

**DRAFT**

## Genus *Panax* L. (Araliaceae) in India

Arun K. Pandey, M. Ajmal Ali and A. A. Mao\*

Plant Systematics Research Centre, University Department of Botany, TM Bhagalpur University,  
Bhagalpur-812007 India

\*Botanical Survey of India, Eastern Circle, Shillong, Meghalaya, India

### Abstract

A taxonomic study of *Panax* L. in India is provided based on literature, field studies, and examination of herbarium collections. Two species and one variety of *Panax* are recognized in India: *Panax assamicus* Ban., *P. bipinnatifidus* Seem., *P. bipinnatifidus* var. *angustifolius* (Burkill) J. Wen. Taxonomic history and description are provided for all the three species and one variety and a taxonomic key is constructed.

**Key words:** *Panax*, Araliaceae, India.

### INTRODUCTION

Araliaceae (the ginseng family) includes about 50 genera and approximately 1500 species (Wen *et al.* 2001a). The family is distributed mostly in tropics and subtropics (especially in southeastern and southern Asia and Pacific islands), with some genera occurring in temperate zone (e.g. *Aralia*, *Hedera*, *Oplopanax* and *Panax*). In India, *Panax* occurs mostly in the north and northeastern regions and is used as folk medicine. But no cultivation practice have been developed for large scale cultivation of Indian ginseng. The taxonomy of Indian ginseng is highly controversial (cf. treatment of Banerjee 1968; Wen *et al.* 2001b; Pandey *et al.* 2002, 2004, 2006).

*Panax* is a perennial, rhizomatous herb of moist rich woods which shows high level of morphological variation. Species of *Panax* vary in terms of persistency of tap roots (roots of *P. japonicus* C. A. Mayer, *P. vietnamensis* Ha & Grushv., and *P. wangianus* S. C. Sun are decayed or detached at a later stage), and shape of roots. Three types of rhizomes are recognizable. *Panax ginseng*, *P. pseudoginseng*, *P. quinquefolius* and *P. trifolius* have short (<5 cm long) and upright rhizomes; *P. japonicus*, *P. stipuleanatus* *P. vietnamensis*, *P. wangianus*, *P. zingiberensis* and *P. assamicus* have horizontally elongated rhizomes with thick and short internodes. The rhizomes of *P. bipinnatifidus* Seem. are also horizontally elongated but they have slender and elongated internodes and subglobe nodes (Wen 2001b). *Panax* species also vary in the number of leaves, presence or absence of stipules, leaflet shape, pubescence, and division, as well as number of flowers per umbellate inflorescence. The peduncle of *P. quinquefolius* is usually shorter than its petiole and in that of other species of *Panax*, is longer than their petioles. *Panax ginseng*, *P. notoginseng* and *P. quinquefolius* bear hermaphrodite flowers; *P. trifolius* is sex exchanging and dioecious; and *P. bipinnatifidus*, *P. pseudoginseng*, *P. vietnamensis*, and *P. wangianus* are polygamo-monoecious. The ovary is 2-locular in *P. ginseng* and *P. quinquefolius*, 3-locular in *P. trifolius* and 2-3 locular in other species. Fruits of *P. ginseng*, *P. notoginseng*, *P. pseudoginseng* and *P. quinquefolius* are bright red; those of *P. trifolius* are yellow; and fruits of other species are red with a black tip. *Panax bipinnatifidus* was described as being characterized by its divided leaflets (Seemann 1868). The degree of the division of its leaflets varied greatly. Division of the leaflets in *Panax* appears to be a plastic character and is associated with at least three species: *P. bipinnatifidus*, *P. stipuleanatus*, and *P. vietnamensis* (Li 1942; Hara, 1970).

### TAXONOMIC HISTORY

The genus *Panax* was established by Linnaeus (1753) described under *Pentandria digyna*. Linnaeus recognized 3 species (*P. quinquefolius*, *P. trifoliatum*, *P. fruticosum*). *P. quinquefolius* was made the lectotype by Graham (1966). *P. trifoliatum* was transferred to *Acanthopanax* Miq. and *P. fruticosum* was the type of *Nothopanax*. *Panax pseudoginseng* was described by Wallich (1829-1832) based on specimens collected from central Nepal. Decaisne and Planchon (1854) shifted *P. quinquefolius*, *P. trifoliatum* to *Aralia*. Bentham and Hooker (1867) supported them, but excluded *Polyscias* and *Pseudopanax*. C. B. Clarke (1879) described only one cultivated species, *P. fruticosum*. *P. pseudoginseng* growing wild in Nepal, Sikkim and Bhutan was described by him as *Aralia pseudoginseng*. Li (1942) reduced *Aralia bipinnatifida* Clarke (*Panax bipinnatifida* Seem.) to varietal

rank, *P. pseudoginseng* Wall. var. *bipinnatifida* Li. Banerjee (1968) recognized four species and two varieties within the genus *Panax*: *P. sikkimensis*, *P. assamicus*, *P. pseudoginseng* var. *pseudoginseng*, *P. pseudoginseng* var. *bipinnatifida* and *P. fruticosus*. Hara (1970) recognized four taxa from Nepal based on rhizome, root and leaf characters: *P. pseudoginseng* subsp. *pseudoginseng* and *P. pseudoginseng* subsp. *himalaicus* Hara var. *himalaicus*, *bipinnatifidus* (Seem.) H. Li. and *angustifolius* (Burkill) H. Li. Hoo & Tseng (1973, 1978) followed Hara's species concept and made a few nomenclatural changes at the varietal level within *P. pseudoginseng*. Zhou *et al.* (1975) however, defined *P. pseudoginseng* narrowly, *sensu* Wall. (1829). The narrowly defined *P. pseudoginseng* has been supported in Wen & Zimmer (1996), Choi & Wen (2000), Yoo *et al.* (2001) and Lee & Wen (2004).

