

***Psidium acidum* (DC.) Landrum (Myrtaceae), a Recently Grown Fruit Tree in Cuba**

Reinaldo Trujillo Sánchez¹, Marta Hernández de la Torre², Iris Yalina Hernández Rodríguez³
& Isidro E. Méndez Santos⁴

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ABSTRACT

This is the first record of *Psidium acidum* (DC.) Landrum (Myrtaceae) in Cuba, a species originally from South America, which belongs to the sour guava group. Botanical methods like collection works, specialized catalogs, description, and scientific illustrations, were used. The usefulness of ripe fruit for human nutrition, the application of fungicides and antioxidants from branch and leaf extracts, and the plant usefulness as graft carrier for commercial cultivars were addressed as well. An analytical key was recommended to contrast from akin taxons observed in the Cuban archipelago.

KEY WORDS:/ Cuban flora, grown plants, fruit trees, *Psidium*, sour guava.

INTRODUCCION

Upon searching for *Psidium guajava* L. (Myrtaceae) cultivars that could be used for genetic improvement or graft-carrier patterns, a team of researchers from the Center of Bioplants at the University of Ciego de Ávila found a variant that did not match any of the taxons recorded in Cuba so far. One of the most notorious features was that the pulp was very similar to that of guava's, but more acidic, whose aroma and taste were completely different from other commercial species of genus *Psidium* L., the main reason why it is called sour guava in the central region of the country.

MATERIALS AND METHODS

The result was achieved within the framework of a research project named, *Installing a centre of excellence in the Central-Eastern region of Cuba to enhance production and research on bioactive plants* (coordinated by the University of Camagüey and the University of Antwerp, funded by the Belgium government through the VLIR-UOS Program. It is part of a strategy for genetic breeding of guava (*Psidium guajava*) in Cuba, which is oriented to broaden the collection of the Myrtaceae family recorded in Cuba by Valdés-Infante, Rodríguez, Velázquez, Sourd, González, Rodríguez, *et al.*, (2012).

In 2013, a number of seeds reported as sour guava, were donated by a farmer in Ciego de Avila province. The seeds were made to germinate in the Laboratory of Metabolic Engineering of the

¹ Bachelor of Science, in Biology. Ph.D Biological Sciences, Senior researcher, Associate professor. Bioplants Center, Maximo Gomez Baez University, Carretera a Morón, Km 9 1/2, Ciego de Ávila. E-mail: rtrujillo@bioplantas.cu

² Ph.D., Professor-Researcher Faculty of Forestry Sciences, University of Concepción Victoria 631, Barrio Universitario. Biobío Region. Chile. P.O. Box 160-C-E-mail 3: marhernandez@udec.cl

³ Agronomical Eng., M.Sc. in Plant Biology. Biofactory, Ciego de Avila, Carretera a Morón, Km 9 1/2, Ciego de Ávila.

⁴ Professor of Agronomy. Ph.D Biological Sciences. Full Professor. Center for Environmental Management Studies. Ignacio Agramonte Loynaz University of Camagüey, Cuba: isidro.mendez@reduc.edu.cu

Bioplants Center, Maximo Gómez University of Ciego de Ávila, Cuba. Planting was made the same year, and 10 individuals were studied for five years. The plants were treated agronomically, according to the technical standards for guava (MINAG, 2011). The samples were herborized, and digital images were taken of different plant organs. The specimens were deposited in Julián Acuña Galé herbarium, at the Ignacio Agramonte University (HIPC-Thiers, 2018).

The identity of the taxon was first established by contrasting the specimens to available online images (<http://www.tropicos.org/Name/22101508?tab=images>). Then they were compared to descriptions and keys in Rivero-Maldonado (2013) and Landrum (2016). Besides, digital images from other herbariums were consulted: US and ASU.

The protolog was located at the open-access portal of the Biodiversity Heritage Library Consortium (<https://www.biodiversitylibrary.org/>). The typological material was located through the database of Global Plant JSTOR (<http://plants.jstor.org>). The species nomenclature fit the standards of the International Code of Nomenclature for algae, fungi, and plants (Turland, Wiersema, Barrie, Greuter, Hawksworth, Herendeen, *et al.*, 2018). The Font Quer (1975) terminology was used for description. The search of possible documentary evidence of the species in Cuba included the review of materials deposited in other herbariums: HAC, HAJB, HIPC, and ULV (Thiers, 2018), along with a review of the literature.

