

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title: Expedition to collect species of *Solanum* (Torva Clade) in the Peruvian Andes

Travel Dates: 15th July – 18th November 2021

Location: Peru – Amazonas, Cajamarca, Cusco, Huánuco, Junín, Lima, La Libertad, Loreto, Pasco, San Martín.

Group Members: Briggithe Melchor Castro

Aims: The project proposes to understand the most complex and poorly known species of Torva Clade of *Solanum* for taxonomic work.

Photography consent form attached: Yes
(please refer to your award letter) No

Outcome (a minimum of 500 words)

**Taxonomy, phylogenetics, and morphological diversity of the pea
eggplant (*Solanum torvum* Sw.) and its wild relatives**

**Expedition to collect species of *Solanum* (Torva Clade)
in the Peruvian Andes**



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SUMMARY

Through this fieldwork were collected species of Torva Clade of *Solanum* in the Andean and Amazon regions of Peru during July and November 2021. A total of 171 specimens were collected of nine species of Torva Clade. The fieldwork was divided into three trips: (1) Central Peru, specifically, to Áncash, Huánuco, Junín, Lima, Pasco; (2) Northern Peru, La Libertad, Cajamarca, Amazonas, San Martín and Loreto; (3) Southern Peru, Cusco.

INTRODUCTION

The Torva Clade of *Solanum* consists of ca. 66 species and includes the cultivated pea eggplant (*S. torvum* Sw.) used across the globe for its edible fruits across the globe (Lim 2013; Vorontsova & Knapp 2016). The clade is mainly restricted to the Neotropics (66 species, Table 1) with a few exceptions (e.g., *S. torvum* distributed globally; Stern et al. 2011, Aubriot et al. 2016). Most of the species are found in the tropical Andes, with a centre of species diversity in Peru.

The taxonomy of the Torva Clade remains poorly understood. A total of 269 names have been published (SolanaceaeSource.org) that refer to species within the clade, and it is unclear how many of these refer to unique species.

The Old-World species of the Torva Clade (i.e., section *Torvum*) have recently been taxonomically revised (Vorontsova & Knapp 2016; Aubriot & Knapp in prep.) but no taxonomic monograph exists for the New World members of the clade. Floristic accounts are useful in identifying species but an overview of the morphology and nomenclature across the group is needed to fully understand species diversity and accepted names in the group.

My PhD project aims to clarify taxonomy, morphology, and molecular phylogenetics of the Torva Clade of *Solanum*, with special focus on the New World members of the clade.

The proposed fieldwork aims to collect herbarium samples of the most complex and/or poorly known species of the Torva Clade of *Solanum* for taxonomic work. Field collections would also enable the collection of silica dried leaf material needed for molecular phylogenetic work.

METHODS AND PRELIMINARY RESULTS

Fieldwork was done between July and September 2021 to observe morphological variation across ca. 16 species of the Torva Clade that are known to

occur in the country (Table 1; Fig. 1, 2, 3). Approximately a total of 500 specimens were collected, of which 179 represent six Torva Clade species (Table 1). The fieldwork was divided into three trips (Table 1, Fig 2). Silica dried leaf material was also collected during the fieldwork to collect DNA samples for Torva Clade.

For all collections, geographical coordinate and elevation data was recorded with Garmin GPS. Label data for all collections included habitat information as well as plant description focused on characters that are lost during the drying process (e.g., habit, size, and smell). Photographs were taken whenever possible. Silica dried leaf material was collected for each numbered collection. Seeds were collected for all collections that had fully mature fruits available. Specimens were dried in the field using a portable drying convection system in the first two fieldtrips. For the last two trips, specimens were preserved in 70% alcohol and heat dried in Lima at the (USM).

Six duplicates were made for each collection whenever possible. All specimens collected during the fieldwork were deposited at the USM herbarium (Peru's national herbarium at Natural History Museum of San Marcos University in Lima). Two duplicates will be sent within Peru to HUT (Trujillo herbarium) and CUZ (Cusco herbarium). Three duplicates will be exported to the UK for further morphological study at E herbarium.

A total of 171 specimens were collected of 9 species of the Torva clade. All collections are summarised in table 1.

Table 1 Summary of the four fieldtrips done in Peru.