## TAXONOMY

***Panax*** L., Sp. Pl. 1058. 1753; Gen. Pl. 481. 1754, Proparte; ed. 6. 554. 1764; Jussieu, Gen. Pl. 218. 1789, Proparte; DC. Prodr. 4: 252. 1830; Walp. Rep. 5: 925. 1846; Decne. et Planch. in Rev. Hort. 105. 1854; Miquel in Ann. Mus. Bot. Lugd.-Bat. 1: 14; 1863; Maxim. Diagn. Plant. Nov. 1: 264. 1866; Benth. et Hook. F. Gen. Pl. 1: 938. 1867; Seem. in Journ. Bot. 6: 62. 1868; Graham in Journ. Arnold Arbor. 47: 132-136. 1966. Lectotype: *P. quinquefolius* Linn. Sp. Pl. ed. 1513. 1763 (Graham 1966).

*Ceirodendron* Nutt. Ex. Seem. in Journ. Bot. 5: 236. 1867.

*Ginseng* Adams. Fam. 2: 102. 1753.

*Maralia* Thou. Gen. Nov. Madag. 13. 1806.

*Oligoscias* Seem. in Journ. Bot. 3: 179. 1865.

*Panacea* Mitch. in Act. Phys. Med. Acad. Nat. Cur. 8: 1748 App. 221.

*Raukana* Seem. in Journ. Bot. 4: 352. 1866.

*Sciadopanax* Seem. I.c. 73 t. 27. 1865.

*Panaxus* St. Lag. in Ann. Soc. Bot. Lyon 7: 109. 1880.

Perennial herbs of moist rich woods. Rhizome short or elongated, branched, fascicled, or simple, tuberous; base of the stem clasped by membranaceous, deciduous or persistent scales. Stem unbranched, erect, glabrous. Leaves 1-5, generally 3 in a single whorl at the summit of stem, digitately compound, membranaceous, exstipulate; leaflets 3-7, mostly 5, petiolate or sessile, glabrous or with sparse to dense setae along the veins on the dorsal surface, elliptic to obovate, sometimes linear, the base acute to rounded, the apex acute to long acuminate, the margin serrated, uni- or biserrate. Inflorescence a single short or long peduncled, terminal umbel of many flowers, the pedicels subtended by lanceolate bracts, sometimes more than one flowers on single pedicels. Flowers bisexual or unisexual or polygamodioecous. Floral tube obconical or cylindrical, articulated in flowers. Sepals 5 cup-shaped or united at the base, 5 toothed, green. Petals 5, triangular or ovate or linearly oblong. Stamens 5, filament fleshy; anthers oblong or ovate to elliptic, bilobed, lobes sometimes angular possibly it marks the longitudinal dehiscence. Ovary 5 celled, style 2-3 united at the base, or free, reflexed, persistent, inserted at the middle of the concave or convex smooth or corrugated disc. Fruits flat or globose, ribbed.

About 18 species of which 16 are from eastern Asia and two from eastern north America. In India, *Panax* occurs mostly in the north and northeastern regions and is used as folk medicine.

### Key to the species and varieties

- 1a. Rhizome short and upright, with 2-5 fleshy roots,  
fusiform, fruit red ..... *P. pseudoginseng*
- 1b. Rhizomes elongate and creeping, fruits red or yellow with a black tip ..... 2
- 2a. Rhizomes with short and thick internodes ..... *P. assamicus*
- 2b. Rhizomes with slender internodes and subglobose node, style united at the base ..... 3
- 3a. Leaflets narrowly elliptic to broadly so, sometimes ovate to obovate, pinnatifid  
to bipinnatifid ..... *P. bipinnatifidus* var. *bipinnatifidus*
- 3b. Leaflets narrow, lanceolate to broadly linear usually unlobed  
..... *P. bipinnatifidus* var. *angustifolius*

**1. *Panax assamicus*** Ban. Bull Bot. Surv. India. 10.(1): 20-27. 1968.; N. P. Singh *et al.* Fl. Manipur, 451. 2000.  
**Lectotype:** Wall cat. 3730, Sheopore, Nepal, June, 1821. Acc. No. 191766 (CAL!)

