

A new taxonomic variety of *Luffa aegyptiaca* Mill.
(Cucurbitaceae):
a wild sponge gourd from Odisha, India

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A new taxonomic variety of *Luffa aegyptiaca* Mill. (Cucurbitaceae): a wild sponge gourd from Odisha, India

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ABSTRACT

Luffa aegyptiaca var. *alba* R.C.Misra, var. nov., a new taxonomic variety of wild sponge gourd, explored from Malkangiri and Mayurbhanj districts of Odisha, India, is described based on morphology. The new variety shares morphological similarities with *L. aegyptiaca* Mill. var. *aegyptiaca* and *L. acutangula* Roxb. var. *amara*. However, it differs from the closely allied typical variety *L. aegyptiaca* var. *aegyptiaca* Mill. mainly by its puberulous and scabrous stem, smaller leaves and petiole, smaller male raceme, male and female flowers and pedicel, smaller bract, calyx tube and acuminate calyx lobe, smaller fruits and white colour fewer seeds with wingless margin. It deviates from *L. acutangula* var. *amara* in possessing its orbicular-reniform leaves, puberulous petiole, deep yellow flowers, 5 stamens, smooth cylindrical ovary, ecostate, oblong-cylindric fruits and smooth white seeds. Detailed description, photographs and comparison of the diagnostic characters among three varieties are provided for easy identification of the taxon.

KEY WORDS

Cucurbitaceae,
L. acutangula,
India,
Odisha,
new variety.

RÉSUMÉ

Une nouvelle variété taxonomique de Luffa aegyptiaca Mill., *courge éponge sauvage d'Odisha, en Inde*. *Luffa aegyptiaca* Mill. var. *alba* R.C.Misra, var. nov., une nouvelle variété taxonomique de courge-éponge sauvage, découverte dans les districts de Malkangiri et Mayurbhanj d'Odisha, en Inde, est décrite sur la base de sa morphologie. Elle partage ainsi des similitudes avec *L. aegyptiaca* Mill. var. *aegyptiaca* et *L. acutangula* Roxb. var. *amara*. Cependant, elle diffère de la variété typique, étroitement apparentée, *L. aegyptiaca* var. *aegyptiaca* Mill., principalement par sa tige pubérulente et scabre, ses feuilles et son pétiole plus petits, son racème mâle plus petit, ses fleurs mâles et femelles et son pédicelle, sa bractée plus petite, son tube du calice à lobes acuminés, ses fruits plus petits et leur couleur blanche, ses graines moins nombreuses et sa marge sans ailes. Elle s'écarte de *L. acutangula* var. *amara*, dont elle se distingue par ses feuilles orbiculaires-réniformes, son pétiole pubérulent, ses fleurs jaune foncé, ses cinq étamines, son ovaire cylindrique lisse, non côtelé, ses fruits oblongs-cylindriques et ses graines blanches et lisses. Une description détaillée, des photographies et une comparaison des caractères diagnostiques des trois variétés sont fournies pour faciliter l'identification du taxon.

MOTS CLÉS

Cucurbitaceae,
L. acutangula,
Inde,
Odisha,
variété nouvelle.

INTRODUCTION

The genus *Luffa* Mill., a member of the tribe Luffeae, subfamily Cucurbitoideae, family Cucurbitaceae Juss., is of Asian origin including Indian subcontinent and the native range extends from Mexico to tropical America, west tropical Africa to Somalia and Australia (Heiser & Schilling 1988; Jeffrey 2005; POWO 2024). Being an old world genus, it has a long history of cultivation in tropical Asia and Africa and the primary centre of diversity is India (Sirohi *et al.* 2005). The exact number of species in the genus is still confusing and varies from four to 10 (Heiser *et al.* 1988; Marr *et al.* 2005; The Plant List 2013; Filipowicz *et al.* 2014; Kumari *et al.* 2019; POWO 2024). There are as a whole 78 plant name records under *Luffa* comprising of synonyms, unresolved and others including nine accepted species viz. *L. acutangula* (L.) Roxb., *L. aegyptiaca* Mill., *L. astorii* Svenson, *L. echinata* Roxb., *L. graveolens* Roxb., *L. operculata* (L.) Cogn., *L. quinquefida* (Hook. & Arn.) Seem, *L. saccata* F.Muell. ex I.Telford and *L. sepium* (G. Mey) C. Jeffrey (POWO 2024). Chakravarty (1982) in his revision of the genus, retained seven species native to India incorporating three more species *L. umbellata* (Klein) Roem. (Gamble 1919), *L. hermaphrodita* Singh & Bhandari (1963) and *L. tuberosa* Roxb., which needs to be debated. Out of these seven species, *L. tuberosa* was included into the genus *Momordica* as *Momordica tuberosa* (Roxb.) Cogn. (Ali *et al.* 2010; Pandey & Prakash 2013). However, only four undisputedly established species of *Luffa* are recognised in India such as *L. acutangula*, *L. aegyptiaca*, *L. echinata* and *L. graveolens* (Renner & Pandey 2013).

