



A synopsis of Solanaceae from Caquetá Department, Colombia

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Summary. We present a complete list of Solanaceae species from Caquetá Department, Colombia, including their distribution by municipalities and conservation status. We also provide a dichotomous key to the genera. Overall, 114 species of 21 Solanaceae genera are listed, with *Solanum* L. the best represented with almost half of the species. The municipality with the highest number of recorded species was Florencia, the capital of the department, with 83 species. We found 22 new records for the flora of Caquetá and one for the flora of Colombia, in addition to five possibly new and recently described species, one endemic species, and 15 cultivated species. This work is expected to enhance future conservation programs in Caquetá.

Key Words. Distribution, endemic species, flora, Florencia, *Solanum*.

Introduction

The Solanaceae, or nightshade family, includes roughly 2800 species and 99 genera (Dupin *et al.* 2017; Palchetti *et al.* 2020; Poczar *et al.* 2022). It is the twenty-eighth most diverse family of flowering plants (Christenhusz & Byng 2016), the fifteenth in Colombia (Bernal *et al.* 2016), and the eleventh in the Americas (Ulloa *et al.* 2017; Palchetti *et al.* 2020). Solanaceae is one of the most important families in the human diet, surpassed only by Poaceae and Fabaceae, and has a significant economic impact on the global economy and on many cultures (Towell 2001).

Solanaceae are highly diverse in habit, habitat and morphology (Knapp *et al.* 2004). Its species encompass large trees to small herbs, including shrubs, subshrubs, climbers, and hemiepiphytic and epiphytic shrubs or vines (Hunziker 2001; Barboza 2013). Morphologically, they are glabrous or pubescent plants with simple or compound alternate leaves, with mostly actinomorphic but also some zygomorphic flowers (e.g., *Schizanthus* Ruiz & Pav.), free or connivent stamens, anthers dehiscent through longitudinal slits or termi-

nal pores, usually pentamerous flowers with superior ovaries, and fruits that range from berries and capsules to drupes, mericarps and anthocarps (Hunziker 2001; Vargas *et al.* 2003). They are also distinguished histologically by the presence of internal phloem (Judd *et al.* 1999).

The Solanaceae is currently distributed on all continents except Antarctica with the highest diversity found in South America (Dupin *et al.* 2017), most often in tropical, subtropical, and temperate regions (Sierra-Muñoz *et al.* 2015), inhabiting between 0 to 5000 m altitude, in various environments such as lowland tropical rainforest and cloud forests, deserts and semi-deserts, pampas and steppes (Barboza 2013).

One of the most dynamic, extensive, and diverse regions globally is the Amazon basin (Armenteras *et al.* 2019a). This encompasses the world's largest expanse of rainforest, where at least 14,003 seed plant species have been documented for just the Amazonian lowlands (Cardoso *et al.* 2017). The northwest Amazon could be the most diverse region because it is the wettest, and this condition is strongly related to high

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floristic diversity (Gentry 1982; Gentry 1988; van der Hammen 2000). The ecotone between the Amazon plain and the Andes Mountain range, known as the Andean-Amazon foothills or piedmont, is located in this same area and recognised as a centre of diversity and endemism of plants (Barrera *et al.* 2007). Unfortunately, these remarkably diverse area contrasts are subject to increasing deforestation that threatens the conservation of the entire Amazonian ecosystem (Armenteras & Defler 2019). Caquetá Department, Colombia, is located within this region. It has been considered the most threatened department in the country due to the increase of agricultural land use plus extensive cattle ranching, illegal activities, mining and hydrocarbon businesses, and infrastructure projects (Cepal & Patrimonio Natural 2013). These situations are likely due to the institutional incentives for land speculation coupled with extreme inequality in land tenure (Armenteras *et al.* 2019b).

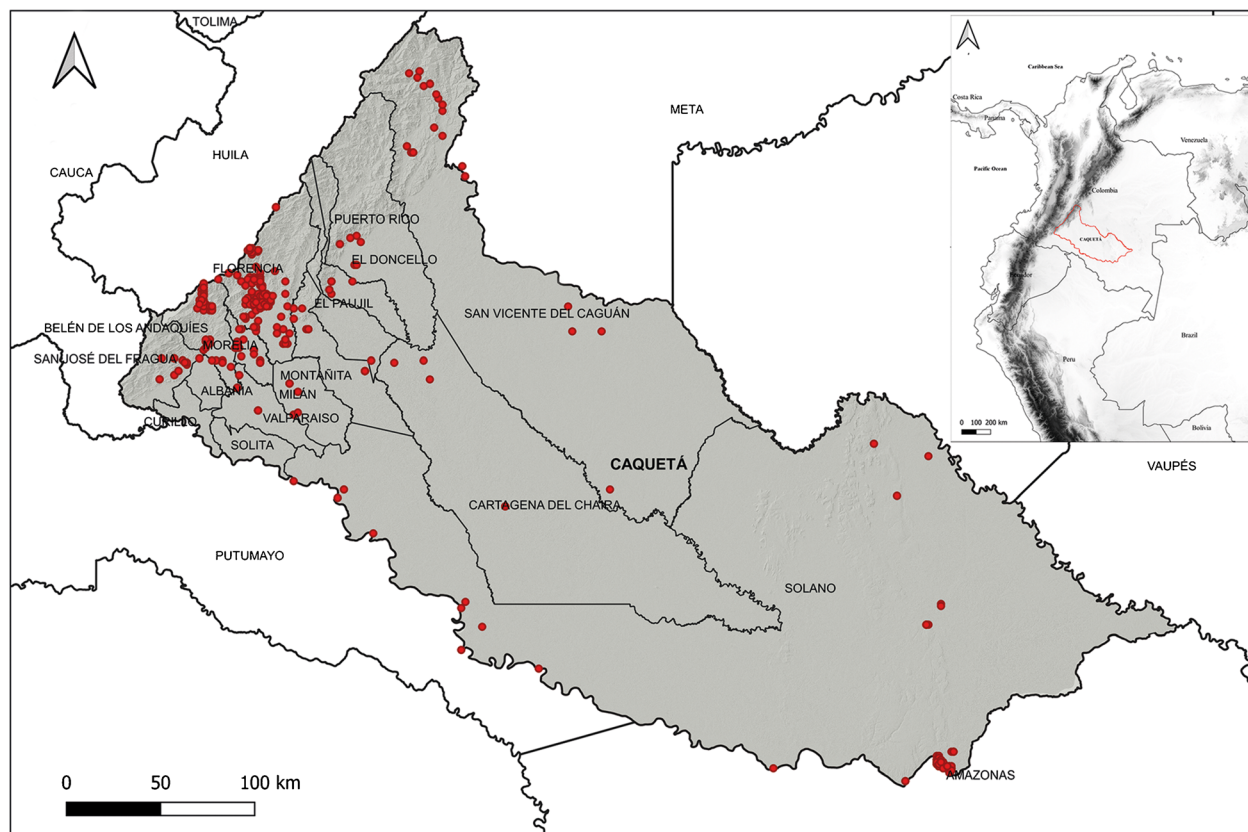
After Amazonas Department, Caquetá is the department best represented by botanical collections in the Colombian Amazon (Cárdenas *et al.* 2007). However, Trujillo-Calderón *et al.* (2015a) showed a lack of floristic information from this department, especially in the Andean-Amazon foothills, highlighting the

need for taxonomic specialists to work on this region. Taxonomic treatments of a flowering plant family have not been published at the department level. The known floristic studies are at the level of the entire Colombian Amazon (e.g., Giraldo-Cañas 1999; Mendoza-Cifuentes & Cárdenas 2015; Balslev *et al.* 2017) or in some of the municipalities or regions of the department (e.g., Trujillo-Trujillo *et al.* 2007; Trujillo-Calderón 2013; Álvarez-B. *et al.* 2019; Castaño *et al.* 2020; Marín *et al.* 2020). As a starting point in the inventory of the Solanaceae from Caquetá, Bernal *et al.* (2016) reported 49 species for 12 genera. To contribute to the knowledge of the diversity and future conservation of Solanaceae, a checklist from Caquetá Department is presented, including commentaries, conservation assessment, distribution novelties, field photographs and a key for the recorded genera.