Dates	Regions	Localities	Species of Torva Clade collected (number of specimens)
Fieldtrip 1 15 th Jul – 6 th Aug	Áncash	Santa Rosa	No recordings
	Huánuco	Ambo	
		Cayna	
		Tomayquichua	
		Huánuco	<i>S. cf. albidum</i> Dunal (1)
		Chinchao	<i>S. asperolanatum</i> Ruiz & Pav. (16)
		Huamalíes	<i>S. glutinosum</i> Dunal (6)
		Cochapata	
		La Unión	
	Tingo María		
	Junín	Chanchamayo	
		Perené	<i>S. albidum</i> Dunal (2)
		San Luis de Shuaro	<i>S. asperolanatum</i> Ruiz & Pav. (1)
		Tarma	<i>S. caricaefolium</i> Rusby (6)
		Palca	<i>S. glutinosum</i> Dunal (10)
Yaul		<i>S. saponaceum</i> Dunal (2)	
La Oroya			
Lima	Huarochiri	<i>S. asperolanatum</i> (1)	
Pasco		<i>S. albidum</i> Dunal (1)	
		<i>S. asperolanatum</i> Ruiz & Pav. (1)	
	Oxapampa	<i>S. caricaefolium</i> Rusby (3)	
	Huancabamba	<i>S. glutinosum</i> Dunal (1)	
	Pozuzo	<i>S. cf. glutinosum</i> Dunal (1)	
	Villa Rica	<i>S. cf. ovalifolium</i> Dunal (2)	
		<i>S. saponaceum</i> Dunal (1)	
Fieldtrip 2 11 th Aug – 4 th Sep	La Libertad	Trujillo	No recordings
		Sausal	
	Cajamarca	Cutervo	
		Bambamarca	<i>S. albidum</i> Dunal (12)
		Chota	<i>S. asperolanatum</i> Ruiz & Pav. (11)
		Jaén	<i>S. saponaceum</i> Dunal (6)
		San José de Lourdes	<i>Solanum</i> sp. (12)
		San Ignacio	

Dates	Regions	Localities	Species of Torva Clade collected (number of specimens)
		Bagua	
		Bongará	
		Florida	<i>S. albidum</i> Dunal (11)
		Jazán	<i>S. asperolanatum</i> Ruiz & Pav. (12)
	Amazonas	Valera	<i>S. saponaceum</i> Dunal (1)
		Chachapoyas	<i>S. cf. saponaceum</i> Dunal (2)
		Condorcaqui	<i>Solanum</i> sp. (3)
		Luya	
		Utcubamba	
		Pardo Miguel	
		Rioja	
		Moyobamba	<i>S. albidum</i> Dunal (1)
		Tarapoto	<i>S. caricaefolium</i> Rusby (1)
	San Martín	Río Naranjillo	<i>S. cf. caricaefolium</i> Rusby (25)
		Betania	<i>Solanum</i> sp. (4)
		Gosén	
		Laguna Venecia	
		El Dorado	
		Pongo de Caynarachi	
	Loreto	Yurimaguas	No recordings
		Caserío Suni playa	
		Carpish	
		Monzón	<i>S. cf. asperolanatum</i> Ruiz & Pav. (8)
	Huánuco	Caserío Nuevos Rondos	<i>S. cf. poinsettifolium</i> Rusby (6)
		Anta	<i>S. glutinosum</i> (2)
		Urubamba	
Fieldtrip 3		Huayopata	<i>S. cf. asperolanatum</i> Ruiz & Pav. (13)
10 th Nov – 18 th Nov	Cusco	Marunara	<i>S. cf. asperolanatum</i> Ruiz & Pav. (9)
		Kosñipata	<i>S. cf. asperolanatum</i> Ruiz & Pav. (2)
		Marcapata	<i>S. cf. asperolanatum</i> Ruiz & Pav. (6)