Luffa aegyptiaca Mill., commonly known as sponge gourd or Egyptian cucumber, is indigenous to tropical South and South-East Asian lowlands, but it has been under cultivation in Egypt since late Medieval times. The native range of this species is Indian subcontinent (Kalloo 1993; POWO 2024). In its wild state, it is found growing in dry tropical open woodlands, thickets, grasslands, wastelands, forest blanks and along road sides at low elevations. In the state of Odisha, India, it occurs only in wild form on dryer areas with smooth and bitter fruits. A considerable discussion on whether the correct name for this species as *L. cylindrica* (L.) M. Roem. or *L. aegyptiaca* Mill. was made, and Jeffrey (1980) suggested the earlier, while the latter was first introduced by Veslingius (1638) as Egyptian cucumber and further sustained by Clarke (1879), Cooke (1903), Heiser & Schilling (1988), Nicolson *et al.* (1988) and POWO (2024). We supported the latter view and preferred to keep this name as *L. aegyptiaca* Mill.

MATERIAL AND METHODS

Eight specific exploration missions were conducted by the senior author in diversity-rich areas of India during 2018-25 and 92 germplasm accessions of *Luffa aegyptiaca* were collected from natural wild habitats. The passport data attributing the collection/accession number, wild biological status, source, frequency, habitat and site of collection for all germplasm ac-

cessions was documented. While during survey and exploration in parts of Odisha in December 2018 and 2019, the authors noticed the occurrence of two interesting wild populations of sponge gourd in Malkangiri and Mayurbhanj districts, which exhibit a strikingly distinct form of sponge gourd different from the others. The location maps indicating two type collection sites of the new variety were generated using Survey of India topographical maps in 1:50 000 scale through Arc-GIS tools (Fig. 1). The plant specimens were collected from live plants those are neither landraces/cultivars nor escaped from the gardens. These were located in natural wild habitat in open scrubland trailed in association with other shrubby/herbaceous elements like *Chromolaena odorata* (L.) R.M.King & H.Rob., *Urena sinuata* L., *Spilanthes calva* DC., *Colocasia esculenta* var. *antiquorum* (Schott) F.T.Hubb. & Rehder, *Mikania micrantha* Kunth, *Ziziphus oenoplia* (L.) Mill., etc. in partly disturbed vegetation as evidenced from the images (Fig. 2A-C). The seed germplasm was collected and conserved in the National Gene Bank, ICAR-NBPGR, New Delhi bearing accession numbers IC-636424 and 636431 for long term storage. On through morphological analysis it was revealed that there were noteworthy differences between the typical variety *L. aegyptiaca* var. *aegyptiaca*, *L. acutangula* var. *amara* and the individuals collected from the above-mentioned two locations. Further, the seeds were multiplied and live plants were characterized in the Field Gene Bank of the centre for four years during 2019-23 and the morphological differences were recorded and found to be persistent. Hence, the individuals collected from these localities can be referred as taxonomic variety. The diagnostic characters of new taxon were compared with all entities of congeneric taxa in *Luffa* using protologues and herbarium specimens described from India and other countries housed at CAL, Kolkata, India along with authentic digital images available online in Kew Herbarium, London. However, none of them matched with this specimen and it is quite different from all known taxa. The herbarium specimens of the new taxon were deposited in the centre along with one set (holotype) at National Herbarium of Crop Plants (NHCP), ICAR-NBPGR, New Delhi and another set (isotype) at Central National Herbarium (CAL), Howrah, India.