Tall, stout herb of 1.5 m tall. Tuber horizontal, creeping and elongated with thick internodes, unbranched. Stem straw coloured, stout, erect, glabrous. Leaves whorled at the summit of the stem, exstipulate, digitately 5-7 foliate, 12-34 cm long, petiolate; petioles glabrous, stout, angular, 7-17 cm long; leaflets petiolulate, long broadly linear, 7-18 cm long, 1.5-3.2 cm wide, long acuminate, acumination up to 3 cm long, base rounded, rarely attenuate, minutely uniformly serrate, midrib regular, rarely oblique, petiolules 3-22 mm long, lateral ones shorter than the rest. Inflorescence a terminal umbel, glabrous, 10-38 cm long, pedunculate, glabrous, stout, sometimes whorled at the top of the rachis; umbels many flowered, 2-4 cm in diameter; bracteoles linear, persistent, glabrous, 1.2 cm long. Flowers greenish-white in bud, bisexual, 1.2 cm long. Calyx green, cuplike obscurely toothed, teeth less than 1mm long, alternate to petals. Corolla polypetalous; petals 5, glabrous, oblong one-nerved, inflexed apiculate. Stamens 5, alternate with petals, filaments filiform, 2 mm long; anthers oblong, bilobed, dorsifixed; ovary inferior. Stigma 2-4, rounded. Fruit red, globose,

*Phenology:* April to October.

*Distribution:* Arunachal Pradesh, Manipur, Meghalaya, Sikkim, Nagaland, West Bengal (Darjeeling).

*Common name:* Shensheng (Khasi)

*Ecology:* Under the floor of the bamboo, along with ferns, mostly in shade.

*Specimen:* ARUNACHAL PRADESH: Tushar valley, Namdapha, 1300 ft., June 12, 1994, A. S. Chauhan 99698 (ASSAM); Old Ziro, Lower Subansiri District, September 18, 1983, G. D. Pal 1227 (ARUN); Begi Amjee, Lower Subansiri District, May 12, 1966, A. R. K. Sastry 45220 (ARUN). MANIPUR: Ukhrul, Mukherjee 3183 (CAL); Shirohee, Manipur-Nagahills, 2135 m, July 10, 1948, S. K. Mukerjee 3183 (CAL); Siroy hills, Ukhrul district, July 2005, Biseshwori Thongam 10002, (IBSD) 4 sheets; Siroy hills, Ukhrul district, July 2005, Ali & Thongam 10001 (BHAG); Ukhrul, Manipur, March 2005, A. A. Mao 15306 (ASSAM). MEGHALAYA: Dunpep, 1891 m, Khasia mountains, May 30, 1911, J. H. Burkill & S. N. Banerjee 34257 (CAL); Mauphlang, 1830 m, Khasia hills, June 16, 1885, C. B. Clarke 38303 (CAL); Mauphlang, 1830 m, May 1920, H. G. Carter 1611 (CAL); Shillong peak, 1952 m, July 23, 1913, U. N. Kanjilal 2344 (CAL); Soyung, 1368 m, Khasia, August 30, 1885, C. B. Clarke 40298 (CAL); Shillong 1520 m, August, 1890. Acc. No. 19176 (CAL); Khasia hills, 1520-1830 m, S. Kurz 385 (CAL); Wahyler, Nongstonia area, Khasia & Jaintia districts June 14, 1958, G. Panigarhi 16113 (CAL); Shillong peak, 1860 m, June 5, 1958, R.S. Rao 11177 (CAL); Shillong peak, Khasia & Jaintia hill district June 17, 1956, R. S. Rao 2743 (CAL); Lawlyngoloh, June 28, 1938, S. R. Sharma 16683 (ASSAM); Myllieum, August 31, 1990, P. C. Kanjilal 8389 (ASSAM); Upper Shillong, 1850 m, July 27, 1990, P. C. Kanjilal 8283 (ASSAM); Nokhlow forest, June 2, 1990, Y. K. Sain 77311 (ASSAM), 4 sheets; Shillong peak, 6100 ft., June 5, 1958, R.S. Rao 11177 (ASSAM) 2 sheets; Lawlyngdoh, K. & J. hills, June 28, 1938, S. R. Sharma 16683 (ASSAM) 2 sheets; Shillong peak; August August 30, 1960, s. n. 22324, (ASSAM); Wahhyer Nongstoin area, K. & J. hills, June 14, 1958, G. Panigrahi 16113 (ASSAM); Jakrun hot spring area, Khasi hill, May 2, 1975, G. H. Bhawmik 61883 (ASSAM); Nongpoh, July 24, 1952, G. K. Deka 23253 (ASSAM); Khasi hills, June 17, 1956, R.S. Rao 2743 (ASSAM); Nongkrem, K. & J Hill, H. Deka 23476 (ASSAM); Shillong peak, June 17, 1956, R.S. Rao 2743 (ASSAM) 2 sheets; Mawphlang, August 21, 1974, P.K. Hajra 52145 (ASSAM); Khasi hills, July 23, 1913, U. Kanjilal 2344 (ASSAM); Mairan, west Khasi hills, July 6, 1981, A.S. Chauhan 74439 (ASSAM); Upper Shillong, 6300ft., July 27, 1930, P.C. Kanjilal 8283 (ASSAM); Elephant falls, Shillong, G. Panigrahi 3400 (ASSAM); Shillong peak, August 30, 1960, G. K. Deka 21855 (ASSAM) 2 sheets; Shillong peak, October 26, 1960, D.C.S. Raju 22035 (ASSAM) 2 sheets; Shillong peak, May 20, 1963, S. K. Kar 32498 (ASSAM); H. K. Naudi (CAL); Khasia Hills, Assam 5-6000 ft., S. Kurz 385 (CAL); Shillong Peak, 6000 ft., June 17, 1956, R. S. Rao 2743 (CAL) 3 sheets; Shillong Peak, 6100 ft., June 5, 1958, R. S. Rao 11177 (CAL) 2 sheets; Elephant fall, E. Khasi hills, August 22, 1978, D. Syiem 48 (NEHU); Mawlai gate, August 22, 1978, L. Hrabsel 9 (NEHU); Shillong peak, September 17, 1976, Juthika Datta s. n. (NEHU); Elephant falls, Shillong, August 22, 1978, Bibha Biswas 16 (NEHU); Upper Nongthumai, September 26, 1978, A. K. Baishya 120 (NEHU); Shillong peak, March, 19, 2005, A. K. Pandey 6060 (BHAG); Shillong peak, A. K. Pandey, 5017 (BHAG) 3 sheets; Shillong peak, A. K. Pandey, 5056 (BHAG); Shillong peak, A. K. Pandey, 5058 (BHAG); Shillong Peak, Meghalaya, A. K. Pandey 5000 H (BHAG); Upper Shillong peak, April 26, 2006, A.

