



Research Article

Taxonomic revision and ethno-medicinal practices of wild species of *Solanum* L. in eastern Uttar Pradesh, India

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Abstract: *Solanum* L., is a cosmopolitan genus, comprising 1,500 species, about 75% of family Solanaceae, but in absence of a recent critical assessment these figures may well be too high. Present paper deals with eight wild species of *Solanum* viz. *S. diphyllum*, *S. incanum*, *S. nigrum*, *S. sisymbriifolium*, *S. surattense*, *S. torvum*, *S. verbascifolium* & *S. villosum*, which are commonly occurring in study area. Beside detailed enumeration, local name, phenology, locality and ethnomedicinal uses are given along with detailed taxonomic descriptions, photo plates and a key to the identification of species are provided for easy identification.

Key words: *Solanum*; Taxonomy; Phenology; Ethnomedicinal; Eastern Uttar Pradesh

Introduction

The Solanaceae, includes genus *Solanum* L. belongs to a cosmopolitan family having many important vegetables and fruits such as potatoes, tomatoes, chilies, green and red peppers, Cape gooseberries, wild species as well as ornamentals such as *Petunia*, *Schizanthus* and *Lycium* species. It also contains tobacco (*Nicotiana* species) - one of the most harmful yet economically important plants in the world - together with many other plants of both poisonous and medicinal value such as belladonna or deadly nightshade (*Atropa belladonna* L.), stramonium (*Datura stramonium* L.), and black henbane (*Hyoscyamus niger* L.). Consisting of approximately 90 genera and between 2000 to 3000 species, the family is widely distributed throughout tropical and temperate regions of the world, with centers of diversity occurring in Central and South America and Australia (Edmonds, 1978; D'Arcy, 1991).

In India the genus *Solanum* L. is represented by 42 species and distributed throughout the country (Deb, 1980). Within the family, *Solanum* L. constitutes the largest and most complex genus, majority of them are economically and medicinally important. The giant genus *Solanum*

L. with its approximately 1500 species has become a model system for collaborative online taxonomy in challenging tropical plant groups (Knapp *et al.*, 2004). The genus is mainly tropical and there are comparatively few species of *Solanum* L. in cool temperate regions. The greatest diversity of species is found in South and Central America and Australia, Africa is less rich but have a significant number of endemics. Eurasia is poor in species numbers.

Among the various plants which are being used as raw materials for the production of steroidal drugs, steroid-bearing *Solanum* L. holds an important place due to its quick growth and low initial investment in its commercial cultivation. It yields a glyco-alkaloid, solasodine, a nitrogen analogue of diosgenine. Solasodine through 16-dehydro-pregnenolone (16-DPA) is converted to a group of compounds like testosterone and methyl testosterone and corticosteroids like prednisolone and hydrocortisone. These steroidal compounds have anti-inflammatory, anabolic and antifertility properties, due to which they find large-scale use in health and family planning programmes all over the world (Haines, 1925). Various species in

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the genus have an important relationship with man as food plants, ornamentals, wild and medicinal plants. Most notable of the food plants is the potato (*S. tuberosum* L.), a native of South America and introduced in some parts of India, which in terms of acreage, tonnage and trade value, is one of the world's most important dicotyledonous crops.

Materials and Methods

Distribution

Genus *Solanum* L. is widely distributed in the sub-continent India, extending from sea-level up to 2000 m and is reported from Khasi, Jaintia and the Naga Hills of Assam and Manipur. It occurs in Sikkim, West Bengal, Orissa, Upper Gangetic Plains and in the Nilgiri forest, ascending to an altitude of 1600 m. It is reported from North-east, North-west, southern as well as Central India, and extends into Burma and China. Its commercial cultivation is mainly confined to the Akola-Jalgoan tract of Maharashtra in an area of about 3000 ha.

In all 18 division of Uttar Pradesh the eastern Uttar Pradesh comprises 30 districts and 8 divisions viz. Deopatan, Basti, Gorakhpur, Faizabad, Azamgarh, Varanasi and Mirzapur. It lies between 23°56' and 28°54' North latitude and 81°10' and 84°40' East longitudes. It is bounded by Nepal in the north. Madhya Pradesh in south, Bihar and Jharkhand in east and the districts of central Uttar Pradesh in west. The area may be divided in to three distinct region: The north terai region being Trans of Ghaghara (north of Ghaghara), the southern upland being Trans Ganga (south of Ganga) and the central plains marked by Ghaghara in the north of Ganga in the south (Figure 1) (Saini *et al.*, 2010). The districts of Eastern Uttar Pradesh lie in sub-tropical climate belt. Based on climatic conduction, the year is divided into three distinct seasons: rainy, winter and summer. Average rainfall is about 90-180 cm per annum. Besides these, there are two short interludes, which mark the transition from one season to another. Study area is well known for their highly dense forest and rich vegetation with a wide variety of plants due to its geographical and climatic conditions, selected to document the medicinal values.

Study area

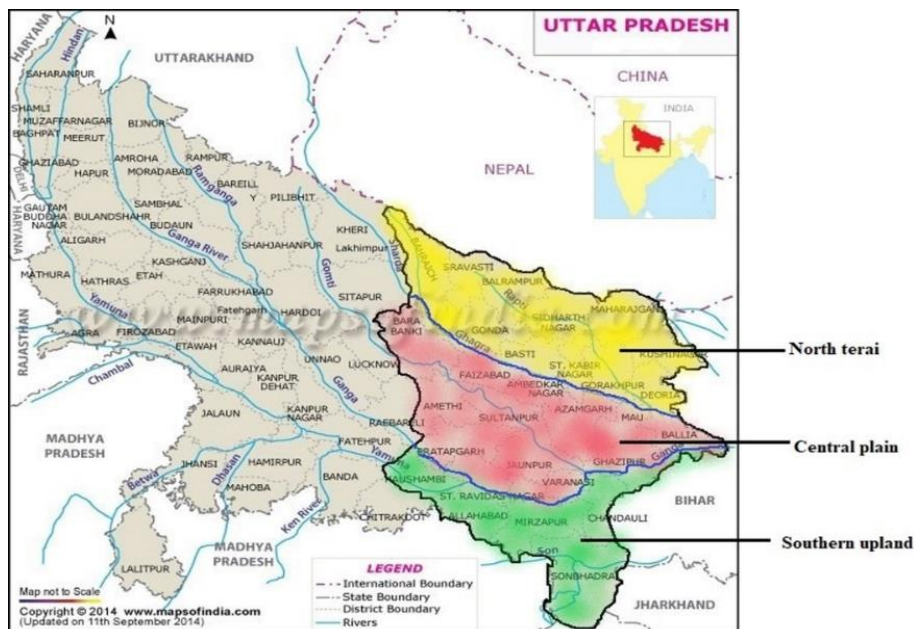


Figure 1. Map of study area indicating North terai, central plains and southern upland region of eastern Uttar Pradesh (Source. www.mapsofindia.com)

Data collection

Information was collected from local inhabitants about 100 persons of age between 40 and 80. The methods used for this study were semi structured interviews (Cotton, 1996). Our questions were based on their medicinal uses, plant parts used in

drug preparation, detailed information about mode of use (that is, decoction, paste, powder, and juice), and form of usage either fresh or dried and mixtures of other plants used as ingredients. Medicinally important plants were collected in different seasons in the years 2016-2019.

The plant specimens were identified with the help of different floras such as Flora of Upper Gangetic Plain and of the adjacent Siwalik and Sub-Himalayan Tracts (FUGP), Duthie, 1903-1920; Flora of British India (FBI), Hooker, 1872-96; Flora of Allahabad, Mishra & Verma, 1992; Dastur, 1970; Jaeger, 1985; Khanna *et al.*, 1999; Mabberley, 2008; Raizada, 1976; Saini *et al.*, 2010 and Singh, 1996. Plant specimens were also authenticated with the herbarium of NBRI (National Botanical Research Institute, Lucknow, Uttar Pradesh, India), KFRI (Kerala Forest Research Institute, Thrissur, Kerala, India) and FRI (Forest Research Institute, Dehradun, Uttarakhand, India). Such plant species specimens are preserved in the herbarium of Botany Department, Udai Pratap College (UPC), Varanasi.

