Section	Life form	Distribution at the INP
<i>Croton alchorneicarpus</i> Croizat	<i>Cyclostigma</i> Griseb.	Treelets to trees	Plateau
<i>Croton campanulatus</i> Caruzo & Cordeiro	<i>Cleodora</i> (Klotzsch) Baill.	Trees	Lower region
<i>Croton dichrous</i> Müll.Arg.	<i>Lamprocroton</i> (Müll. Arg.) Pax in Engler & Prantl.	Shrubs	Plateau
<i>Croton floribundus</i> Spreng.	<i>Lasiogyne</i> (Klotzsch) Baill.	Trees	Lower region
<i>Croton lundianus</i> (Didr.) Müll.Arg.	<i>Geiseleria</i> (A. Gray) Baill.	Subshrubs	Lower region
<i>Croton organensis</i> Baill.	<i>Cleodora</i> (Klotzsch) Baill.	Trees	Lower region
<i>Croton vulnerarius</i> Baill.	<i>Cyclostigma</i> Griseb.	Treelets to trees	Lower region

from the base or united into a short column. Capsules septicide-loculicide; columella persistent; seeds smooth to verrucose, with caruncle (Webster

1993; Burger & Huft 1995; Radcliffe-Smith 2001; Caruzo & Cordeiro 2007; Lima & Pirani 2008; van Ee *et al.* 2011).

Identification key to the species of *Croton* from Itatiaia National Park

1. Shrubby species from high elevation grasslands or edge of forests.
 2. Young branches covered by lepidote trichomes. Leaves with margin entire, without petiolar glands 3. *Croton dichrous*
 - 2'. Young branches covered by stellate and stellate-porrect trichomes. Leaves with margin dentate, with a pair of acropetiolar glands 5. *Croton lundianus*
- 1'. Arborescent species from Submontane to Montane Ombrophilous Dense forests.
 3. Leaves with acropetiolar glands.
 4. Young branches covered by lepidote trichomes. Leaf margin entire. Flowers with 20–25 stamens; pistillate flowers campanulate 2. *Croton campanulatus*
 - 4'. Young branches covered by stellate, stellate-porrect, dendritic or dendritic-porrect trichomes. Leaf margin entire to inconspicuously serrate. Flowers with 30 stamens or more; pistillate flowers subcampanulate.
 5. Young branches densely tomentose or pilose. Leaves pilose in both surfaces. Flowers with 90–120 stamens, pistillate flowers subsessile 7. *Croton vulnerarius*
 - 5'. Young branches pubescent. Leaves glabrate in adaxial surface and pubescent in abaxial one. Flowers with 30–50 stamens, pistillate flowers sessile to subsessile 1. *Croton alchorneicarpus*
 - 3'. Leaves without acropetiolar glands or with inconspicuous basilaminar glands.
 6. Flowers with 15–20 stamens. pistillate flowers subcampanulate, sepals reduplicate-valvate. Capsules verrucose; seeds smooth 4. *Croton floribundus*
 - 6'. Flowers with 10–15 stamens, pistillate flowers flask-shaped, sepals imbricate. Capsules smooth; seeds ribbed 6. *Croton organensis*

1. *Croton alchorneicarpus* Croizat, Darwiniana 6: 451. 1944. Fig. 4a-d

Treelets to trees, 2–10 m tall, pale yellow to orange-colored latex; young branches pubescent with indumentum whitish ochraceous, stellate, stellate-porrect, dendritic and dendritic-porrect trichomes. Leaves 4–19 × 2–10 cm, discolor, ovate to cordate, apex long acuminate, base obtuse to cordate, margin entire to inconspicuously serrate; indumentum glabrate on the adaxial surface and pubescent at the abaxial surface; venation pinnate, eucamptodromous; petiole 2–16 cm long, 2(4) acropetiolar stalked saucer-shaped glands; stipules lanceolate to linear, strongly foliaceous in the young branches, 0.5–2 cm long. Inflorescences 4–18 cm long; proximal cymules bisexual, distal cymules unisexual (staminate); bracts linear to lanceolate; staminate flowers rotate, pedicellate, 30–50 stamens; pistillate flowers 5-merous, subcampanulate, sessile to subsessile, sepals slightly imbricate; petals reduced, filiform; ovary

subglobose, pilose; styles 4-fid, joined at the base. Capsules subglobose, ca. 1.5 cm long, pilose; seeds subglobose, striated, ca. 0.5 cm long.

Selected specimen examined: Itatiaia, planalto, 1700 m, 12.VIII.1977, fl. and fr., *C. Pereira 813* (RFA); E. do Rio - Serra do Itatiaia; 7.VI.1958, *P. Occhioni 1477* (RFA); 2000 m, 3.VI.1902, *P. Dusen 456* (R); 2000 m, *A. Sampaio 4755* (R); Parque Nacional do Itatiaia, estrada para o Pico das Agulhas Negras, 2200 m, 3.XII.1996, fl. and fr., *S.J. Silva Neto et al. 758* (RB, MBM); 16.XI.2007, fl. and fr., *L.R. Lima & R.R. Rodrigues 471* (RB, SP); 2.XII.1983, fl. and fr., *Cesar & Furlan 100* (SP); ocorrendo no caminho entre Macieiras e o Abrigo, 1800-1900 m, 8.XI.1993, fl. e fr., *R. Guedes et al. 2306* (RB); estrada BR-485, Brejo da Lapa, 22°22'47"S, 44°43'38"W, 2320 m, 7.II.2015, fl. and fr., *R.G. Barbosa-Silva et al. 420*, (RB); estrada Eng. Passos (BR-354, RJ-MG), 22°23'11,4"S, 44°45'14,6"W, 1410 m, 7.II.2006, fr., *R. Riina & M.B.R. Caruzo 1526* (SP); km 3, 1480 m, 7.II.2006, *R. Riina & M.B.R. Caruzo 1527* (SP); (entre o km 2 e km 3), 22°23'18,4"S, 44°45'00,0"W, 1450 m, 7.II.2006, fl. and fr., *R. Riina & M.B.R. Caruzo 1529* (SP); estr. Registro-Agulhas

Negras, 17.I.1979, fl. and fr., *Occhioni*, 8736 (MBM, RFA); estr. p/ o planalto, 17.II.1980, fl., *P. Occhioni* 9206 (MBM, RFA); próximo à portaria do parque na estrada para o Abrigo Rebouças, 22°21'54,1"S, 44°43'36,6"W, fr., *I. Cordeiro et al.* 2990 (MBM, SP); estrada de terra (saindo da BR-354 no km 0) sentido posto Marcão, 22°22'08,6"S, 44°44'52,2"W, 1895 m, 13.II.2016, fr., *M.B.R. Caruzo et al.* 187 (SP); entrada para o planalto, 1200 m, V.1977, fl., *P. Occhioni*, 8208 (MBM, RFA); estrada para o posto Marcão, 22°21'40"S, 44°43'57"W, 1798 m, 9.XI.2017, fl. and fr., *M. Nadruz et al.* 3275 (RB); Maromba, 5.III.1947, fl., *P. Occhioni* 820 (RFA); 22°21'34,8"S, 44°44'11,3"W, 2153 m, 7.XII.2017, fl. and fr., *L. Giovane et al.* 34 (RFA); Brejo da Lapa, 22°21'61"S, 44°44'21"W, 2157 m, 21.XI.2010, fl. and fr., *S.J. Silva Neto et al.* (HB 093705). Resende, estrada sentido portaria, 22°21'52.94"S,

