

## A census of *Piper* L. (Piperaceae) in Terai, Duars and the hills of Darjeeling and Sikkim Himalayas

A. P. Das, A. K. Samanta<sup>1</sup> and Kishor Biswas

Taxonomy and Environmental Biology Laboratory, Department of Botany, North Bengal University,  
Siliguri-734 013, WB, India

<sup>1</sup>Present address: Department of Botany, Ramnagar College, Depal-721 453, Purba Medinipur, WB, India  
E-mails: [apdas.nbu@gmail.com](mailto:apdas.nbu@gmail.com); [achintyaksamanta@gmail.com](mailto:achintyaksamanta@gmail.com)

### Abstract

Present investigation reports the distribution of thirteen species of *Piper* L. in Terai, Duars and hills of Darjeeling and Sikkim Himalayas along with their systematic enumeration, key to the identification, flowering and fruiting periods, and uses.

**Key words:** *Piper*, Darjeeling & Sikkim Himalayas, distribution, ecology

### INTRODUCTION

Darjeeling and Sikkim Himalayas are parts of the Eastern Himalaya in the Indian territory and are situated between 26° 31' and 28° 7' N latitude, 87° 59' and 89° 00' E longitudes. These hills are covering only 9020 sq km out of the total 1,22,802 sq km area of Eastern Himalaya (Negi 1990). Apart from some part of the sub-division of Siliguri, the district of Darjeeling is covered with hills of Singalila Range of Eastern Himalaya covering an altitudinal range ca. 132 m at Sukna to 3660 m at Phalut; whereas the Sikkim Himalaya covers an altitudinal range ca 300 m at Jorethang to 8598 m at the summit of Mt. Kanchenjunga (Negi 1990). The climate of these regions varies greatly in different areas based on altitude, exposure, location, distant from the permanently snow covered zones etc. It varies from nearly tropical at lower altitude (below 900 m) to alpine at higher altitude (above 4000 m). Most of these places receive well distributed high rainfall (Chopra 1985; Das 1995, 2004). In the mid-hill regions, the temperature generally varies greatly and the hottest time is July – August (13° - 26° C) and the coldest time is January when the temperature often goes down below 0° C. However, in alpine and permanent snow-covered regions the subzero temperature is generally maintained. On the other hand the tropical rolling plains of Terai and Duars are also covered with very rich and diverse vegetation cover, which is contiguous with the vegetation of Darjiling Hills (Das 2004).

The vegetation (except snow cover regions) of Darjeeling and Sikkim Himalayas and their extension into Terai and Duars are very rich and covers all major groups of plants including several numbers of endemic and RET species (Biswas 1940; Chatterjee 1940; Das 1995, 2004; Das & Chanda 1987; Samanta 2000; Samanta & Das 1995; Ghosh & Das 2009).

The genus *Piper* L. (Piperaceae) is one of the large genera of flowering plants and distributed throughout the tropical and sub-tropical regions, mainly in the Central and Northern South America, India, Malaysia, Indonesia, China, Srilanka, Nepal and Bhutan (Yuncker 1958).

Indian species of *Piper* are distributed mainly in two centres - Eastern Himalaya along with its adjacent North East India and the Southern Decan but most of them are confined in distribution to North East India (Gajurel *et al* 2002). Being a part of Eastern Himalaya, Sikkim and Darjeeling Himalayas is quiet rich in *Piper* species. Some of those are important source of food and medicine to the tribal and rural people. Most of the floristic accounts covering this region have recorded the occurrence of a good number of species of this genus (Table 1) in the area. So far, Long (1984) has recorded the largest number of twelve species of this genus from Sikkim, Darjeeling and Bhutan.

His work partly covers the present study area but it was found that all the twelve species recorded by him do not occur in Darjeeling and Sikkim and some other species grows here but not recorded by him. In the mean time, Das & Chanda (1987) and Mukherjee & Deb Roy (1987) enumerated eight species from Darjeeling and/or Sikkim areas.

**Table 1.** Record of species of *Piper* L. in different floristic accounts covering wholly or partly of the study area.