Materials and Methods

Study area

Caquetá Department is the area of study of this research (Map 1). With an extent of 88,965 km², it occupies 7.8% of the national territory and 22.9% of



Map 1. Location of Caquetá Department and its municipalities. Red Points: Records of Solanaceae.

the Colombian Amazon (Calderón 2007; Cárdenas *et al.* 2007; Sogecol 2011). Caquetá borders Putumayo and Amazonas Departments to the south, Meta and Guaviare Departments to the north, Vaupés and Amazonas Departments to the east, and Huila and Cauca Departments to the west (Gobernación del Caquetá 2020). Caquetá is composed of four ecoregions, the Andes, Andean-Amazon foothills, Amazon Plain and Guyana Shield (Mendoza-Cifuentes & Cárdenas 2015), which makes it a quite heterogeneous and complex department like the Amazon itself.

Field work

Specimens were collected from June 2017 to June 2020 through the method known as *Caminhamento* (i.e., walks to collect freely), proposed by Filgueiras *et al.* (1994). Sampling was prioritised in vegetation on the roadside, on the edge of water bodies, and inside forests and grasslands. Samples were collected and processed using standard methods described by Escobar (1982) and Villareal *et al.* (2004). The specimens were deposited at COL, COAH, HEAA and HUAZ herbaria (abbreviations according to Thiers 2020).

Taxonomic identification, database and conservation assessment

Taxonomic treatments, checklists and all botanical literature concerning Solanaceae of Caquetá were compiled and reviewed, including the treatments for *Brugmansia* Pers. (Hay *et al.* 2012), *Cestrum* L. (Canal 2011), *Cuatresia* Hunz. (Canal & Orozco 2012), *Deprea* Raf. (Deanna *et al.* 2016; Deanna *et al.* 2018), *Markea* Rich. (Orejuela *et al.* 2014), *Solanum* clade *Cyphomandra* (ex *Cyphomandra* Mart. ex Sendtn.) (Bohs 1994), *Solanum* sect. *Crinitum* Whalen ex A.Child (Beltran-Z. & Orozco 2012), *Solanum* sect. *Geminata* (G.Don) Walp. (Knapp 2002), *Solanum* sect. *Herpysticum* Bitter (Tepe & Bohs 2011) and *Solanum* sect. *Pterioidea* Dunal (Tepe & Bohs 2010). Species registered in the catalogue of plants and lichens of Colombia were first filtered according to Bernal *et al.* (2016). Then, literature that listed species of Solanaceae from Caquetá was also revised (Duivenvoorden 1994; Trujillo-Calderón & Correa 2010; Alvarez-B. *et al.* 2019; Castaño *et al.* 2020; Marín *et al.* 2020). In addition to queries to specialists (see acknowledgements) and comparisons to specimens housed at COAH, COL and HUAZ herbaria, we also consulted online databases of the herbaria COAH (Sinchi 2021), COL (Universidad Nacional de Colombia 2020) and F (Field Museum 2020).

Records of other herbaria found in the GBIF database were also included, such as FMB (Borja-Acosta 2017), HUA (Martínez *et al.* 2018), HPUJ (García *et al.* 2020), PSO (González & Pacheco 2018) and UDBC

(Sastoque & Moreno-Vargas 2018). Georeferenced reports from the COAH herbarium (Sua 2018) were also obtained from GBIF. We omit GBIF records without vouchers due to the impossibility of being determined or verified. Species names and their respective protologues and type specimens were studied from the databases BHL (<https://www.biodiversitylibrary.org>), ColPlantA (<http://colplanta.org>), IPNI (<https://www.ipni.org>), JSTOR (<https://plants.jstor.org>), Solanaceae Source (<http://solanaceaesource.org>), TNRS (<http://tnrs.iplantcollaborative.org>), and Tropicos (<https://www.tropicos.org/home>).

Conservation assessments were extracted from the IUCN Red List of Threatened Species (<https://www.iucnredlist.org>). In addition, we carried out regional assessments for Caquetá Department following the guidelines of IUCN (2012a) and applying the criteria of IUCN (2012b) to the species already globally assessed as threatened according to the IUCN Red List of Threatened Species. Conservation assessments were undertaken using IUCN criteria B, ‘geographic range’ in the form of B2 (Area of Occupancy [AOO]), and indicators of present or possible threats in the near future (IUCN 2012b). The Extent of Occurrence (EOO) criterion (B1) could not be applied because the assessed species had fewer than three localities.

Identification key

A dichotomous key for the identification of genera of Solanaceae recorded in Caquetá was created following the analyses of morphological characters performed by Woodson *et al.* (1973), Knapp *et al.* (1997), Vargas *et al.* (2003), Barboza (2013), and descriptions for some genera, *Hawkesiophyton* Hunz. (Giacomin & Costa 2018) and *Schwenckia* D.Royen ex L. (Benítez 2006). In total, we combine 21 vegetative and four reproductive characters for the 21 genera recorded.

Results and Discussion

Diversity

In total, 114 species of Solanaceae, both native and cultivated, were recorded, which are included in 21 genera (Fig. 1, Table 1, S1). The greatest species diversity was found in *Solanum*, with 53 species (46.5%), followed by *Cestrum* with 11 species (9.6%), *Capsicum* L. with seven species (6.1%), and both *Deprea* Raf. and *Lycianthes* (Dunal) Hassl. with six species (5.3%) each. The diversity of *Solanum* is correlated with the fact that this large genus includes 1,228 accepted species and contains almost half of the species of the family (Knapp *et al.* 2004; Knapp 2008; Gagnon *et al.* 2022) (Fig. 2). *Cestrum* is the second most diverse genus of Solanaceae (Mora & Orozco 2002), which also explains our records. As a starting point,