44°43'36.80"W, 2247 m, 21.XI.2018, fl., *G.F. Silva et al.* 31 (HUFSP); Rodovia Sebastião Alves do Nascimento (BR-354), sentido Eng.º Passos, 22°22'59.66"S, 44°45'9.59"W, 1582 m, 21.XI.2018, *G.F. Silva et al.* 33 (HUFSP); sentido Itamonte-MG, bem próximo a divisa RJ-MG, 22°22'41,2"S, 44°45'29,7"W, 1391 m, 13.II.2016, fl. and fr., *R.F. Santos et al.* 54 (RB, SP). MINAS GERAIS: Itamonte, Rodovia BR-485 (acesso pela BR-354, entrada de terra) estrada para o Parque Nacional do Itatiaia sentido posto do Marcão "Posto 3", 22°22'08,6"S, 44°44'52,2"W, 1895 m, 13.II.2016, fl. and fr., *R.F. Santos et al.* 53 (SP); Parque Nacional do Itatiaia, 22°20'28.20"S, 44°44'8.60"W, 1986 m, 20.XI.2018, fl. and fr., *G.F. Silva et al.* 25 (HUFSP); 22°20'27.58"S, 44°44'8.70"W, 1988 m, 20.XI.2018, fl. and fr., *G.F. Silva et al.* 26 (HUFSP); próximo ao Brejo da Lapa, 22°20'40.71"S, 44°44'6.50"W, 2053 m,

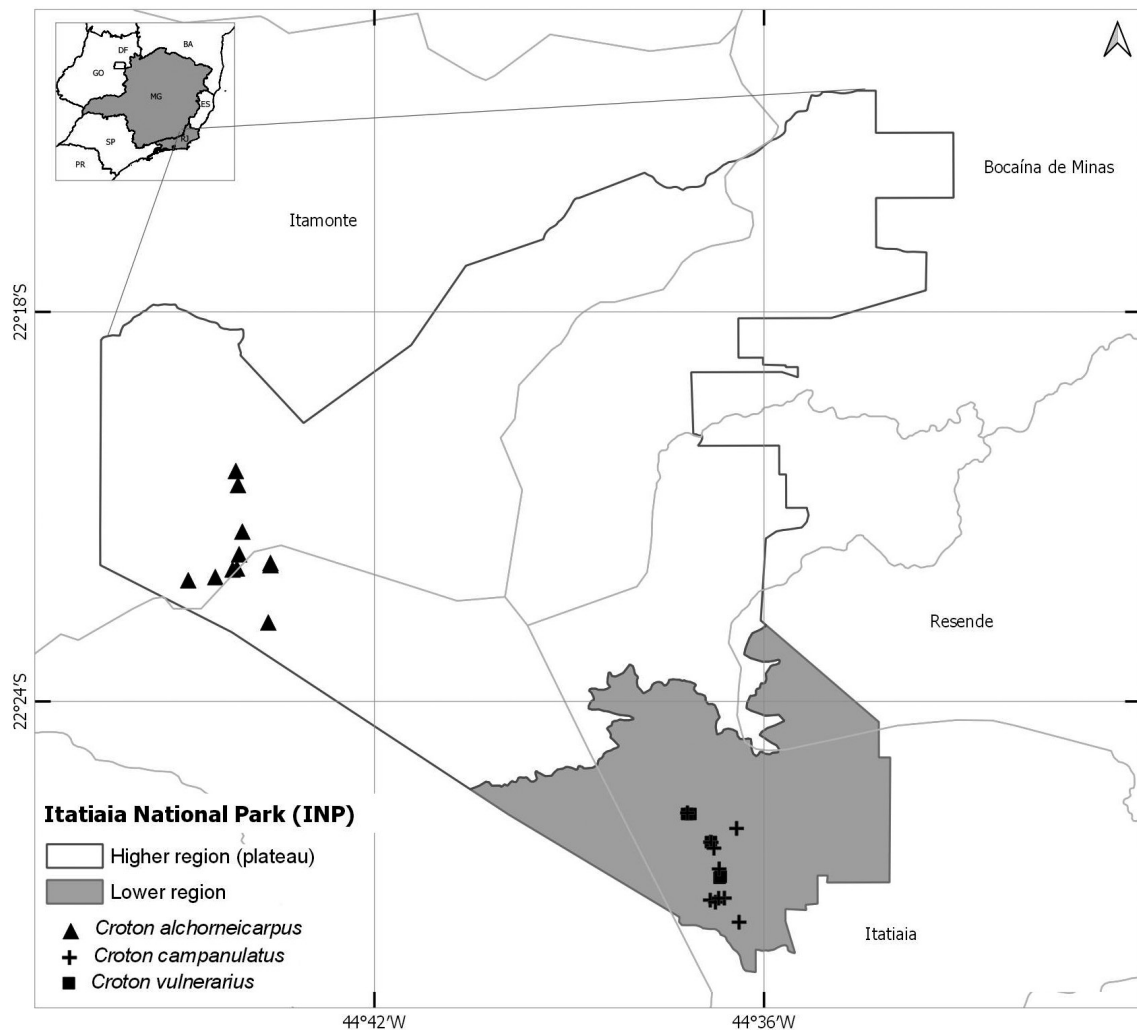


Figure 2 – Geographic distribution of *Croton alchorneicarpus*, *C. campanulatus* and *C. vulnerarius* at the Itatiaia National Park.

18.X.2017, 20.XI.2018, fr., *G.F. Silva et al. 22* (HUFSP); 22°20'33.75"S, 44°44'8.05"W, 2018 m, fl., *G.F. Silva et al. 23* (HUFSP); sentido pousadas, 22°20'29.41"S, 44°44'8.31"W, 1996 m, 20.XI.2018, fl. and fr., *G.F. Silva et al. 24* (HUFSP); estrada de acesso à portaria, 22°21'57.66"S, 44°44'7.73"W, 2077 m, 17.X.2017, fl. and fr., *G.F. Silva & D.F. Silva 1* (HUFSP); 22°21'23.27"S, 44°44'2.61"W, 2166 m, 17.X.2017, fl., *G.F. Silva & D.F. Silva 2* (HUFSP); 22°21'44.96"S, 44°44'5.27"W, 2119 m, 18.X.2017, fl., *G.F. Silva & D.F. Silva 12* (HUFSP); 22°21'58.20"S, 44°44'11.08"W, 2047 m, 18.X.2017, *G.F. Silva & D.F. Silva 13* (HUFSP); 22°22'5.94"S, 44°44'27.52"W, 2044 m, 18.X.2017, fl. and fr., *G.F. Silva & D.F. Silva 14* (HUFSP); próximo a Casa de Pedra, 22°22'7.61"S, 44°44'43.31"W, 2008 m, 20.XI.2018, fl. and fr., *G.F. Silva et al. 27* (HUFSP).

Croton alchorneicarpus is endemic to Serra da Mantiqueira, in the states of Minas Gerais, São Paulo and Rio de Janeiro states, in Montane Ombrophilous Forests (Santos *et al.* 2017). In the INP, it is commonly found only at the 'plateau', in Montane and High Montane Ombrophilous Dense Forest, between 1,200 and 2,320 m of elevation. Santos *et al.* (2017) and Oliveira (2014) categorized the species as Vulnerable (VU).

The species was collected with flowers in January, February, October and November, and with fruits from February to April, and October to December.