Taxonomic treatment

Solanum L. is prominent genus of family Solanaceae growing in wild or is cultivated in various parts of Eastern Uttar Pradesh and/or are used medicinally. Following is the list of species of the area with enumeration & medicinal uses.

Artificial key for Identification

- 1a. Unarmed herb;
- 2a. Leaves opposite equal;
- 3a. Plant herbaceous:
- 4a. Berries orange at maturity.....8. *S. villosum*
- 4b. Berries black at maturity.....3. *S. nigrum*
- 3b. Plant shrub or small tree....7. *S. verbasicifolium*
- 2b. Leaves opposite unequal.....1. *S. diphyllum*
- 1b. Armed herb or shrub;
- 5a. Diffuse or prostrate herb; Flowers bluish-purple; berries blotched with green.....
-5. *S. surattense*
- 5b. Erect herb or shrub;
- 6a. Calyx prickly; flower white; berry red at maturity.....4. *S. sisymbriifolium*
- 6b. Calyx not prickly;
- 7a. Flowers blue or purple.....2. *S. incanum*
- 7b. Flowers white.....6. *S. torvum*

Description of the species:

1. *Solanum diphyllum* L. Sp. Pl. 184. 1753; D'Arcy, Ann. Missouri Bot. Gard. 61: 845. 1974; Zhi Y. Zhang *et al.*, in C.Y. Wu & P.H. Raven, Fl. China 17: 317. 1994; M. Das *et al.*, J. Econ. Taxon. Bot. 21: 158. 1997; T.K. Paul & M.C. Biswas, Bull. Bot. Surv. India 37: 137. 2000. - Type: Herb. L. 248.5; M. Reema Kumari in Rheede 23(1) 50-51. 2013; P. Singh & M.P. Singh, Ind. For., 141 (9):1001-1002, 2015.

Description:- (Figure 2) A Shrub, to 3 m high, minutely pubescent throughout. Stem terete, green to brown; Leaves 2 at each node, unequal, elliptic, oblong-elliptic or linear-obovate, acute or decurrent into petiole, entire at margins, acute or obtuse at apex, 1-10 × 0.5-4 cm; petioles up to 5 mm long. Flowers are racemose fascicle, 10-flowered; peduncles to 7 mm long. Calyx cupular, 1.5-2 × 2-2.5 mm, minutely pubescent, 5-lobed; lobes broadly triangular, acute, 0.5 × 0.8 mm, hirsute. Corolla stellate, 5-8 mm across, creamy white, 5-lobed; lobes equal, elliptic or linear-ovate, acute, 4-5 × 2.5-3 mm, Stamens 5, equal, epipetalous, introse; filaments 1 mm long, flat; anthers oblong, 2 × 1 mm, basifixed, yellow, initially dehiscent poricidally, later longitudinally. Ovary globose, 1 mm long; style 4-5 mm long. Berries globose, slightly constricted in middle, 7-12 mm diameter, glabrous, yellow or reddish yellow; seeds creamy.

Local name: Pili Makoe;

Phenology: March - September.

Locality: Mostly found in moist & sandy soils.

Specimens examined: INDIA, Uttar Pradesh, Varanasi, Bot. Gard., Sampuranand Sanskrit University, 09.09.2014, Prashant Singh 8501 (UPC); Bot. Gard., Banaras Hindu University, 11.09.2014, Prashant Singh 8502 (UPC); Jalhupur, Kaithi near Markande Mahadev temple, 14.07.2014 Prashant Singh 8408 (UPC). Sonebhadra, village Bichari, Lojhara, Ranhor, Dullapatar of Anpara Forest Division, 14.08.2014, Prashant Singh 8051(UPC); Jorkahu, Dudhi, Hathinala of Renukoot Forest Division, 15.08.2014, Prashant Singh 8052 (UPC) Mirzapur, Village Chilh, 07.05.2014 Prashant Singh 8215 (UPC), Village Mallepur, 03.06.2014 Prashant Singh 8302 (UPC).

2. *Solanum incanum* L. Sp. Pl. 188, 1753; FUGP 2: 126. 1753 - *S.coagulans* Forsk. Fl. Aegypt-Arb.47.1775; FBI 4:236, 1883.

Description:- (Figure 3) An erect, branched, prickly, stellate pale-fulvus hairy shrub; prickles erect, stout sharp, shining yellow. Leaves 4.5-11 × 4-7.5 cm, ovate-elliptic, sinuate or lobed, sub-acute, midrib and lateral nerves with scattered prickles. Flowers blue or pale-purple. petioles up to 6 mm long. Flowers are racemose fascicle, peduncles to 8 mm long. Calyx cupular, 3.5-5×8-13 mm, minutely pubescent, 5-lobed; lobes broadly triangular, acute. Corolla stellate, 11-15 mm across, purple, 5-lobed; lobes equal, elliptic or linear-ovate, acute. Stamens 5, equal, epipetalous, introse; filaments 3-5 mm long, flat; anthers oblong, 1.8 × 7.5 mm, basifixed, yellow. Ovary

globose, 8 mm long; style 10-13 mm long. Berry about 2 cm in diam., subglobose, yellow at maturity. Seeds minutely pitted.

Frequent, along the river-banks. Plants are used as a remedy for toothache and sore throat. The decoction of plant is taken for chest troubles.

Local name: Ban-bhanta

Phenology: January – May.

Locality: Mostly found in moist & sandy soils, Cultivated in gardens.

Specimens examined: **INDIA, Uttar Pradesh, Varanasi**, Bot. Gard., Sampurnanand Sanskrit University, 16.01.2015, Prashant Singh 8901 (UPC); Drabya Gun Vibhag, Banaras Hindu University, 05.02.2016, Prashant Singh 9002 (UPC). **Sonebhadra**, village Dadari, Renusager, Dullapatar of Anpara Forest Division, 18.04.2016, Prashant Singh 8139 (UPC); Moyrpur, Dudhi, Hathinala of Renukoot Forest Division, 24.04.2016, Prashant Singh 8052 (UPC) **Mirzapur**, Village Narayanpur, 05.03.2016, Prashant Singh 9102 (UPC), Village Manikpur, 08.06.2016 Prashant Singh 9119 (UPC). **NBRI**, Alwar to Bulafort forest, Rajasthan, 14.07.1956; Hiralal, 34432 (NBRI), accession No. 17825; Kanda Village Dehra Dun, 02.10.1995, T.S Rana & B. Datt, 108256 (NBRI), accession No. 89806; Jimli Forest, Dehra Dun U.P, 9.12.1956, V. Chauhan & Party 42989 (NBRI), accession No. 37521; On way to Gopi Nath, Saurashtra, 12.4.1954, Kaul & Party 8785 (NBRI), accession No. 32069; Katawala, Bijnor, U.P. 22.12.1956 V. Chandra & Party 43801 (NBRI), accession No. 31117; Singhana Rajasthan, 20.06.1927, Saran & Party 42932 (NBRI), accession No. 30882; Tanakpur Nainital, U.P 1.3.1955 Kaul & Party 19654 (NBRI), accession No. 35410; Pandhijir, M.P, 19.01.1959 A. Singh & Party 55603 (NBRI), accession No. 34761; Karnal Road, Delhi, 01.09.1954 Kaul & Party, 13231 (NBRI), accession No. 33355; Artol near Jagesshwar Mandir, Almora, 01.06.1972, K.M Malyapur & Pandey 93414 (NBRI), accession No. 70684; Musa Devi Temple, Chandigarh, 02.09.1954, Kaul & Party 13279 (NBRI), accession No. 33400; Taranmal Forest, Nandurbag, 13/08/2000 P.P Sharma 50E-836 (NBRI), accession No. 90747; Mandhera Forest, Bharatpur, Alwar Road Rajasthan, 27.11.1978, P.H.S Khan & Party, 18546 (NBRI) accession No. 42645; Phanton, Bijnor 29.12.1956 V. Chandra & Party, 44137 (NBRI) accession No. 42645; Ranikhet, Nainital U.P 26.02.1955 Kaul & Party, 19346 (NBRI) accession No. 24903.