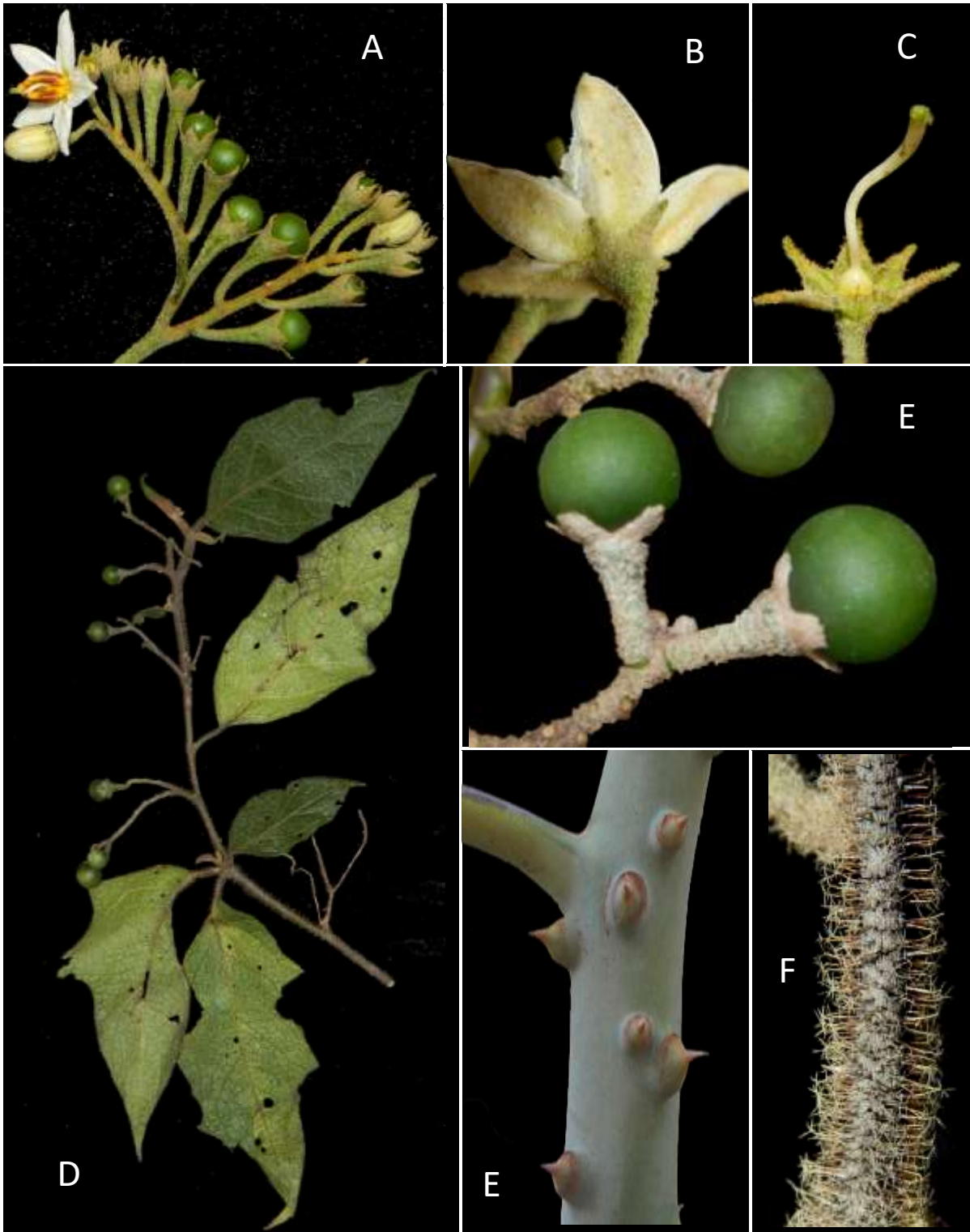


Figure 1. Morphological characters of **Torva Clade species of *Solanum***. A. racemose inflorescence. B. Abaxial face of flower. C. Pistil. D. Habit. E. Spines on the stem. F. Stellate pubescence.

