

The first record of *Physalis angulata* L. (Solanaceae) for the flora of Libya

Mohammed H. Mahklouf

Department of Botany, Faculty of Sciences, Tripoli University, Tripoli-Libya, e-mail: mahklouf64@yahoo.com; ORCID: <https://orcid.org/0000-0001-8402-797X>

Abstract. *Physalis angulata* has been discovered and recorded for the first time in the flora of Libya. This species was collected from the Bilash'har region belonging to the city of Tajura, about 20 km east of Tripoli. *P. angulata* is easily identified by its small yellow flowers without central dark spots in the center, and by pedulus globose berry enclosed within an inflated bladdery fruiting calyx. Detailed descriptions, photographs, habitat and ecology are provided for easy identification, and to facilitate further identification of this species and to warrant its future detection.

Key words: *Physalis angulata*, Solanaceae, Wild tomato, Gooseberry, Ribes uva-crispa

1. Introduction

The name *Physalis* is from the Greek, meaning 'bladder', and refers to the inflated calyx. The genus is a member of the Nightshade family, Solanaceae (Mahalakshmi & Nidavani 2014). *Physalis* species are annuals or perennials, erect or decumbent, sometimes rhizomatous, glabrous or pubescent, and with variously toothed or lobed leaves (Mahalakshmi & Nidavani 2014). The genus *Physalis* is consisting of about 90-100 species (Mahklouf 2016; Sultana *et al.* 2008). It is thought that it originated in Mexico and presently, it is mainly distributed in tropical, south, and temperate America, although some species have a world-wide distribution (Kindscher *et al.* 2012; Rengifo-Salgado & Vargas-Arana 2013).

Most species of *Physalis* are native to America, except *P. alkekengi* that is native to the Old World (Hunziker 2001; Toledo & Barboza 2005). *Physalis* is a clearly defined genus, in the subfamily Solanoideae, tribe *Physaleae* (Toledo 2013; Samuels 2015), and has a distinctive fruit, a globose two-carpelate berry, small or large (4-7/10-20 mm in diameter) with either juicy or rather dry pericarp, enclosed in the inflated bladdery calyx (Martínez 1998; Hunziker 2001; Arenas & Kamienkowski 2013).

The centre of diversity of *Physalis* is Mexico, with most of species endemic to this area; two other centres

of the species diversity and endemism are United States and Central America (Martínez 1998). A few species are cultivated in the temperate and tropical Old World and in Australia, while others (mainly *P. peruviana* and *P. angulata*) are ruderal plants or weeds (National research Council 1989; Hunziker 2001). These plants were introduced into warm areas of the world in post-Columbian times, as a result of the voyages of exploration, discovery and commercial exploitation that began in the 16th century (Hedrick 1919; Arenas & Kamienkowski 2013).

The genus *Physalis* contains many species grown for their ornamental or edible fruits that are eaten raw or cooked. The most commonly cultivated species in North America is the tomatillo (*P. philadelphica*), which is often cultivated for food and used in salsa verde. Many other species, such as the Cape gooseberry (*P. peruviana*) and the husk tomato or muyaca in South America (*P. pubescens*), have been cultivated and eaten for their acidulous fruits (Von Mueller 1895). The Chinese lantern plant (*P. alkekengi*) is an ornamental species that is cultivated for its brightly colored orange-red husk (Kelly *et al.* 2012; Mahalakshmi & Nidavani 2014)

P. angulata is popularly known as Camapu, Cutleaf groundcherry, Wild tomato, Winter cherry, Cow pops, Chinese lantern, Mullaca, Koropo (in Western Africa) and Wild gooseberry, and has herbal characteristics

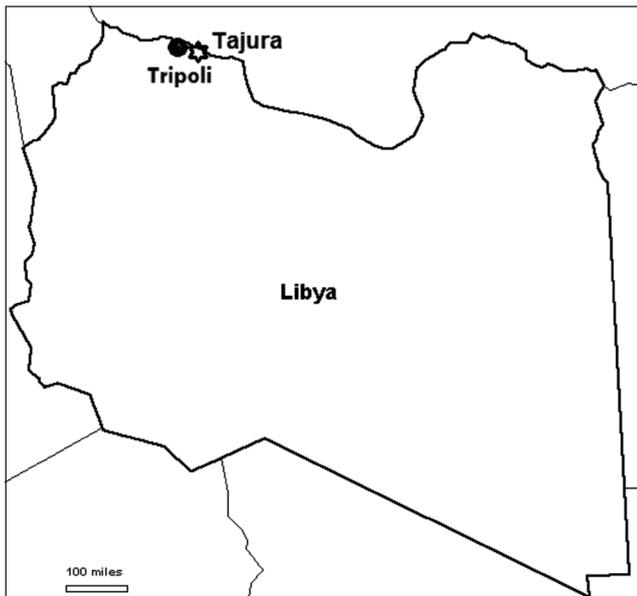


Fig. 1. A map of Libya showing the city of Tajura (Tajoura)