Species	Cowan & Cowan (1929)	Hara (1966)	Hara <i>et al</i> (1982)	Matthew (1981)	Long (1984)	Das & Chanda (1987)	Mukherjee & Deb Roy (1987)	Present work (2010)
<i>Piper attenuatum</i>	✓				✓		✓	✓
<i>Piper betle</i>								✓
<i>Piper betleoides</i>					✓			✓
<i>Piper boehmeriaefolium</i>	✓	✓	✓			✓	✓	
<i>Piper brachystachyum</i>	✓							
<i>Piper chaba</i>								✓
<i>Piper chuyva</i>					✓			✓
<i>Piper hamiltonii</i>	✓				✓			✓
<i>Piper khasianum</i>					✓			✓
<i>Piper longum</i>	✓	✓	✓		✓		✓	✓
<i>Piper mullesua</i>		✓	✓	✓	✓	✓	✓	✓
<i>Piper nepalense</i>	✓	✓				✓	✓	
<i>Piper nigrum</i>							✓	✓
<i>Piper pedicellatum</i>					✓	✓		
<i>Piper peepuloides</i>	✓	✓	✓	✓	✓	✓		✓
<i>Piper sarmentosum</i>						✓		
<i>Piper suipigua</i>			✓		✓			✓
<i>Piper sylveticum</i>	✓				✓		✓	✓
<i>Piper thomsonii</i>	✓							
<i>Piper wallichii</i>		✓	✓					
<b>TOTAL:</b>	<b>9</b>	<b>6</b>	<b>6</b>	<b>2</b>	<b>11</b>	<b>6</b>	<b>7</b>	<b>12</b>

So the present study was designed to record the status of the genus *Piper* in Sikkim and Darjeeling Himalayas along with their flowering and fruiting period, ecology, local names, uses, etc and an artificial key for the identification of different locally available species of *Piper*.

## MATERIALS AND METHODS

Survey for the climbing angiosperms in Darjeeling and Sikkim Himalayas was initiated in 1994, and, through this process a good number of different species of *Piper* L. were also collected. The specimens have been collected in different stages of their life cycle but preferences were given to flowering and fruiting stages. For the processing of specimens leading to the preparation of mounted herbarium sheets Jain & Rao (1977) was followed mostly. Specimens were primarily identified in the Taxonomy and Environmental Biology Laboratory of the Department of Botany, North Bengal University and matched at NBU and CAL. Voucher specimens were deposited at the NBU-Herbarium. At the end of the description notes are given particularly on information gathered from local people of Darjeeling and Sikkim Himalayas.

## SYSTEMATIC DISCOURSES

## Key to the species

1. Lamina with 3-armed stellate hairs below, stamens 3-4.....*P. peepuloides*
1. Lamina glabrous or with simple hairs below, stamens 2 or 3 .....2
2. Bracts never peltate; lamina orbicular-ovate.....*P. attenuatum*
2. Bracts peltate; lamina ovate or ovate-lanceolate or elliptic- ovate.....3
3. Erect shrub rarely climbing, drupes densely aggregated.....*P. pedicellatum*
3. Always climbing, drupes densely or loosely aggregated.....4
4. Fruiting spike interrupted, drupes loosely aggregated.....9
4. Fruiting spike not interrupted; drupes densely aggregated .....5
5. Plant parts glabrous; young tips green; stipule deciduous ..... *P. betle*
5. Plant parts pubescent ..... 6
6. Young vegetative shoot purple, drupes sunken on fleshy rachis..... *P. betleoides*
6. Young vegetative shoot greenish, drupes not sunken ..... 7
7. Leaves gland dotted beneath, stamens 3..... *P. sylvaticum*
7. Leaves eglandular beneath, stamens 2..... 8
8. Female spike globose, fruiting spike 6-12 mm, vegetative leaves rounded or cuneate at base  
..... *P. mullesua*
8. Female spike cylindric, fruiting spike 20-25 mm, vegetative leaves deeply cordate at base  
..... *P. longum*
9. Lamina thickly coriaceous, stamens 2 ..... *P. nigrum*
9. Lamina thinly coriaceous or membranous, stamens 2-3 ..... 10
10. Lower surface of lamina gland dotted, drupes densely aggregated ..... *P. chaba*,
10. Lower surface of lamina eglandular, drupes loosely aggregated ..... 11
11. Drupes ovoid, sessile ..... *P. suipigua*
11. Drupes sub-globose to globose, shortly stalked ..... 12
12. Lamina long acuminate, membranous, drupes globose, 3 - 4 mm ..... *P. khasianum*
12. Lamina obtuse, thinly coriaceous, drupes sub-globose, 2.5 mm ..... *P. hamiltonii*