RESULTS AND DISCUSSION

The species was identified as *Psidium acidum* (DC). Landrum, from the Myrtaceae family. Therefore, it is a novel plant grown in Cuba. Below are the most significant details related to the nomenclature, morphology, distribution, ethnobotany, and ecology:

Psidium acidum (DC.) Landrum Brittonia 68: 411. 2016≡*Psidium acutangulum* var. *acidum* DC. Podr. 3: 233. 1828. Holotype: [specimen] Brazil. “ad Nogueira prov. Rio-Negro”, C. F. P. Martius n.a. (M [photo!]). Fig. 1.

Small tree up to 3.5 m high, semi-erect, with numerous horizontal branches. *Leaves*: erect opposite decussate; 0.5 cm slightly curved petioles; lanceolate-elliptical laminas, brown-reddish when young-light green when adult, 7-10.5 x 4-5 cm; venation brachidodrome, sunk in the upper side, prominent on the lower side, with 10-16 secondary vein pairs, initially straight then curved between 3-10 mm before the edge; undulated margin; apiculate apex; round base; hairless on either side. *Flowers*: solitary axillary flowers, sometimes in clusters of 2-3 units; hermaphrodite; 2-3 cm pedicels. *Calyx*: 2-3 free, suborbicular concave sepals, 0.5-1 x 1-1.8 cm, green outside and whitish inside, hairless, and rounded in the apex. *Corolla*: 4-5 petals (one of them usually modified and atrophied), free, white, elliptical, 1.5-1.9 x 1-1.6 cm, obtuse in the apex. *Androecium*: more than 397 stamens, erect, compacted; up to 1.5 cm long filaments; dorsifixed anthers, with longitudinal dehiscence. *Gynoecium*: 4-5-carpellary, swollen hypanthium; inferior ovary, 1.7 cm style; capitate stigma. *Fruit*: in the form of a smooth spherical berry (6-7 cm diameter), green when young and yellow as mature. *Seeds*: smooth cuneiform, and beige; 16 or more per fruit.

The plant is originally from South America, and lives in Brazil, Ecuador, and Peru. It is spread in virgin and disturbed forests, near rivers, and frequently flooded, between 180 and 500 m of altitude (Landrum, 2016). The reports of *P. acutangulum* in the north of the continent, Guyana,

Orinoco Heights, and Low Amazon (Falcão *et al.*, 1992); Surinam (Roosmalen, 1985), Colombia, Venezuela, Peru (Cavalcante, 1974; Rivero-Maldonado, Pacheco, Fuenmayor, Sánchez, Quirós, Ortega, *et al.*, 2012), Bolivia and Ecuador (USDA, 2017), as well as in the Brazilian states of the Amazon region, Pará (Maia, 2001 and Revilla, 2002), and Acre (Landrum, 2003), should be re-evaluated, according to the criteria of Landrum (2016) to contrast the two species, which might broaden the known distribution of *P. acidum*.

All seems to indicate that the introduction of *P. acidum* in Cuba was made recently. This plant has only been spotted in Ciego de Ávila so far. It is part of the live collections at the Bioplants Center, of Maximo Gómez University, Ciego de Ávila, from where it was taken by the main author of this research to other institutions, like the National Botanical Garden and the Botanical Garden of Pinar del Río province, as well as collectors in the province of Sancti Spiritus.

This species has not been recorded in Cuba in the works of Pichardo (1862), Sauvalle (1873), Gómez de la Maza (1889 y 1897), Gómez de la Maza & Roig (1914), Alain (1953), Roig (1965), Alain (1969), Boldo & Estévez (1990), Esquivel, Knüpffer & Hammer (1992), Acevedo-Rodríguez, & Strong (2012), and Greuter & Rankin (2017). No references of this species have been found in the Cuban Network of Biodiversity Information or in herbariums HAC, HAJB, HIPC, and ULV (updated Thiers).

Specimens observed: Ciego de Ávila, backyard of the biofactory, Km 9 1/2, Carretera a Morón, R. Trujillo, HPC-12030, 15-V-2016 (HIPC).

The ripe fruit is used for human nutrition despite its acidity (Fretter, Vizzotto, Corbelini & González, 2010). It is sold in the Brazilian Amazon states, mostly as wild plants for the local market only (Genovese, Pinto, Souza & Lajolo, 2008). Moreover, its application is potentially high, especially due to its fungal action. Extracts collected from branches and leaves have been active against fungi *Rhizoctonia solani*, *Helminthosporium teres* and *Pythium ultimum*. Other studies have conferred it fungicidal activity produced by the 3'-formyl-2',4',6'-trihydroxy chalcone compound in the organs (Howard, Rosa de Medeiros, Chittawong, Hedin, Swithenbank & Lidert, 1991).