3. *Solanum nigrum* L. Sp.pl. 186, 1753; FBI 4:229, 1865; FUGP 2:124, 1753; - *S. rubrum* Mill. Garb. Dict. 4: 126, 1768.

Description:- (Figure 4) An erect or sub - erect branched, glabrous, annual herb up to 60 cm height. Leaves 2-8 x 1.5-5 cm., ovate or ovate lanceolate, entire, toothed or lobed, acute or acuminate, base oblique, petioles up to 10 mm long. Flowers white in drooping sub umbellate, extra axillary cymes; peduncles to 9 mm long. Calyx, 5-8 x 6-10 mm, minutely pubescent, 5-lobed; lobes broadly triangular, acute. Corolla, 10-12 mm across, creamy white, 5-lobed; lobes equal, elliptic or linear-ovate, acute, Stamens 5, equal, epipetalous, introse; filaments 3-4 mm long, flat; anthers oblong, 7x4 mm, basifixed, yellow, initially dehiscent poricidally, later longitudinally. Ovary globose, 2-3 mm long; style 7-8 mm long. Berries 5-8 mm. on diam., globose, black at maturity. Seeds yellow 6x11.5mm.

Common in moist, sandy and shady places.

Local name: Kali Makoe.

Phenology: November- June;

Locality: Mostly found in moist places near nullah.

Specimens examined: **INDIA, Uttar Pradesh, Varanasi**, U.P. College campus, 05.06.2015, Prashant Singh 8303 (UPC); Shivpur, 11.09.2014, Prashant Singh 8503 (UPC); Jalhupur, Kaithi near Markande Mahadev temple, 14.07.2014 Prashant Singh 8409 (UPC). **Sonebhadra**, Anpara Forest Division, 15.06.2014, Prashant Singh 8304 (UPC); Dudhi, Hathinala of Renukoot Forest Division, 20.06.2014, Prashant Singh 8052 (UPC) **Mirzapur**, Village Chilh, 07.05.2014 Prashant Singh 8217 (UPC), Village Mallepur, 24.11.2014 Prashant Singh 8724 (UPC). **NBRI**, Simla, 7800 feet above sea level, 08.09.1954 Ram Singh 15834 (NBRI) accession No. 10535; 165 mile from Nathdwara, 08.04.1954 Kaul & Party 8568 (NBRI) accession No. 15514.

4. *Solanum sisymbriifolium* Lamk. Illustr. 2:25. 1793; Backer & Bakh. f.Fl. Java 2:472, 1965; Sahani & Naithani in Acta Botanica Indica 2:151-153, 1974. *S. balbisii* Dunn. Hist. Solan. 232, t 3.1813.

Description:- (Figure 5) A very prickly herb or under shrub up to 1.2 m high with spreading branches. Prickles yellowish, up to 0.7 cm. Leaves are ovate or broadly ovate deeply lobed, usually 8-12 cm long. Leaf apex acute, base obtuse or chordate winged and prickles present. Flowers cymose up to 2 cm across. Calyx prickly triangular. Corolla up to 2 cm long, white to

bluish white. Filament 2 cm long, anther 1 cm long linear. Ovary and style glabrous. Stigma slightly 2-fid. Berry 15-20 mm diams. Seeds pale yellow, 2.9-3.2 mm long.

Common on dry and graveled soils along roadsides.

Local name: Lal Bhatkatayia.

Phenology: June- January

Locality: Along roadside

Specimens examined: INDIA, Uttar Pradesh, Varanasi, Banaras Hindu University, 20.04.2015, Prashant Singh 8207 (UPC); Chandauli, Ali nager, Mugalsarai 25.06.2016 Prashant Singh 8310 (UPC). Sonebhadra, Renusager, Anpara Forest Division, 20.09.2014, Prashant Singh 8507 (UPC); Jorkahu, Dudhi, Hathinala, Moyrpur of Renukoot Forest Division, 22.09.2014, Prashant Singh 8513 (UPC). NBRI, K.K Singh and Anand Prakash 216928 (NBRI) accession No. 88163; Shillong Assam, 28.04.1962, S Chopra & Party 62414 (NBRI), accession No. 48887. National Botanical Garden Uttar Pradesh, Lucknow, 14.04.1967, A.P Pandey, 69442 (NBRI), accession No. 63435. Elephant Fall Shillong Assam, 06.05.1962 J.G Srivastava & Party 91842 (NBRI), accession No.50246; Holy Forest, Mauphlong, K J Wall Assam 19.05.1958 B.K Nayer & Party 50554 (NBRI), accession No.43421. Ooty Tamilnadu, 17.03.1988 Gupta, Singh & Party EBH 7056 (NBRI), accession No. 69265; Coonori, Nilgiri, Madras, 17.11.1959 S.L Kapoor 64811 (NBRI) accession No. 43486; Coonori, Tiger Hill, Nilgiri, Madras, 19.11.1959 S.L Kapoor 64861 (NBRI) accession No.43485.

5. *Solanum surattense* Burm. F. Fl. Ind. 57. 1768 (excl. syn Plunk & Raj.) – *S. xanthocarpum* Schard. & Wendl. Sert. Hanov. 1:8, t.2, 17; FBI 4:236, 1865; FUGP 2:125, 1765.

Description: - (Figure 6) A prostrate, deep-rooted, prickly annul herb. Leaves 5-15 cm, elliptic or oblong-ovate, sinuate, or sub pinnatifid, prickly on both sides. Flowers up to 2 cm across. Calyx prickly triangular. Corolla up to 2 cm long, bluish purple, solitary or in few-flowered, extra axillary cymes. Berry 1.5-2 cm in diam., globose, yellow with green blotches. Seeds smooth upto 13mm long.

Common on dry and graveled soils along roadsides.

Local name: Bhatkatayia.

Phenology: June - January

Locality: Throughout Plain

Specimens examined: INDIA, Uttar Pradesh, Varanasi, Parmanandpur, 24.09.2015, Prashant Singh 8586 (UPC); Banaras Hindu University,

11.06.2015, Prashant Singh 8357 (UPC); Jalhupur, Kaithi near Markande Mahadev temple, 15.11.2016 Prashant Singh 8738 (UPC). Sonebhadra, Anpara, 05.10.2015, Prashant Singh 8601(UPC); Hathinala, 20.08.2014, Prashant Singh 8080 (UPC) Mirzapur, Tandafall, 07.07.2015 Prashant Singh 8430 (UPC), Village Narayanpur, 08.07.2015 Prashant Singh 8438 (UPC). Chandauli, Rajdari, 06.07.2014, 8402 (UPC).

6. *Solanum torvum* Sw. prod. 47.1788; Clarke in Hk.f. FBI 4:234, 1883; Raizada in Journ. Ind. Bot. Soc. 35: 162, 1936; Backer & Bakh f. Fl. Java. 2: 475, 1965; P.C. Kanjilal For. Fl. Plains Uttar Pradesh 492, 1966.

Description:- (Figure 7) A woolly tomentose, sparsely prickly shrub upto 2 mm high. Leaves 5-18 x 4-10 cm ovate, sinuate or coarsely lobed, acute base cordate rounded or unequal sided flowers white in extra axillary dense dichotomous cymes upto 2cm across. Corolla up to 2 cm long, white, solitary or in few-flowered, extra axillary cymes. Stamens 5, equal, epipetalous, introse; filaments upto 2 mm long, flat; anthers oblong, 8x1 mm, basifixed, yellow, initially dehiscing poricidally, later longitudinally. Ovary globose, 2-3 mm long; style 7-8 mm long. Berries 1.5cm in diam, yellow at maturity seeds many brown upto 1.5cm diam. Found along the bank of rivers.