On critical examination of morphological features of the live plants along with herbarium specimens and perusal of relevant literature (Drury 1864; Clarke 1879; Cooke 1903; Prain 1903; WOI 1962; Chakravarty 1982; Shetty & Singh 1987; Heiser & Schilling 1988; Verma *et al.* 1993; Renner & Pandey 2013; Khan *et al.* 2017; Suresh *et al.* 2019), it was observed that it is quite different from the typical taxon *L. aegyptiaca* var. *aegyptiaca* and also from *L. acutangula* var. *amara* in many aspects. The new variety shares morphological similarities with *L. aegyptiaca* Mill. var. *aegyptiaca* and *L. acutangula* Roxb. var. *amara* in some attributes. However, it differs from the closely allied typical variety *L. aegyptiaca* var. *aegyptiaca* Mill. mainly by its puberulous and scabrous stem, smaller leaves and petiole, smaller male raceme, male and female flowers and pedicel, smaller bract and calyx tube and acuminate calyx lobe, smaller fruits, seeds white, fewer with wingless margin. It also deviates from *L. acutangula* var.

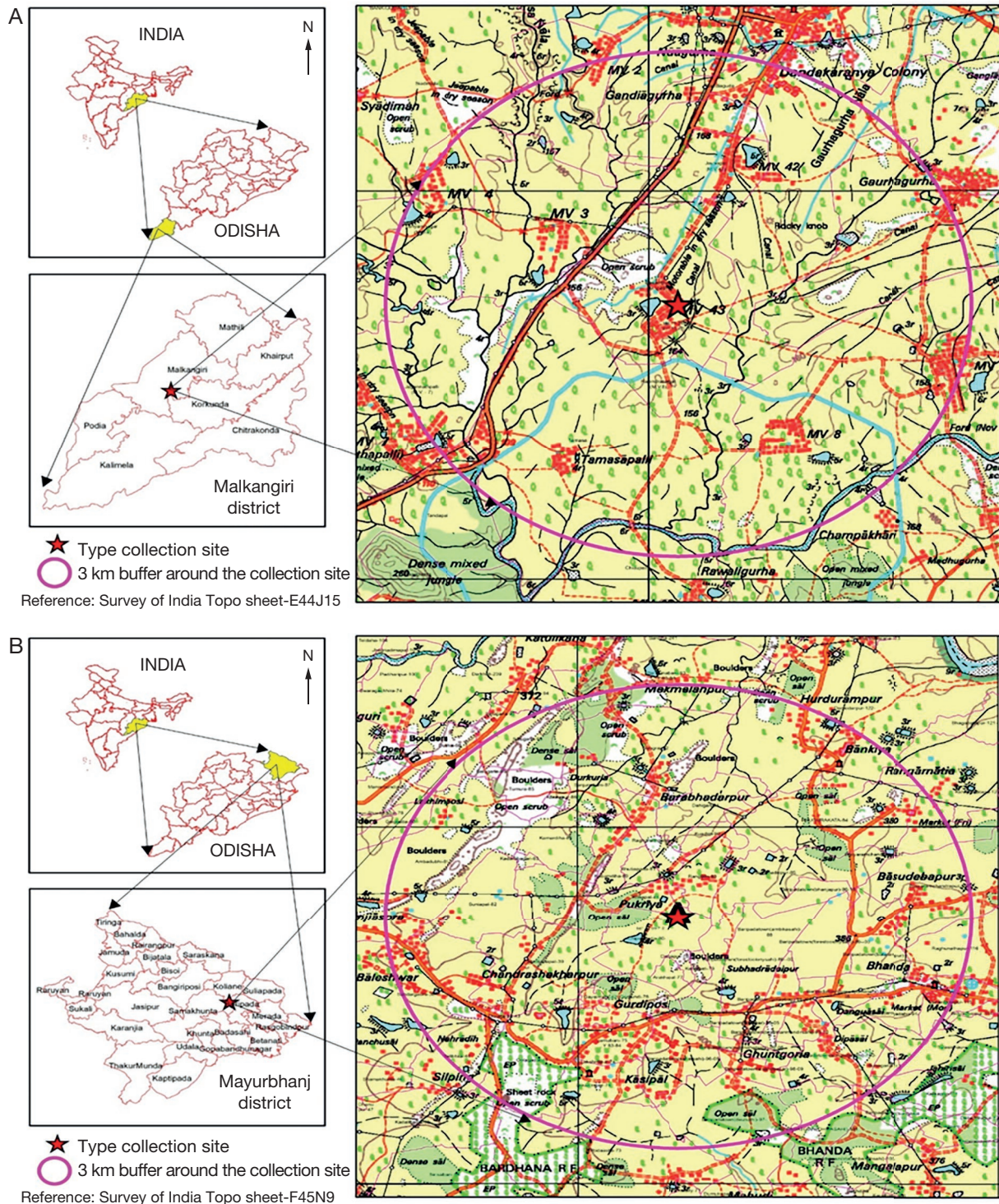


FIG. 1. — Location map of type collection sites of *L. aegyptiaca* var. *alba* R.C.Misra, var. nov.: **A**, Malkangiri district, Odisha; **B**, Mayurbhanj district, Odisha. Generated using Survey of India topographical maps and Arc-GIS tools.

amara in possessing its orbicular-reniform leaves, puberulous petiole, deep yellow flowers, 5 stamens, smooth cylindrical ovary, ecostate, oblong-cylindric fruits and white smooth seeds. Therefore, this enabled us to conclude that these two interesting populations are a new entity hitherto undescribed with diagnostic characters and warranting a varietal status. Thus, it is described here as a new variety under the name

L. aegyptiaca var. *alba* R.C.Misra, var. nov. The comparison of diagnostic characters among the three affined taxa is outlined in Table 1 for ease of identification. Hence, the present collection forms new taxonomic variety record from India. However, the sponge gourd crop having white seeds was indicated from India (Prakash *et al.* 2014), Sri Lanka (Kumari *et al.* 2019) and Turkey (Mavi *et al.* 2018) for analyzing biochemi-

