A new species of *Panax* L. (Araliaceae) from Arunachal Pradesh, India

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[Received 01.11.2018; Revised 09.12.2018; Accepted 14.12.2018; Published 31.12.2018]

Abstract

Panax arunachalensis, a new species in Araliaceae from Ziro valley in Lower Subansiri District of Arunachal Pradesh in Northeastern India is recognized and named. Its nomenclature along with detailed description, distribution, suitable photographs and illustration are provided. A comparison of the species with known species of *Panax* L. from the Indian Himalayan region is also provided.

Key words: *Panax arunachalensis*, New species, Araliaceae, Ziro Valley, Arunachal Pradesh, India

INTRODUCTION

Araliaceae (the ginseng family) includes about 50 genera and approximately 1500 species. The family is distributed mostly in tropics and subtropics with some genera occurring in temperate regions (e.g. *Aralia*, *Hedera*, *Oplopanax* and *Panax*) (Pandey *et al.* 2007). The Himalayas and central and western China are the current centre of diversity of the genus (Wen & Zimmer 1996). The plants of the family include perennial herbs, trees, vines, epiphytes and succulents.

The systematics of Araliaceae is currently under study and taxonomic changes and novelties are to be expected (<https://en.wikipedia.org/wiki/Araliaceae>). Species of Araliaceae are of crucial significance in traditional Chinese medicine in which *Panax* L. is medicinally most important genus (Jiang *et al.* 2018).

The genus *Panax* was established by Linnaeus (1753) and was described under *Pentandria digyna* (Pandey *et al.* 2007) and is consist of 19 species world wide of which two species grow in eastern North America and other species in Eastern-Central Asia (Venugopal & Ahuja 2014). Seven species of *Panax* are described in China (e-flora of china) and 11 of its accepted species are listed in the plant list (www.theplantlist.org). But, Kew Science has listed 13 accepted species for the genus, which includes *Panax assamicus* R.N Banerjee and *Panax sokpayensis* Shiva K. Sharma & Pandit (www.plantsoftheworldonline.org). All the *Panax* species are commonly known as ginseng and commercially its name go with their country of origin (Gurung *et al.* 2016). Maximum species diversity in *Panax* is reported from eastern, southwestern and central provinces of China, Central to Eastern Himalaya (Nepal, Bhutan and India) and some parts of South-East Asia. The lack of congruence in morphological characters among *Panax* species has made the taxonomic delimitation in the genus rather controversial (Sharma & Pandit 2009). In India, *Panax* occurs mostly in the north and northeastern regions

Figure 1. Illustration of *Panax arunachalensis* M.Taram, A.P. Das & H.Tag: **a.** Plant habit; **b.** Single flower; **c.** Flower parts corolla removed; **d.** Dorsal and ventral surface of corolla; **e.** Stamen; **f.** Gynoecium with 2 styles; **g.** Gynoecium with 1 style; **h.** Bract; **i.** Stipels at the base of leaflets

and is widely used in folk medicines (Pandey *et al.* 2007). Clarke (1879) reported two species, viz. *Aralia pseudoginseng* (Wall.) Benth. ex C.B. Clarke (syn. *Panax pseudoginseng* Wall.) and *A. bipinnatifida* C.B. Clarke (syn. *P. bipinnatifidus* Seem.) from Sikkim Himalaya and Banerjee (1968) described two new species, viz. *P. sikkimensis* R.N. Banerjee and *P. assamicus* R.N. Banerjee from Sikkim in addition to *P. pseudoginseng* and *P. bipinnatifidus* and, later on, Sharma and Pandit (2009) described *Panax sokpayensis* Sharma & Pandit from the Sikkim Himalaya.

Taxonomic position of *panax bipinnatifidus* was controversial and problematic. Sharma and Pandit (2011) worked on the morphometric analysis and taxonomic study of *Panax* species from the Sikkim Himalaya and concluded that *P. sikkimensis* R.N. Banerjee is the synonym of *P. bipinnatifidus* Seem. in Indian Himalaya.