and perennial habit (Mahalakshmi & Nidavani 2014).

2. Material and methods

Plant specimens were reported from Bilash'har area belonging to the city of Tajura about 20 km east of Tripoli, (32°52'33.97" N, and 13°19'04.65" E) for two consecutive seasons 2017-2018, (Figs. 1-2). Plant specimens were collected by the author several times at the flowering and fruiting stages, brought to

the herbarium and subjected to ordinary herbarium techniques (pressing, drying, mounting, labeling). Then, they were examined carefully and characterized with detailed description. This procedure can facilitate the detection of new populations, supposing that *P. angulata* will continue to spread in the Libya territory.

The identification authentication of this species was done by the author, based on the data from the following literature sources: Mahklouf (2016), Sultana *et al.* (2008) and Gonen *et al.* (2000). The collected specimens were given a voucher number (76.62.8.2) and then deposited at the National Herbarium of the Department of Botany (ULT), Faculty of Sciences, Tripoli University, Libya.

Photographs were taken by the author and Mr Salem Saa'rana.

3. Results and discussion

The description was provided by the author based on the examined specimens.

Physalis angulata L. Sp. Pl. 1: 183. 1753.

Synonym: *Physalis pendula* Rydb. *Physalis angulata* L. var. *angulata*; *Physalis ciliata* Sieber; *Physalis minima* L.; *Physalis minima* L. var. *indica* (Lam.) C. B. Clarke.; *Physalis indica* Lam.; *Physalis parviflora* R. Br.

English names: Gooseberry, Hogweed, Balloon Cherry.

Description: Annual herb up to 100 cm tall, with erect to procumbent stem, glabrous or with a few short appressed hairs; stems quadrangular, hollow. Leaves

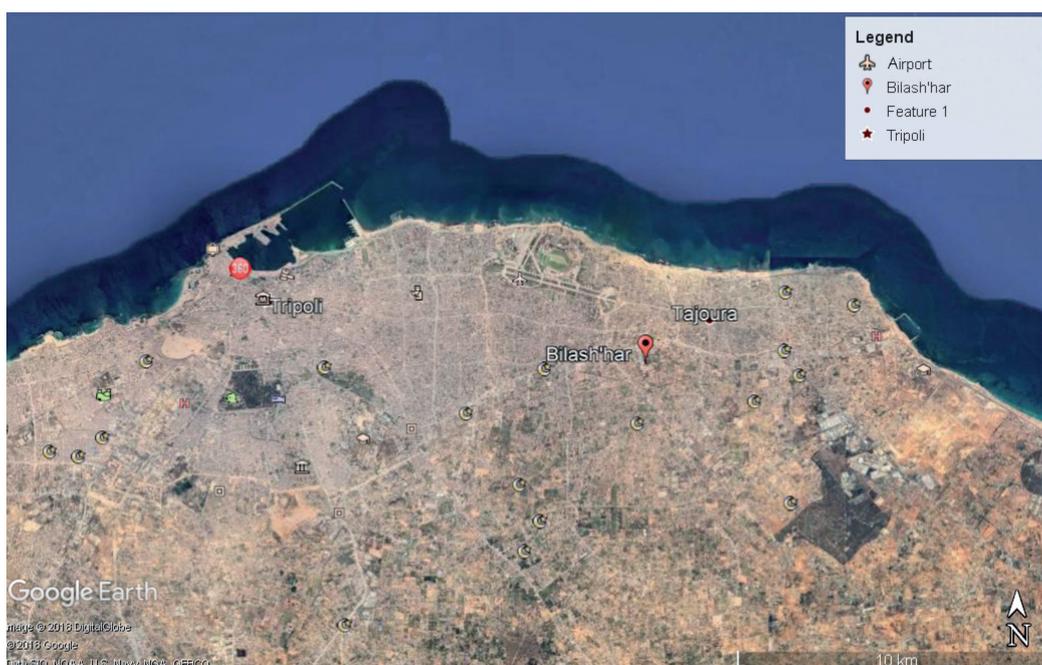


Fig. 2. A map of north-west Libya showing the site of *Physalis angulata* collection (Bilash'har) (source: Google earth)



