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THE MYTH OF ‘MINIMA’ AND ‘MAXIMA’, THE SPECIES OF *PHYSALIS* IN THE INDIAN SUBCONTINENT

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Abstract The status of the names, *Physalis minima* and *Physalis maxima* (Solanaceae), and their alleged presence on the Indian subcontinent are discussed. The issues of nativity and identity of Linnaean *Physalis minima* are long-debated while the use of the name *P. maxima* Mill. and its report from India are recent. The available evidence indicates that the name “*P. minima* L.” is misapplied to two different elements, viz. *P. angulata* L. and *P. lagascae* Roem. & Shult. The name *Physalis minima* L. may be rejected as *nomen confusum*. As on today, it is submerged under the synonymy of *P. angulata* L. The correct name for the widely known *P. minima* is *P. lagascae*. The name “*P. maxima* Mill.” applied to the escape and naturalized weed in the Indian subcontinent and elsewhere, on the other hand, is to be substituted by *P. pruinosa* L., the name which is misapplied to *P. grisea* (Waterf.) M. Martínez.

Key words Indian subcontinent, *nomenclature*, *Physalis*, *Physalis angulata*, *Physalis grisea*, *Physalis lagascae*, *Physalis maxima*, *Physalis minima*, *Physalis pruinosa*.

The uncertainty in the number of species of *Physalis* occurring in India and their improper distinctions are due to: (i) introduction as weeds and cultivated species, and (ii) the problem of hybridization amongst some of these species, a reality outside their native habitats and beyond the experience of those who bred them under captivity. Thus, several of the *Physalis* species and their natural hybrids are now well-established invasive weeds of disturbed landscapes and crops throughout the tropics, including Asia. According to Deb (1979), six species of *Physalis* L. occur in India, viz.: (i) *P. alkekengi* L., (ii) *P. angulata* L., (iii) *P. ixocarpa* Brot., (iv) *P. longiflora* Nutt. and (v) *P. peruviana* L. as cultivated species and (vi) *P. minima* L. as common weed. While the identity of *P. longifolia* Nutt. (*P. virginiana* Mill. var. *sonorae* Torrey) of the collections from India is certainly doubtful, Singh & Pandey (2002) added *P. maxima*

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Mill. to the list as a new introduction to India. Besides, from the perusal of global literature and in our experience with the taxonomy of *Physalis* in southern India, we are unable to form a clear concept of *P. minima* L. It is the case with this name elsewhere, including Americas. Therefore, there is an urgent need to resolve this issue of the proper application of the scientific names in view of the medicinal importance of *P. minima* (Glotter et al. 1975; Alluri et al. 1976; Sahai & Kirson 1984; Putalun et al. 2004) and food value of *P. maxima*.

1 The taxonomic history of “*P. minima*”

Van Rheedee (l.c. 1690) was perhaps the first to describe two pre-Linnaean elements of *Physalis* from India, namely: **Inota-inodien** (Hort. Malab. 10: 139, t.70. 1690) and **Pre-inota-inodien** (Hort. Malab. 10: 140, t. 71. 1690). Linnaeus cited (p.184) the *latter* in the protologue of his *P. minima*. Nicolson et al. (1988) interpreted both these two elements of Van Rheedee as *P. angulata* L. Linnaeus, in his first edition of *Species Plantarum* (1753: 182, 183), described nine species of *Physalis* of which four were accredited to India. They are: *P. flexuosa* (no.2) which is *Withania somnifera*, *P. angulata* (no.6), *P. pubescens* (no.7) and *P. minima* (no.8). Later, Roxburgh (1832: 189) enlisted *four* species of *Physalis*, viz.: 1) *P. flexuosa*, 2) *P. Alkekengi* (from the Botanical garden at Calcutta), 3) *P. peruviana* (under cultivation), and 4) *P. minima* (common on cultivated ground and along the coast of Coromandel). Of these, *P. flexuosa* is *Withania somnifera*. Under *P. minima*, Roxburgh cites *Inota-inodien* of Rheedee (which was considered as *P. angulata* by Nicolson et al. 1988) while his description pertains to *P. lagascae* Roem. & Shult. (*Present study*).