Phenology: December-June

Locality: Mostly found in moist & sandy soils

Specimens examined: INDIA, Uttar Pradesh, Varanasi, Banaras Hindu University, 05.02.2016, Prashant Singh 9003 (UPC); Sarnath, 05.01.2015 Prashant Singh 8905 (UPC). KFRI Pechi, trichur, 6.2.1979, N. Sasidharan, 705, accession No. 1020 (KFRI).

7. *Solanum villosum* Miller, Gard. Dict. 8:2. 1768 ssp villosum; Edmonds in Bot. J. L. Soc. 78: 214. 1979. – *S. purpureilineatum* Sabnis et Bhatt on Bull. Bot. Surv. Ind. 12 (1-4): 258-260.1970; Raizada in suppl. FUGP 174. 1976.

Description:- (Figure 8) An erect or decumbent, glabrous, annual herb, 25-40 cm high. Leaf 3-6x1-2 cm, ovate, irregular dentate, acute, base oblique or truncate, sparsely hairy on both surface. Flowers yellowish green upto 1.5 cm across. Corolla up to 1.5 cm long, white. Stamens 5, equal, epipetalous; filaments upto 8 mm long, flat; anthers oblong, 15x4 mm, basifixed, yellow, initially dehiscing poricidally, later longitudinally. Ovary, 4-5 mm long; style 12-15 mm long, hairy. Berry 6-6.5 mm in diam, globose. Orange red at maturity. Seed 2 mm in diam, pale-coloured.

Common in moist, sandy soil and shady situation.

Local name: Lal Makoe.

Phenology: December- March

Locality: Mostly found in moist & sandy soils, near nullah

Specimens examined: INDIA, Uttar Pradesh, Varanasi, Cantonment board, 09.09.2014, Prashant Singh 8505 (UPC); Banaras Hindu University, 05.02.2016, Prashant Singh 9004 (UPC); Jalhupur, 14.07.2014 Prashant Singh 8410 (UPC). Sonebhadra, Anpara, 05.12.2014, Prashant Singh 8801(UPC); Hathinala, 10.12.2015, Prashant Singh 8820 (UPC) Mirzapur, Tandafall, 07.07.2015 Prashant Singh 8435 (UPC), Village Narayanpur, 08.07.2015 Prashant Singh 8440 (UPC). Chandauli, Rajdari, 06.07.2014, 8420 (UPC).

8. *S.verbasoifolium*, Linn.Sp.Pl.184; Royle. III.279; F.B. I. Iv, 230; Watt E.D.; Kanjilal For.Fl. 253; Gamble Man. Ind. Timb.508; Collett Fl. Bimi. 342; Prain Beng. Pl.746; Cooke Fl.Bomb.ii, 263 ; Brandis Ind. Trees 489. *S. pubescens*, Rob. Fl. Ind. 564. *S.erianthum*, Don Prod.96.- Vern. Aseda (Bijnor), ban-tamaku (Dehradun).

Description:- (Figure 9) A tall erect unarmed shrub or small trees, densely tomentose with yellowish or grey sourfly stellate hairs. Leaves 4-3 in. long, elliptic-lanceolate, scute or acuminate, entire, softly pubescent above, densely woolly beneath,

thickly herbaceous; base usually acute, sometimes rhomboid or rounded, main lateral nerves about 8 pairs, petiole 1-2 in. Flowers many, densely clustered in woolly 2-chotomous corymbose subterminal cymes; peduncles erect, about 1-4 in. long; pedicels in. long, stout. Calyx $\frac{1}{4}$ in. long, densely stellate-tomentose enlarged in fruit but shorter than the berry; teeth triangular, acute. Corolla white, in. across stellate-hairy outside; lobes $1\frac{1}{2}$ in.in diam., globose, yellow. Seeds minutely dotted.

Local name: Ban tamakhu.

Phenology: July-August

Locality: Mostly found in moist & sandy soils, near nullah

Specimens examined: INDIA, Uttar Pradesh, Varanasi, Assi ghat, 15.09.2018, Prashant Singh 9123 (UPC); Samneghat lanka, 13.10.2018, Prashant Singh 8932 (UPC); Jalhupur, Kaithi near Markande Mahadev temple, 15.10.2018 Prashant Singh 9102 (UPC). Gorakhpur, Balua Village, 07.11.2018, Prashant Singh 8151(UPC); Basti, Near railway station, 9.11.2018, Prashant Singh 8154 (UPC) Mirzapur, Village Chilh, 08.12.2018 Prashant Singh 8335 (UPC), Village Mallepur, 09.12.2018 Prashant Singh 8340 (UPC); Azamgarh, Sibli College, 23.01.2019 Prashant Singh 8059 (UPC).

Table: New Medicinal records, part use as medicinal prospective of genus *Solanum* L. of eastern U.P.

S.No.	Plant	English name	Part use	New Medicinal records
1.	<i>S. diphyllum</i>	Two-leaf nightshade	Fruits, Green fruits, Seeds	Fruits are given as tonic and laxative, to improve appetite and are useful in asthma and skin diseases. Green fruits are crushed and applied locally on ringworm. Dried seeds fried in oil are taken as a vermifuge.
2.	<i>S. incanum</i>	Thorn apple, bitter apple, bitter ball	Leaf, Root, Fruit	Sore throat, angina, stomach ache, ear inflammation, snake bites, wounds, liver disorders, ringworm, painful menstruation, pneumonia and fever.
3.	<i>S. nigrum</i>	Black nightshade, Garden nightshade	Berries, Stem, Leaves	Berries are used in fever, diarrhea, eye diseases and hydrophobia. Paste of young shoots are applied in skin disease. Decoction of leaves are diuretic and laxative.
4.	<i>S. sisymbriifolium</i>	Sticky nightshade	Whole plant	Juice of plant is useful on ulcers and other skin diseases.
5.	<i>S. surattense</i>	Wild Eggplant, Yellow- Berried Nightshade	Whole plant, Root, Leaves	Roots are expectorant used in cough, asthma, fever and pain in chest. Decoction of plant used in gonorrhea. Leaves are applied locally to relive pain. Juice given with black pepper in rheumatism.
6.	<i>S. torvum</i>	Turkey berry	Leaf, Root, Fruit	Fever, wounds, tooth decay, reproductive problems and hypertension.
7.	<i>S. verbasoifolium</i>	Ban tamakhu	Berries, Leaves	Typhoid, Tuberculosis, Urinary tract infection, diarrhea, oral infection, amoebiasis.
8.	<i>S. villosum</i>	Hairy nightshade, red nightshade or woolly nightshade	Berries, Stem, Leaves	Inflammation, sore eyes, treat enlargement of spleen, liver, piles, gonorrhea and hydrophobia.