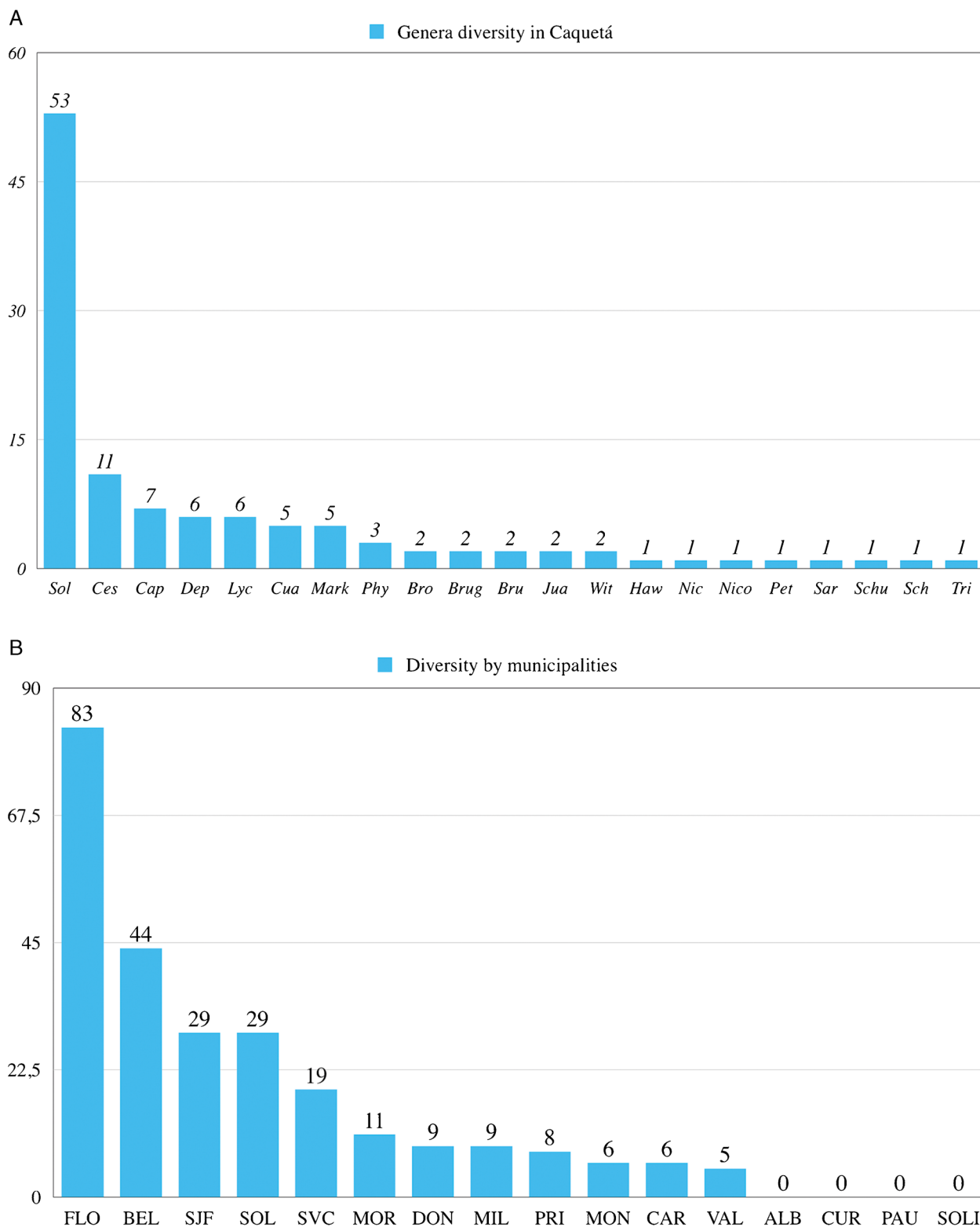


Fig. 1. Diversity of Solanaceae in Caquetá Department. **A** number of species per genus; **B** number of species by municipalities. Abbreviations: **Sol** (*Solanum*), **Ces** (*Cestrum*), **Cap** (*Capsicum*), **Dep** (*Deprea*), **Lyc** (*Lycianthes*), **Cua** (*Cuatresia*), **Mark** (*Markea*), **Phy** (*Physalis*), **Bro** (*Browallia*), **Brug** (*Brugmansia*), **Bru** (*Brunfelsia*), **Jua** (*Juanulloa*), **Wit** (*Witheringia*), **Haw** (*Hawkesiophyton*), **Nic** (*Nicandra*), **Nico** (*Nicotiana*), **Pet** (*Petunia*), **Sar** (*Saracha*), **Schu** (*Schultesia*), **Sch** (*Schwenckia*), **Tri** (*Trianaea*), **ALB** (*Albania*), **BEL** (*Belén de los Andaquíes*), **CAR** (*Cartagena del Chairá*), **CUR** (*Curillo*), **DON** (*El Doncello*), **FLO** (*Florencia*), **MIL** (*Milán*), **MON** (*La Montañita*), **MOR** (*Morelia*), **PAU** (*El Paujil*), **PRI** (*Puerto Rico*), **SJF** (*San José del Fragua*), **SVC** (*San Vicente del Caguan*), **SOL** (*Solano*), **SOLI** (*Solita*), **VAL** (*Valparaiso*).

Orozco *et al.* (2015) mentioned that 49 species of Solanaceae occurred in Caquetá, and Alvarez-B. *et al.* (2019) recorded 17 species in a forest of the Andean-Amazon foothills, thus adding five species to the checklist. Recently, Castaño *et al.* (2020) and Marín *et al.* (2020) listed 34 and 30 species, respectively, from foothill localities near Florencia, which added 23 more records. Our study increases the number of Solanaceae species recorded from Caquetá by 32.45%.

Sampling status

The municipalities with the highest number of recorded taxa were Florencia, with 83 species (72.8%), Belén de los Andaquíes with 44 species (38.6%), and San José del Fragua and Solano with 29 species (25.4%) each. On the other hand, Cartagena del Chaira, El Doncello, La Montañita, Milán, Morelia, Puerto Rico, San Vicente del Cagüán and Valparaiso had the lowest number of taxa, with a range of five to 19 species (4.4 – 16.7%). We did not find Solanaceae specimens from Albania, Curillo, El Paujil and Solita. These results could be biased according to the road access and problems of public order, so they might not reflect the diversity of those territories, suggesting the need to develop more botanical explorations targeting the mentioned municipalities.

Florencia includes the highest number of species most likely because it is the capital of the Caquetá and where most botanical collections have taken place. In the second place, the high diversity of Belén de los Andaquíes could be explained by the ColombiaBio expedition to the Camino Andaquí in 2017 organised by Instituto Amazónico de Investigaciones Científicas SINCHI and other affiliated institutions (Colciencias 2017; Castaño *et al.* 2020). The diversity of San José del Fragua is also explained by SINCHI expeditions and recent field trips by the authors in the National Natural Park Alto Fragua Indi Wasi. According to Cárdenas *et al.* (2007), most of the floristic studies in Caquetá have been carried out in Solano, a locality where the COAH herbarium facilities were initially placed, which at some point explained the largest number of botanical collections there. The information gaps of the remaining municipalities and the need to re-direct fieldwork efforts have already been sought by Trujillo-Calderón *et al.* (2015a) and Cárdenas *et al.* (2007).

Endemism, domestication, distribution and new species

Caquetá Department now includes 22 new records; *Cuatresia fosteriana* Hunz. is also newly recorded for Colombia. *Deprea macasiana* (Deanna, S.Leiva & Barboza) Barboza (Fig. 3), *Markea epifita* S.Knapp, and *Solanum junctum* S.R.Stern & M.Nee were reported as recent new records for the country by Castaño *et al.*

(2020) and Marín *et al.* (2020). In addition, *Schwenckia alvaroana* Benítez was found to be endemic to Caquetá and is only known from the type collection (Benítez 2006). A few recently described species were also recorded here, including *Capsicum regale* Barboza & Bohs (Barboza *et al.* 2020) and *Deprea teresitae* Deanna & A.Orejuela (Deanna *et al.* 2018) (Fig. 4).

Furthermore, 15 species of cultivated Solanaceae are included in the inventory. From those, *Physalis pubescens* L. (bejigón) and *Solanum sessiliflorum* Dunal (cocona) are native plants used as fresh fruits by local people (Frausin *et al.* 2010; Alvarez-B. *et al.* 2018). *Nicotiana tabacum* L. (tabaco) is widely consumed and considered by the *Murui Muina* indigenous people as the second sacred plant of their culture (Ortiz-Andoke *et al.* 2018), producing “ambil” a concentrated solution of nicotine.

These new records show the importance of focused taxonomic studies of a particular region. In addition, they justify the need to expand collection efforts to strategic and unexplored areas such as municipalities located in the Andean-Amazonian foothills, where recent new records have been published in other taxonomic groups (e.g., Trujillo-Calderón *et al.* (2015b) in Arecaceae, Sanín *et al.* (2017) in ferns, Parra-O. *et al.* (2020) in Myrtaceae, and Perdomo *et al.* (2020a, b) in orchids).

Conservation assessment

Most of the species (56.1%) have not previously been evaluated according to the IUCN criteria (NE). The remaining species were assessed in one of the IUCN categories, of those, 37.7% are in the category Least Concern (LC), followed by the categories Endangered (EN) and Extinct in the Wild (EW) with 1.8% of representatives each, and Data Deficient (DD), Near Threatened and Vulnerable (VU) categories only represented by 0.9%. Our regional assessments support the assessment of Barboza *et al.* (2020) for *Capsicum regale* Barboza & Bohs and suggest up-listing four species to Critically Endangered (CR), especially *Schwenckia alvaroana* Benítez because its assessment also applies globally (Table 2).