K. Pandey & M. Ajmal Ali 10051 (BHAG); Shillong, Meghalaya, July 2005, A. K. Pandey & A. A. Mao, 103 (BHAG). SIKKIM: Sonada Sikkim, 1982 m. S. Kurz, s. n., Acc. No. 191763 (CAL); Rungbee, May 10, 1876, Dungbo, s. n., Acc. No. 191760 (CAL); Samdong, Sikkim, 1901, Prains 223 (CAL); Chungthang-Lachan (North Sikkim), 5000-6000 ft., May 16, 1945, K. Biswas 6686 (CAL); Nebbi to Buckeem (West Sikkim) 7-8000 ft., October 6, 1862, s. n. (CAL); March 1932, K. Biswas 148 (CAL); Birch Hill 7000 ft., June 5, 1956, D. Chaterjee 48 (CAL). NAGALAND: Sirhoe, Naga Hills, 7000 ft., S. K. Mukerjee 3183 (CAL); Nagaland, March 2005, A. A. Mao 109043 (ASSAM); Nagaland, March 2005, A. A. Mao 106377 (ASSAM); Nagaland, March 2005, A. A. Mao 106358 (ASSAM); Jotosma, August 25, 2006, A. K. Pandey & M. Ajmal Ali, 8055 (BHAG). WEST BENGAL: Sandakphu to Rimbick, October 9, 1941, K. Biswas 5661 (CAL); Darjeeling 6000 ft. October 4, 1870, C. B. Clarke 12652 (CAL); Darjeeling, A. K. Pandey, 5000H (BHAG); Darjeeling, Smith and Cave 4907 (LBG); Jalapahar, 6,500 ft., August 23, 2004, Santosh Rai & Suman, (LBG), Jalapahar, Darjeeling June 16, 1980, A. P. Das (NBU); Alubari to Jaributti, Neora Valley National Park, June 14, 1994, A. P. Das & P. C. Rai 60 (NBU); Bismaili, September 23, 2005, A. K. Pandey & M. Ajmal Ali, 7073 (BHAG); Jalapahar, Darjeeling, July 2, 2006, A. K. Pandey & M. Ajmal Ali, 8005 (BHAG).

**2a. *Panax bipinnatifidus*** Seemann, J. Bot. (Morat.) 6: 54. 1868. Bull Bot. Surv. India 10. (1). 20-27. 1968; Hajra *et al.* Mat. Fl. Arunachal Pradesh 1: 551. 1996.

*Aralia quinquefolia* (L.) Decne. et Planch. var. *elegantior* Burkill in Kew Bull. 1902; 8. 1902.

*Aralia quinquefolia* (L.) Decne. et Planch. var. *major* Burkill, Kew Bull. 1902; 7. 1902.

*Aralia bipinnatifida* (Seemann) C. B. Clarke in J. D. Hooker, Fl. British India 2: 722. 1879

*Panax japonicus* C. A. Meyer var. *major* (Burkill) C. Y. Wu & K. M. Feng in Wu *et al.*, Acta Phytotax. Sinica 13 (2): 43. 1975.

*Panax major* Ting ex Pei *et al.*, Med. Fl. China 6: t. 280. 1958.

*Panax pseudoginseng* Wallich var. *bipinnatifidus* (Seemann) Li, Sargentia 2: 118. 1942.

*Panax pseudoginseng* Wallich var. *major* (Burkill) Li, Sargentia 2: 119. 1942.

*Panax pseudoginseng* Wallich var. *elegantior* (Burkill) Hoo & Tseng, Acta Phytotax. Sinica 11: 436. 1973.

*Panax pseudoginseng* Wallich var. ssp. *himalaicus* Hara, J. Jap. Bot. 45: 208, t.11:c-e: 12:a, f. 2: b. 1970.