TABLE 1. — Comparison of diagnostic characters among *Luffa aegyptiaca* var. *aegyptiaca*, *L. acutangula* var. *amara* and *L. aegyptiaca* var. *alba* R.C.Misra, var. nov.

Characters	<i>Luffa aegyptiaca</i> var. <i>aegyptiaca</i>	<i>Luffa acutangula</i> var. <i>amara</i>	<i>Luffa aegyptiaca</i> var. <i>alba</i> var. nov.
Stem	Glabrous, smooth	Glabrous, angles scabrous	Puberulent, scabrous
Leaves	Orbicular-reniform, glabrous, smooth, green beneath, 15-25 (30) × 15-25 cm; petiole 7-12 cm, glabrous	Orbicular-cordate, pubescent, softly villous in young, scabrous, whitish beneath, 7-12 × 6-10 cm; petiole 2-4 cm, scabrous	Orbicular-reniform, puberulent, scabrous, green beneath, 7-15 × 6-14 cm; petiole 1-5 cm, puberulent
Male inflorescence	Raceme 25-40 cm	Raceme 10-15 cm	Raceme 12-25 cm
Male flowers	Pedicle 1-2 cm, bracts 4-7.5 mm, 8-10 cm across; calyx tube 7.5-10 mm, calyx lobe 20-30 × 10-15 mm, apex acute, stamens 5	Pedicle 1-3 cm, bracts 3-7 mm, 3-4 cm across; calyx tube 5-8 mm, calyx lobe 4-6 × 2-4 mm, apex acuminate, stamens 3	Pedicle < 1 cm, bracts 2-3 mm, 5-7.5 cm across; calyx tube 4-7 mm, calyx lobe 10-15 × 3-7 mm, apex acuminate, stamens 5
Female flowers	Deep yellow, 10-13 cm across, ovary smooth, cylindrical	Pale yellow, 3.5-5 cm across, ovary prominently ribbed, club shaped	Deep yellow, 7-9 cm across, ovary smooth, cylindrical
Fruits	Smooth, ecostate, oblong-cylindric, marked with longitudinal stripes, 15-45 × 6-10 cm	Longitudinally 10-angled, obovoid, obtusely conical at both ends, 5-10 × 2.5-4 cm	Smooth, ecostate, oblong-cylindric, often marked with longitudinal stripes, 7-20 × 5-8 cm
Seeds	Black or dark grey, not beaked, margin distinctly winged, smooth, 11-13 × 7-8 mm, average 90-500 seeds/fruit	Black, beaked, margin wingless, rugulose or verrucose, 8-10 × 5 mm, average 15-30 seeds/fruit	White, not beaked, margin wingless, smooth, 11-12 × 7-8 mm, average 30-80 seeds/fruit