*Piper attenuatum* Miquel, Syst. Pip. 306. 1843; Hook.f. in Fl. Brit. India 5: 92.1886. *P. malamaris* Roxburgh, Fl. India 1: 160. 1832. *P. sirium* C.DC. in DC., Prodr. 16(1): 160. 1869.

**Local Name:** *Pipal & Chaba* (Nepali).

Shrubby root-climber, upto 2.5 m long. Stem and branches stout, but soft, become compressed grooved when dry, greenish-yellow, glabrous, lower internodes 8.0 – 8.5 cm, upper 2.0 – 3.5 cm long; stipules 0.5 – 0.65 cm, subulate. Lamina broadly cordate; lower 8.0 – 9.5 x 7.0 – 10 cm, slightly broader than length, orbicular-ovate; upper 4.5-7.0 x 2.5 – 5.0 cm, entire, pellucid, acute to acuminate with a mucro, base cordate-truncate, membranous, almost glabrous above, hairy on veins, nerves mostly 7, sometimes 7 – 9 from base, laterals divergent except middle; petioles 2.5 – 6.5 cm long, angled, greenish-yellow, hairy upwards; plants dioecious; male spike c 0.03 cm long, clustered; stamens 3, sessile, adnate to oblong basifixed bracts (1.0 – 0.2 cm), winged, decurrent (4.0 – 5.0 cm long) rachis; female spikes (up to 10 cm long) with adnate bracts bearing its end on ovoid ovary (0.05 cm long); stigma obscurely 4; drupes 0.2 x 0.15 cm, globose, loosely aggregated, glabrous, sessile, 0.35 – 0.4 cm across, black.

**Flowering & Fruiting:** August to March

**Distribution:** India: Darjeeling, Sikkim, Assam, Arunachal Pradesh, Meghalaya; Indonesia, Java, Philippines.

**Ecology:** Occurs mostly in hill slopes between 200 – 2200m. Less common.

**Exsiccatae:** Birch Hill, Darjeeling, 2200 m, July 7, 1996, Das & Samanta 712,

*Note:* Fruits edible; roots medicinally useful.

*Piper betle* Linnaeus, Sp. Pl. 28. 1753; Roxburgh, Fl. Indica 1: 166. 1820; Hook.f. in Fl. Brit. India 5: 85. 1886; Prain, Bengal Pl. 2: 893. 1903; C.DC. in Prodr. 16(1): 359. 1869. *Chavica betle* (L.) Miquel. Syst. Pip. 224. 1843. *P. siriboa* L., Sp. Ol. 29. 1953.

**Local Name:** *Paan* (Bengali).

Dioecious shrubby glabrous climber; old stem woody; branches dimorphic, climbing branches grow upward with nodal roots, lateral branches with rootless nodes; petioles 2 – 10 cm; prophylls ca. 1/3 as long as petiole; lamina 6 – 17 x 5 – 14 cm, ovate to ovate-oblong to ovate-lanceolate, acuminate, cordate to rounded, symmetric, 7-veined at base, major veins elevated below, membranous; male spikes leaf-opposed, pendulous, upto 12 cm long or equaling the leaf; bracts peltate, nearly sessile, orbicular to obovate, 1 – 1.3 mm wide; stamens 2, filaments thick, as long as reniform anthers; female flowers not seen.

**Flowering:** May to June

**Distribution:** SE Asiatic plant; throughout India in warmer places, generally cultivated; Indonesia, Malaysia, Philippines, Sri Lanka, Bangladesh.

**Ecology:** Prefer loam or sandy-loam soil; in warm low altitude places in study area.

**Exsiccatae:** Garden of Medicinal Plants, North Bengal University, 130 m, 17.05. 2010, *A.P. Das* 5016 (NBU).

*Piper betleoides* C. DC. in Candollea 1: 186. 1923 *et in* 2: 207. 1925. *P. betleoides* var. *glabrifolium* C. DC in Candollea 1: 186. 1923 *et in* 2: 207. 1925.