Fig. 3 and 4. *Physalis angulata* habit

alternate, simple; exstipulate; petiole 2-11 cm long; blade ovate to broadly ovate, 4-15 cm × 3-10 cm, margin irregularly toothed. Flowers axillary, solitary, spreading or nodding, bisexual, regular, 5-merous; pedicel 6-12 mm long, elongated in fruit up to 22 mm; calyx campanulate, 5-lobed, 3-5 mm long, lobes acute, as long as tube, angled or ribbed, fruiting calyx 2-4 cm long; corolla campanulate, 6-13 mm long, pale yellow with faint 5 spots inside; stamens inserted near the base

of the corolla tube, filaments 2-5 mm long, anthers blue-purple; ovary superior, 2-celled, style filiform, stigma capitata. Fruit a globose berry 10-16 mm in diameter, pendulous, yellow, viscid, many-seeded, enclosed in the persistent, inflated bladdery calyx, which is 10 ribbed and 5-angled. Seeds many, reniform, 1.5-2.0 mm × 1.0-1.5 mm, pale brown (Figs. 3-6).

Flowering and fruiting: Almost throughout the year. (From. Sultana *et al.* 2008).



Fig. 5. Close-up of *Physalis angulata* flower



Fig. 6. *Physalis angulata* fruits

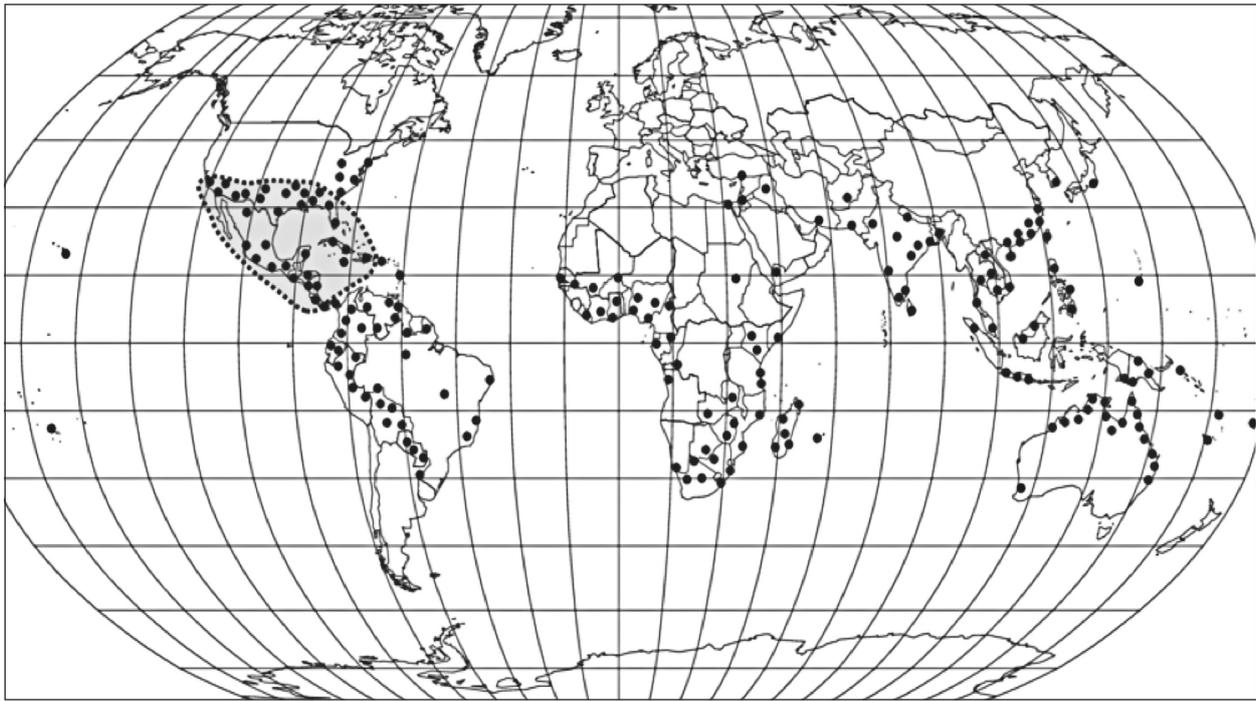


Fig. 7. Distribution of *Physalis angulata*

Explanation: the dots indicate the current distribution of *P. angulata* (on the basis of Flora treatments and herbarium specimen records); the shaded area represents the approximate area of ancient distribution [according to Martínez (1999)]

Chromosome number: $2n=24, 48$ (Fedorov 1969; Sultana *et al.* 2008). Tetraploid ($2n=48$) (Raju *et al.* 2007).