Perennial herb, 0.75 m tall. Rhizome creeping and elongated, with slender internodes and subglobose nodes. Stem straight, slender, terete, glabrous, bearing whorl of 3-5 leaves at the top, leaflets narrowly elliptic to broadly elliptic, sometimes slightly cleft to bipinnatifid, 8-18 cm long, petiolate, petioles glabrous, terete 3.5-8 cm long, leaflets shortly petiolulate, bipinnatifid, lanceolate acuminate, lobes serrated. Inflorescence terminal, solitary, bearing single umbel at the top or 2-5 clustered, 25-45 flowered, peduncles 7-18 cm long, glabrous, terete, articulated. Flowers green, bisexual, actinomorphic, bracteate, bracts caducous. Petals 5, triangular, Calyx cupular, sepals obscurely toothed; teeth 5, caducous, valvate. Stamens 5, anthers bilobed, dorsifixed, Ovary inferior, styles 2-3, erect. Fruits berries, red with a black tip, 1-3 seeded, seeds white brown, thick ovate, 3.5-5 mm long, 3-3.5 mm wide, ca. 3 mm thick.

*Phenology*: April to September.

*Distribution*: Arunachal Pradesh, Sikkim, West Bengal (Darjeeling).

*Ecology*: In mixed forest or coniferous forests or under the floor of the bamboos; in moist habitat or along ravines; alt. 1200 – 5000 m.

*Specimen*: ARUNACHAL PRADESH: Tawang, 3400 m, Kameng F. D., May 30, 1957, R. S. Rao 7962 (ASSAM); Dibang Valley, M. K. Pathak & M. Bhaumik 4115 (CAL); Tawang, September 1, 1984, K. Haridasan 1602 (SFRI) 4 sheets; Tibet: Pinchungmy, June 28, 1878, Dungbo s. n. Acc. No. 191780 (CAL). SIKKIM: Laghep, 3050 m, Sikkim, July 11, 1910, W. W. Smith, 3375 (CAL); Mt. Singalah, 3660 m, Sikkim, June 13, 1892, G. A. Gammie 64 (CAL); Mt. Tankra, 3507 m, Sikkim, August 18, 1892, G. A. Gammie 664 (CAL); Sikkim Himalaya, 3050 m, J. D. H. s. n. (CAL); On the way from Lachen to Thangu, North district, 3500 m, August 26, 1982, P. Chakraborty 2389 (BSHC); Gompa to Lachen near Bote Pastic, North district, July 24, 1986, D. C. S. Raju & S. Singh 6260 (BSHC); Yakchey to Yumthang, North district, July 10, 1986, D. C. S. Raju & S. Singh 5726 (BSHC); On the way Zemie, Sikkim, May 10, 1955, R. Seshagiri Rao 494 (BSHC); Lachen-Tallam, Near Gompa, North district, July 15, 1986, D. C. S. Raju & S. Singh 5908 (BSHC); Lachen-Tallam, Near Gompa,

North district, July 15, 1986, D. C. S. Raju & S. Singh 5909 (BSHC); Dzungri-Tsoka, West Sikkim, June 22, 1993, S. Pradhan 5156 (BSHC); Lachung-Yumthang, North Sikkim, 2500 m, D. C. S. Raju & S. Singh 7573 (BSHC); Kyangnosla Alpine Sanctuary, East Sikkim, 2500 m, June 23, 2000, S. S. Dash 22727 (BSHC) 4 sheets; From Lichen-Thangu, North Sikkim, 3500m, August 26, 1982, P. Chakraborty 2387 (BSHC); Bakhim, shaded boulders side, West Sikkim, June 5, 1996, A. Maity & S. K. Rai 15855 (BSHC); Yakchey-Yumthang, North Sikkim, July 10, 1986, D. C. S. Raju & S. Singh 5727 (BSHC); Gompa to Lachen, North Sikkim, July 24, 1986, D. C. S. Raju & S. Singh 6261 (BSHC); Lachung-Yumthang, Dombayang, North Sikkim, July 13, 1987, D. C. S. Raju & S. Singh 7574 (BSHC) 2 sheets; Lachen to Tallam, July 15, 1986, D. C. S. Raju & S. Singh 5909 (BSHC); On way from Lachen to Thangu, 3500 m, August 26, 1982, P. Chakraborty 2389 (BSHC); Dzungri-Tsoka, June 22, 1993, S. Pradhan 15156 (BSHC); Gompa to Lachen, near Bote basti, July 24, 1986, D. C. S. Raju & S. Singh 6260 (BSHC); Kyangnosala, East Sikkim, 14400 ft., September 8, 2005, A. K. Pandey & M. Ajmal Ali 7042 (BHAG); Yumthang, Sikkim, July 12, 2006, A. K. Pandey & M. Ajmal Ali, 8035 (BHAG) WEST BENGAL: Tonglo, 2440 m, June 4, 1884, C. B. Clarke 35691 (CAL); Darjeeling, Batasia to Palnagura, May 8, 1956, C. Chatterjee 41 (CAL); Sandakphu to Runibick, October 9, 1941, K. Biswas 5661 (CAL); Darjeeling s. n. 4908 (LBG); 12,000 ft., November 1, 1919, Smith & Cave, 4910 (LBG); Karponang, 10,000 ft., November 6, 1917, Smith & Cave 4911(LBG); Zemu, 13,000 ft., October 16, 1924, Smith & Cave, 2227, (LBG); Simehul in forests, 8000 ft., October 22, 1923, Smith and Cave 4906 (LBG).