**Local Name:** *Janglipaa* (Bengali)

Stout climber, finely pubescent; young shoots purple with prominent hairs, vegetative branches densely pubescent with rooting nodes; fertile lateral branches rootless, finely pubescent; stipules adnate, deciduous; petiole 3 – 6 cm long, grooved above; lamina in vegetative branches ovate-cordate, membranous, shortly acuminate, base cordate; in fertile branches petiole short, 1 – 2 cm long; lamina lanceolate, long acuminate, base strongly asymmetric, petiole and under surface of leaves of both type of branches minutely pubescent mainly on veins; prominent lateral veins 3 pairs, all arising from the base in vegetative branch, two of anterior pair arising alternately from 2 – 3 cm above the base in fertile branches; spikes pendent, slender; flower densely arranged; bracts peltate, orbicular; stamens 2; drupes densely aggregated, sunken on fleshy rachis, highly pungent.

**Flowering & Fruiting:** March to September.

**Distribution:** India: Terai, Duars, Sikkim, Assam, Arunachal Pradesh; Bhutan.

**Ecology:** Grows mainly in the foothills

**Exsiccatae:** North Rajavatkhaoa, Jalpaiguri, 06.04.2009, *AP. Das et al* 0542 (NBU); NRVK, Jalpaiguri, 11.02.2009, *AP. Das et al* 0514 (NBU).

*Note:* Used for medicinal and chewing purpose.

*Piper chaba* Hunter in Asiat. Res. 9: 391. 1809; Hook.f. in Fl. Brit. India 5: 83. 1886.

**Local Name:** *Chaba* (Nep.)

Much branched, slender shrubby climber; rooting from nodes; stem terete, solid, glabrous, warted, greenish-brown. Petioles upto 1.5 cm long, auricled, rusty brown; lamina 6.0 – 15 x 3.5 – 7.0 cm, oblong-ovate, entire acuminate, base unequally cordate, membranous, thinly coriaceous, glabrous

above, puberulous and gland dotted below, 5 – 7 nerved, apart 2.0 – 3.0 cm from base. Plants dioecious; bracts peltate; spikes axillary, solitary; male spikes 5.0 – 7.0 cm long; peduncle 1.5 – 2.0 cm long; stamens 2 within; female spike 6.7 – 10 cm long, drupes 0.35 – 0.4 cm.

**Flowering & Fruiting:** April to December

**Distribution:** Generally cultivated in parts of India; Malaysia

**Ecology:** Occurs mostly in hill slopes up to 1200m. Less common.

**Exsiccatae:** Latpunchor, Darjeeling, 850 m, May 17. 1995, *Das & Samanta* 743 (NBU).

*Note:* Leaves used as vegetables.

*Piper hamiltonii* C. DC. in DC., Prodr. 16(1): 360. 1869; Hook.f. in Fl. Brit India 5: 88. 1886; Prain, Bengal Pl. 2: 898. 1903.

**Local Name:** *Janglipan* (Nepali).

Small climber with terete dimorphic branches, glabrous, rooting from nodes in vegetative branches; petioles in vegetative branches 1.5 – 3 cm long with a swallow grooves; lamina small ovate to orbicular, acuminate, base rounded, membranous; in fertile branches petiole short 1 – 2 cm, lamina 7 – 11 × 4 – 7 cm, elliptic to ovate-lanceolate, acuminate, base cuneate, lateral veins 2 pairs, all arising from base, in fertile leaves 2 of anterior pair arise alternatively from 1 – 1.5 cm above the base; spikes pendulous, compact; stamens 3; fruiting spike pendulous; drupes loosely arranged, ovoid.

**Flowering & Fruiting:** November to August.

**Distribution:** India: Darjeeling, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Tripura, Manipur; Bhutan, Nepal, Bangladesh, Myanmar, West China.

**Ecology:** Prefers moist area. Less common.

**Exsiccatae:** Rajavatkhaoa North, Jalpaiguri, 10.04.2009, *Das et al 0549* (NBU)

*Note:* Leaves and fruits used medicinally.