Rydberg (1896) recognized no American accession as *P. minima* L. Waterfall (1967), the recent monographer of *Physalis*, discussed the identity of *P. minima* L. under *P. lagascae* Roem. & Schult. According to him, there is no *Physalis minima* in the Linnaean material at Stockholm, nor there any in Hortus Cliffortianus herbarium at BM. Moreover, Waterfall failed to form a concept of *P. minima*. Furthermore, we have to note that:

- i) The Linnaean species, *P. minima*, was described from India ("Habitat in Indiae aridis sordidis") whereas *P. minima* Mill. (Gard. Dict. ed. 8, no.11. 1768) is a smooth plant which is generally regarded as conspecific to *P. indica* Lam. (Rydberg 1896: 304).
- ii) The first synonym cited under *P. minima* by Linnaeus (p.184) is "*Solanum vesicarium indicum minimum* Herm. Lugb. 569. pl. 571". Nees (1831) included it in *P. indica* while Dunal (DC. Prodr. 13(1): 444. 1852) described the same as *P. hermannii*.
- iii) Clarke (Hook.f. Fl. Brit. India 4: 238.1883) identified the Indian material as *P. minima* var. *indica* (Lam.) C.B. Clarke.
- iv) *P. parviflora* R.Br. (Prodr. Nov. Holl.: 447. 1810) was regarded as a form of *P. indica* Lam. (Rydberg 1896).
- (v) O.E. Schultze (Symbol. Antill. 4:141. 1909) noted *P. indica* Lam. to be *P. parviflora* R.Br.
- vi) Santapau (1948) recognized two forms in *P. minima*: one is glabrescent/sub-glabrous while the other is densely pubescent.
- vii) Nicolson et al. (1988) reduced *P. minima* L. as a synonym of *P. angulata* L., and
- viii) There is a need to typify *Physalis minima* L. However, Edmonds opines (in litt. 2005) that the typification of the Linnaean *P. minima* is complex, with the lectotype (Hort. Cliff. no. 62, *Physalis* 5) being conspecific to *P. angulata*. Therefore, she considers it as pro synonym with the latter in her forthcoming account of Solanaceae in '*Flora of Tropical East Africa*'. Most of the descriptions and plates on which Linnaeus based his species also refer to *P. angulata* rather than to the small-flowered prostrate plant, usually known as "*P. minima*" (that we conceive here as *Physalis lagascae*).

Conversely, in the Indian taxonomic literature, we are dealing with two distinct elements (Table 1) under the name *P. minima*: *First one* is an erect, robust, smooth, tetraploid taxon with bigger flowers (> 6 mm across), bluish anthers, and fruiting calyces tinged purple (*P. angulata*) and the *second one* is a diffuse, relatively smaller, pubescent, diploid taxon with smaller (< 6 mm across) flowers (parviflora or micrantha), yellow anthers, and greenish fruiting calyces (*P. lagascae*). To elaborate further:

Table 1 Distinguishing morphological characters of *Physalis angulata* and *P. lagascae*.

Character	<i>P. angulata</i>	<i>P. lagascae</i>
Plants	Erect, robust	Diffuse, slender, smaller
Plant parts	More or less smooth or glabrescent	Pubescent
Leaves	Less oblique, more dentate	More oblique, less dentate
Flower (corolla)	> 7 mm across, pale yellow or white	< 6 mm across, yellow
Anthers	Bluish	Yellow
Fruiting calyces	Tingled purple, 5-ribbed (weakly 10-angled), ovoid	Greenish, obtusely 10-angled, sub-globose
Fruiting pedicels	Fruiting pedicel > 1 cm	Fruiting pedicel < 1 cm
Berry	c 1.2 cm diameter	c 0.6 cm in diameter

- a) *Physalis angulata* L. Sp. Pl.: 183. 1753; Rydberg in Mem. Torrey Bot. Club 4: 333. 1896; Reddy et al. in J. Econ. Tax. Bot. 23: 710. 1999. Lectotype: India: Herb. Linn. no. 247.9) (LINN). (Fig. 1 A-C)

It is a neotropical tetraploid ($2n=48$) species of *Physalis* occurring in India as an adventive weed, occupying the nutrient-rich (garbage) soils. Its identity, as a distinct species, is now well-established (Nicolson et al. 1988; Reddy et al. 1999). One of the synonyms cited under *P. angulata* by Linnaeus and Nees is “*Alkekengi indicum glabrum chenopodiifolio* Dill. Elth. P.13, t.12”, which was described by Nees as *P. linkiana* (1831). Rydberg (1896: 302) considered this taxon as the “true” *P. angulata*.