Although the knowledge of the conservation status of the species is the tool that allows defining conservation actions (Dieta & Biganzoli 2019), only 4% of plant species have been assigned a conservation status according to the IUCN criteria evaluations (Rivers *et al.* 2010). Pitman & Jørgensen (2002) estimated that up to half of the plant species in the world might be threatened. Thus, our results may be positive for the Solanaceae family in Caquetá due to the high number of assessed and not threatened species. However, there is a need to increase the evaluations of the conservation status for more species, given that some groups could be threatened.

Table 1. Solanaceae species of Caquetá Department with voucher information, growth habit, novelties, endemism and domestication, conservation status, and recorded municipalities. Abbreviations: **Hrb** (Herb), **Shr** (Shrub), **Tr** (Tree), **Vin** (Vine), **Hem** (Hemipiphyte), **COL** (novelty to Colombia), **CQT** (novelty to Caquetá), **CUL** (Cultivated), **sp. nov.** (Taxonomic novelty), **RD** (recently described), **END** (Endemic), **NE** (Not Evaluated), **LC** (Least Concern), **NT** (Near Threatened), **VU** (Vulnerable), **EN** (Endangered), **EW** (Extinct in the wild), **BEL** (Belén de los Andes), **CAR** (Cartagena del Chairá), **DON** (El Doncello), **FLO** (Flores), **MIL** (Milán), **MON** (La Montaña), **MOR** (Morelia), **PRI** (Puerto Rico), **SJF** (San José del Fragua), **SVC** (San Vicente del Caguan), **SOL** (Solano), **VAL** (Valparaiso).

Species	Voucher Collections	Habit	Novelties, Endemism and Domestication	Conservation Status	Municipalities
<i>Browallia americana</i> L.	Cuatrecasas, J. 9135; Hoyos, D. 183 & 200	Hrb.	-	LC	BEL, FLO
<i>Browallia speciosa</i> Hook.	Castaño, N. 3291; Hoyos, D. 154 & 227	Hrb.	CUL	NE	DON, FLO
<i>Brugmansia aurea</i> Lagerh.	Correa, M. 2689	Shr.	CUL	EW	FLO
<i>Brugmansia insignis</i> (Barb.Rodr.) Lockwood ex R.E. Schult.	Hoyos, D. 166, 173 & 219	Shr.	CUL	EW	FLO
<i>Brunfelsia chinensis</i> Plowman	Romero, R. 4179 & 4193	Shr.; Tr.	-	NE	PRI, SOL
<i>Brunfelsia grandiflora</i> D. Don	Pérez, E. 688; Hoyos, D. 167 & 189	Shr.; Tr.	-	LC	FLO, SJF, SOL
<i>Capsicum annuum</i> L.	Correa, M. 3892; Hoyos, D. 211	Hrb.; Shr.	CUL	LC	FLO, SOL
<i>Capsicum baccatum</i> L.	Díaz, J. 275	Shr.	CUL	LC	FLO
<i>Capsicum chinense</i> Jacq.	Trujillo, W. 130; Cárdenas, D. 9319	Hrb.; Shr.	-	NE	FLO, MIL, SOL
<i>Capsicum dimorphum</i> (Miers) Kuntze	Cuatrecasas, J. 8752; Orejuela, A. 2685	Shr.	-	LC	FLO
<i>Capsicum frutescens</i> L.	Trujillo, W. 208; Hoyos, D. 175	Hrb.; Shr.	-	LC	FLO, MIL, SOL
<i>Capsicum geminifolium</i> (Damm.) Hunz.	Cuatrecasas, J. 8456; Hoyos, D. 182 & 216	Hrb.	-	LC	FLO
<i>Capsicum regale</i> Barboza & Bohl	Sanín, D. 6236; Hoyos, D. 118 & 127	Shr.	RD	EN	FLO, SJF
<i>Cestrum acuminatissimum</i> Dunal	Cárdenas, D. 41903; Betancur, J. 20709	Shr.	-	LC	BEL, MOR
<i>Cestrum humboldtii</i> Franchet	Orozco, C.I. 2751; Hoyos, D. 215	Shr.	CQT	LC	FLO, SVC
<i>Cestrum megalophyllum</i> Dunal	Cuatrecasas, J. 27239; Sanín, D. 6059	Shr.	-	NE	FLO
<i>Cestrum microdylex</i> Franchet	Orejuela, A. 2646; Hoyos, D. 198 & 201	Shr.	-	LC	BEL, FLO, SJF
<i>Cestrum nocturnum</i> L.	Correa, M. 5100; Hoyos, D. 223	Shr.	CUL	LC	BEL, FLO
<i>Cestrum racemosum</i> Ruiz & Pav.	Díaz, J. 105; Hoyos, D. 11	Shr.	-	LC	FLO
<i>Cestrum reflexum</i> Sendtn.	Sanín, D. 6206	Shr.	-	NE	FLO
<i>Cestrum scandens</i> Vahl	Von Sneider, K. 1177	Vin.	CQT	MOR	
<i>Cestrum schlechtendahlit</i> G. Don	Sanín, D. 6059; Hoyos, D. 139 & 203	Shr.; Tr.	-	LC	BEL, FLO, SJF, SOL
<i>Cestrum schubertianum</i> Franchet	Castro, S. 209, 658	Shr.	CQT	SOL	
<i>Cestrum tubulosum</i> Sendtn.	Idrobo, J.M. 11439; Duivenvoorden, J. 2734	Shr.; Tr.	-	NE	MIL, SOL
<i>Cuatresia glomeriflora</i> Canal & C.I. Orozco	Granados, J.C. 897	Hrb.; Shr.	-	NE	FLO
<i>Cuatresia fosteriana</i> Hunz.	Hoyos, D. 30, 133 & 228	Shr.	COL	NE	BEL, FLO, SJF
<i>Cuatresia harlingiana</i> Hunz.	Hoyos, D. 19 & 180	Shr.	CQT	NT	FLO
<i>Cuatresia platanifolia</i> Hunz.	Orozco, C.I. 2764	Shr.	-	NE	SVC
<i>Cuatresia trianae</i> Hunz.	Hoyos, D. 128 & 148	Shr.	CQT	NE	FLO, SJF
<i>Deprea daryana</i> (N.W. Sawyer) Barboza & S. Leiva	Trujillo, W. 944 Orejuela, A. 2663	Shr.	-	NE	BEL, FLO
<i>Deprea haekesi</i> (Hunz.) Deanna	Betancur, J. 20765; Hoyos, D. 7 & 91	Shr.	-	NE	BEL, FLO
<i>Deprea glabra</i> (Standl.) Hunz.	Cárdenas, D. 41460; Vargas, V. 84	Shr.	CQT	NE	BEL
<i>Deprea macassana</i> (Deanna, S. Leiva & Barboza) Barboza	Cárdenas, D. 41834; Hoyos, D. 138 & 209	Shr.	-	NE	BEL, FLO, SJF
<i>Deprea</i> cf. <i>sachapapa</i> (Hunz.) S. Leiva & Deanna	Hoyos, D. 122 & 131	Shr.	CQT	NE	SJF
<i>Deprea teresitae</i> Deanna & A. Orejuela	Deanna, R. 433	Shr.	CQT, RD	EN	FLO
<i>Haekesiophyton ulai</i> (Damm) Hunz.	Duque, A. 4907; Torres, M. 1072	Hem.	CQT	NE	SOL
<i>Juanulloa ochracea</i> Cuatrec.	Gentry, A. 9106; Hoyos, D. 155 & 190	Hem.	-	LC	BEL, FLO, MON, MOR, SJF
<i>Juanulloa speciosa</i> (Miers) Dunal	Cuatrecasas, J. 8565; Hoyos, D. 162 & 237	Vin.	-	NE	FLO