While working on the *Panax* species of Lower Subansiri District, Arunachal Pradesh under a project of Board of Research in Nuclear Science on *The quality enhancement of traditional anti-oxidant plants (Panax species) from Arunachal Himalayan Region*, authors have collected one *Panax* species having solitary umbel inflorescence from the Medicinal Plant Conservation Area at Hake Tari, Ziro. After critical study and perusal of various literatures and websites, e.g. Sharma & Pandit (2009, 2011), Pandey *et al.* (2007), *Flora of China* @ efloras.org, [envis.frlht.org](http://envis.frlht.org/plantdetails)>plantdetails, <https://plants.jstor.org>, [apps.kew.org](http://apps.kew.org/herbcat)>herbcat, and m.flowersofindia.net, it revealed that it is hitherto one undescribed species having close affinity with *Panax sokpayensis* Shiva K. Sharma & Pandit and *Panax assamicus* R.N. Banerjee. Hence this species is described herein as a new species with illustrations and photographs.

TAXONOMIC TREATMENT

Panax arunachalensis M.Taram, A.P Das & H.Tag, *sp. nov.*

Panax arunachalensis differs from *Panax sokpayensis* Shiva K. Sharma & Pandit in having trichomes on both surfaces of leaf, lanceolate leaflets, Inflorescence with single terminal umbel, triangular calyx-lobes and much smaller bracts. The new species differs from *Panax assamicus* R.N. Banerjee in having horizontal rhizome, stem color, lanceolate leaflets with oblique base, triangular calyx, lanceolate petals, fruit having lower portion red and apical part black and flattish seed. It also differs from *Panax bipinnatifidus* Seem. in having horizontal rhizome, pinnatifid lobed leaflets, trichomes on both surfaces of leaf, linear bracts and flattish seeds; and differs from *Panax pseudoginseng* Wall. in having horizontal rhizome, stem color, lanceolate leaflets with attenuate or oblique base, presence of trichomes on both surfaces of leaf, single umbel inflorescence, linear bract, lanceolate corolla and fruits with lower portion red and only apical part black.

TYPE: INDIA, Arunachal Pradesh: Lower Subansiri District. Ziro Valley, 2300 m, 27.63 ° N latitude 93.83° E longitude, dated 23.12.2017, Momang Taram, A.P Das & Hui Tag - HAU/MT-790/23.12.2017/Hake Tari (*Holotype*: ASSAM; *Paratype*: HAU, ARUN)

Perennial herbs, 40 – 110 cm tall; rhizomes 25 – 30 cm, horizontal, variable in shape with prominent stem scars and rings at node; internodes short and thick, ca. 0.4 – 0.6 cm. Stem stout, brownish-green, terete, erect, 24 – 95 × 0.3 – 0.7 cm with scales at base. Leaves 2 – 7, verticillate at stem-tip, 18 – 30 cm long, exstipulate, palmately compound; petioles glabrous, stout, 8 – 20 cm long; stipels 0.013 cm – 0.014 cm, linear to lanceolate; petiolules 1 – 4 cm with different sizes on a leaf; leaflets 5 – 7, lateral leaflets shorter, lanceolate, 10 – 25.5 × 2.5 – 4.5 cm, lateral one unequal-sided, serrulate, narrowly caudate-acuminate, cauda up to 4 cm long, base attenuate, oblique in lateral ones, both surfaces setose, trichomes 0.08 cm –

PLATE - I. *Panax arunachalensis* sp. nov.: **A.** Whole plant; **B.** Matured plant with fruits; **C.** Young leaves; **D.** Umbel with flowers; **E.** Umbel with developing fruits; **F.** One flower; **G.** Rhizome in upright position; **H.** Rhizome inverted; **I.** Ripe fruits; **J.** Pistil with calyx; **K.** Petals; **L.** Stamens; **M.** Ovary with 1-style; **N.** Ovary with 2-styles

0.09 cm long, cylindrical on veins and veinlets; venation reticulate. Umbel solitary, simple, terminal; peduncle stout, 13 – 20 cm long; bracts linear 0.1 – 0.3 × 0.1 cm, green; pedicels 0.5 – 1 cm long, glaucous. Flowers 80 – 90 per umbel, actinomorphic, bisexual, epigynous; calyx persistent, sepals 5, deltoid, glabrous, alternate to petals, green; petals 5, free, lanceolate, 0.2 × 0.1 cm, glabrous, yellowish-green; stamens 5, free, 0.3 – 0.4 cm, filaments free 0.3 cm, anthers oblong, bilobed, white, ca. 0.2 × 0.1 cm, dorsifixed; carpels 2 – 3, syncarpous, ovary inferior, glabrous, green; style 1 or 2, stigma continuous, green; placentation apical. Berry more or less reniform, lower portion red and only apical part black, ca. 0.9 cm broad and 1.2 cm long; seed large and flattish ca. 0.6 – 0.9 cm long.