A few herbarium collections of *Croton alchorneicarpus* from INP were misidentified as

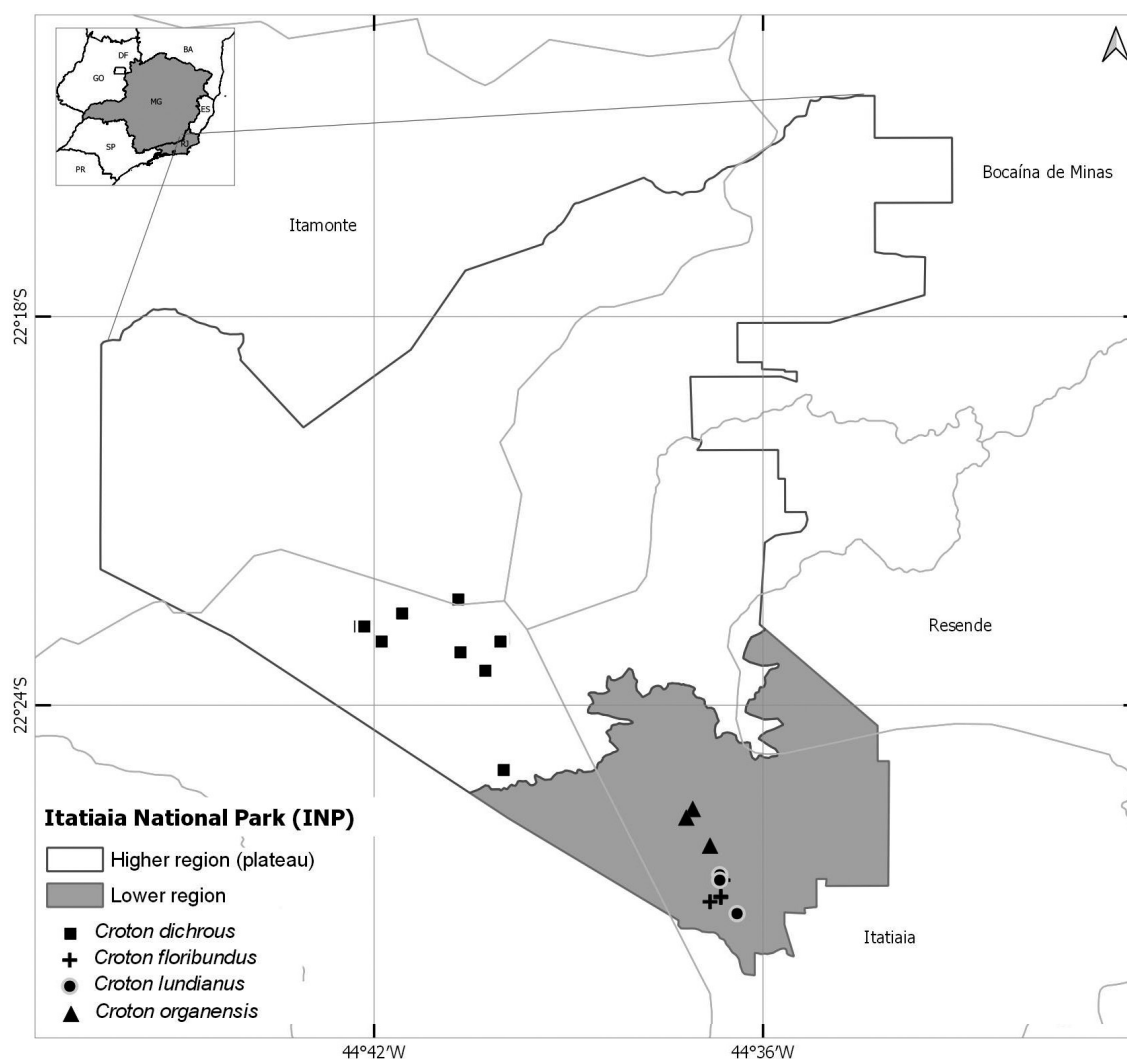


Figure 3 – Geographic distribution of *Croton dichrous*, *C. floribundus*, *C. lundianus* and *C. organensis* at the Itatiaia National Park.



Figure 4 – a-d. *Croton alchorneicarpus* – a. immature fruits; b. staminate flower; c. acropetiolar glands; d. inflorescence with staminate flowers and fruits. e-h. *C. campanulatus* – e. inflorescence with staminate flowers; f. staminate flower; g. acropetiolar glands; h. reddish latex. i-l. *C. dichrous* – i. fruit and staminate flower; j. pistillate flower; k. adaxial surface glabrate or sparsely covered by simple trichomes; l. lower surface lepidote. Photos by G.F. Silva, except a-b and e-h S.S. Silva.

C. celtidifolius Baill. However, Santos *et al.* (2017) stated that these two species can be distinguished by many vegetative and reproductive characteristics. Among the other species cited in this treatment, *C. alchorneicarpus* is distinguished mainly by the pale yellow to orange latex, and the foliaceous stipules in young branches.

2. *Croton campanulatus* Caruzo & Cordeiro, *Brittonia* 60(3): 261. 2008. Fig. 4e-h

Trees, 8–10 m tall, reddish latex; indumentum rufous-silvery, lepidote trichomes; branchlets cylindric. Leaves 3–19 × 2–12 cm, discolor, ovate, apex acuminate, base rounded to truncate, margin entire; indumentum lepidote in both surfaces; venation pinnate, brochidodromous; petiole 0.5–15 cm long, 2(4) stalked saucer-shaped acropetiole glands; stipules linear to lanceolate, 0.5–1 cm long. Inflorescences 2–10 cm long; proximal cymules bisexual, distal cymules unisexual (staminate); bracts linear to lanceolate; staminate flowers subcampanulate, pedicellate, 20–25 stamens; pistillate flowers 5-merous, campanulate, subsessile, sepals imbricate; petals reduced to inconspicuous ovoid glands (< 0.1 cm); ovary globose, lepidote; styles 4-fid, slightly united at the base. Capsules globose, ca. 1 cm long, lepidote, calyx strongly accrescent, covering the young fruit; seeds ellipsoid, smooth, ca. 0.5 cm long.

Selected specimen examined: Itatiaia, 950 m, 4.III.1962, fl., *E. Pereira 6974* (HB, MBM, RFA); 800 m, 30.V.1935, fl., *Povade 14650* (RB); km 13 e 14, 8.I.1947, *A. Duarte & E. Pereira* (RB60829); Parque Nacional do Itatiaia, 5.III.1948, fl., *A. Mello* (RB 66479); 5.VI.1948, fl., *Rawitscher* (SP392273, SPF00016201); 22°26'37.56"S, 44°36'40.46"W, 946 m, 21.XI.2018, fl., *G.F. Silva et al. 34* (HUFSP); Três Picos, 1200 m, 27.III.1995, fl., *R. Guedes et al. 2536* (RB, SPF, MBM); Ponte do Maromba, 11.VIII.1997, fr., *M.P.M. de Lima et al. 399* (SP, SPF, RB); estrada para a piscina do Maromba, ao longo da estrada, 1100 m, 18.XI.2008, fl., *M.B.R. Caruzo & L.R. Lima 123* (HUFSP); 22°26'10.27"S, 44°36'48.76"W, 1031 m, 19.X.2017, fl., *G.F. Silva & D.F. Silva 20* (HUFSP); km 3, 28.II.1963, fl., *S. Andrade 171* (RB); 4.III.1947, fl., *P. Occhioni 801* (RFA); fl., (RB507481); 6.V.1977, fl., *P. Occhioni 8142* (RFA); entre a piscina do Maromba e a ponte do Maromba, às margens do Rio Campo Belo, 1100 m, 6.II.2006, fl., *M.B.R. Caruzo et al. 94* (SP); Lago Azul, 700-750 m, 14.II.1995, *J.M.A. Braga et al. 1987* (RB); 25.V.1979, fl., *P. Occhioni 8941* (RFA); estrada para a portaria 2, Rodovia BR-485 entre km 5 e 6, 22°27'24", 44°36'23", 824 m, 11.II.2016, fl., *R.F. Santos et al. 45* (SP); trilha principal para a cachoeira do Maromba, 22°26'34,8"S, 44°36'41,4"W, 1032

m, 12.II.2016, fl., *R.F. Santos et al. 46* (SP); estrada do parque sentido Hotel Simon, 22°26'37.56"S, 44°36'40.46"W, 946 m, 22.XI.2018, fl., *G.F. Silva et al. 40* (HUFSP); fl., *G.F. Silva et al. 41* (HUFSP); 18.V.1999, fl., *A. Quinet et al. 201* (SP); trilha próxima a Casa do Pesquisador, 22°27'5.53"S, 44°36'44.82"W, 799 m, 19.X.2017, *G.F. Silva & D.F. Silva 15* (HUFSP); 22°27'1.88"S, 44°36'41.86"W, 825 m, 19.X.2017, *G.F. Silva & D.F. Silva 17* (HUFSP); Rodovia RJ-163 km 25, próximo ao mirante da luz, 1288 m, 12.II.2016, fl. and fr., *R.F. Santos et al. 48* (RB, SP). Resende, perto do museu e do abrigo nº 21, 18.XI.1977, fl., *V.F. Ferreira & Briolanjo 157* (RB). Visconde de Mauá, trilha para a Cachoeira do Alcantilado, na borda da trilha, 16.XI.2007, fl., *L.R. Lima & R.R. Rodrigues 469* (SP).