<i>Lycianthes acutifolia</i> (Ruiz & Pav.) Bitter	Hoyos, D. 102 & 181	Hrb.	CQT	NE	FLO
<i>Lycianthes inaequilatera</i> (Rusby) Bitter	Castaño, N. 9461; Hoyos, D. 58	Shr.	-	NE	BEL, FLO, MOR
<i>Lycianthes medusacalyx</i> (Bitter) Bitter	Granados, J.C. 896; Hoyos, D. 197 & 204	Shr.	-	NE	BEL, FLO, SJF
<i>Lycianthes</i> aff. <i>pauciflora</i> (Vahl) Bitter	Peña, J.L. 177; Hoyos, D. 151 & 156	Hem.	-	NE	BEL, FLO, SOL
<i>Lycianthes synanthera</i> (Sendtn.) Bitter	Romero, R. 4230	Vin.	-	LC	SOL
<i>Lycianthes</i> sp.			sp. nov.	NE	FLO
<i>Markea coccinea</i> Rich.	Cuatrecasas, J. 8518; Hoyos, D. 55 & 160	Shr.	-	NE	SOL
<i>Markea epifita</i> S.Knapp	Arévalo, R. 413; Barbosa, C. 8096	Hem.	-	NE	SOL
<i>Markea fornicarum</i> Dammer	Cárdenas, D. 45979	Vin.	-	VU	BEL
<i>Markea hartlingiana</i> Hunz.	Vester, H. 231; Cárdenas, D. 7361	Hem.	CQT	NE	SOL
<i>Markea ploxmanii</i> Hunz.	Cárdenas, D. 41639 & 45861	Hem.	-	NE	BEL, SJF
<i>Nicandra physalodes</i> (L.) Gaertn.	Mendoza, H. 8863; Hoyos, D. 125 & 134	Hem.	CQT	NE	SJF
<i>Nicotiana tabacum</i> L.	Gómez, L.T. 5	Hrb.	CQT	NE	FLO
<i>Petunia hybrida</i> E.Vilm.	Trujillo, W. 288; Hoyos, D. 350	Shr.	CUL	NE	FLO, MIL
<i>Physalis angulata</i> L.	Hoyos, D. 364	Hrb.	CUL	NE	FLO
<i>Physalis peruviana</i> L.	Castro, S. 351; Hoyos, D. 220	Hrb.	CUL	LC	FLO, MON, PRI, SOL, VAL
<i>Physalis pubescens</i> L.	Hoyos, D. 171 and 212	Hrb.	CUL	LC	FLO
<i>Saracha nigribaccata</i> J.M.H.Shaw	Erazo, A. 10; Álvarez, C. 241	Hrb.	CUL	LC	DON, FLO, SOL
<i>Schlesiaanthus megalandrus</i> (Dunal) Hunz.	Cuatrecasas, J. 8521; Hoyos, D. 76 & 163	Shr.; Tr.	-	NE	FLO
<i>Schwendia alvariana</i> Benítez	Castaño, N. 8683	Hem.	-	NE	BEL
<i>Solanum abitaquense</i> S.Knapp	Betancur, J. 2378	Vin.	END	NE	SVC
<i>Solanum acanthodes</i> Hook.f.	Betancur, J. 20325; Cárdenas, D. 45799	Shr.; Tr.	-	LC	BEL
<i>Solanum americanum</i> Mill.	Cárdenas, D. 24881; Castaño, N. 7703	Shr.; Tr.	-	LC	BEL, FLO
<i>Solanum anceps</i> Ruiz & Pav.	Granados, J.C. 892; Hoyos, D. 184	Hrb.	-	LC	DON, FLO, PRI, SVC
<i>Solanum anisophyllum</i> Van Heurck & Müll.Arg.	Orejuela, A. 86; Hoyos, D. 99 & 224	Hrb.; Shr.	-	NE	BEL, FLO, PRI, SJF
<i>Solanum apaporum</i> R.E.Schult.	Cuatrecasas, J. 9041; Hoyos, D. 22 & 207	Shr.	-	LC	BEL, FLO, SJF, SVC
<i>Solanum appressum</i> K.E.Roe	Cárdenas, D. 44393	Vin.	CQT	NE	SVC
<i>Solanum aspersum</i> S.Knapp	Trujillo, E. 1877; Hoyos, D. 141 & 152	Shr.	-	NE	BEL, FLO, MOR, SJF, VAL
<i>Solanum asperolanatum</i> Ruiz & Pav.	Hoyos, D. 4 & 193	Vin.	CQT	NE	FLO
<i>Solanum aturense</i> Dunal	Betancur, J. 20283 & 20368	Shr.; Tr.	-	NE	BEL
<i>Solanum barbeyanum</i> Huber	Van der Wal, M. 142; Correa, M. 5342	Vin.	-	LC	BEL, FLO, PRI, SOL
<i>Solanum betaceum</i> Cav.	Sarín, D. 6464; Hoyos, D. 89 & 206	Shr.	-	LC	BEL, FLO
<i>Solanum bicolor</i> Willd. ex Roem. & Schult.	Hoyos, D. 218	Shr.; Tr.	CUL	DD	FLO
<i>Solanum crinitum</i> Lam.	Davidse, G. 5755; Trujillo, W. 1133	Shr.	-	LC	MON, SJF, SVC
<i>Solanum cyathophorum</i> M.Nee & Farruggia	Cuatrecasas, 8751; Hoyos, D. 78 & 126	Shr.	-	NE	BEL, FLO, SJF, SVC
<i>Solanum endopogon</i> Bohs	Van der Wal, M. 41; Edén, Mj. 126	Shr.; Tr.	-	LC	SOL
<i>Solanum evolutifolium</i> Greenm.	Betancur, J. 2195; Hoyos, D. 210	Tr.	-	NE	FLO, SVC
<i>Solanum grandiflorum</i> Ruiz & Pav.	Trujillo, W. 709	Tr.	CQT	LC	MIL
<i>Solanum jamaicense</i> Mill.	Marín, N. 2419; Hoyos, D. 44	Vin.	-	NE	FLO
<i>Solanum junctum</i> S.R.Stern & M.Nee	Little, EL. 7744 & 9497; Hoyos, D. 77	Tr.	-	NE	BEL, DON, FLO, MON, MIL, MOR, PRI, SJF, SVC, SOL, VAL
<i>Solanum juglandifolium</i> Dunal	Von Sneiderm, K. 1054; Pérez A, E. 755	Hrb.	-	LC	BEL, CAR, DON, FLO, MON, MIL, MOR, SVC, SOL
<i>Solanum kioniotrichum</i> Bitter ex. J.F.Macbr.	Orejuela, A. 2659; Hoyos, D. 6 & 164	Shr.; Vin.	-	NE	FLO
<i>Solanum lepidotum</i> Dunal	Orejuela, A. 2686; Hoyos, D. 114 & 161	Vin.	-	NE	FLO
<i>Solanum leptopodum</i> Van Heurck & Müll.Arg.	Idrobo, J.M. 11425; Vester, H. 308	Tr.	-	NE	CAR, SOL
<i>Solanum leucocarpum</i> Dunal	Peña, J.L. 396; Hoyos, D. 202	Tr.	-	LC	BEL, CAR, DON, FLO, SJF, SVC
<i>Solanum leucopogon</i> Huber	Romero, 4060; Hoyos, D. 56	Shr.	-	NE	BEL, CAR, FLO, SOL
<i>Solanum lycopersicum</i> L.	Little, EL. 7718; Hoyos, D. 2 & 113	Shr.	-	LC	FLO, SVC, SOL
<i>Solanum macrodonum</i> Bitter	Orejuela, A. 100; Hoyos, D. 217	Vin.	-	NE	BEL, FLO
<i>Solanum malloti</i> S.Knapp	Díaz, J. 111; Hoyos, D. 172	Hrb.	CUL	NE	FLO
	Gentry, A. 9040; Hoyos, D. 157	Hrb.	-	NE	FLO
	Palacios, P. 2724	Hrb.; Shr.	-	NE	SOL