Flowering: June - August; **Fruiting:** September – December

Distribution and Ecology: Geographical location of the type locality is 27.63° N Latitude and 93.83° E Longitude. So far, *Panax arunachalensis* is known only from the type locality and is growing in temperate environment of 2200 m amsl at Ziro valley in Lower Subansiri district of Arunachal Pradesh, India. The species is shade loving, grows on moist humus-rich soil of forest floor along with *Strobilanthes* sp., *Mycetia* sp., *Anoectochilus* sp., etc. According to IUCN Red List categories and criteria (IUCN 2014), this species should be assessed as Critically Endangered (CR) based on the present situation, i.e. restricted geographic range of less than 2 km² with only single location (CR: B2a) and restricted population (CR: D).

Conservation status: The known population of this new species is narrowly distributed in the Medicinal Plant Conservation Area Hake Tari, Ziro Lower Subansiri District in Arunachal Pradesh and due to its high medicinal values and demand in the market, there is continuous uncontrolled harvest of its rhizome that will surely cause decline its population structure.

Etymology: The new species epithet '*arunachalensis*' is based after the name of Arunachal Pradesh, the North-East Indian and extreme east Eastern Himalayan Indian state where from the species was collected and growing with its entire known population.

Table1. Comparative morphology of *Panax arunachalensis* sp.nov. with the other known species of *Panax* L. in Eastern Himalaya

Character	<i>P. arunachalensis</i>	<i>P. sokpayensis</i>	<i>P. assamicus</i>	<i>P. bipinnatifidus</i>	<i>P. pseudoginseng</i>
Plant height	40 – 100 cm	80 – 130 cm	70 – 150 cm	50 – 100 cm	30 – 60 cm
Rhizome	Horizontal, short and thick internodes	Horizontal, short and thick internodes	Small zinger like, horizontal, short and thick internodes	Creeping, elongated, internodes slender; nodes sub-globose	Short, vertical; carrot like or fascicled
Stem color	Greenish brown	Dark brown	Typically straw	Dark brown	Light straw
Leaf	3 - 7 foliate	4 - 5 foliate	5 - 7 foliate	3 - 6 foliate	3 - 5 foliate
Leaflets	Lanceolate, long caudate	Oblanceolate to narrowly elliptic	Broadly linear	Oblong-lanceolate to lanceolate or ovate	Ovobate to obovate-oblong
Base	Attenuate or oblique	Round, attenuate or oblique	Rounded, rarely attenuate	Rounded or attenuate, oblique	base angustate and obtuse
Margin	Serrulate	Entire, serrate, some biserrate	Entire, minutely uniform serrate	Pinnatifid, lobes single or doubly serrate	Entire, doubly incise –serrate
Trichome	Setose both surfaces	Setose on adaxial surface	Setose on both surfaces	Setose on adaxial surface	Setose on adaxial surface

Character	<i>P. arunachalensis</i>	<i>P. sokpayensis</i>	<i>P. assamicus</i>	<i>P. bipinnatifidus</i>	<i>P. pseudoginseng</i>
Peduncle length	Shorter or equal to leaf length	Shorter than leaf length	Equal to leaf length	Longer than leaves	Shorter than leaves
Inflorescence	Umbel terminal, solitary	Umbels 6, on branches of peduncle	Umbel terminal, solitary	Umbel single or 2 - 5 in one cluster	Umbels 1 - 3 on branches of peduncle
Bracts	Linear, 0.1 - 0.3 cm	Linear, 0.5 - 2.0 cm	Linear, 0.3 - 1.2 cm	Inconspicuous	Inconspicuous
Calyx	Triangular	Lanceolate	Lanceolate	Triangular	Sub-triangular
Corolla	Lanceolate	Lanceolate	Oblong	Lanceolate or triangular	Triangular
Fruits	Berry, red with only apical part black	Berry, lower half red, upper half black	Globose, red	Berry, lower half red, upper half black	Compressed, red
Seeds	Flattish, 6 – 9 mm long	Ovoid, 4 – 6 mm long	Ovoid, 5 – 8 mm long	Ovoid, 5 – 7 mm long	Flattish, 5 – 8 mm long

Acknowledgements

The authors are thankful to Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy, Government of India for Funding Support through a research project. Authors are deeply thankful to Prof. A.K Pandey, Vice-Chancellor, Mansarovar Global University, Bhopal for his valuable comments. The first author is thankful to Ojar Taku for his kind help during the field work.

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