Croton campanulatus is restricted to three different locations in Brazil, in the Itatiaia National Park (Rio de Janeiro) and in the cities Mirantão and Piedade do Rio Grande (Minas Gerais) (Caruzo & Cordeiro 2013; Santos *et al.* 2017). It is found exclusively in Submontane and Montane Ombrophilous Dense Forest at the lower part of the INP, between 750 and 1,200 m of elevation. Santos *et al.* (2017) and Oliveira (2014) categorized the species as Endangered (EN).

The species was found flowering from January to May, November and December, and fruiting in April, May, August, November and December.

Several herbarium collections of *Croton campanulatus* from INP were erroneously identified as *C. salutaris* Casar. In fact, both species are similar but can be distinguished by some reproductive characteristics (Caruzo *et al.* 2008; Caruzo & Cordeiro 2013; Santos *et al.* 2017). Among the other species cited in this treatment, *C. campanulatus* stands out by its latex reddish and the rufous-silvery indumentum composed by lepidote trichomes.

3. *Croton dichrous* Müll. Arg., *Linnaea* 34: 105. 1865. Fig. 4i-l

Shrubs, 0.5–2 m tall, latex not seen; indumentum silvery, lepidote trichomes, rarely simple. Leaves 0.6–4 × 0.4–2 cm, discolor, elliptic, ovate to ovate-lanceolate, apex mucronate, base obtuse, margin entire; indumentum glabrate on the adaxial surface or sparsely covered by simple trichomes and lepidote at the abaxial surface; venation pinnate, eucamptodromous; petiole 0.2–2 cm long, glands absent; stipules deciduous. Inflorescences 0.5–2 cm long; proximal cymules pistillate, distal cymules staminate; bracts lanceolate; staminate flowers rotate, pedicellate,

7–10 stamens; pistillate flowers 5-merous, subcampanulate, subsessile, sepals valvate; petals filiform, reduced; ovary subglobose, pilose; styles 2-fid, free. Capsules subglobose, 0.4–0.8 cm long, lepidote; seeds subglobose, smooth, 0.3–0.5 cm long.

Selected specimen examined: Itatiaia, 20.IV.1957, fl., *L. Emygdio 1469* (R); 2000 to 2200 m, 13.IV.1963, *E. Pereira et al. 7574* (HB); 2400 m, IX.1964, fl., *A.C. Brade* (HB25460); 2470 m, 20.X.1922, *P.C. Porto* (RB20759); 2400 m, VI.1913, fl. and fr., *Toledo et al. 1959* (RB); Várzea do Lírio, 2350 m, 20.IV.1959, fl., *Carlos-Peres B. 47* (R); planalto de Itatiaia, 13.IX.1994, fl. and fr., *M.P.M. de Lima et al. 287* (RB, SP, MBM); Estação Biológica do Itatiaia, Prateleiras, 18.I.1935, fl., *C. Porto 2687* (RB); 16.VI.1940, *F. Stickney 13* (R); Rio das Flores, 31.I.1935, *C. Porto 2715* (RB); Parque Nacional do Itatiaia, planalto, 2100 m, 16.IV.1967, fl., *J.C. Lindeman & J.H. de Haas 5177* (RB); Prateleiras, 2300 m, 8.V.1975, fl., *A.M. Camerih 26* (RB); estrada em direção as Prateleiras, próximo a curso d'água, 5.X.1991, fl., *S.A. Nicolau 234* (SP, SPF); estrada para Prateleiras, depois do abrigo Rebouças, 4.VI.1978, *H.P. Bautista & Seheltno 292* (HB, R), Pico das Agulhas Negras, 2350 m, 29.IV.1977, fl., *M.S.F. Silvestre 83* (SP); along road to Agulhas Negras, 22°25'S, 44°40'W, 2000-2600 m, 18.X.1977, fl., *L.R. Landrum 2109* (RB); estrada para o Pico das Agulhas Negras, 2100 m, 02.XII.1997, fl., *M.P.M. de Lima et al. 406* (RB, SP); 2400 m, 3.VI.2010, fl., *A.C. Cervi et al. 9611* (MBM); km 10, 18.I.1979, fl., *P. Occhioni 8682* (MBM); entre a guarita e o abrigo Rebouças, afloramentos rochosos e campo gramíneo, 22°22'35"S, 44°41'34"W, 2448 m, 14.XII.2004, fl., *R.C. Forzza 3726* (RB); Agulhas Negras, 22-28.XI.1938, fl., *Markgrat & Brade 3696* (RB); 22°25'S, 44°40'W, 2000-2600 m, 18.X.1977, fl. and fr., *L.R. Landrum 2125* (RB); 23.X.1931, fl. and fr., *P.C. Porto 2091* (RB); 2400 m, 27.V.1969, fl., *D. Sucre et al. 5135* (RB, SP); planalto próximo ao Abrigo Rebouças, 2200 m, 6.XI.1976, fl., *G. Martinelli et al. 1078* (RB); 2400 m, 12.X.2006, fl. and fr., *H.C. de Lima et al. 6468* (RB); 2300 m, 11.X.1977, fl., *P.J.M. Maas & G. Martinelli 3191* (RB); 2200 m, 3.VII.1967, fl., *J. Lindeman & H. Haas 5595* (MBM); 3.VII.1966, fl., *G. Pabst et al. 8920* (HB); XII.1966, *H. Strang 762* (HB); brejo da Lapa, 1.II.1967, fl., *J. Lindeman & H. Haas 4119* (MBM); brejo da Lapa próximo do Abrigo Rebouças, 2000 m, 1.II.1967, fl., *P.J.M. Maas & G. Martinelli 4119* (RB); trilha do abrigo Rebouças para o pico Agulhas Negras, 16.XI.2007, fl. and fr., *L.R. Lima & R.R. Rodrigues 472* (RB, SP); Est. do Rio, Hotel Donati, IV.1962, *A. Castellanos 23330* (R). Resende, trilha do Morro do Couto, 17.X.2017, fl. and fr., *G.F. Silva & D.F. Silva 9* (HUFSP); estrada para a antena, próximo a entrada para a trilha do Couto, 22°22'46.7"S, 44°42'13.4"W, 4.XI.2016, fl. and fr., *M.B.R. Caruzo et al. 196* (HUFSP, RFA); planalto próximo ao abrigo