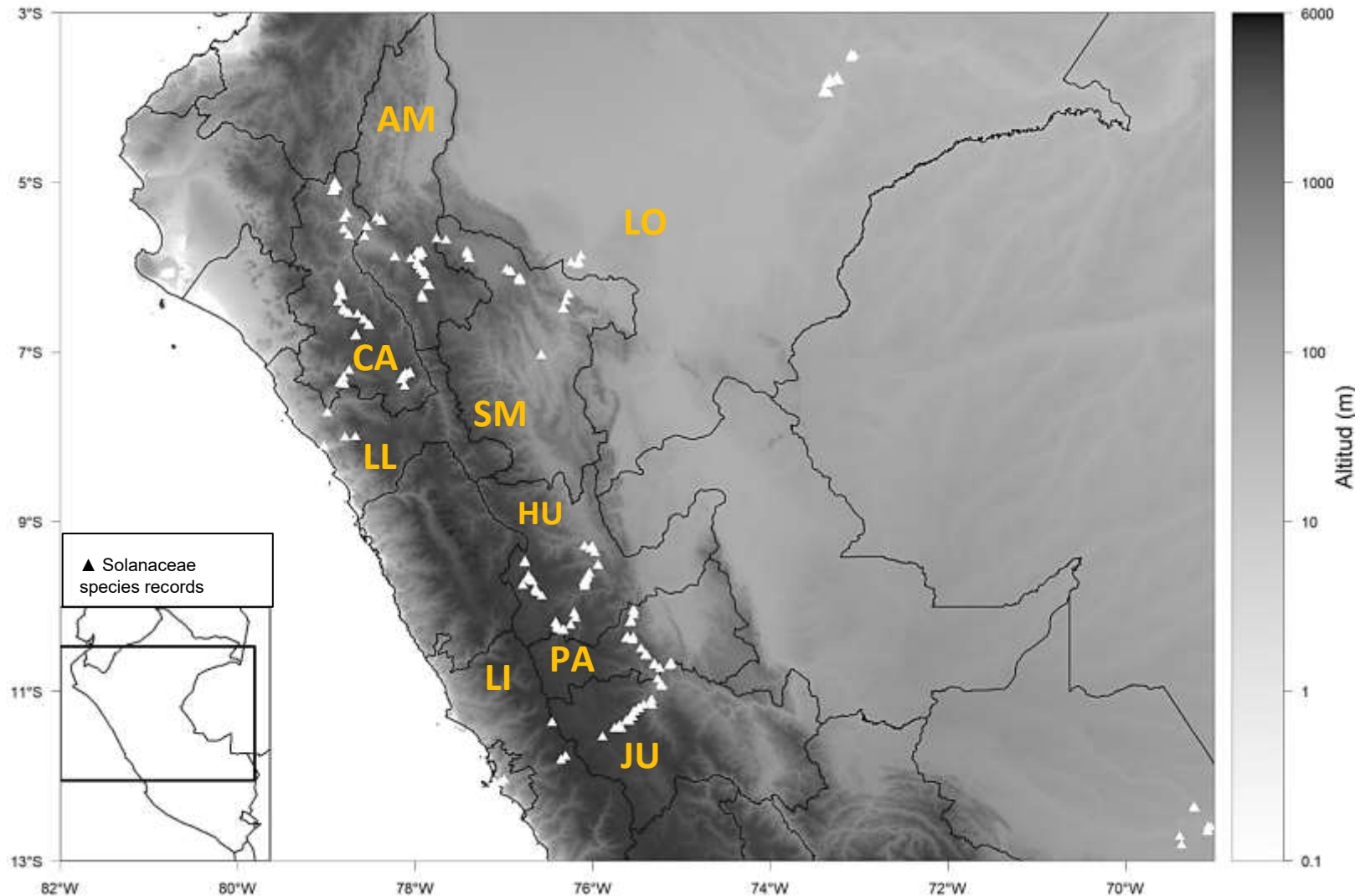


Figure 2. Map of fieldwork done in Peru during the 1st year of the PhD targeting all 16 species of Torva Clade of *Solanum* known to occur in the country. Collections made during the fieldwork are shown in white triangles. Main regions of Peru are show in black outlines and names are abbreviated as follows: AM Amazonas, CA Cajamarca, HU Huánuco, JU Junín, LI Lima, LL La Libertad, LO Loreto, PA Pasco, and SM San Martin.