Physalis angulata is reported for the first time from the Bilash'har area, belonging to the city of Tajura, about 20 km east of Tripoli ($32^{\circ}52'33.97''$ N, and $13^{\circ}19'04.65''$ E). The identification of this species was done using the data from the following literature sources: Mahklouf 2016, Sultana *et al.* 2008, and Gonen *et al.* 2000. In addition, it is easily recognized by its yellow flowers without dark spots or with faint spots in the center, and pendulous globose green berry enclosed within the inflated baldberry fruiting calyx.

P. angulata was previously identified as *P. lanceifolia* (Jepson 1951). According to Gleason (1958), *P. pendula* and *P. angulata* were identified as two different species. Three varieties of *P. angulata* were recorded by Correl (1970): var. *angulata*, var. *lanceifolia* and var. *pendula*. *P. pendula* was recorded as the var. *angulata* in the eastern and southeastern USA in 1986. Finally, *P. lanceifolia* and *P. pendula* were recorded as synonyms of *P. angulata* in 1994 (Mahklouf 2016; Gonen *et al.* 2000).

P. angulata is an exotic species native to tropical America and currently it has a typical tropical and pantropical distribution as shown in Fig. 6 (Martínez 1999; Bean 2007). It should be considered a potential invader in the Mediterranean ecosystems, especially, in the East Mediterranean, where it was recorded in

Egypt by Tackholm (1974), reported from Turkey by Gonen *et al.* (2000), and from Iraq by Al-Ellagi (2012). Then, it was recorded from Syria by Mahklouf (2016) (Fig. 7), thus, this record constitutes a new point of spread of this species in the Mediterranean region, especially, it is the first record in north Africa and the West Mediterranean.

In the flora of Libya, only one species, *P. peruviana*, was recorded to be cultivated by Keith (1965), without locality or specimen in the herbarium (Siddiqi 1978), thus our present report is the first documented record of the genus *Physalis* represented by the species *P. angulata*, here is a key provided to distinguish this species from *P. peruviana*.

- Plant annual, glabrous, leaves irregularly dentate-serrate, corolla 0.6-1.3 mm a cross. Without dark purple spots or with faint spots inside, berry green *P. angulata*
- Plant perennial, densely tomentose, leaves entire or undulate, corolla 1.5-2.5 cm a cross, with dark purple spots inside, berry yellow *P. peruviana*

The species *P. angulata* is widespread as a weed and it is also cultivated for various purposes, including medicinal, food, forage, ornamental and other usages (Mahalakshmi & Nidavani 2014).

Acknowledgements. I am grateful to Mr Salem Shaarana and his daughter Rowaeda for their kind Help in collecting plant specimens and taking field photographs of the studied species.