Rebouças, 2400 m, 9.X.1981, fl. and fr., *G. Martinelli et al. 7763* (RB); 4.XII.1983, *J. Cardoso 235* (R); Mt. Itatiaia. West edge of planalto, at km 12 along road to shelter house, "Abrigo Rebouças", 22°25'S, 44°42'W, 2250 m, 6.XI.1965, fl. and fr., *G. Eiten & L.T. Eiten 6676* (SP); Mt. Itatiaia, 200 m SSE of shelter house, 2300 m, 3.XI.1965, fl., *G. Eiten & L.T. Eiten 6558* (SP); próximo à portaria do parque, na estrada para o Abrigo Rebouças e trilha para o Pico das Agulhas Negras, 22°23'S, 44°40'W, 2500 m, 16.IV.2005, fl., *I. Cordeiro et al. 2991* (SP, SPF); Estrada do Rio, Abrigo Rebouças, 12.XII.1964, fl., *N. Santos 20* (R); 2350 m, 12.III.1960, fl., *C. Angeli 55* (R); 21.I.1961, *E. Fromm et al. 144* (R); 3-4.VI.1978, *F. Oliveira 420* (R); trilha do Pico das Agulhas Negras, 22°23'0.97"S, 44°40'2.78"W, 2420 m, 17.X.2017, fl. and fr., *G.F. Silva & D.F. Silva 3* (HUFSP); 22°22'59.33"S, 44°40'0.73"W, 2425 m, 17.X.2017, fl., *G.F. Silva & D.F. Silva 4* (HUFSP); fl. and fr., *G.F. Silva & D.F. Silva 5* (HUFSP); 22°23'0.97"S, 44°40'2.78"W, 2420 m, 17.X.2017, fl., *G.F. Silva & D.F. Silva 6* (HUFSP); 22°23'1.42"S, 44°40'3.49"W, 2418 m, 17.X.2017, fl. and fr., *G.F. Silva & D.F. Silva 7* (HUFSP); trilha do Morro da Antena, 22°22'47.43"S, 44°42'13.32"W, 2528 m, fl., *G.F. Silva & D.F. Silva 8* (HUFSP); 22°23'1.43"S, 44°41'53.35"W, 2568 m, 17.X.2017, fl., *G.F. Silva & D.F. Silva 10* (HUFSP); trilha para as Prateleiras, 22°23'11.01"S, 44°40'40.94"W, 2378 m, 21.XI.2018, *G.F. Silva et al. 28* (HUFSP); 22°23'11.32"S, 44°40'40.31"W, 2375 m, 21.XI.2018, fl., *G.F. Silva et al. 29* (HUFSP); 22°23'28.16"S, 44°40'17.88"W, 2354 m, 21.XI.2018, *G.F. Silva et al. 30* (HUFSP). MINAS GERAIS: Itamonte, Parque Nacional do Itatiaia, trilha para Cachoeira Aiuruoca, 22°22'22.59"S, 44°40'42.80"W, 2531 m, 18.X.2017, fl., *G.F. Silva & D.F. Silva 11* (HUFSP).

Croton dichrous occurs in high elevation grasslands of the Atlantic Rain Forest domain in the states of Minas Gerais, São Paulo and Rio de Janeiro. In the latter is found only in rock outcrops of the 'plateau' region at INP (Lima & Pirani 2008), between 2,000 and 2,570 m of elevation. Oliveira (2014) categorized the species as Least Concern (LC).

The species was collected at the INP in flower in February, March, October, November and December, and in fruit from January to June, September and November.

Several specimens of *Croton dichrous* from INP were erroneously identified as *C. splendidus* Mart. ex Colla. However, as already pointed out by Lima & Pirani (2008), both species can be distinguished mainly by leaf indumentum. *Croton dichrous* can be distinguished among the other species treated in this survey by its shrubby habit and lepidote leaf indumentum.

4. *Croton floribundus* Spreng., Syst. Veg. [Sprengel], editio decima sexta 3: 873. 1826.

Fig. 5a-b

Trees, 8–12 m tall, latex colorless, indumentum whitish ochraceous, stellate, stellate-porrect, stellate-lepidote and dendritic trichomes. Leaves 3.5–26 × 1.5–13 cm, discolor, ovate-lanceolate, apex acute to acuminate, base obtuse to rounded, margin entire; venation pinnate, brochidodromous; indumentum hirsute on the adaxial surface and pubescent at the abaxial surface; petiole 1–8 cm long, without glands; stipules lanceolate, 0.5–2 cm long. Inflorescences 5.5–30 cm long; proximal cymules pistillate, distal cymules staminate; bracts lanceolate; staminate flowers rotate, subsessile to pedicellate, 15–20 stamens; pistillate flowers 5-merous, subcampanulate, subsessile to pedicellate, sepals reduplicate-valvate; petals filiform, reduced; ovary globose, strigose; styles multifid, joined at the base. Capsules subglobose, 1–1.5 cm long, verrucose, strigose; seeds globose, smooth, 0.5–0.6 cm long.

Selected specimen examined: Itatiaia, 5.I.1960, *O.M. Barth 151* (RFA); Parque Nacional do Itatiaia, *C. Mello* (RB 66477); lote 30, 24.XII.1942, fl., *s.c.* 1055 (RB 83929); 23.II.2015, *V. Maia & B. Mascarenhas* (R232953); 22°26'58.12"S, 44°36'39.57"W, 852 m, 19.X.2017, fl., *G.F. Silva & D.F. Silva 18* (HUFSP); trilha próxima a Casa do Pesquisador, 22°27'2.85"S, 44°36'49.62"W, 786 m, 19.X.2017, fl., *G.F. Silva & D.F. Silva 16* (HUFSP); beira da estrada do parque sentido piscina do Maromba, 22°26'42.67"S, 44°36'37.02"W, 1,096 m, 22.XI.2018, *G.F. Silva et al. 44* (HUFSP); 22°26'57.73"S, 44°36'39.38"W, 871 m, 22.XI.2018, fl., *G.F. Silva 45* (HUFSP). Resende, 24.XI.1967, fl., *J. Mattos & N. Mattos 15200* (SP).

Supplementary material examined: BRAZIL. BAHIA: Camacã, estrada a Canavieiras, Mata litorânea, 22.I.1971, fl., *T.S. dos Santos 1395* (SP). MINAS GERAIS: Lavras, 4.I.1.1937, fr., *E.P. Heringer 157* (SP). Uberlândia, Fazenda do Glória, UFU, 2.XI.1989, fr., *G.M. Araujo 709* (SP). PARANÁ: Londrina, Floresta do Godoy, 14.I.1989, fr., *I.H. Soares e Silva & F. Chagas e Silva 171* (SP). SÃO PAULO: Amparo, alto do morro, Estação Experimental, 21.XII.1942, fl. and fr., *M. Kuhlmann 254* (SP). Campinas, Faz. Riqueza, J. Egidio, 6.XI.1938, fl., *C. Mourão et al. 2908* (SP). Itatinga, estrada para Avaré km 6, estrada para a Fazenda Aratinga, 26.IX.1994, fl., *J.Y. Tamashiro et al. 604* (SP). Jaboticabal, Faz. Sta. Izabel, 15.IV.1990, fl. and fr., *E.H.A. Rodrigues 08* (SP). Monte Alegre do Sul, Estação Experimental do IAC, 16.III.1995, fr., *L.C. Bernacchi et al. 1307* (SP). Ribeirão Preto, mato próx. Est. Exp. Rib. Preto, 22.X.1938, fl., *G.P. Viegas 2379* (SP). São João da Boa Vista, 30.XI.1920, fl. and fr., *G. Gehrt* (SP 4642).

São Paulo, Parque Estadual das Fontes do Ipiranga, Jardim Botânico, 29.XII.1977, fr., *M. Goes et al. 1244* (SP). São Simão, Fazenda Bocaina, 29.XI.1960, fl., *J. Mattos 8646* (SP); Sorocaba, XI.1934, fl. and fr., *C. Smith* (SP 33218).