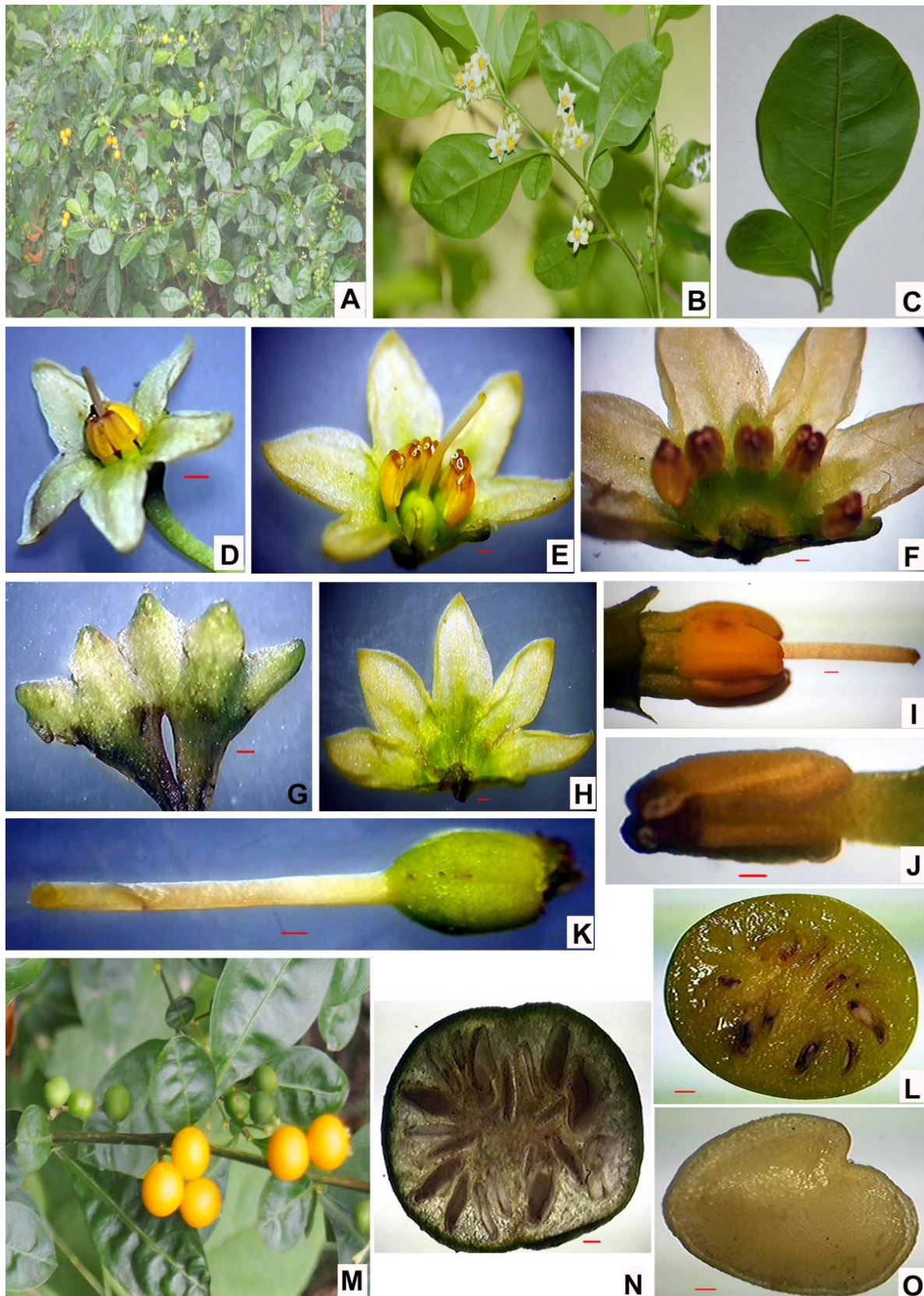


Figure 2. *Solanum diphyllum* L. A. Habit; B. Flowering twig; C. Leaf; D. Flower; E. Longitudinal section of flower; F. Corolla with stamens (epipetalous); G. Calyx; H. Corolla; I. Androecium-gynoecium arrangements; J. A stamen; K. Gynoecium; L. Transverse section of ovary; M. Fruiting twig; N. Transverse section of mature fruit; O. Seed. (Measurement bar in each diagram is of 1 mm except figure 2A, 2B, 2C and 5M)

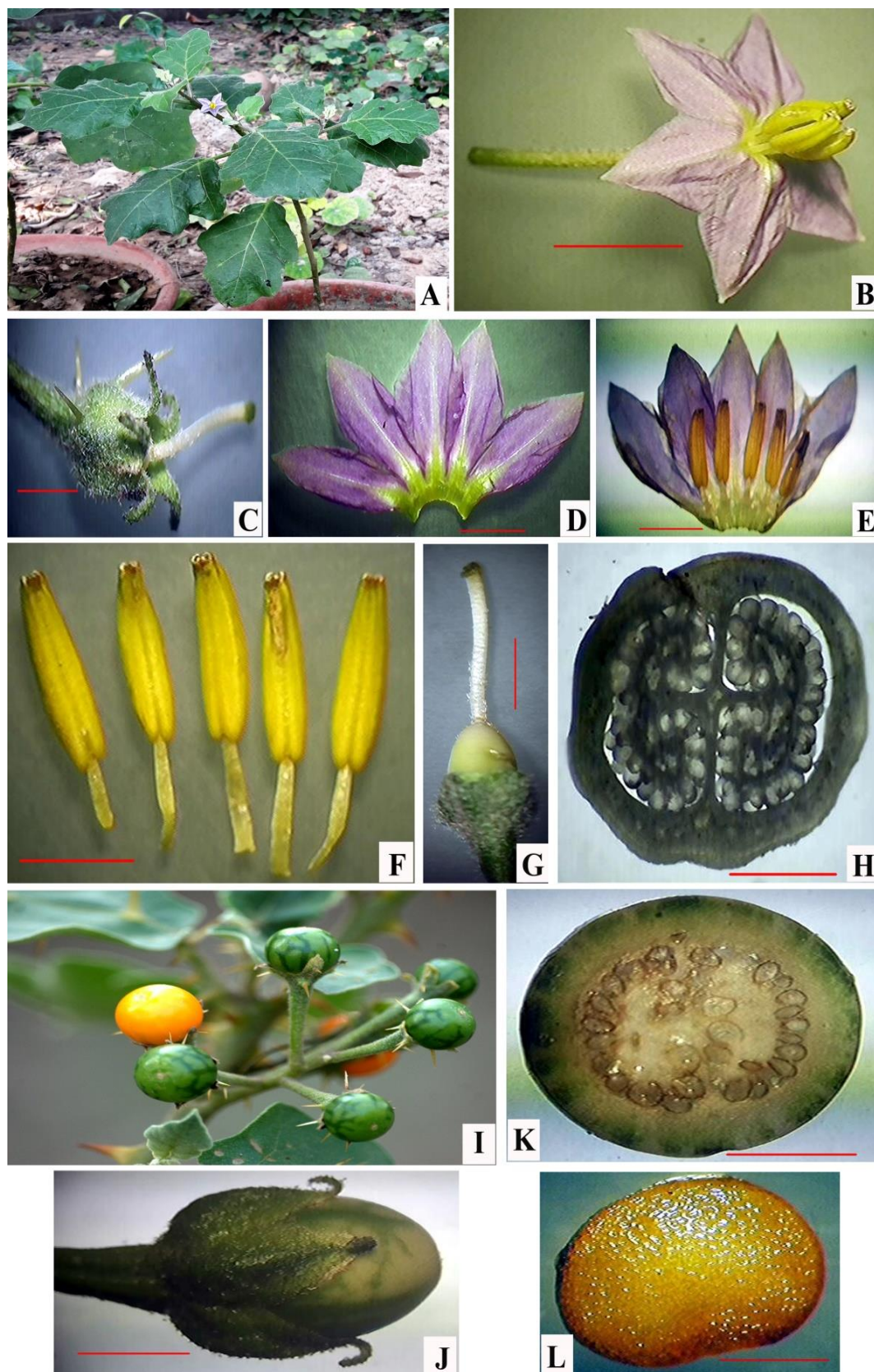


Figure 3. *Solanum incanum* L. A. Habit; B. Flower; C. Calyx; D. Corolla; E. Corolla with stamens; F. Stamens; G. Gynoecium; H. Transverse section of ovary; I. Fruiting twig; J. A immature fruit; K. Transverse section immature fruit L. Seed. (Bar in each diagram is 5 mm except figure 3A, 3I)