*Pipeer khasianum* C. DC. in DC., Prodr. 16(1): 349. 1869; Hook.f., Fl. Brit India 5: 89. 1886. *P. curtistipes* C. DC., Candollea 1: 225. 1923; et 2: 213 – 214. 1925. *P. manii* C. DC., Candollea 1: 196. 1923; et 2: 204. 1925.

**Local Name:** *Chabo* (Nepali)

Large climbing dioecious shrubs, stems faintly striate, glabrous; petioles 4 – 8 mm; lamina 6 – 1 × 2 – 4 cm, lanceolate or narrowly ovate, long – acuminate, base cuneate, membranous, 3 – veined at base, 2 other lateral veins arising 1 – 1.5cm above base; axillary buds more numerous, 3 – 4 mm; in fertile branches petiole upto 1.8 cm, lamina 6 – 10 × 4 – 6 cm, elliptic to ovate-lanceolate, acuminate, base cuneate; spikes short, 2 – 3 cm, peduncle 4 – 8 mm; stamens 3; fruiting spikes 3 – 6 cm; drupes loosely arranged, ovate, 3 × 4 mm on 0.5 – 1 mm stalks.

**Flowering & Fruiting:** February to June.

**Distribution:** India: Darjeeling, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Manipur; Bhutan, Nepal, Myanmar, Bangladesh, West China.

**Ecology:** Occurs in bushes, prefers moist areas. Less common.

**Exsiccatae:** Medicinal Plants Garden, North Bengal University, 17.05.2010, *Das et al 5009*, (NBU).

*Note:* Leaves and fruits medicinally useful.

*Piper longum* Linneaus, Sp. Pl. 1: 29. 1753; Roxburgh, Fl. Indica 1: 156. 1820; ed.2, 1: 156. 1832; Hook.f. in Fl. Brit. India 5: 83. 1886; Manandhar, Med. Pl. Nepal Himal. 57, t. 1980. *Chavica roxburghii* Miquel in Hooker, Lon. J. Bot. 4: 433. 1845. *P. latifolium* Hunter in Asia. Res. 9: 390. 1809. *P. sarmentosum* Wallich, Cat. 6641. 1832.

**Local Name:** *Pipal*, *Pipla-mul*, *Pipul-mul* (Nepali).

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Shrubby slender root-climber; stem softly puberulous, internodes up to 11 cm long; axillary buds needle like up to 0.30 cm, hairy; petioles 2.5-4.0 cm; lamina 7.0 – 11 x 5.0 – 8.5 cm, broadly ovate – cordate, acute to bluntly acuminate, deeply cordate, sinus auriculate rounded, membranous, rusty hairy at margins, gland dotted upwards above, veins 7, divergent; dioecious or monoecious; bracts stalked, orbicular, peltate; stamens 2, anthers inclined, included; male spike 5 – 8 cm long with 2 – 3 cm peduncle; female spikes 1.2 – 2.6 cm, cylindrical; peduncles 1.1 – 2.5 cm, pubescent; stigmas 4; infructescence 3 – 5 x 0.5 – 0.8 cm; drupes 0.12 – 0.21 cm in diameter, fleshy, globose, densely coherent.

**Flowering & Fruiting:** May to February

**Distribution:** India: Darjeeling, Sikkim, Assam, Meghalaya; Bhutan, Nepal, Srilanka, Malesia

**Ecology:** Occurs mostly on trees in the hills in between 600 – 2000 m. Rare.

**Exsiccatae:** Mongpoo, Darjeeling, 1300 m, 13.12.1995, *Das & Samanta* 481 (CAL); Manga, Sikkim, 1350m, 26.09.1996, *Das & Samanta* 1533 (NBU).

*Note:* Leaves and roots used medicinally. Decoction of roots and immature fruits is used in bronchitis and also as antidote for snake bite (Mukherjee & Deb Roy 1987).