Croton floribundus is widely distributed in Brazil, popularly known as 'capixingui', where it can be found in the states of Tocantins, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Bahia, Alagoas, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Espírito Santo, São Paulo, Rio de Janeiro and Paraná. It is a pioneer species, very common in the edges of Ombrophilous, Deciduous and Semi-deciduous Forests and secondary formations within the Atlantic Rain Forest, Caatinga and Cerrado domains (Caruzo & Cordeiro 2007; Santos *et al.* 2017). At the INP, this species occurs only in the lower part, in Montane Ombrophilous Dense Forest, between 780 and 1,100 m of elevation. It is noteworthy that, even though *Croton floribundus* is a very common and widely distributed species, few collections are known for the National Park (most of them from more than 50 years ago). Santos *et al.* (2017) and Oliveira (2014) categorized the species as Least Concern (LC).

The species was found at the INP in flower in January, April and from August to December, and in fruit from March to December.

Croton floribundus is vegetatively similar to other tree species of the genus that occur in the Atlantic Forest Domain, however, the species can be identified mainly by the absence of petiolar or basilaminar glands.

5. *Croton lundianus* (Didr.) Müll. Arg., Prodr. 15(2): 662. 1866. Fig. 5c-e

Subshrubs, 0.5–0.9 m tall, latex not seen; stellate and stellate-porrect trichomes. Leaves 1.8–6.5 × 1–3.5 cm, ovate, apex acute, base obtuse, margin dentate; indumentum glabrate on the adaxial surface and pubescent at the abaxial surface; venation pinnate, craspedodromous; petiole 0.3–2 cm long, 2(4) stalked saucer-shaped acropetiolar glands; stipules linear, 0.2–0.6 cm long. Inflorescences 2–4 cm long; proximal cymules pistillate, separated from the staminate distal ones by an area without flowers; bracts linear; staminate flowers rotate, pedicellate, ca. 10 stamens; pistillate flowers 5(–6)-merous, campanulate, subsessile; sepals valvate; petals filiform, reduced; ovary subglobose, pilose; styles 2-fid, free. Capsules subglobose, 1 cm compr., pilose; seeds globose, smooth, 0.3–0.4 cm long.

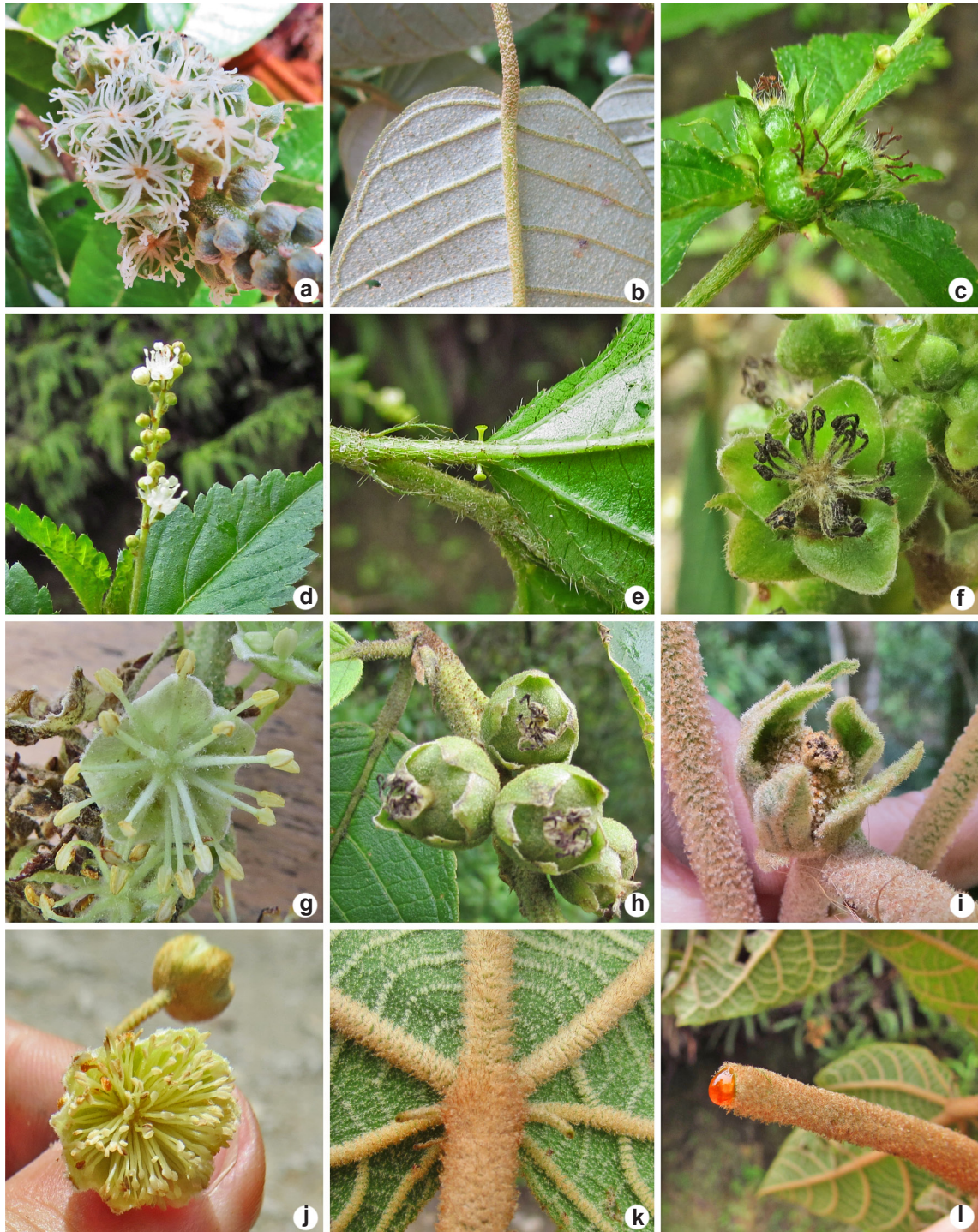


Figure 5 – a-b. *Croton floribundus* – a. pistillate flowers; b. leaf without glands. c-e. *C. lundianus* – c. fruits; d. inflorescence with staminate flowers; e. acropetiolar glands. f-h. *C. organensis* – f. pistillate flowers; g. staminate flower; h. fruits. i-l. *C. vulnerarius* – i. immature fruit; j. staminate flower; k. acropetiolar glands; l. latex reddish. Photos by G.F. Silva, except a-e S.S. Silva.

Selected specimen examined: Itatiaia, Via Dutra to Abrigo Rebouças, 3.VII.1967, *J.C. Lindeman & J.H. de Haas 5586* (R); Serra do Itatiaia, 16.X.1971, fl., *J.C. de Andrade* (R161208); Parque Nacional do Itatiaia, abrigo III, 22°15'–22°28'S, 44°34'–44°45'W, 650 m, 6.XII.1995, fl. and fr., *J.M.A. Braga et al. 3040* (RB); 22°27'13.16"S, 44°36'24.96"W, 823 m, 20.X.2017, fl. and fr., *G.F. Silva & D.F. Silva 21* (HUFSP); sítio Sr Sebastião, V.2002, fl. and fr., *C. Magnanini 122* (RB); Rio Campo Belo, 10.X.1977, fl. and fr., *P.J.M. Maas & G. Martinelli 3166* (RB); próximo ao Centro de visitantes, na parte baixa do parque, 3.XI.2002, fl. and fr., *L.R. Lima & A. Lobão 180* (SPF); caminho que liga o Maromba ao Vêu da noiva, margem da estrada, 3.XII.1983, fl., *L. Sylvestre & M.I. Brandão 9* (RFA); E. do Rio, 4.III.1947, fl., *P. Occhioni 805* (RFA); estrada para o Parque Nacional do Itatiaia, próximo a Pousada Meu Xodó, Beira de estrada, 6.II.2006, fl. and fr., *M.B.R. Caruzo et al. 92* (HUFSP); estrada do parque sentido Hotel Simon, 22°26'42.54"S, 44°36'40.22"W, 942 m, 22.XI.2018, fl., *G.F. Silva et al. 36* (HUFSP); *G.F. Silva et al. 37* (HUFSP); fr., *G.F. Silva et al. 38* (HUFSP); 22°26'37.56"S, 44°36'40.46"W, 946 m, 22.XI.2018, fl. and fr., *G.F. Silva et al. 39* (HUFSP).