<i>Solanum mammosum</i> L.	Betancur, J. 1559; Hoyos, D. 153	Shr.	-	NE	BEL, FLO, MOR, SVC, VAL
<i>Solanum nigrescens</i> M.Martens & Galeotti	Orejuela, A. 694	Hrb.	CQT	NE	FLO
<i>Solanum nudum</i> Dunal	Betancur, J. 2088; Hoyos, D. 1 & 143	Shr.; Tr.	-	LC	FLO, MON, SVC
<i>Solanum occultum</i> Bohs	Cárdenas, D. 46023 & 46193	Tr.	-	LC	BEL, SJF
<i>Solanum oppositifolium</i> Ruiz & Pav.	Trujillo, E. 210 & 1011; Hoyos, D. 69	Shr.	-	LC	CAR, FLO, SOL
<i>Solanum ovalifolium</i> Dunal	Velasco, G. 49; Hoyos, D. 8 & 115	Shr.	-	LC	BEL, FLO
<i>Solanum oxyphyllum</i> C.V.Morton	Sanín, D. 6222	Shr.	-	LC	FLO
<i>Solanum pectinatum</i> Dunal	Trujillo, E. 704; Hoyos, D. 145 & 150	Shr.	-	NE	FLO, SJF
<i>Solanum pentaphyllum</i> Bitter	Cárdenas, D. 40721 & 45464	Vin.	CQT	NE	BEL, MOR
<i>Solanum pseudohulo</i> Heiser	Castañó, N. 3305; Hoyos, D. 168 & 213	Shr.	CQT	NE	DON, FLO, SVC
<i>Solanum rugosum</i> Dunal	Schröder, T. 37; Trujillo, W. 1177 & 1807	Shr.	-	NE	BEL, FLO, SVC, SOL
<i>Solanum. quibense</i> Lam.	Hoyos, D. 159.	Shr.	CUL	NE	FLO
<i>Solanum schlechtendalianum</i> Walp.	Trujillo, E. 1882; Hoyos, D. 82 & 222	Shr.	-	LC	BEL, DON, FLO, MOR, SJF
<i>Solanum sessile</i> Ruiz & Pav.	Cuatrecasas, J. 8915; Hoyos, D. 185 & 231	Shr.	-	LC	BEL, DON, FLO, SJF, SOL
<i>Solanum sessiliflorum</i> Dunal	Schultes, RE. 5881; von Sneider, K. 1156	Shr.	-	NE	BEL, FLO, MIL, MOR, PRI, SJF, SOL
<i>Solanum splendens</i> (Dunal) Bohs	Correa, M. 3757; Hoyos, D. 121 & 140	Tr.	-	NE	BEL, FLO, SJF, SVC, SOL
<i>Solanum stellatiglandulosum</i> Bitter	Betancur, J. 2195; Davidse, G. 5620	Shr.	CQT	LC	FLO, SVC
<i>Solanum stramonifolium</i> Jacq.	Trujillo, W. 245	Shr.	CQT	NE	MIL
<i>Solanum subinerme</i> Jacq.	Castañó, N. 8647; Davidse, G. 5746	Tr.	-	LC	BEL, SJF
<i>Solanum sycophanta</i> Dunal	Cuatrecasas, J. 8743	Tr.	-	LC	FLO
<i>Solanum thelopodium</i> Sendtn.	Torres, M. 1117; Romero, C. 4031	Shr.	-	LC	BEL, CAR, FLO, SJF, SOL
<i>Solanum ulcanum</i> Bitter	Granados, JC. 895; Hoyos, D. 124	Hem.	-	NE	FLO, SJF
<i>Solanum</i> sp.	Hoyos, D. 101 & 239	Tr.	sp. nov.	NE	FLO
<i>Trianaea speciosa</i> (Drake) Soler.	Castañó, N. 7513 & 9134	Hem.	-	NE	BEL
<i>Witheringia solanacea</i> L'Her.	Castañó, N. 7941; Hoyos, D. 57 & 195	Hrb.; Shr.	-	LC	BEL, FLO, PRI, SJF, VAL
<i>Witheringia</i> sp.	Hoyos, D. 9	Shr.	sp. nov.	NE	FLO