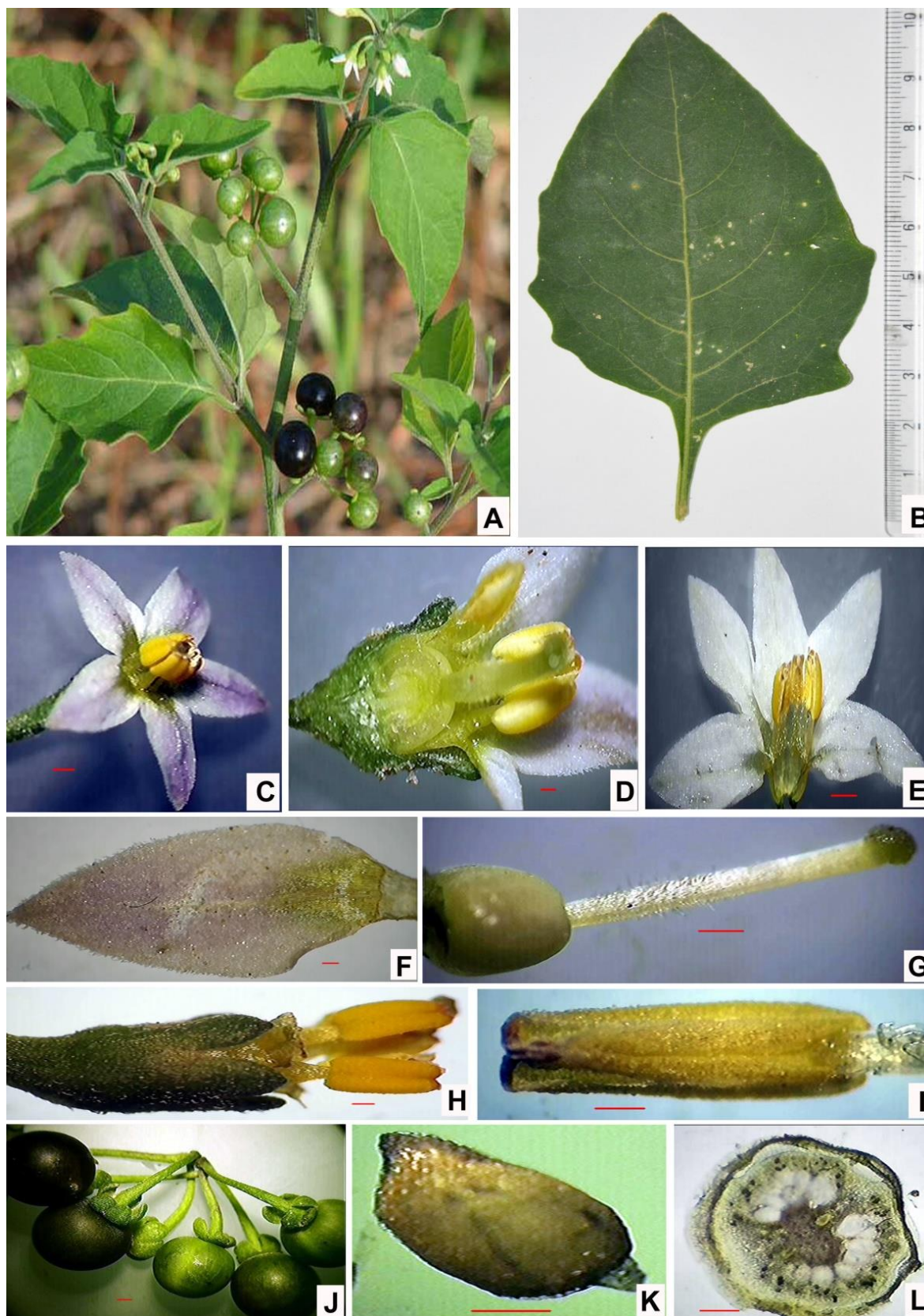


Figure 4. *Solanum nigrum* L.: A. Habit; B. Leaf; C. Flower; D. Longitudinal section of flower; E. Corolla with Stamens; F. A petal; G. Gynoecium; H. Androecium; I. A stamen; J. Fruiting twig; K. Seed; L. Transverse section of ovary. (Bar in each diagram is of 1 mm except figure 4A, 4B)



Figure 5. *Solanum sisymbriifolium* Lam: A. Habit; B. Leaf; C. Flower; D. Calyx; E. Corolla; F. Longitudinal section of flower; G. Androecium-gynoecium arrangements; H. Stamens; I. Gynoecium; J. Transverse section of ovary; K. Fruiting twig; L. Transverse section of fruit; M. Seed (Bar in each diagram is of 1 mm except figure 5A, 5B, 5K and 5L)

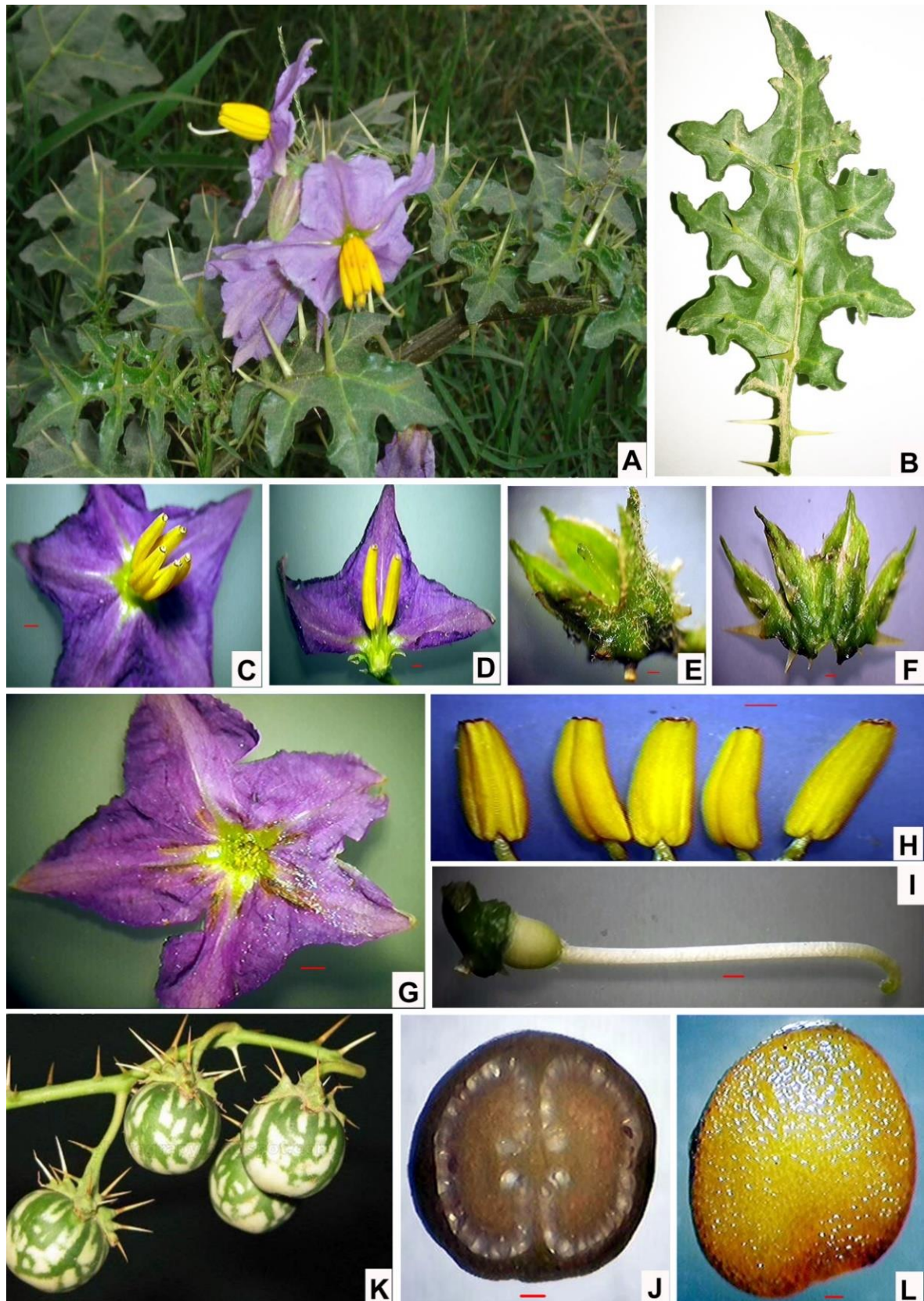


Figure 6. *Solanum surattense* Burm. F.: A. Habit; B. Leaf; C. Flower; D. L S of Flower; E & F. Calyx; G. Corolla; H. Stamens; I. Gynoecium; J. T S of ovary; K. Fruit; L. Seed (Bar in each diagram is of 1 mm except figure 6A, 6B, 6K)