cal parameters. White seeds of solely cultivated/ high yield varieties of sponge gourd are also available from various seed traders for large scale cultivation. Nevertheless, these plants

are neither naturally occurring nor of any explicit collection locality from wild sources and lack details of information on specific diagnostic characters of any reported taxon.

KEY TO THE VARIETIES OF *LUFFA AEGYPTIACA* MILL.

1. Seeds black or dark grey, margin distinctly winged; stem glabrous, petiole 7.0-12.0 cm, male raceme 25-40 cm, pedicle 1-2 cm, calyx tube 7.5-10.0 mm, female flowers 10-13 cm across, corolla 8-10 cm across, fruits 15-45 × 6-10 cm *Luffa aegyptiaca* var. *aegyptiaca* Mill.
- Seeds white or off-white, margin not winged; stem puberulous, petiole up to 5 cm, male raceme 12-25 cm, pedicle < 1 cm, calyx tube 4-7 mm, female flowers 7-9 cm, corolla 5.0-7.5 cm across, fruits 7-20 × 5-8 cm *Luffa aegyptiaca* var. *alba* R.C.Misra, var. nov.

TAXONOMIC TREATMENT

Family CUCURBITACEAE Juss.

Genus *Luffa* Mill.

Luffa aegyptiaca Mill. var. *alba* R.C.Misra, var. nov.
(Fig. 2A-J; 3)

DIAGNOSIS. — *Luffa aegyptiaca* var. *alba* R.C.Misra var. nov. closely resembles to the typical variety *Luffa aegyptiaca* var. *aegyptiaca*, but differs from it in having puberulent and scabrous stem vs glabrous and smooth stem; leaves smaller, 7-15 × 6-14 cm vs 15-25 (30) × 15-25 cm, puberulent and scabrous vs glabrous and smooth; smaller petiole 1-5 cm vs 7-12 cm; smaller male raceme 12-25 cm vs 25-40 cm; smaller bracts 2-3 mm vs 4-7.5 mm, smaller calyx tube 4-7 mm vs 7.5-10 mm and lobes acute, 10-15 × 3-7 mm vs acuminate, 20-30 × 10-15 mm; smaller male flower 5-7.5 cm vs 8-10 cm, pedicle <1 cm vs 1-2 cm and female flower 7-9 cm vs 10-13 cm across; smaller fruits 7-20 × 5-8 cm vs 15-45 × 6-10 cm; seeds white, fewer, margin wingless vs black or dark grey, many and distinctly winged (Fig. 2K, L)

TYPE MATERIAL. — **India** • Odisha, Malkangiri district, Malkangiri block, nearby village MV-43; 18°19.268'N, 81°52.671'E; elevation 180 m; 09.XII.2018; *R.C.Misra HS no. 1550-1552*; holotype: NHCP!; isotype: CAL!; seed germplasm acc. no. IC-636424 (collection no. RCM/PK/BR/42); biological status: wild; frequency: rare; local names: “Pulu”, “Bana potala”, “Bana jahni” (Odia).

HABITAT AND ECOLOGY. — Population of two plants was growing wild in partly disturbed open scrub land. Climbers were trailed on bushes and trees on undulated landmass in disturbed sites near village MV-43. The tribal/rural inhabitants reported that the tender fruits are very bitter and occasionally cooked with other vegetables like pumpkin and tomato after double boiling the gourd till the bitterness reduces.

PHENOLOGY. — Flowering: October-November; Fruiting: December-January.

ETYMOLOGY. — The infra-specific epithet (variety) *alba* refers to the white colour of seeds.