**2b. *Panax bipinnatifidus* var. *angustifolius*** (Burkill) J. Wen, Proc. Int. Ginseng Workshop, 67, 2001

*Panax pseudoginseng* Wallich, Bull Bot. Surv. India 10.(1) 20-27. 1968.; in Trans. Med. Phys. Soc.. Cal. 4: 117, 1829; Pl. As. Rar. 2: 30. t. 137. 1831; Pharm. Centralbl. 3.23: 353. 1832; Meyer in Repert, Pharm, U. Pr. Chen. 7: 525. 1842; Bull. Phys. Math. Acad. St. Peterb. 2 ser. 1: 340. 1843; steud. Nom. Bot. ed. 2: 249. 1840-41. Walp. Rep. 5: 924. 1846; Seem. in Journ. Bot. 6: 54. 1866, Rev. Heder. 99. 1868; Harms in Nat. Pflanzenfam. 3 (8): 59. 1894; Merr. in Journ. Arnold arbor. 23: 187. 1942; Li in Sargentia 2: 117. 1942; Grushivitzky, ginseng 1961; N.P. Singh *et al* in Fl. Manipur, 451. 2000; Hajra, P.K. *et al* in Mat. Fl. Arunachal Pradesh 1: 551. 1996. *Aralia pseudoginseng* (Wallich) Benth. ex C. B. Clarke var. *angustifolia* (Burkill) Craib, Fl. Siam. Enum 1: 794. 1931.

*A. quinquefolia* (L.) Decne. *et* Planch. var. *angustifolia* Burkill, Kew Bull. 1902:7. 1902

*Panax pseudoginseng* Wallich var. *angustifolius* (Burkill) Li, Sargentia 2: 118. 1942.

*Panax repens* Maxim. var. *angustifolium* (Burkill) F. H. Chen, Not. Forestry 1948: 8. 1948.

*Panax japonicus* C.A. Meyer var. *angustifolius* (Burkill) Cheng & Chu, Bull.Med.Sinica 9(9): 538,t.2, f.1. 1962

*Panax sikkimensis* Ban., Bull. Bot. Surv. India 10: 21, f.1. 1968.

*Panax shinseng* Nees var. *nepalens* Nees V. Eseb, Icon medic. 1: 70,. 1933

*P. schin-seng* Seusu Chien, contrib.. Biol. Lab. Sci. soc. China 3: 68. 1927; W. W. Smith in notes Bot. Gard. Edinb. 17: 318. 1930; hand. zaz. Syno. Sin 7: 706. 1933 *non* Nees

Herb, 0.6 m tall, Rhizome creeping, elongated with fleshy deciduous scales. Stem straight, soft smooth, having whorl of leaves at the top. Leaves palmately compound, up to 25 cm long, 5 foliate, rarely 3 foliate, long petiolate, 5-15 cm long 1-5.5 cm wide, lanceolate, membranaceous, bristly hairs along the veins, margins indented with cuspidate double serratures, acuminate, acumination up to 2 cm, base angustate to obtuse, Inflorescence terminal umbel 6- 21 cm long; pedicels slender, 2 cm long puberulous, simple or bracteoles deciduous, 0.4 cm long narrowly lanceolate to linear. Flowers bisexual, 1 cm long, orange. Sepals glabrous or more or less puberulous, margin obscurely 5 dentate- 1 mm long. Corolla polypetalous, petals 5, cuneate, glabrous. Stamens 5, alternate to petals, 2 mm long, filament 1mm long, filiform, anther oblong, bilobed, dorsifixed. Disc flattened or concave. Ovary 2-3 celled, styles 2, united at the base, straight. Fruit drupe, yellow, globose or laterally compressed.

*Phenology*: April to September.

*Distribution*: Arunachal Pradesh, Sikkim, West Bengal (Darjeeling)

*Ecology*: Under the floor of bamboo or on rocks covered with moss.

*Uses*: In stomach trouble, for soothing irritation, gastric trouble, counteracting fever, stimulating the gonads, prevent thickening of arteries, reduces high blood pressure and raises low blood pressure to the normal.

*Notes:* This variety differs from the typical variety in its narrower leaflets.