Specimens examined: see Reddy et al. (1999).

Range: Central America, Mexico and India (Rydberg 1896: 333); now, a pantropical invasive weed.

Note: (i) The tetraploid *P. minima* so reported by Ganapathi et al. (1991) and Sudhakaran & Ganapathi (1999), earlier by Bhaduri (cf. Menzel 1951) and others are likely variants of *P. angulata*, and (ii) the morphological variation in *P. angulata* was noted even by Linnaeus.

- b) *Physalis lagascae* Roem.& Schult. Syst. Veg. 4: 679. 1819, as “Lagascae”; Rydberg in Mem. Torrey Bot. Club 4: 328. 1896.
P. parviflora Lag. Gen. Sp. Pl.: 11, no. 147. 1816, nom. illeg., non R. Br. (1810).
P. villosa Roth, Nov. Pl. Sp.: 122. 1821, nom. illeg., non Mill. (1768).
P. minima auct. non L. (1753): Roxb. Fl. Ind. 1: 563. 1832, pro parte; Nees in Linnaea 6: 479. 1831. (Fig.1 D, E)

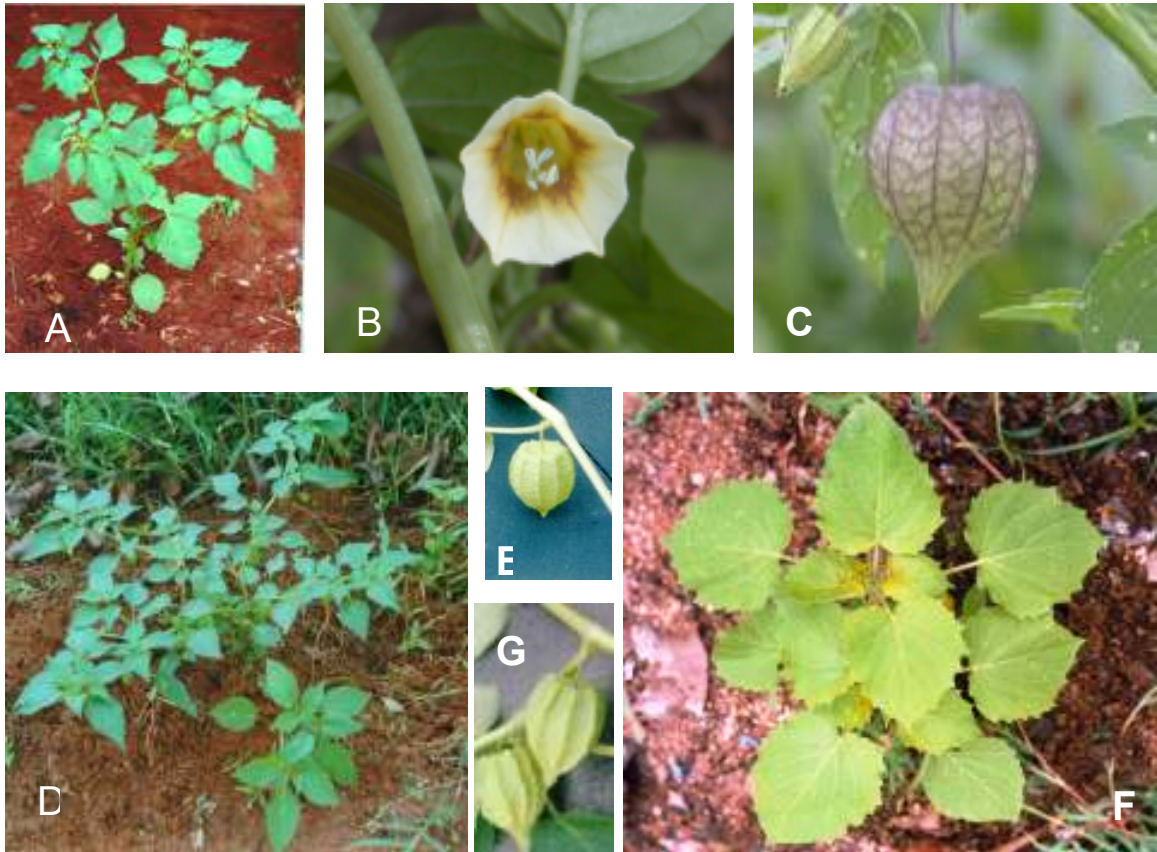


Fig. 1 *Physalis* species. **A-C** Habit, Flower and fruiting calyx of *Physalis angulata*; **D, E** – Habit and fruiting calyx of *Physalis lagascae*; **F,G** – Habit and fruiting calyx of *P. pruinosa*.

Range: Native of Mexico, the West and East Indies; in United States, probably it is only introduced (Rydberg 1896).

Note: (i) *Physalis parviflora* Lag. (1816) is an illegitimate name being a later homonym of *P. parviflora* R.Br. (Prodr. Nov. Holl.: 447. 1810). Therefore, we have to apply the nomen novum, *P. lagascae* (Roem. & Schult. Syst. Veg. 4: 679. 1819) to the pubescent American plant which is adventive in India and other parts of Asia. It is because Roth's *P. villosa* (Nov. Pl. Sp.: 122. 1821) is again illegitimate being a later homonym (non Mill. 1768) as well as a superfluous name.

(ii) *P. rothiana* Roem. & Schult. was considered doubtfully under two species twice by the *Physalis* experts: *P. angulata* and *P. pruinosa* by Nees (1831) and *P. pruinosa* and *P. lagascae* by Rydberg (1896:374).

- (iii) Roxburgh (Fl. Ind. I: 563. 1832) reported this species from India as *P. minima*. Although he cited Rheede's *Inota-inodien* in the protologue, his description of the plant from Bengal and Coromandel Coast with yellow anthers clearly belongs to *P. lagascae*. Conversely, this distinct species though not so common, missed the attention of many a recent Indian worker of *Physalis*. Sudhakaran & Ganapathi (1999: 336), with a doubt, reported it as a new record for southern India, though it was only a rediscovery.