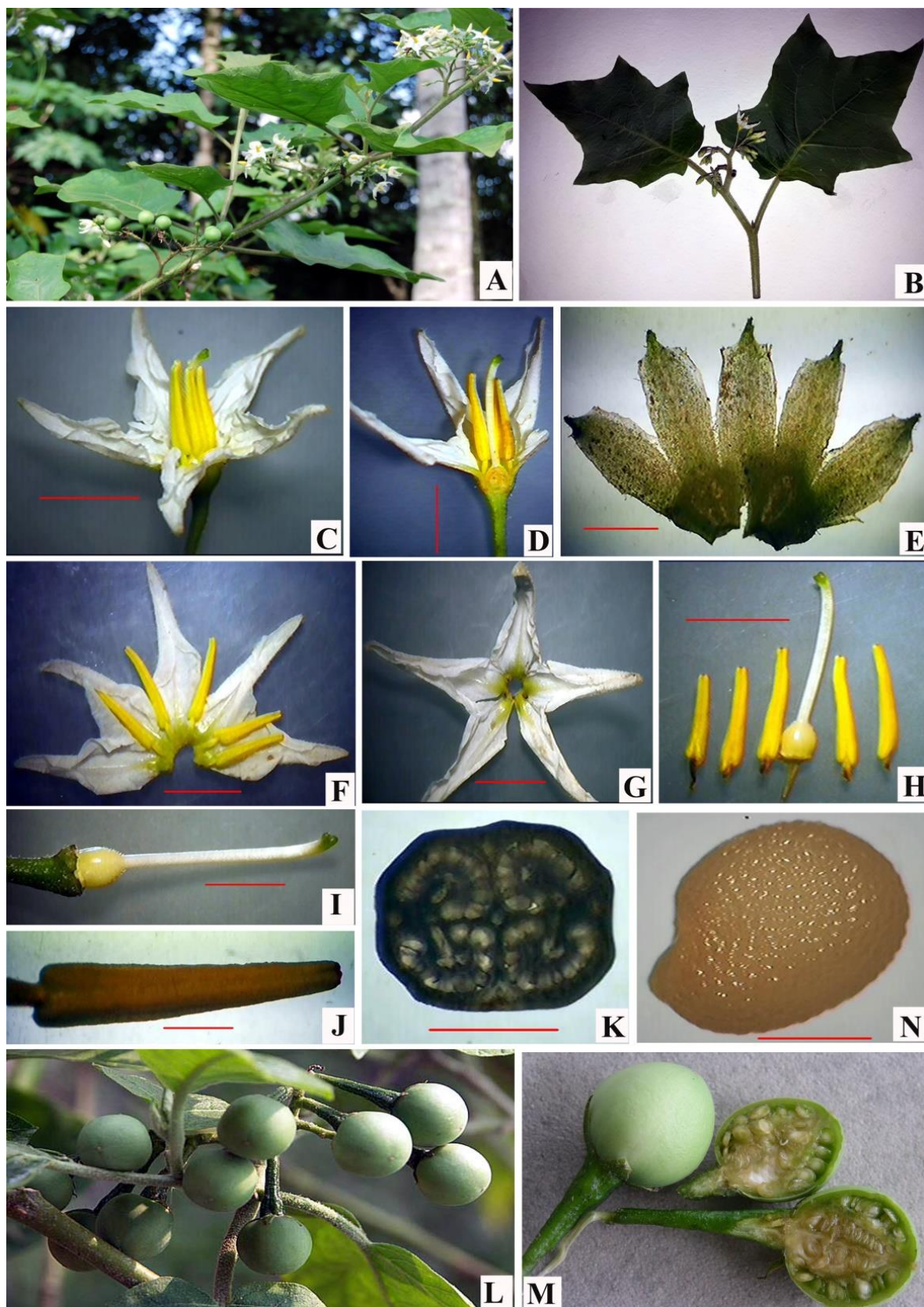


Figure 7. *Solanum torvum* Sw. prodr. A. Habit; B. Flowering twig; C. Flower; D. L.S. of Flower; E. Calyx; F. Corolla with stamens; G. Corolla; H. Stamens; I. Gynoecium; J. A Stamens; K. T.S. of ovary; L. Fruiting twig; M. T.S. Fruit; N. Seed. (Bar in each diagram is of 5 mm except figure 7A, 7B, 7L & 7M)

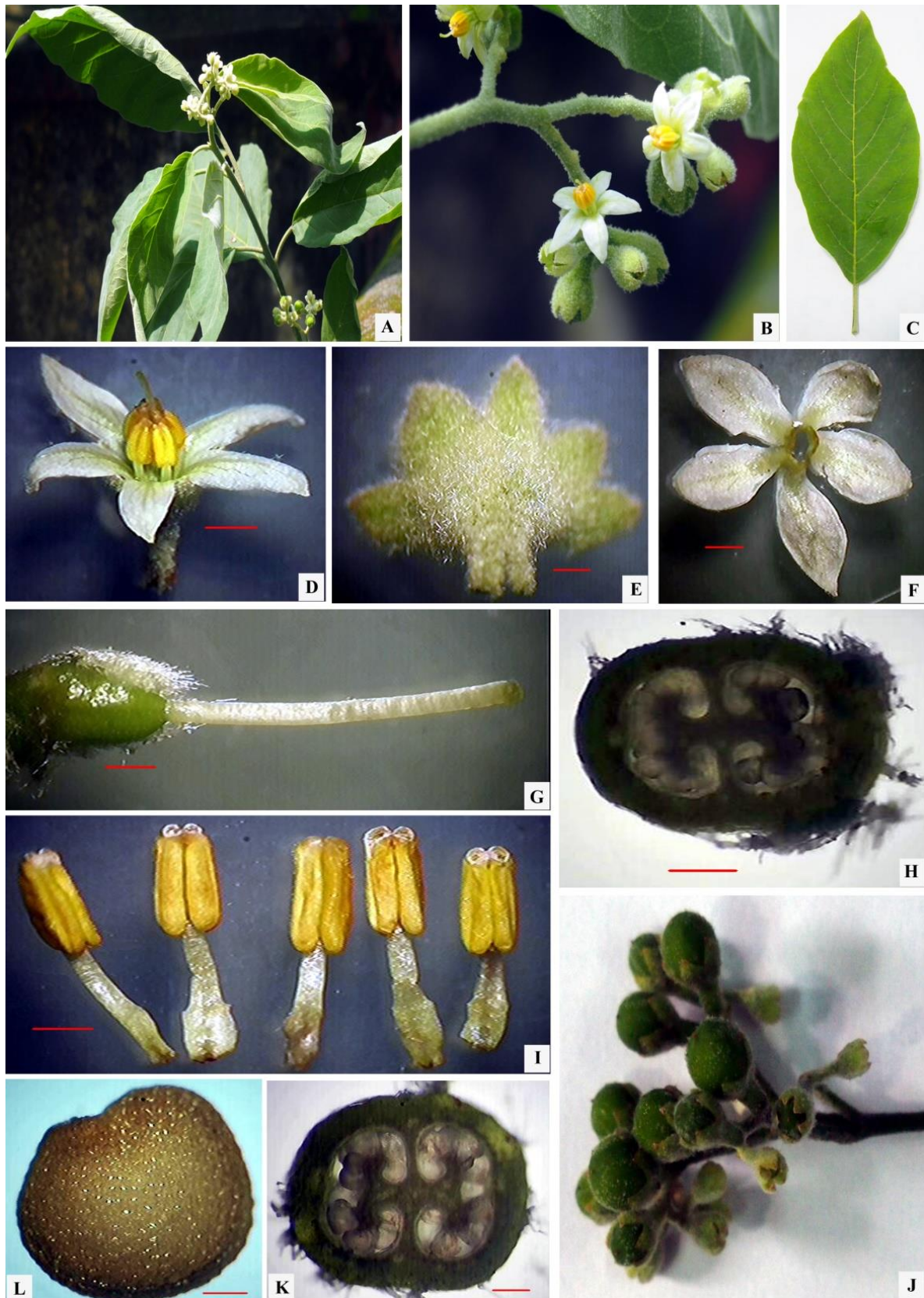


Figure 8. *Solanum verbasoifolium* L. A. Habit; B. Flowering twig; C. Leaf; D. Flower; E. Calyx; F. Corolla; G. Gynoecium; H. T.S. of ovary; I. Stamens; J. Fruiting twig; K. T.S. Fruit; L. Seed. (Bar in each diagram is of 1 mm except figure 7A, 7B, 7L & 7J)