*Specimen:* ARUNACHAL PRADESH: Raho to Vokanoska, Tirap F. D., NEFA, August 26, 1958, under shrub on humid soil flowers orange yellow fruits, G. Panigarhi 16833 (ASSAM); Shengum to Wakka, 2745 m, Tirap F. D. NEFA, July, 3, 1961, D. B. Deb 26479 (ASSAM); Eastern Himalaya, Rahu to Wakka, July 2, 1961, Tirap Frontier Division, NEFA, D. B. Deb 26395 (CAL); Old Ziro, Lower Subansiri District, September 18, 1983, G. D. Pal, 1227 (ARUN); Begi Amjee, Lower Subansiri District, May 12, 1966, A. R. K. Sastry 45220 (ARUN); Tale Valley, Lower Sunabsiri District, June 10, 1984, K. Haridasan 1122 (SFRI); Simbi Hot spring, September 14, 1994, K. Haridasan 6533 (SFRI); Gumpa hill Lumla, Tawang District, June 30, 1987, J. Lal 85 (ARUN) 2 sheets; Melinja, Lohit District, October 8, 1984, K. Haridasan 1538 (SFRI) 2 sheets; SIKKIM: Neebi to Buckeem 2135-2440 m, Sikkim, October 6, 1862, T. Thomson 644 (CAL); Cuungthang, 1525 m, May 16, 1945, K. Biswas 6686 (CAL); Sikkim, Griffith Kew Distrib no. 2658 (CAL); Kalep to before plains of Thangu, North Sikkim, 3700 m, September 17, 1988, S. Kumar 9863 (BSHC); Yumthang, North Sikkim, 3530 m, July 13, 1996, G. P. Sinha & D. G. Long 17816 (BSHC); Yumthang to Helipad, North district, July 20, 1987, D. C. S. Raju & S. Singh 7737 (BSHC); Lachung to Denebeyanj, North Sikkim, July 27, 1997, S. S. Dash & D. Maiti 18539 (BSHC); Lachung to Dombeyang, July 27, 1997, S. S. Dash & A. Maiti 18539 (BSHC); Yumthang, July 13, 1996, G. P. Sinha 17816 (BSHC); Kalep to before plains of Thangu, September 17, 1988, S. Kumar & S. Singh, 9863 (BSHC); On way to Yumthang, July 27, 1989, R. C. Srivastava 12901A (BSHC); Surenthang, November 25, 1911, Smith & Cave 5770 (LBG); Kyangnosala, East Sikkim, 14400 ft., September 8, 2005, A. K. Pandey & M. Ajmal Ali 7048 (BHAG); West Bengal (Darjeeling) Tonglo, Sikkim, T. Thomson 56 (CAL); Tonglo, 2745 m, September 4, 1874, G. King Acc. No. 191761 (CAL); Tonglo 3050 m, June 8, 1884, C. B. Clarke 35745 (CAL); Zemu valley, 2745m, Sikkim Himalaya, Smith Cave 2781 (CAL); Lachung, 2593 m, Tibet, May 1883, Kings Coll. s. n. (CAL); Sikkim, 2135-3355 m, JDH s. n. Acc. No. 191764 (CAL); Sikkim Himalaya, G. A. Gammie s. n., Acc. No. 191735 (CAL); Gomchu 2226 m, 5.9.1965, A. S. Rao 43445 (CAL) WEST BENGAL: Sundakphoo, June 3, 1995, on way to Karsyang, Darjeeling, Rashmi Kartei 50 (NBU); Karsyang, May 27, 1996, Jyothsna Rai 65 (NBU); Sundakphu, June 3, 1995, Anirudra 001 (NBU); Central Himalaya, Nepal, June 1821, Wall. Cat No. 3730, Lectotype (CAL); Tonglu, Darjeeling, July 7, 2006, A. K. Pandey & M. Ajmal Ali, 8024 (BHAG).

**3. *Panax pseudoginseng*** Wallich, Trans. Med. Phys. Soc. Calcutta 4: 117. 1829.

*Aralia pseudoginseng* (Wall.) Benth. ex C. B. Clarke, Fl. Brit. Ind. 2: 721. 1879.

*Aralia quinquefolia* var. *pseudoginseng* (Wall.) Burkill, Kew Bull. 1902: 7. 1902.

Herbs, perennial, ca. 50 cm tall. Rootstock short, with 2–5, fleshy roots, fusiform, 2–4 cm, ca. 1 cm in diam. Tubers single or fascicled. Base of aerial stem with persistent glabrous and membranaceous scales. Stem glabrous, 25-50 cm long. Leaves 3-4, verticillate at apex of stem, with persistent stipules leaflets lanceolate or narrowly elliptic, upper surface with bristly hairs along veins and veinlets, lower surface glabrous, palmately compound; bases of petiole and petiolules with numerous lanceolate, stipulelike appendages, obovate-elliptic to obovate-oblong, 9–10 × 3.5–4 cm (lateral ones smaller), membranous, abaxially glabrous, adaxially setose on veins (trichomes 1.5–2 mm), base attenuate, margin biserrate, apex long caudate-acuminate. Inflorescence with 1-3 umbels, each 40-65 flowered, peduncle ca. 12 cm, pedicels ca. 1 cm, glabrous. Ovary 2-carpellate; styles 2 divided, reflexed. Fruit red or red, 1-2 seeded. Seeds broadly kidney-shaped, 7-7.5 mm long, 6-6.5 mm wide, 5-6 mm thick, surface rough.