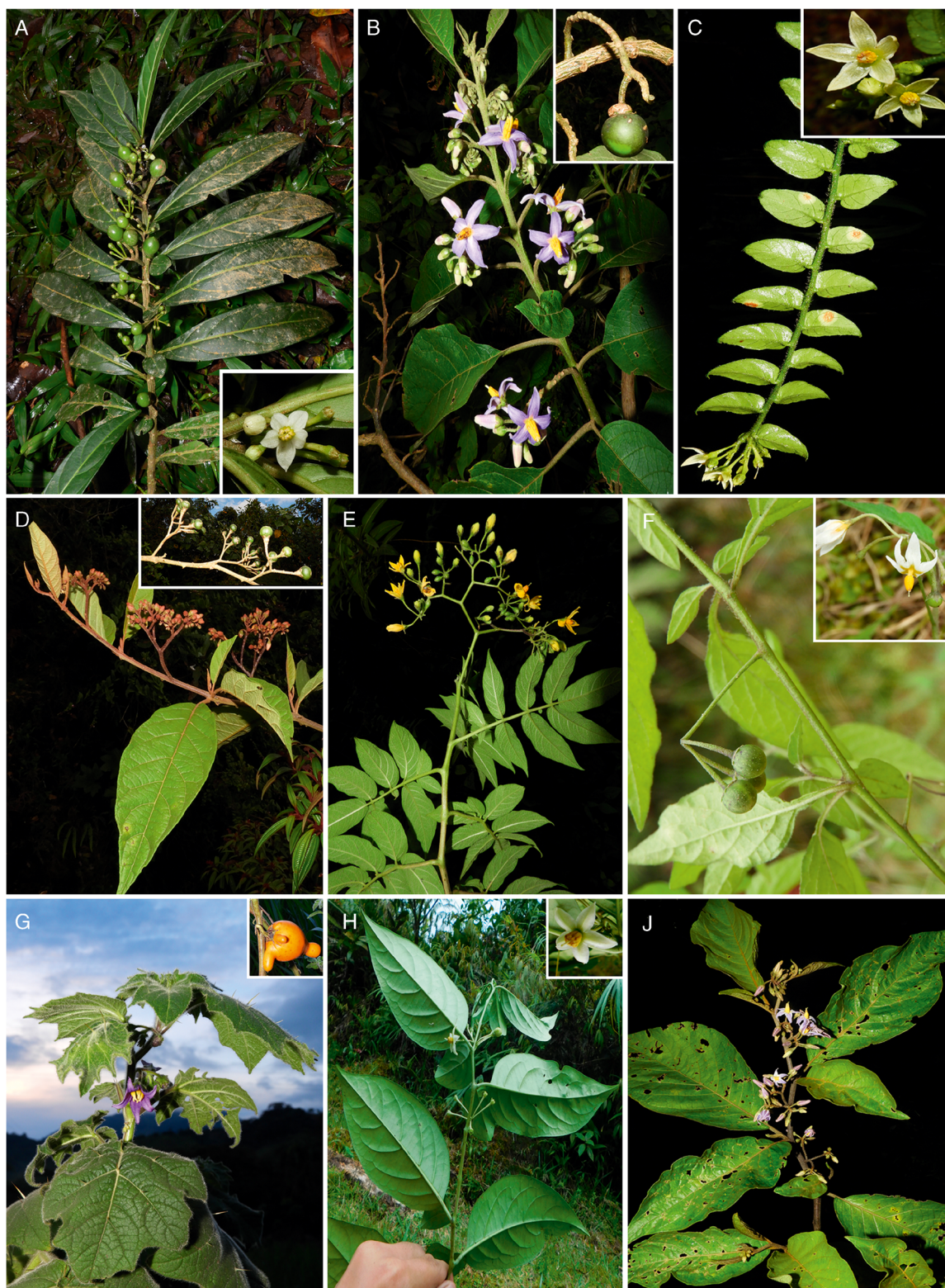


Fig. 2. Species of *Solanum* present in Caquetá Department. A *S. cf. anisophyllum* Van Heurck & Müll.Arg. (Hoyos 22 [COAH, HUAZ]); B *S. cyathophorum* M.Nee & Farruggia (Hoyos 210 [COAH, HUAZ]); C *S. evolvulifolium* Greenm. (Hoyos 44 [HUAZ]); D *S. junctum* S.R.Stern & M.Nee (Hoyos 164 [HUAZ]); E *S. juglandifolium* Dunal (Hoyos 161 [COAH, HUAZ]); F *S. macrotonum* Bitter (Hoyos 157 [COAH, HUAZ]); G *S. mammosum* L. (Hoyos 153 [COL]); H *S. nudum* Dunal (Hoyos 1 [HUAZ]); J *S. ovalifolium* Dunal (Hoyos 115 [COAH]). PHOTOS: D. HOYOS.

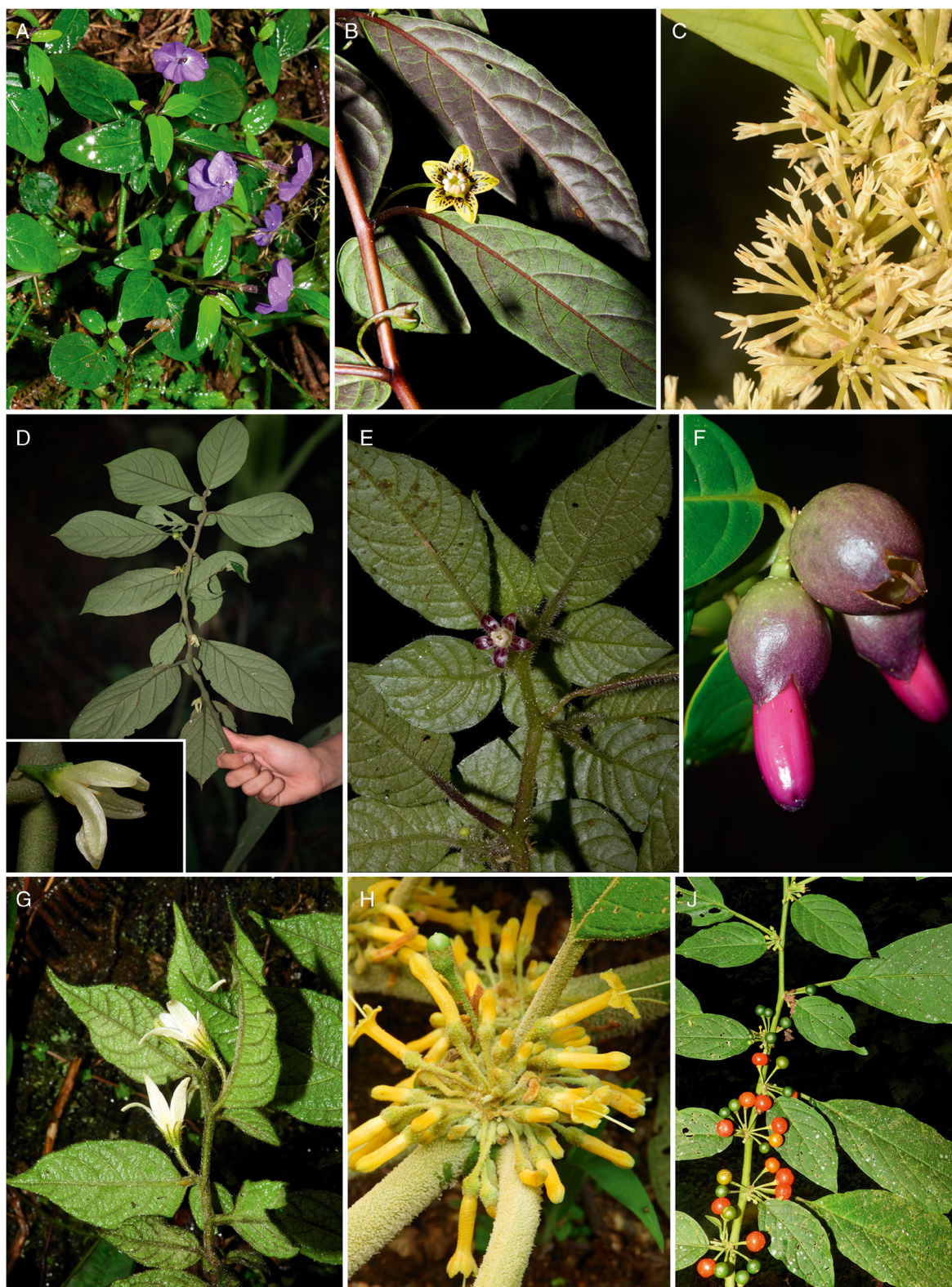


Fig. 3. Genera of Solanaceae present in Caquetá Department. **A** *Browallia americana* L. (Hoyos 183 [HEA]); **B** *Capsicum geminifolium* (Dammer) Hunz. (Hoyos 165 [COAH, HUAZ]); **C** *Cestrum schlechtendahlui* G.Don (Hoyos 107 [COAH, HUAZ]); **D** *Cuatresia harlingiana* Hunz. (Hoyos 180 [COAH]); **E** *Deprea macasiana* (Deanna, S.Leiva & Barboza) Barboza (Hoyos 138 [COAH]); **F** *Juanulloa speciosa* (Miers) Dunal (Hoyos 237 [HUAZ]); **G** *Lycianthes acutifolia* (Ruiz & Pav.) Bitter (Hoyos 181 [COAH, HUAZ]); **H** *Saracha nigribaccata* J.M.H.Shaw (Hoyos 163 [COAH, HUAZ]); **J** *Witheringia solanacea* L'Hér. (Hoyos 158 [COAH, HUAZ]). PHOTOS: **A, B, G, H, J** D. HOYOS; **C, F** D. SANIN; **D** S. MORENO; **E** L. CLAVIJO.