- iv) Hepper (Rev. Handb. Fl. Ceylon 6: 393. 1988) conceived *Physalis hermannii* Dunal as *P. micrantha* Link (Enum. Hort. Berol. Alt. 1:181.1821), with the type from Peru. This, however, was treated by Waterfall (Rhodora 69: 220. 1967) as a synonym of *P. lagascae* Roem. & Schult. (1819).
- (v) The species considered as *P. minima sensu* Reddy et al. (1999) from Andhra Pradesh (India), does really fit into this species, and
- (vi) Edmonds (in litt. 2005), also view *P. lagascae* Roem. & Schult. as the correct name for the taxon widely known as *P. minima*, and
- (vii) The description of *Physalis minima* in *Flora of China* (plants hairy, corolla c 5 mm across, anthers yellow, fruiting pedicels less than 1 cm, calyx green, ovoid, etc.) pertains to *P. lagascae*, which was reduced to synonymy by Zhang et al. (2006).

2. The episode of “*P. maxima*”

In our hunt for *Physalis*, we collected a *Physalis* species in July 2000 as an adventive weed of waysides at places like Chowtuppal and Bhongiri in Nalgonda district of Andhra Pradesh, peninsular India. It was identified as *P. pruinosa*, with uncertainty, in view of the differences it has with the cultivated species under the name, which was obtained from USA for cytogenetic studies by Prof. K.G. Rajarao (one of the authors of this article). The presence of short-stalked glandular hairs on the plant in question was a problem to fix the species, following Rydberg (1896). However, Martínez's (1993) article on *P. grisea* and the correct application of the name *P. pruinosa* L. helped to resolve the problem. We could identify our species as the “real” *P. pruinosa*. Meanwhile, Singh & Pandey (2002) reported this species from Jodhpur (Rajasthan) in northern India,

not as *P. pruinosa* L. but as *P. maxima* Mill., which name is conspecific with the former. To distinguish the wild *Physalis pruinosa* from its cultivated ally, *P. grisea*:

Key to the species

1. Anthers purple; corolla with 5 brown spots on the throat; fruiting calyx as long as broad and abruptly acuminate at apex; berry tawny orange when mature; stems (young) and major veins of leaves covered with villous pubescence intermixed with sessile glands; leaves gray green and coarsely and prominently dentate from base and frequently drying orange or with orange spots..... *Physalis grisea*
1. Anthers yellow (without purple tinge); corolla with 5 pale green inconspicuous spots on the throat; fruiting calyx longer than broad and gradually acuminate at apex; berry gray green when mature; stems (young) and major veins of leaves covered with villous pubescence intermixed with short stalked glands; leaves light green, coarsely and prominently dentate from middle and frequently drying yellow *Physalis pruinosa*

Physalis pruinosa L. Sp. Pl.: 184. 1753; Martínez in Taxon 42: 104. 1993. Type: Mexico: Herb. Linn. no. 247.13 (HT: LINN).

Physalis maxima Mill., Gard. Dict. (ed. 8), *Physalis* no. 15. 1768; Gentry & Standley in Flora Guatemala 10: 90.1974; Ganapathi et al. in Cytologia 56: 285. 1991; Singh & Pandey in Indian J. Forestry 25: 187. 2002. Type: México: Veracruz, *Houstoun* s.n. (BM-SL). (Fig.1 F,G)

Specimens Examined: Andhra Pradesh: Nalgonda district, Bhongiri: *V.S. Raju & K.G. Rajarao* 4000 (KUH); Warangal district, Komuravelli: *C.S. Reddy* 1972 (KUH).

Erect, stout annual herbs, villous-viscid pubescent all over. *Stems* up to 1 m high, angular-ribbed, fistular. *Leaves* simple, spirally arranged, 4-9x 3-6 cm, ovate, base oblique, rounded, margin sinuate-dentate above middle, acuminate, light green. *Petioles* 4-10 cm. *Flowers* solitary, axillary, small, 1-1.5 cm across, pedicels erect, 1.5-7.0 cm. *Flowering calyx* double the length of the tube, up to 6mm, divided halfway down, subulate. *Corolla* campanulate, pale yellow, 1 cm across, throat with 5, inconspicuous, pale green blotches; gibbous below. *Stamens* 5, filaments 0.6 cm long, exerted, glabrous, epipetalous; anthers upto 4 mm long, yellow. *Ovary* globose; style terminal, stigma green. *Fruiting pedicels* drooping, extending up to 6 cm. *Fruiting calyx* 2-2.5 cm long, downy, inflated, deeply sunken at base, strongly 5-angled, reticulately veined, glabrescent, acuminate. *Fruits* persistent, not falling; alternately borne from the first

dichotomy. *Berries* gray green, 1.5 cm across, sour. *Seeds* many, obvoid, brownish and pitted.

Range: Mexico and Central America; introduced into tropical Asia (India: Andhra Pradesh, Rajasthan, Tamil Nadu, etc.).

Illustration: Fig. 1 of Singh & Pandey (2002); Fig. 1 **F, G** (present paper).

Note: (i) Waterfall (1967) resurrected the name *Physalis maxima* Mill. for the Mexican and central American plant. But, Martínez (1993) considered it as conspecific to *P. pruinosa* L.

(ii) The cultivated Gray Ground-cherry, Strawberry tomato and Dwarf Cape-goose berry (Pyne 2003), thus far, known as *P. pruinosa* in general in the past (taxonomic literature) and current websites in general is perhaps be treated as *P. grisea* (Waterf.) M. Martínez (*P. pubescens* var. *grisea* Waterf.), and

(iii) The diploid natural populations of *Physalis* discovered by Ganapathi *et al.* (1991) on disturbed sites in Tamil Nadu (southern India) which was ultimately determined by them as *P. pubescens*, could possibly be this species. The petiole length of 7.4 (4.2-9.4) cm given for the taxon in question (Ganapathi *et al.* 1991: 285) agrees well with *P. pruinosa*, described above. *P. lagascae*, *P. pruinosa* and *P. pubescens* are all closely allied diploid taxa bearing the same somatic chromosome number, i.e. $2n = 24$, with a satellite attached to the short arm of one of the three shortest pairs (Menzel 1951). All these species pertain to the section **Pubescentes** of *Physalis*.

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