*Piper mullesua* Buchanon-Hamilton ex D. Don, Prodr. Fl. Nepal 20. 1825. *Chavica mullesua* Buch.-Ham. ex D. Don) Miquel, Syst. Pipe., 280. 1843. *P. guigual* Buchanon-Hamilton ex D. Don, Prodr. Fl. Nepal 20. 1825. *C. guigual* Miquel, Syst. Pipe. 280.1843. *C. splerostachya* Wallich ex Miquel, Syst. Pipe. 278. 1843. *P. brachystachyum* Wallich ex Hook.f. in Fl. Brit. India 5: 87: 1886.

**Local Name:** *Dala chabo & Pila* (Nepali).

Small dioecious shrubby root-climber; branches slender, pendent; stem terete, much branched, glabrous, lower stem warted, internodes 3.5 – 8.5 cm long; petioles 0.5 – 1.5 cm long, slender, slightly auricled, nearly glabrous; lamina 5.5 – 11 x 2.3 – 5.5 cm, ovate to elliptic to lanceolate, caudate to acuminate, base acute slightly unequal, membranous, glabrous above, minutely gland dotted below, nerves 5, 2 from base, 3 originated slightly above, convergent; male spikes slender, 2.5 – 7.0 cm long, erect; peduncles 0.25 – 0.35 cm long; bracts peltate, almost sessile; stamens 2, anthers reniform, bithecous; female spikes shortly stalked up to 0.35 cm, globose, up to 1.2 cm, rachis almost glabrous; ovary ca 0.15 cm, shortly cylindrical, stigmas 3, minute; drupes 0.18 – 0.3 cm in diameter, densely clustered.

**Flowering & Fruiting:** August to December

**Distribution:** India: Darjeeling, Assam, Meghalaya, Manipur, Himachal Pradesh; Bhutan

**Ecology:** Occurs mostly in the bushy places of hill slopes in between 1200-2000m. Common

**Exsiccatae:** Birch Hill, Darjeeling, 2100 m, 17.6.1996, *Das & Samanta* 1004(CAL)

*Note:* Ripe fruits edible.

*Piper nigrum* Linneaus, Sp. Pl. ed 1: 29. 1753; Roxburgh, Fl. Indica 1: 150. 1832; Hook.f. in Fl. Brit. Ind. 5: 90. 1886; Prain, Beng. Pl. 2: 668. 1903. *P. trioicum* Roxburgh, Fl. Indica 1: 151. 1820. *P. nigrum* var. *trioicum* C. DC. in Prodr. 16(1): 363. 1869.

**Local Name:** *Golmorich & Kala-mirich* (Bengali).

Medium dioecious root-climber; stem terete, solid, rusty villous; branches slender, glabrous; auriculated from axillary buds, blackish brown when dry; petioles 0.6 – 1.0 cm long, slightly winged, puberulous; lamina of lower leaves 2.5 – 5.0 x 1.5 – 3.5 cm, broadly ovate, acute-caudate, base cordate, glabrous above, finely pubescent below, nerves 5-7; lamina of upper leaves 6.0 – 12 x 2.0 – 6.0 cm, ovate to elliptic to lanceolate, membranous, both surfaces glabrous, greenish-yellow, nerves strongly alternate; stamens 2; spikes pendulous, greenish white, filiform, 6 – 14 cm long, peduncle 1 – 2 cm, bracts of female spikes forming a short hemispherical cup below ovary, without raised margin; drupes large, globose, 0.25 – 3.0 cm, loosely aggregated.

**Flowering & Fruiting:** June to October

**Distribution:** India: Darjeeling, Sikkim, Assam, Malabar; Srilanka, Singapore, Malasia

**Ecology:** Occurs mostly on the trees of hill slopes in between 400 – 2000m. Less common

**Exsiccatae:** Latpunchor, Darjeeling, 900 m, 17.5.1995, *Das & Samanta* 1053 (NBU); Mangan, Sikkim, 1350 m, 26.9.1996, *Das & Samanta* 1508 (NBU).

*Note:* Seeds used as spice. The dried unripe fruit is stimulant, stomachic and carminatic (Mukherjee & Deb Roy 1987).