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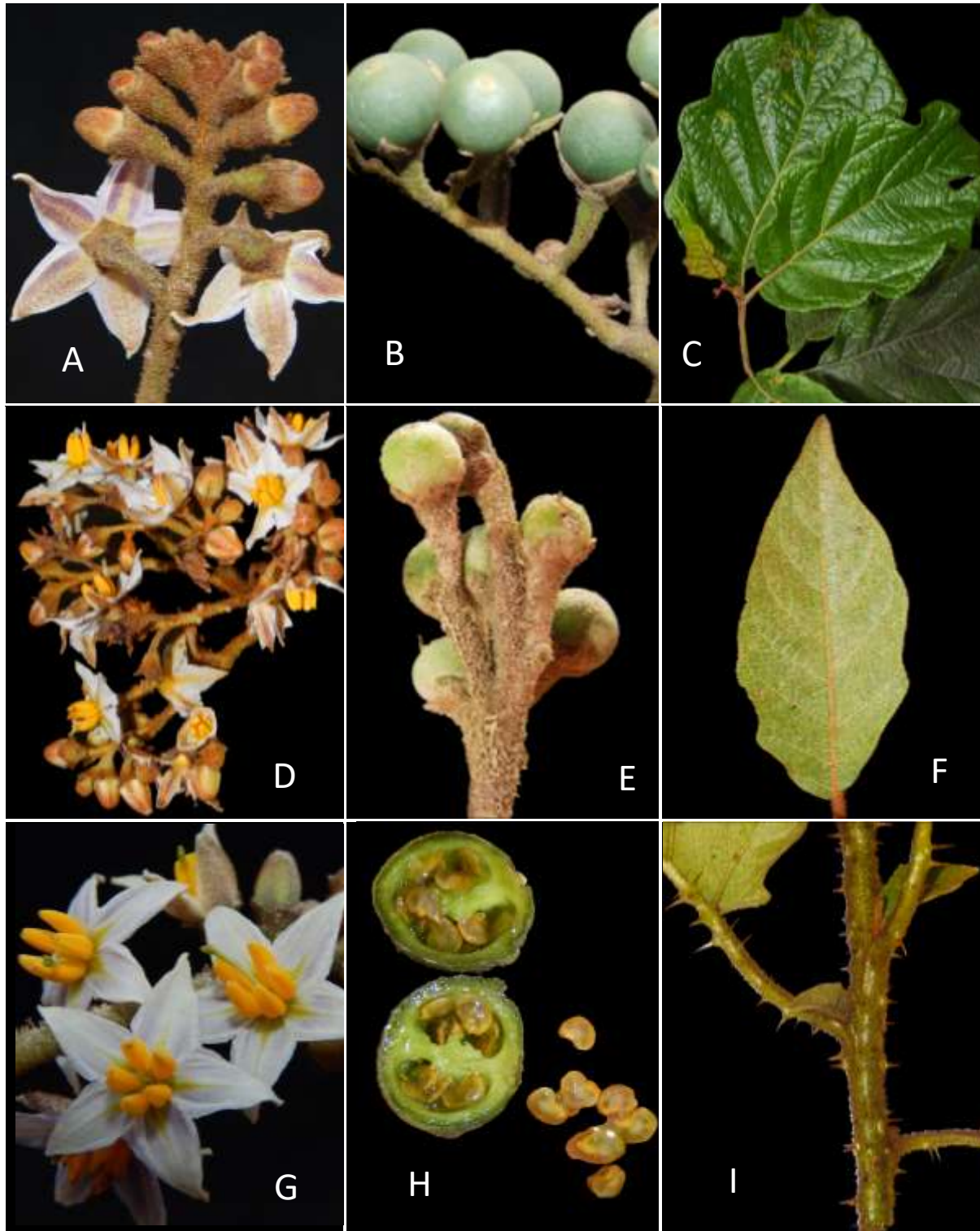


Figure 3. Morphological diversity of Torva Clade species of *Solanum*. **(A–I) *Solanum asperolanatum* Ruiz & Pav.** A. Flower (abaxial surface, *Melchor 1186*). B. Fruits (*Melchor 832*) C. Leaf blade (adaxial surface, *Melchor 832*). D. Inflorescences (*Melchor 1162*). E. Fruits and pedicels (*Melchor 1181*). F. Leaf blade (*Melchor 1164*). G. Flowers (*Melchor 1186*). H. Fruit (transversal cut) and seeds (*Melchor 1181*). I. Spiny stem (*Melchor 1165*).

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