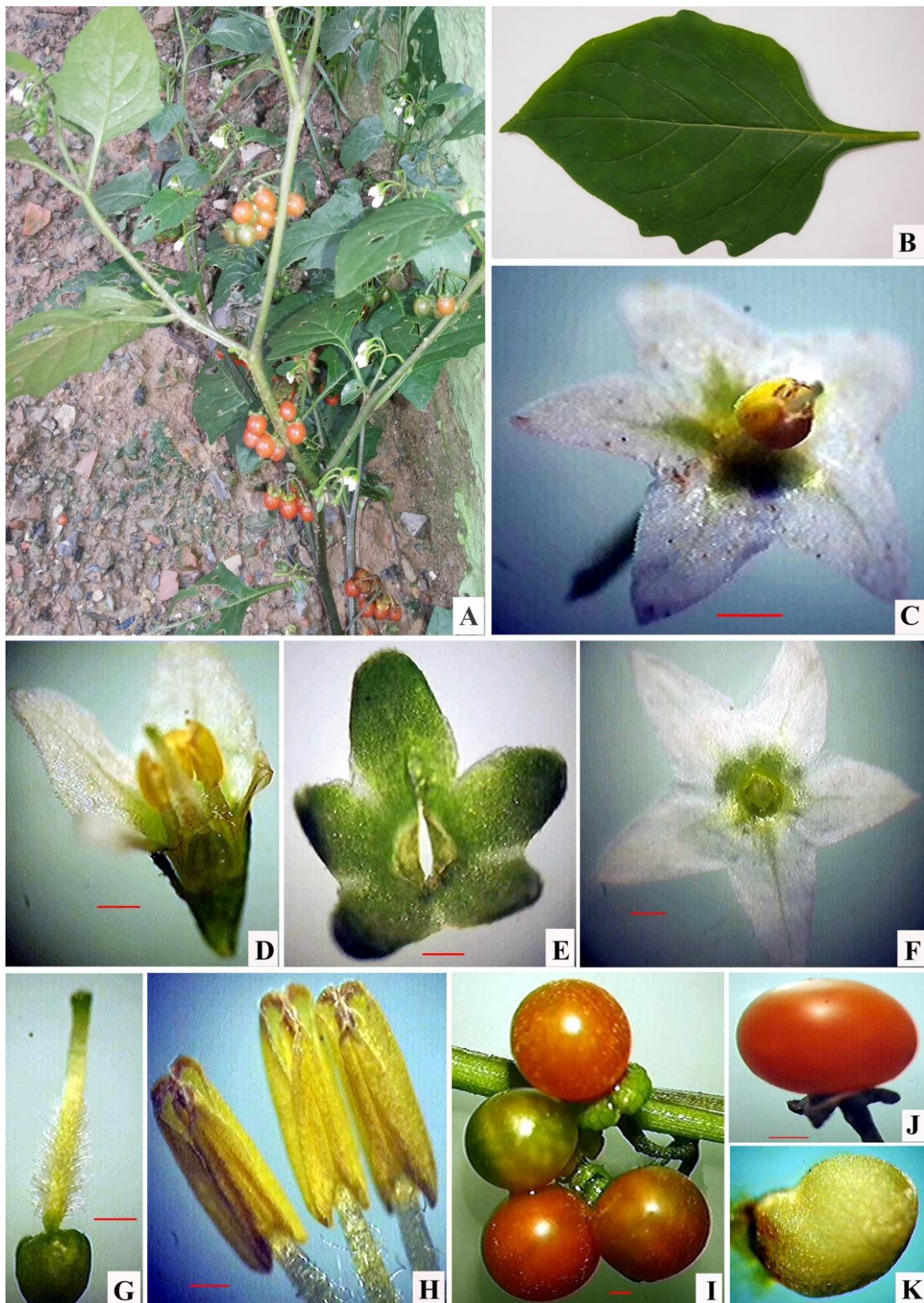


Figure 9. *Solanum villosum* L. A. Habit; B. Leaf; C. Flower; D. L S of Flower; E. Calyx; F. Corolla; G. Gynoecium; H. Stamens; I. Fruiting twig; J. A Fruit; K. Seed. (Bar in each diagram is of 1 mm except figure 8A, 8B)

Ethnomedicinal properties and uses

Berries and leaves of *Solanum* L. are mainly used for medicinal purposes, besides other parts of the

whole plant. The leaves are used as poultice for rheumatic and gouty joints (disease causing the joints to swell and become painful), skin diseases, used in the treatment of tuberculosis and are said

to produce diaphoresis. Leaves are also used in dropsy, nausea and nervous disorders (Hussain *et al.*, 1992; Jain, 1999). The decoction of the berries and flowers are useful in cough, erysipelas (specific, acute, cutaneous inflammatory disease caused by a haemolytic streptococcus and are characterized by redhot). These are remedy for pulmonary tuberculosis and bronchitis, diuretic. The juice of the berries used as an antidiarrheal, ophthalmopathy and hydrophobia. It is also used in heart diseases. Berries are used to possess tonic, diuretic and cathartic properties. Seeds are useful in giddiness and dipsia. They are also useful in inflammations and skin diseases. The roots are useful in otopathy, ophthalmopathy, rhinopathy and hepatitis. (Jainu & Devi, 2006) The whole plant used as antiseptic, anti-inflammatory, expectorant, cardiogenic, digestive, diuretic, laxative, diaphoretic, sedative, swelling, cough, asthma The plant is also effective in curing cardiopathy, leprosy, hemorrhoids, nephropathy, ophthalmopathy, dropsy and general debility. Decoction of the plant depresses the Central nervous system and reflexes of the spinal cord (Martin, 1995; Nadkarni, 1973; Perez *et al.*, 1998; Chopra *et al.*, 1961; Kirtikar & Basu, 1935; Nadkarni, 1973; Saleem *et al.*, 2009).

Conclusion

Solanum L. is prominent genus of family Solanaceae having high medicinal properties of given species. These plants are used by indigenous peoples of study area to treat various ailments. The indigenous community still relies on traditional medicine although; the modern health-care services are available, which indicates the significance of plant based traditional recipes. Besides medicinal value, other species are of much value as ornamental and food plant etc. eight important plant species i.e. *Solanum villosum*, *S. nigrum*, *S. diphyllum*, *S. surattense*, *S. sisymbriifolium*, *S. torvum*, *S. incanum* & *S. verbascifolium* are described in present paper which are found wild in area, for each species legitimate botanical name, brief description, English name locality and new medicinal record are mentioned in table. The green herbs continue to fascinate man as they have done since the dawn of history. The application of those plants in many forms to eradicate diseases is being practiced from time immemorial. Even after growth of modern medicine the herbal practices still continue to flourish.

Our findings provide baseline data to establish a connection between the traditional health practitioners and scientific communities, which could be substantial in novel drug discovery. Furthermore, ethnobotanical data is of significant value for conservation managers and policy makers for sustainable management of medicinal plant species, which are under threat due to over exploitation

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