Extracts collected of what was formerly called *P. acutangulum* demonstrated antioxidant activity comparable to other representatives of genus *Psidium* (Zapata *et al.*, 2013). Ramos, Rodrigo, Boleti, Bruginski, Lima, Campos *et al.* (2015) identified nine compounds (a disaccharide, five monosaccharides, two organic acids, one trihydroxycinnamic glucopyranosyl acid, tannin digloiloil glucopyranosyl, five, triterpenoid acids, and six fatty acids) isolated from fruits. Three of them were discovered in this genus for the first time. Also, Rivero-Maldonado, Pacheco, Martín, Sánchez-Urdaneta, Quirós, Ortega, *et al.* (2013) confirmed the presence of myricetin, another flavonoid with similar properties. The work of Landrum (2016) shows some level of uncertainty in relation to the higher antioxidant capacity than *P. friedrichsthalianum* (Berg.) Nied. ("el arañá-de Costa Rica") and *P. guajava*, is actually from *P. acutangulum* or *P. acidum*.

P. acidum is part of the so called group of sour guava trees, which also comprises *P. acutangulum*, *P. friedrichsthalianum*, known as 'cass'; *P. sartorianum* (O. Berg) Nied., commonly named 'arrayan', and *P. cattleianum* Sabine (guava-strawberry). The second is, at least, used as graft carrier for commercial species, since it has demonstrated to confer nematode

resistance (Flores, 2011), particularly against *Meloidogyne enterolobii* Yang & Eisenback (Marques, Pimentel, Tavares, Veiga & Berbara, 2012). These properties should be evaluated in the first species too.

With the inclusion of *P. acidum* the total number of species (1993-94 census of the National Botanical Garden, Greuter & Rankin, 2017) of this genus represented in Cuba is 28, either by spontaneous appearance (18 of which are endemic), or cultivated (even by related institutions). This is the fourth species of sour guava seen in the country, at least in scientific collections (the others are *P. cattleianum*, *P. friedrichsthalianum*, and *P. sartorianum*), which can be contrasted through the analytical key below:

- 1 Opposite distic leaves..... *P. friedrichsthalianum*
- 1* Opposite decussate leaves..... 2
- 2 Number of secondary vein pairs in the foliar laminas, always above 10 (16 or more)..... *P. acidum*
- 2* Number of secondary vein pairs in the foliar laminas, usually below 10, rarely seen 12-15 (16) leaves 3
- 3 1-3 cm petiole; up to 5 seeds per fruit *P. sartorianum*
- 3* 0.2-1.4 cm petiole; between 12 and 64 seeds per fruit.....
*P. cattleianum*

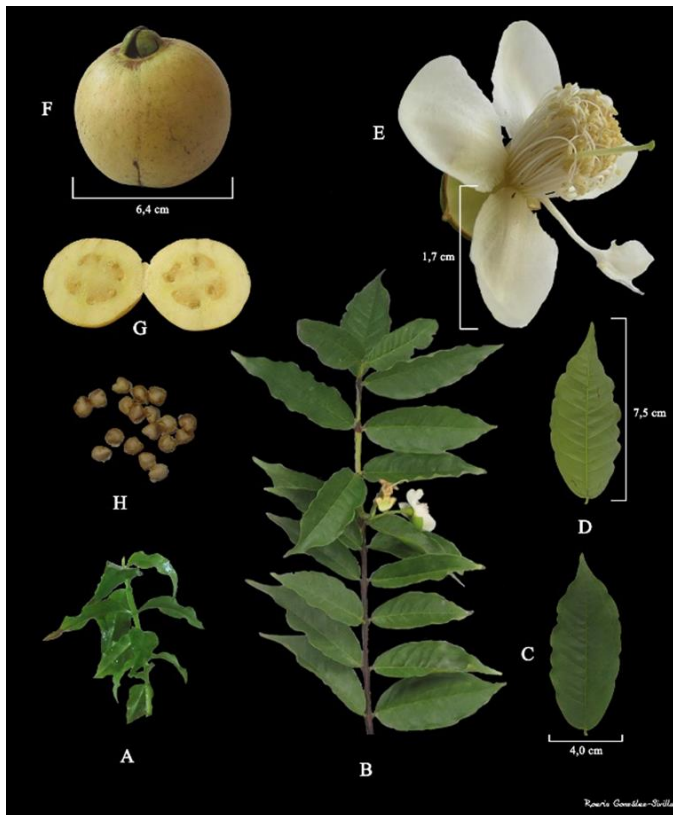


Figure 1. *Psidium acidum* (DC.) Landrum (Myrtaceae). A and B, branches C, leaf (upper side). D, leaf (lower side). E, flower. F, fruit (outer view). G, fruit (inner view). H, seeds. Photos: Reinaldo Trujillo Sánchez. Photo testimony. Roeris González-Sivilla

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