*Phenology:* May to September

*Distribution:* Nagaland

*Common names:* Jia renshen, Himalayan ginseng, nepal ginseng, and pseudoginseng

**Notes:** Li (1942) treated all central, western, southern Chinese ginsengs as *P. pseudoginseng*. Hara (1970) recognized two Asiatic species: the northern *P. ginseng* and the widely distributed *P. pseudoginseng* (central, southern, western China, and the Himalayas). Wen and Zimmer (1996), Choi and Wen (2000), and Yoo et al. (2001) showed that *P. pseudoginseng* sensu Li or Hara was heterogeneous, and argued for the narrow definition of *P. pseudoginseng* sensu Wall. (1829). The author indeed found *P. pseudoginseng* sympatric with *P. bipinnatifidus*

in the type locality of the former and in other locations in Nepal as well. However, Yoo *et al.* (2001) found that the two species collected in the same location had very distinct chloroplast DNA and nuclear ribosomal ITS profiles. *Specimen: NAGALAND: Jotosma, August 25, 2006, A. K. Pandey & M. Ajmal Ali, 8065 (BHAG)*

#### Acknowledgement

Financial support for this study was provided by Department of Biotechnology, Govt. of India (#BT/PR/4131/AGR/16/344/2003) to AKP.

#### LITERATURE CITED

- Banerjee, R.N. 1968. A taxonomic revision of Indian *Panax* L. *Bull. Bot. Surv. India* 10(1):20-27.
- Bentham, G. & Hooker, J. D. 1867. Araliaceae. *Genera Plantarum*. London., 1: 933-939.
- Choi, H.K. & Wen, J. 2000. A phylogenetic analysis of *Panax* (Araliaceae): integrating evidence of chloroplast DNA and the ITS sequences of nrDNA. *Plant Syst. Evol.* 224: 109-120.
- Clarke, C.B. 1879. Araliaceae, J. D. Hooker's *Flora British India*. 2: 720-740.
- Decainse, J. & Planchon, E. 1854. *Equisse d'une monographie des araliaceae's* Rev. Hort., 3 (4): 104-109.
- Graham, S.A. 1966. The genera of Araliaceae in South Eastern United States. *J. Arnold Arbor.* 17: 132-136.
- Hara, H. 1970. On the Asiatic species of the genus *Panax*. *J. Jap. Bot.* 45:197-212.
- Hoo, G. & Tseng, C.J. 1973. On the Chinese species of *Panax* Linn. *Acta Phytotax. Sin.* 11
- Hoo, G. & Tseng, C.J. 1978. Angiospermae, dicotyledoneae, Araliaceae. *Flora Reipublicae Popularis Sinicae*. Vol. 54. Science Press, Beijing. [In Chinese]
- Lee, Chunghee & Wen, J. 2004. Phylogeny of *Panax* using chloroplast trnC-trnD intergenic region and the utility of trnC-trnD in interspecific studies of plants. *Mol. Phylog. Evol.* 31: 894-903.
- Li, H.L. 1942. The Araliaceae of China. *Sargentia* 2: 1-134.
- Linnaeus, C. 1753. *Species Plantarum*. 1: 270, 1058-1059.
- Pandey, A.K.; Lee, C. & Wen, J. 2002. A molecular systematic study of *Aralia* L. and *Panax* L. (Araliaceae) in India and its taxonomic implications. *Rheedea* 12(2), 89 – 99.
- Pandey, A.K.; Wen, J. & Pathak, M.K. 2004. Relationships among Indian Araliaceae inferred from Internal transcribed spacer sequences of nuclear ribosomal DNA. *Rheedea* 14: 1 – 8.
- Pandey, A.K. & Ali, M. Ajmal 2006. Molecular Markers in Plant Systematics I: Nuclear sequences. In: *Plant Sciences Research in India: Challenges and Prospects* (ed. S. Kumar), Botanical survey of India, Dehradun, pp. 21-34.
- Seemann, B. 1868. Revision of the natural order of Hederaceae. L. Reeve & Co., London.
- Wallich, N. 1829. An account of the Nipal ginseng. *Trans. Med. Phys. Soc. Calcutta* 4: 115 – 120
- Wen, J. 2001a. Evolution of *Aralia-Panax* complex (Araliaceae) as inferred from nuclear ribosomal ITS sequences. *Edinb. J. Bot.* 58: 243 – 257.
- Wen, J. 2001b. Species diversity, nomenclature, phylogeny, biogeography and classification of the ginseng genus (*Panax* L., Araliaceae), In: Z.K. Punja (Ed.). *Proc. International Ginseng Workshop*. Simon Fraser University, Burnaby, Canada, pp. 67 – 88.
- Wen, J. & Zimmer, E.A. 1966. Phylogeny and biogeography of *Panax* L. (the ginseng genus, Araliaceae): inferences from ITS sequences of nuclear ribosomal DNA. *Molec. Phylog. Evol.* 6: 166 – 177.
- Yoo, K.; Malla, K.J. & Wen, J. 2001. Chloroplast DNA variation of *Panax* (Araliaceae) in Nepal and its taxonomic implications. *Brittonia* 53 (3): 447 – 453.
- Zhou, J.; Huang, W.G.; Wu, M.Z.; Yang, C.R.; Feng, K.M. & Wu, Z. Y. 1975. Triterpenoids from *Panax* L. and their relationship with taxonomy and geographical distribution. *Acta Phytotax. Sin.* 13(2): 29 – 45.