*Pipeer pedicillatum* C. DC. in J. Bot. 4; 164.1866; in Fedde Repert 10: 518. 1912. *Piper boehmerifolium* Wallich (cat. no. 6654. A. 18932, *nom. nud.*) ex DC. Prodr. 16(1): 348. 1869; Hook.f. in Fl. Brit. India 5: 85.1886. *P. clarkei* C. DC. in Candollea 1: 186. 1923; et in 2: 192. 1925. *P. nigranebtum* C. DC., Fedde Repart. 14: 199. 1914. *P. pedicillosum* Wallich ex C.DC. *sensu* Das & Chanda

**Local Name:** *Balay chabo & Long pipla* (Nepali)

Shrubby slender dioecious root-climber; stem terete, sparsely hairy, dense at nodes; petioles 0.6 – 0.8 cm long, rusty hairy; lamina 8.0 – 13 x 5 – 8.2 cm, broadly ovate-elliptic, entire, caudate, base narrowly cuneate to cordate, membranous, almost glabrous below, rusty brown, especially on veins, 5-nerved, 3 from base, rests from ca 0.3 cm above base; spikes solitary; male spikes flexuous, slender, 10 – 20 cm long; peduncles 1.5 – 2.0 cm; bracts stalked, stout, peltate; stamens 2, slightly shorter than bracts, anthers almost sessile; female peduncles up to 10 cm long rusty hairy; ovary c 0.1 cm in diameter, almost sessile; stigmas 3-5; drupes ovoid, obtuse, densely coherent o.14 – 0.15 cm, across.

**Flowering & Fruiting:** May to February

**Distribution:** India: Darjeeling, Assam, Meghalaya; Bhutan, Nepal, Nepal, North Myanmar

**Ecology:** Occurs sparsely on the hill slopes in between 350 – 220m.

**Exsiccatae:** Kurseong, Darjeeling, 1550 m, 31.03.1983, *A.P. Das* 1358 (NBU).

*Note:* Stems & roots used medicinally.

*Pipeer peepuloides* Roxburgh., [Hort. Beng. 4, 1814, *nom. nud.*]; Fl. Indica 1: 159. 1820; ed. 2. 157.1832; Wall. Cat. 224, n. 6650. 1832; Hook.f. in Fl. Brit. India 5: 83. 1886; Banerjee in Rec. Bot. Surv. India 19(2): 79. 1966.

**Local Name:** *Janglipaan, Pipla* (Bengali); *Ruk Peepla* (Nepali).

A medium sized slender root climbers; stems and branches spreading, terete, old stem warted; lamina 4.5 – 12 x 3.0 – 6.0cm, linear or oblong-ovate, entire, caudate – acuminate, base sub – cordate oblique, membranous, nerves 3-5 from base, glabrous above, 3 – armed small stellate hairy below towards base; petioles 0.4-1.2 cm long, slightly winged, nearly glabrous; plants dioecious; spikes lateral to petiole; male spikes up to 0.5 cm long, peduncles up to 5.5 cm; stamens 3 – 4, bracts peltate; female spikes up to 2.0 cm long, peduncle short ; drupes 1.6 – 1.8 cm, globose, minute.

**Flowering & Fruiting:** October to March

**Distribution:** India: Darjeeling, Sikkim, Assam, Meghalaya, Manipur; Bhutan, Nepal, Myanmar, West China.

**Ecology:** Occurs rarely in the bushy places of hill slopes of in between 600 – 2000 m. Common

**Exsiccatae:** Birch Hill, Darjeeling, 2100 m, 13.6.81, *A. P. Das* 474 (N.B.U.); Tadong, Gangtok, Sikkim, 1500 m, 11.5.1996, *Das & Samanta*, 1247 (N.B.U)

*Note:* Leaves and fruits used medicinally.

*Piper suipigua* Buchanan-Hamilton *ex* D. Don, Prodr. Fl. Nepal 20. 1925. *Chavica suipigua* (Buchanan-Hamilton *ex* D. Don) Miquel, Syst. Pipe. 280.1843. *P. nepalense* Miquel, Syst. Pipe. 318. 1843. *P. gamblei* C. DC. in Candollea 1: 204. 1923 *et* in 2: 208. 1925. *P. japonicum* C. DC., in

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Candollea 1: 193. 1923 *et in* 2: 200. 1925. *P. subrigidilimum* C. DC., in Candollea 1: 193. 1923 *et in* 2: 201. 1925.