References

- AL-ELLAGI S. 2012, New record *Physalis angulata* (Solanaceae) to the Flora of Iraq. *J Sci Univ Al-Nahreen*.15(4): 31- 42.
- ARENAS P. & KAMIENKOWSKI N. 2013. Ethnobotany of the genus *Physalis* L. (Solanaceae) in the South American Gran Chaco. *Candollea* 68(2): 251-266.
- BEAN A. R. 2007. A new system for determining which plant species are indigenous in Australia. *Aust Syst Bot* 20: 1-43.
- CORREL D. S. & JOHNSTON M. C. 1970. *Manual of the Vascular Plants of Texas*, pp. 1387-1391. Texas Research Foundation, Renner, Texas.
- FEDOROV A. A. 1969. *Chromosome Numbers of Flowering Plants*. 926 pp. Academy of Science of USSR, Moscow.
- GLEASON H. A. 1958. *The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada*. Vol. 3, Second edition, pp. 193-199.
- GONEN O., YILDIRIM A. & UYGUR F. N. 2000. New Record for the Flora of Turkey *Physalis angulata* L. (Solanaceae). *Turk J Bot*. 24: 299-301.
- HEDRICK U. P. 1919. Sturtevant's notes on edible plants. State of New York Department of Agriculture 2, II. J. b. Lyon Company, State Printers. Albany.
- HUNZIKER A. T. 2001. *Genera Solanacearum*. The genera of Solanaceae illustrated, arranged according to a new system. Gantner Verlag, Ruggell.
- JEPSON W. L. 1951. *A manual of the Flowering Plants of California*. California Press. Berkeley and Los Angeles. p. 893- 894.
- KEITH H. G. 1965. *Libyan Flora*. Ministry of Agriculture and Agrarian Reform. Libyan Arab Republic.
- KELLY K., QUINN L., STEVE C., KIRSTEN B., HILLARY L., MARK C. & BARBARA N. T. 2012. The Ethnobotany and Ethnopharmacology of Wild Tomatillos, *Physalis longifolia* Nutt., and Related *Physalis* Species: A Review. *Economic Botany* 20(10): 1-13.
- KINDSCHER K., LONG Q., CORBETT S., BOSNAK K., LORING H., COHEN M. & TIMMERMANN B. N. 2012. The Ethnobotany and Ethnopharmacology of Wild Tomatillos, *Physalis longifolia* Nutt., and Related *Physalis* Species: A Review. *Economic Botany*, pp. 1-13.
- MAHALAKSHMI A. M & NIDAVANI R. B. 2014. *Physalis Angulata* L.: An Ethnopharmacological Review. *Indo American Journal Of Pharmaceutical Research*. 4(3): 1479-1486.
- MAHKLOUF M. H. 2016. A New Record *Physalis angulata* L. (Solanaceae) for the Flora of Syria. *American Journal of Life Science Researches*. 2(1): 9-11.
- MARTÍNEZ M. 1998. Revision of *Physalis* section *Epeteiorhiza* (Solanaceae). *Anales Inst. Biol. Univ. Nac. Auton. Mexico, Bot*. 69: 71-117.
- MARTÍNEZ M. 1999. Infrageneric taxonomy of *Physalis*. In: M. NEE, D. E. SYMON, R. N. LESTER & J. P. JESSOP (eds.). *Solanaceae IV*, pp. 275-283. Kew, Royal Botanic Gardens.
- NATIONAL RESEARCH COUNCIL. 1989. *Lost crops of the Incas: Little-Known plants of the Andes with promise for worldwide cultivation*, pp. 240-251. National Academic Press. Washington.
- RENGIFO-SALGADO E. & VARGAS-ARANA G. 2013. *Physalis angulata* L. (Bolsa Mullaca): A Review of its Traditional Uses, Chemistry and Pharmacology. *Boletín Latinoamericano y del Caribe de Plantas Medicinales y Aromáticas* 12(5): 431-445.
- SAMUELS J. 2015. Biodiversity of Food Species of the Solanaceae Family: A Preliminary Taxonomic Inventory of Subfamily Solanoideae. *Resources* 4: 277-322.
- SIDDIQI M. A. 1978. *Flora of Libya (Solanaceae)*. Al-Faateh University, Faculty of Sciences. Vol 62: 29-30.
- SULTANA N., HASSAN M. A., BEGUM M. & SULTANA M. 2008. *Physalis angulata* L. (Solanaceae) – A New Angiospermic Record For Bangladesh. *Bangladesh J Bot* 37(2): 195-198.
- TACKHOLM V. 1974. *Students flora of Egypt*. 2nd ed. Beirut: Cooperative Printing Co.
- TOLEDO J. M. 2013. *Physalis victoriana* (Solanaceae) a new species from Northern Argentina. *Phytotaxa* 124(1): 60-64.
- TOLEDO J. M. & BARBOZA G. E. 2005. Novedades en *Physalis* (Solanaceae). *Kurtziana* 31: 69-85.
- RAJU S. V., REDDY C. S & RAJARAO K. G. 2007. The myth of “*minima*” and “*maxima*”, the species of *Physalis* in the Indian Subcontinent. *Acta Phytotaxonomica Sinica* 45(2): 239-245.
- VON MUELLER B. F. 1895. *Select Extra-Tropical Plants, Readily Eligible for Industrial, Culture or Naturalisation*. Robert Drain, Government Printer, Melbourne, Australia.