Croton lundianus is an ruderal species, widely distributed in Brazil. Popularly known as 'chá-de-periquito' or 'gervão-branco' it is found in all Brazilian phytogeographical domains, in disturbed sites and edges of forests (Caruzo & Cordeiro 2007; Flora do Brasil 2020). At the INP, the species was found exclusively in the lower region, on the edge of the Montane Ombrophilous Dense Forest, between 650 and 950 m of elevation. Oliveira (2014) categorized the species as Least Concern (LC).

The species was collected at the INP with flowers and fruits in May and October to December.

Croton lundianus is a widespread and morphologically variable species (Sodré *et al.* 2019). Among the other species occurring at INP, *C. lundianus* is easily recognized due to its subshrub habit and stalked saucer-shaped acropetiole glands.

6. *Croton organensis* Baill., *Adansonia* 4: 325. 1864. Fig. 5f-h

Trees, 8–10 m tall, latex clear; indumentum brownish, simple, stellate and dendritic trichomes; branchlets flattened. Leaves 9–28 × 3–11 cm, discolor, ovate-lanceolate to elliptic, apex acuminate, rarely acute, base cordate, obtuse to cuneate, margin inconspicuously serrate; indumentum pubescent on the adaxial surface and densely pubescent at the abaxial surface; venation pinnate, eucamptodromous. Petiole 1–3 cm long, 2 sessile basilaminar glands, inconspicuous and

maculate, usually covered by stellate trichomes; stipules linear, 1–2 cm long. Inflorescences 15–30 cm long; proximal cymules bisexual, distal cymules unisexual (staminate); bracts linear to lanceolate; staminate flowers rotate, pedicellate, 10–15 stamens; pistillate flowers 5-merous, flask-shaped, pedicellate; sepals imbricate; petals absent; ovary globose, pilose; styles multifid, united at the base. Capsules ellipsoid, smooth, 1–2 cm long, pubescent; seeds ribbed, 0.8–0.9 cm long.

Selected specimen examined: Itatiaia, Parque Nacional do Itatiaia, 22°25'36"S, 44°37'5"W, 1054 m, 8.II.2015, fl. and fr., *R.G. Barbosa-Silva et al. 440* (RB, SP); próximo ao Centro de visitantes, piscina do Maromba, 22°25'44.78"S, 44°37'11.19"W, 1130 m, 22.XI.2018, fl., *G.F. Silva et al. 42* (HUFSP); lote 90, 16.X.1947, fl., *Jocelino* (RB 62075); E. do rio, lote 60, 850 m, 8.I.1941, *W.D. Barros 157* (RB); 830 m, 2.XI.1941, fl., *W.D. Barros 430* (RB); trail in forest near Vêu de Noiva, fall in Upper Rio Maromba, 1100 m, 3.II.1919, fr., *J.C. Lindeman & J.H. de Haas 4202* (MBM, RB); parte baixa, estrada principal, 28.X.2011, fl., *A. Lobão & G.C.L. Paes 1735* (RB). Visconde de Mauá, trilha a partir da fazenda do CPRM, 6.X.1995, fl., *S.J.S. Neto et al. 785* (RB, SP); ponte do Maromba, próximo margem do Rio Campo Belo, 8.XI.1993, fl., *L. Sylvestre et al. 912* (RB); Lago Azul, 650 m, 13.III.1996, fr., *J.M.A. Braga et al. 3285* (RB); estrada para a piscina do Maromba, ao longo da estrada, 22°26'10"S, 44°36'49.4"W, 1100 m, 18.XI.2008, fl., *M.B.R. Caruzo & L.R. Lima 122* (HUFSP). Resende, Rodovia BR-354, sentido Itamonte-MG, Borda de mata/estrada, 22°23'33.10"S, 44°45'23.8"W, 1380 m, 13.II.2016, fl. and fr., *R.F. Santos et al. 52* (SP); Rodovia Sebastião Alves do Nascimento (BR-354) sentido Eng.º Passos, 22°22'59.66"S, 44°45'9.59"W, 1582 m, 21.XI.2018, fl., *G.F. Silva et al. 32* (HUFSP).

Croton organensis is endemic to the Atlantic Rain Forest domain, in Montane Ombrophilous Forests of Serra do Mar and Serra da Mantiqueira in Southeastern Brazil (Caruzo & Cordeiro 2013; Santos *et al.* 2017). At the INP, the species was found exclusively in the lower region, in Montane Ombrophilous Dense Forest, between 650 and 1130 m of elevation. Santos *et al.* (2017) and Oliveira (2014) categorized the species as Least Concern (LC).

The species was collected at the INP flowers in February, October and November, and fruits from February to March.

Croton organensis is endemic to the Atlantic Rain Forest (Santos *et al.* 2017) and, among the species cited in this treatment, is vegetatively most similar to *C. floribundus*. However, both species

can be distinguished by the presence of leaf glands (basilaminar, inconspicuous and maculate in *C. organensis* vs. absent in *C. floribundus*), type of young branches (strongly flattened in *C. organensis* vs. cylindrical in *C. floribundus*), and number of stamens (10–15 in *C. organensis* vs. 30–50 in *C. floribundus*).

7. *Croton vulnerarius* Baill., Adansonia 4: 328. 1864.

Fig. 5i-l

Treelets to trees, 3–10 m tall, latex reddish; young branches densely tomentose or pilose with indumentum ochraceous, stellate, appressed-stellate and dendritic trichomes. Leaves 6.5–23.5 × 4–14 cm, discolor, ovate to cordate, apex acuminate to long acuminate, base cordate to obtuse, margin inconspicuously serrate; indumentum pilose on the adaxial surface and densely pilose at the abaxial surface; venation pinnate, brochidodromous; petiole 1.5–9.5 cm long, 2(4) stalked saucer-shaped acropetiole glands; stipules linear to lanceolate, 0.5–2 cm long. Inflorescences 5–30 cm long; proximal cymules bisexual, distal cymules unisexual (staminate); bracts linear to lanceolate; staminate flowers rotate, pedicellate, 90–120 stamens; pistillate flowers 5-merous subcampanulate, subsessile; sepals imbricate; petals reduced, filiform; ovary subglobose, strigose; styles multifids, united at the base. Capsules subglobose, 1–1.5 cm long, glabrous; seeds ellipsoid, ribbed, 0.6 cm long.