**Local Name:** *Dakley chabo* (Nepali)

Large climbing shrub, stem faintly striate on drying, glabrous; leaves in vegetative branches with petioles 5-8 cm; lamina ovate, 8 – 15 × 5 – 6 cm, acute, base semi-cordate, thinly coriaceous; in fertile branches petioles short, 1-2 cm; lamina elliptic-lanceolate, 10 – 12 × 7 – 8 cm, acuminate, base cuneate, veins prominent, lateral veins 2 pair, both arising from base in vegetative branches and from 2- 3 cm above in fertile branches; stamens 3; female spikes pendant, 4 – 6 cm on slender peduncle, bract peltate; stigmas 4; fruiting spikes upto 12 cm, slender; drupes loosely arranged, spherical, turn black on ripening.

**Flowering & Fruiting:** June to March

**Distribution:** India: Darjeeling, Jalpaiguri, Sikkim, Assam, Arunachal Pradesh, Meghalaya, Tripura; Bhutan, Nepal.

**Ecology:** Grows mainly in the foothills. Female plants are more common.

**Exsiccatae:** Nandu Gaon, South Sikkim, 21.05.1996, *Das & Samanta* 1125 (NBU)

*Piper sylvaticum* Roxburgh, Fl. India 1: 156. 1832; C. DC. in DC., Prodr., 16(1): 355. 1869; Wallich, Cat. 6653. A.B., 1832; Hook.f. in Fl. Brit. India 5: 84. 1886; Prain, Bengal Pl. 2: 893. 1903. *Chavica thomsonii* C. DC. in DC., Prodr. 16(1): 389. 1869. *P. thomsonii* (C. DC.) Hook.f. in Fl. Brit. India 5: 87. 1886.

**Local Name:** *Janglipaan* (Bengali)

Creeping or climbing shrub; plants glabrous, sometimes finely pubescent when young, stem soft, terete, deep green; branches dimorphic; leaves in vegetative branches with petioles 5 – 12cm long, deeply grooved; lamina broadly ovate-cordate or oblong, acuminate, base deeply cordate, membranous or thinly coriaceous, pale green underneath, finely puberulent; in fertile branches petioles short, 1 – 2.5cm; lamina elliptic-lanceolate, shortly acuminate, base slightly asymmetric, cuneate, veins prominent, lateral veins 3 – 4 pairs, all arise from base in vegetative leaf, anterior pair in fertile leaf arising from 1.5 – 2.5cm above base; spikes erect, cylindric, rachis hairy; male spikes 4 – 8 cm, female spikes short 0.6 – 1.5 cm; peduncles 0.5 – 1.0 cm; bracts orbicular peltate; stamens 3, exerted; ovaries globose, stigmas 4; fruiting spikes short, terete, 2.5 – 4 cm, peduncle 4 – 9 mm; drupes densely aggregated, spherical, black on ripening.

**Flowering & Fruiting:** February to September.

**Distribution:** North East India: Darjeeling, Jalpaiguri, Sikkim, Assam, Tripura, Arunachal Pradesh, Bhutan, Nepal, China.

**Ecology:** Grows mainly in foothill forest and prefer moist shaded area.

**Exsiccatae:** Neora Valley, Darjeeling, 29.04.1995, *Das & Samanta* 0648 (NBU); Dolka forest, Bengdubi, Darjeeling, 08.09.1996, *Das & Samanta* 1373 (NBU); Jorethang, South Sikkim, 28.10.1995, *Das & Samanta* 0802 (NBU)

## DISCUSSION

The systematic delimitation of *Piper* L. appears to be difficult mainly due to the non-availability of proper flowering and fruiting materials. Lamina structure varies too much within the population of a particular species and too much sensitive to habitat conditions and phenophase in the life cycle. Maintaining different populations in a garden to get reproductive structure is also too much time consuming.

The thirteen species of *Piper* enumerated above can not be considered as the final species content for the genus in the study area. With the availability of more and more flowering and fruiting

materials may help us to get a better picture. Majority of *Pipers* are climbers and gets affected during any forestry operations. On the other hand many of the local species of *Piper* are medicinally important and many others produce edible leaves. Considering the wide diversity in the population it is important to conserve these plants properly population-wise and make intensive study of each and every population in all phases of their life.

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