CONSERVATION STATUS. — Two different populations of the new taxon *Luffa aegyptiaca* var. *alba* R.C.Misra, var. nov. were recorded during the exploration survey in the wastelands near disturbed areas of Malkangiri and Mayurbhanj districts of Odisha. The surrounding area is in danger of threats of possible biotic interferences of agriculture and colony encroachment and likely to face abrupt habitat loss. However, the data is inadequate to ascertain the conservation category. Hence, the variety can be included in the category of DD (Data Deficient), as further exploration is needed to access the exact size and range of distribution (IUCN 2022).

ADDITIONAL SPECIMENS EXAMINED. — **India** • Odisha, Mayurbhanj district, Samakhunta block, nearby village: Chipat Astia; 21°56.871'N, 86°43.097'E; 463 ft.; 18.XII.2019; *R.C.Misra, HS no. 1557-1558*; seed germplasm acc. no. IC-636431 (collection no. RCM/PK/19/08); biological status: wild; frequency: rare; local name: “Palla”, “Pita jahni” (Odia).



FIG. 2. — **A-J**, *Luffa aegyptiaca* var. *alba* R.C.Misra, var. nov.: **A-C**, occurrence of natural wild population of the variety on undulated open scrub land in Malkangiri and Mayurbhanj districts, Odisha; **D**, maintained in field gene bank; **E**, leaves; **F**, flowers: dorsal view; **G**, flowers: ventral view; **H**, dry fruits freshly collected; **I**, single fruit; **J**, seeds; **K, L**, *L. aegyptiaca* var. *aegyptiaca*: **K**, seeds with winged margin; **L**, separated wing fragments. Photographs: R. C. Misra. Scale bars: 2 cm.



FIG. 3. — Type specimen of *Luffa aegyptiaca* var. *alba* R.C.Misra, var. nov. (R.C.Misra HS no. 1550).

DESCRIPTION

Large, fast growing, monoecious, prostrate or scandent annual climbing herb. Stem and branches puberulent, scabrous, sulcate, sometimes twisted; tendrils 3-fid. Leaves narrowly

orbicular-reniform to hastate, 7-15 × 6-14 cm, base deeply cordate, palmately 5-7 lobed, with deep basal sinus, apex acuminate, lobes shallow or deep, margin distantly thin-denticulate, puberulous, hairy on nerves beneath, scabrous

above or on both sides, upper surface glandular-punctate; petiole puberulent, scabrous, 1-5 cm, base pulvinous. Flowers dioecious, bright yellow, male and female often on the same axil, either staminate and sterile or pistillate and fertile. Male flowers: racemes 12-25 cm long, in loose clusters; bracts linear to spatulate, 2-3 mm, with 1-5 glands on surface; pedicel < 1 cm, jointed near the top. Calyx broadly campanulate; tube short, 4-7 mm; lobes 5, 10-15 × 3-7 mm; lanceolate, reflexed above, puberulent, 3-veined, tapering towards apex, acuminate. Corolla spreading, bright yellow, 5.0-7.5 cm across, rotate, thinly hairy; petals 5, oblong, wedge shaped, 2.5-3.5 × 1-2 cm; densely villous inside, base attenuate, apex rounded-obtuse. Stamens usually 5, perfect, borne on calyx tube, free, inserted near mouth of the calyx tube; all 1-celled; sometimes 3, one 1-celled and two 2-celled; filaments 6-8 mm, villous at base, connate at first later free; anthers narrow, twisted. Female flowers: solitary, co-axillary with male flowers, peduncle 5-8 cm; calyx glandular, lobes 5, up to 1.6 cm long; corolla 5, 7-9 cm across, deep yellow, petals 4.0 × 3.0 cm; staminodes 3-5, imperfect, on the disc at the base of corolla, yellowish white, pointed at apex; pistil 1, ovary oblong to narrowly cylindric, 1-celled, appressed villous, style columnar; stigma 3-lobed, 2-cleft on both sides from middle; ovules many. Fruit pepo, oblong-cylindric, blunt at both ends, club shaped, 3-celled, smooth, ecostate, 7-20 × 5-8 cm, marked with longitudinal stripes; operculated, opening at apex by a lid when ripe, filled within with strong fibres which are branched and netted. Seeds ovate, smooth, not beaked, many, average 30-80 per fruit, white, margin wingless or wings indistinct, 11-12 × 7-8 mm, c. 2 mm thick, embedded in pulp when young.

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