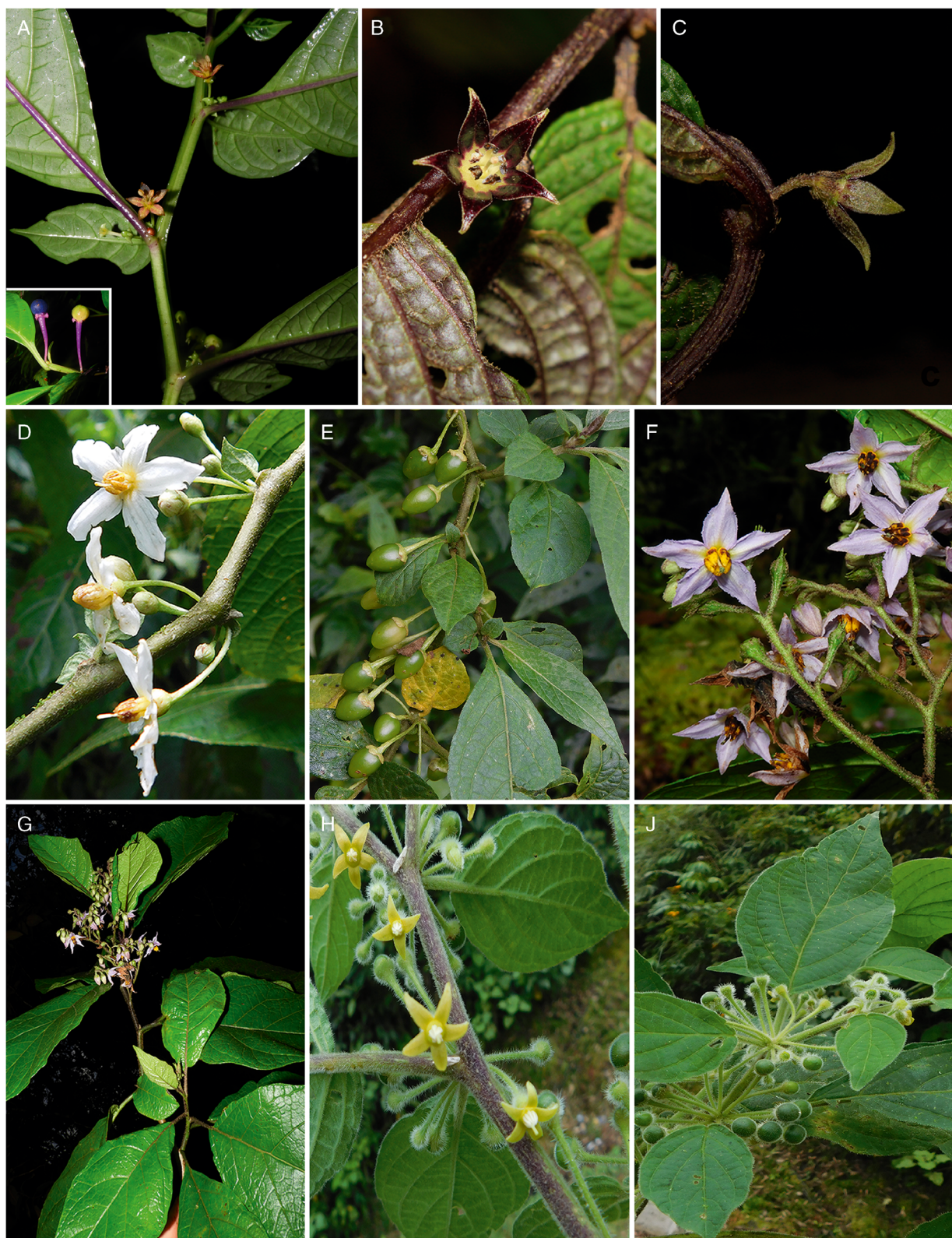


Fig. 4. Possibly new and recently described species found in Caquetá Department. **A** *Capsicum regale* Barboza & Bohs (Hoyos 118 [COAH, HUAZ]); **B, C** *Deprea teresitae* Deanna & A.Orejuela (Deanna 433 [CORD]); **D, E** *Lycianthes* sp. (Hoyos 55 [COAH, HUAZ]); **F, G** *Solanum* sect. *Torva* (Hoyos 239 [HUAZ]); **H, J** *Witheringia* sp. (Hoyos 9 [COAH, HUAZ]); PHOTOS: **A, E – J** D. HOYOS; **B, C** R. DEANNA.

Table 2. Regional assessments for conservation status according to IUCN (2012a).

Species	AOO (km ²)	Number of localities	Indicators of present or possible threats in the near future	IUCN global category	Category and criteria regionally assessed
<i>Capsicum regale</i> Barboza & Bohs	12	2	Habitat loss due to fragmentation and deforestation for wood extraction and land use change for cattle ranching and agricultural crops	EN	EN B2ab(iii)
<i>Cuatresia harlingiana</i> Hunz.	8	2	Both localities are interrupted by a road, besides this species is associated with small streams so it is subject to constant torrential floods caused by deforestation	NT	CR B2b(iii)
<i>Deprea teresitae</i> Deanna & A.Orejuela	4	1	This species was recorded at the roadside, where vegetation is periodically removed for road maintenance	EN	CR B2ab(iii)
<i>Markea epifita</i> S.Knapp	4	1	Habitat loss due to fragmentation and deforestation for wood extraction and land use change for cattle ranching and agricultural crops	VU	CR B2ab(iii)
<i>Schwenckia alvaroana</i> Benítez	4	1	It is only known from the type collection, collected more than 30 years ago. Known from only one locality with high rates of deforestation for cattle ranching	NE	CR B2ab(ii, iii)

Key to the genera of the Solanaceae from Caquetá, Colombia

1. Plants dioecious **Saracha** (*S. nigribaccata*)
1. Plants monoecious or with perfect flowers 2
2. Anthers with poricidal dehiscence 3
2. Anthers with longitudinal dehiscence 4
3. Calyx 5-toothed, lobed or truncate with 5 vascular ribs; plants sometimes with compound leaves, tubers and/or thorns **Solanum**
3. Calyx 10-toothed or truncate with 10 vascular ribs; plants always with simple leaves, without tubers or thorns **Lycianthes**
4. Androecium with 4 stamens/staminodia or fewer 5
4. Androecium with 5 stamens 8
5. Corolla salver-shaped 6
5. Corolla stellate, tubular or funnel-shaped 7
6. Herbs; stems herbaceous; membranes interpetalar present **Browallia**
6. Shrubs or trees; stems woody; membranes interpetalar absent **Brunfelsia**
7. Climbers; calyx toothed tubular; 2 stamens, with staminodes (3); fruit a capsule **Schwenckia** (*S. alvaroana*)
7. Herbs or shrubs; calyx truncate cyathiform; 4 stamens, without staminodes; fruit a berry **Witheringia**
8. Fruiting calyx inflated, completely enveloping the fruit 9
8. Fruiting calyx slightly or not accrescent, not completely enveloping the fruit 11
9. Calyx deeply lobed with cordate sagittal lobes at their bases (lobes widely separated, joining at the base of the calyx) **Nicandra** (*N. physalodes*)
9. Calyx fused without cordate sagittal lobes at their bases (lobes shortly separated, joining the calyx in the middle or above) 10
10. Corolla campanulate, stellate or infundibuliform, green, yellowish-green or purple; stamens with staminal plaque and sometimes conspicuous auricles **Deprea**
10. Corolla rotate, yellow, sometimes with purplish spots inside; stamens without staminal **Physalis**
11. Inflorescence in thyrses; bracts and bracteoles present 12
11. Inflorescences in corymbs, fasciculate, cymose, racemose or solitary flowers; bracts and bracteoles absent ... 13
12. Leaves petiolate; calyx < 8 mm long; fruit a berry **Cestrum**
12. Leaves sessile; calyx > 9 mm long; fruit a capsule **Nicotiana** (*N. tabacum*)
13. Herbs, shrubs, or trees 14
13. Epiphytic or hemiepiphytic shrubs or vines 17
14. Anthers basifixed; flowers > 20 cm long **Brugmansia**

14. Anthers dorsifixed or ventrifixed; flowers < 15 cm long 15
15. Leaves alternate, geminate; fruit a berry 16
15. Leaves opposite or subopposite, not geminate; fruit a capsule..... **Petunia (P. × hybrida)**
16. Plants growing near water; stems with thickened knobs; anthers ventrifixed **Cuatresia**
16. Plants growing at edges, in forest interiors, in pastures, or cultivated; stems without thickened knobs; anthers dorsifixed... **Capsicum**
17. Corolla tube the same length as the sepals.... **Trianaea (T. speciosa)**
17. Corolla tube much longer than the sepals 18
18. Flowers zygomorphic; stamens exserted **Schultesianthus**
18. Flowers actinomorphic; stamens included 19
19. Corolla < 2 cm long..... **Hawkesiophyton (H. ulei)**
19. Corolla > 2 cm long 20
20. Corolla narrowly tubular; the tube and lobes thick and fleshy in texture; anthers dorsifixed; seeds reniform **Juanulloa**
20. Corolla infundibuliform; the tube and lobes membranous in texture; anthers basifixed; seeds elongated **Markea**

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1007/s12225-022-10062-z>.

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Declarations

Conflict of interest. The Authors declare that they have no conflict of interest.

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