Selected specimen examined: Itatiaia, 7.VI.1871, *A.F.N. Glaziou* (RB82954); 15.II.1958, *A. Castellanos 21890* (R); estrada do Rio, 1000 a 1600 m, V.1926, *A. Sampaio 4783* (R); Parque Nacional do Itatiaia, 8.III.1948, fl. and fr., *C. Mello* (RB 66478); 5.VI.1948, fl., *Rawitscher* (SPF 19652); 17.II.1960, *O.M. Barth 1201* (RFA); Macieiras, km 8, 8.V.1977, fl., *P. Occhioni 8153* (RFA); estrada para o abrigo Macieiras, 22°15'22" S, 44°34'44" W, 1300 m, 21.V.1996, fl., *S.J.S. Neto et al. 741* (RB, SP, MBM); estrada para a piscina do Maromba, ao longo da estrada, 22°26'10" S, 44°36'49,4" W, 950 m, 6.II.2006, fl. and fr., *R. Riina et al. 1524* (SP); 22°26'43,9" S, 44°36'41" W, 925 m, 11.II.2016, fl., *M.B.R. Caruzo et al. 185* (SP); próximo ao centro de visitantes, piscina do Maromba, 22°25'44.78" S, 44°37'11.19" W, 1130 m, 22.XI.2018, fl. and fr., *G.F. Silva et al. 43* (HUFSP); disturbed forest near Veu da Noiva, 1000-1100 m, 12.X.1977, fl. and fr., *P.J.M. Maas & G. Martinelli 3225* (RB); Maromba, próx. à ponte, 12.VII.1953, fr., *E. Pereira et al. 44* (RB); e. do rio, lote Limon, prox. à usina de eletricidade, 15.VII.1953, fl., *E. Pereira et al. 55* (RB); e. do rio, Lote 60, Vale do Taquaral, 11.VI.1941, *W.D. Barros 305* (RB); Macieiras, estrada para o Abrigo Lamego, 1100 m, 21.IX.1994, fl. and fr., *S.J.S. Neto et al.*

321 (RB, SP); estrada do Maromba, próximo a ponte do Maromba, moita frequente na beira da estrada, 1100 m, 23.IV.2001, fl., *H.C. de Lima et al. 5769* (RB, SP); Lago Azul, margem do rio Campo Belo, 650 m, 8.VIII.1996, fl. and fr., *S.J.S. Neto et al. 750* (RB); 3 km acima da Ponte Maromba, após curva à direita, após seguir um rio caudaloso, 1.III.1983, fl., *K.S. Brown Jr. 14531* (SPSF); estrada para a cachoeira do Maromba, próximo à entrada para a cachoeira Veu da Noiva, borda de mata, 2°25'44,3" S, 44°37'08,8" W, 1111 m, 12.II.2016, fl., *R.F. Santos et al. 47* (SP); estrada para a piscina do Maromba, ao longo da estrada, 22°26'10" S, 44°36'49,4" W, 950 m, 6.II.2006, fl., *R. Riina et al. 1523* (SP); estrada do parque sentido Hotel Simon, 22°26'42.54" S, 44°36'40.22" W, 942 m, 22.XI.2018, *G.F. Silva et al. 35* (HUFSP).

Croton vulnerarius is endemic from the Brazilian Atlantic Rain Forest, popularly known as 'sangue-de-boi' in Ombrophilous, Deciduous and Semi-deciduous Forests (Santos *et al.* 2017). It was found only in the lower region of the reserve, in Montane Ombrophilous Dense Forest, between 650 and 1300 m of elevation. Santos *et al.* (2017) and Oliveira (2014) categorized the species as Least Concern (LC).

It was collected at the INP with flowers from February to April, July and August, and with fruits in February, March, and September to November.

Some collections of *Croton vulnerarius* from INP were identified as *Croton novi-friburgi* Müll. Arg. and *C. hecatonandrus* Müll. Arg. However, both species were recently synonymized under *Croton vulnerarius* (Santos *et al.* 2017), which we accept and follow in this study. The species can be easily recognized by its dense ochraceous indumentum, abundant reddish latex and the high number of stamens (90–120).

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List of exsiccates

Andrade JC (R161208) (5). **Andrade S** 171 (2). **Angeli C** 55 (3). **Araujo GM** 709 (4). **Barbosa-Silva RG** 420 (1),440 (6). **Barros WD** 157 (6),305 (7),430 (6). **Barth OM** I201 (7), I51 (4). **Bautista HP** 292 (3). **Bernacci LC** 1307 (4). **Brade AC** (HB25460) (3). **Braga JMA** 1987 (2), 3040 (5), 3285 (6). **Camerih AM** 26 (3). **Cardoso J** 235 (3). **Carlos-Peres B** 47 (3). **Caruzo MBR** 92 (5),94 (2),122 (6),123 (2),185 (7),196 (3). **Castellanos A** 21890 (7),23330 (3). **Cervi AC** 9611 (3). **Cesar O** 100 (1). **Cordeiro I** 2990 (1), 2991 (3). **Duarte A** (RB60829) (2). **Eiten G** 6558 (3),6676 (3). **Emmerich M** (R158351) (7). **Emygdio L** 1469 (3). **Ferreira VF** 157 (2). **Forzza RC** 3726 (3). **Fromm E** 144 (3). **Gehrt G** (SP4642) (4). **Giovane L** 34 (1). **Glaziou A** (RB82954) (7). **Goes M** 124A (4). **Guedes R** 2536 (2). **Guedes RG** 2306 (1). **Heringer EP** 157 (4). **Jocelino** (RB62075) (6). **Keith S** 14531 (7). **Kuhlmann M** 254 (4). **Landrum LR** 2109 (3),2125 (3). **Lima HC** 5769 (7), 6468 (3). **Lima LR** 180 (5), 469 (2), 471 (1), 472 (3). **Lima MPM** 287 (3), 399 (2), 406 (3). **Lindeman J** 4119 (3), 5595 (3). **Lindeman JC** 4202 (6), 5177 (3), 5586 (5). **Lobão A** 1735 (6). **Maas PJM** 3166 (5), 3191 (3), 3225 (7), 4119 (3). **Magnanini C** 122 (5). **Maia VF** (R232953) (4). **Markgrat 3696** (3). **Martinelli G** 1078 (3), 7763 (3). **Mattos J** 8646 (4), 15200 (4). **Mello C** (RB66477) (4), (RB66478) (7), (RB66479) (2). **Mourão C** 2908 (4). **Nadruz M** 3275 (1). **Nicolau SA** 234 (3). **Occhioni P** 801 (2), 805 (5), 820 (1), 1477 (1), 8142 (2), 8153 (7), 8208 (1), 8682 (3), 8736 (1), 8941 (2), 9206 (1). **Oliveira F** 420 (3). **Pabst G** 8920 (3). **Pereira C** (RFA18714) (1). **Pereira E** 44 (7), 55 (7), 6974 (2), 7574 (3). **Porto C** 2687 (3), 2715 (3). **Porto PC** 2091 (3), (RB20759) (3). **Povade** 14650 (2). **Quinet A** 201 (2). **Rawitscher F** (SPF00016201) (2), (SPF00019652) (7). **Riina R** 1523 (7), 1524 (7), 1526 (1), 1527 (1), 1529 (1). **Rodrigues EHA** 8 (4). S/col, 1055 (4), (RB507481) (2). **Sampaio A** 4755 (1), 4783 (7). **Santos N** 20 (3). **Santos RF** 45 (2), 46 (2), 47 (7), 48 (2), 52 (6), 53 (1), 54 (1), 187 (1). **Santos TS** 1395 (4). **Silva GF** 1 (1), 2 (1), 3 (3), 4 (3), 5 (3), 6 (3), 7 (3), 8 (3), 9 (3), 10 (3), 11 (3), 12 (1), 13 (1), 14 (1), 15 (2), 16 (4), 17 (2), 18 (4), 20 (2), 21 (5), 22 (1), 23 (1), 24 (1), 25 (1), 26 (1), 27 (1), 28 (3), 29 (3), 30 (3), 31 (1), 32 (6), 33 (1), 34 (2), 35 (7), 36 (5), 37 (5), 38 (5), 39 (5), 40 (2), 41 (2), 42 (6), 43 (7), 44 (4), 45 (4). **Silva-Neto SJ** 321 (7), 741 (7), 750 (7), 758 (1), 785 (6), (HB93705) (1). **Silvestre MSF** 83 (3). **Smith C** (SP33218) (4). **Soares e Silva IH** 171 (4). **Stickney F** 13 (3). **Strang H** 762 (3). **Sucre D** 5135 (3). **Sylvestre L** 9 (5), 912 (6). **Tamashiro JY** 604 (4). **Toledo J** 1959 (3). **Viegas GP** 2379 (4).

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