

Diversity of the genus *Sonchus* Linnaeus (Asteraceae) in Assam

Santa Paul¹ and Nilakshee Devi

Department of Botany, Gauhati University, Guwahati-781014, Assam, India

¹Communicating author; E-mail: santalaceae12@yahoo.com

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Abstract

The present paper deals with the six taxa under the genus *Sonchus* Linnaeus (Asteraceae) from Assam along with their description and distribution pattern.

Key words: *Sonchus* Linnaeus, Diversity, Assam.

INTRODUCTION

The name of the genus *Sonchus* Linnaeus (Asteraceae) is a Greek for “sow thistle” and means “hollow”. This is in reference to its hollow stems. Different species of *Sonchus* has been considered as the worst weeds of the World (Holm *et al.* 1997). The genus includes over 50 species belongs to sub-tribe *Crepidinea* of the tribe *Lactuceae* (Hajra *et al.* 1995).

Plants of this genus are generally erect, leafy, glabrous, glaucous, annual and perennial herbs, emerging from a ground rosette; white milky juice; taproot or rhizomatous; up to 1.2 m high. up high. Stem glabrous, striate and hollowed. Leaves cauline, alternate, runcinate, acute to apiculate, narrowed at the base; margins lobed, more or less and irregularly dentate; glabrous; leaves rosette - like crowded at the base, with wider internodes towards the apex at the stem and sessile.

For the North-Eastern region of India Kanjilal *et al.* (1939) recorded only one species of *Sonchus* from Assam; while Choudhury (2005) recorded its three species. Haridasan & Rao (1987) did not record any species of this genus in their “Forest flora of Meghalaya”. Similarly, the genus was not recorded also in the “Flora of Nongpoh and vicinity” (Joseph 1968), and Cherapunji Sub-division, East Khashi hills, Meghalaya (Dam 1994).

Species of *Sonchus* are used in the treatment of various diseases. The leaves of its some species are used to cure infections. It is also used as sedative, stomachic, diuretic and to treat liver diseases, including hepatitis and antibacterial activity. Sesquiterpene lactones, have been isolated from *Sonchus* species. This genus has attracted much attention and has been the subject of numerous chemical and pharmacological studies. It is a rich source of sesquiterpene lactones of the eudismanolides and guaianolide with other constituents includes ionone glycosides, phenyl propanoides, phenolics (flavonoids and coumarins), in addition to sterols and lignans (El-Khayat 2009).

The present paper focus on the six taxa of *Sonchus* occurring in different parts of Assam along with their descriptions, distribution, medicinal uses and other properties.

MATERIALS AND METHODS

The present investigation is based entirely on specimens collected from different parts of Assam during the years 2011 – 2013. Field observations were noted on Field Note Book and the voucher specimens were made into mounted herbarium specimens following Jain & Rao (1977). Specimens were identified by consulting different available floras (Hooker 1892; Kanjilal *et al.*, 1939; Deb 1983; Hajra *et al.* 1995; Barua & Nath 1998; Choudhury, 2005) and confirmed by matching at CAL and in the herbarium of Gauhati University, Assam. The nomenclature was verified through www.theplantlist.org.

ENUMERATION

The recognized six taxa under the genus *Sonchus* Linnaeus of Asteraceae are enumerated below alphabetically along with protologue references, reference to voucher specimens, distribution, uses, etc. A dichotomous artificial key to the species has been prepared using morphological characters.

Key to the Species

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|---|----------------------|
| 1a. Plants non-rhizomatous, annual or perennial | 2 |
| 1b. Plants rhizomatous, perennial | 4 |
| 2a. Plants perennial with deep creeping roots | <i>S. arvensis</i> |
| 2b. Plants annual with tap root | 3 |
| 3a. Leaves with acute auricles | <i>S. oleraceus</i> |
| 3b. Leaves with obtuse auricles | <i>S. asper</i> |
| 4a. Heads glandular hairy with densely white tomentum | <i>S. wightianus</i> |
| 4b. Heads eglandular hairy with simple hairs at base | <i>S. brachyotus</i> |

Sonchus arvensis Linnaeus, Sp. Pl. 2: 793. 1753; Kanjilal *et al.*, Fl. Ass. 3: 126. 1939; Kitamura, Mem. Coll. Sci. Kyoto Imp. Univ. Ser. B. Boil. 23: 147. 1956; Li, Fl. Taiwan 4: 940. 1978.

Stems erect, 120 – 200 cm tall after the basal rosette, glabrous, umbellately branched. Leaves oblong-ob lanceolate, radical 10 – 22 cm x 4 – 6 cm, lanceolate, entire and denticulate, obtuse, base narrowed, glabrous on both surfaces; lower cauline leaves narrowly oblong, 22 – 30 x 4 – 6 cm, denticulate, acute, base auriculate-clasping, glabrous; upper leaves gradually smaller, auriculate clasping. Inflorescence pseudo-umbellate, pedunculate; peduncle 2 – 6 cm in long, glabrous or glandular hairy. Involucres blackish green, broadly tubular, 12 – 24 mm x 10 – 13 mm, densely or sparsely glandular hairy; bracts tri - tetra seriate, outer bracts shorter, lanceolate, 3 – 4 mm long, margins transparent, apex obtuse; inner bracts linear, 1 – 1.4 cm long, margins transparent, dentate, obtuse,. Florets tubular, 10-20 mm, yellowish; corolla 12-15 mm long. Anthers 8-10mm, sagittate, truncate. ovary 16 – 20 mm long; stigma bifid. Achenes narrowly oblong, 1.8 – 3 mm x 0.8 – 10 mm, brown, 5 – 8 ribbed. Pappus bristles slender, 8 – 10 mm long, white.

Flowering and Fruiting: January – April.

Exiccatus: Baksha, *Santa Paul 0010*, dated 20.05.2011.

Distribution: All temperate and in many tropical countries of the world, wild or introduced.

Uses: The roots are used in cough, bronchitis, and asthma. The leaves are applied to swellings, while its latex is used for the treatment of eye diseases (Yildirim *et al.* 2001).

Association: Road sides, disturb fields like wastelands and cultivated fields and in moist areas like drain side, old walls. Associated with *Ageratum conyzoides* Linnaeus, *Achyranthes bidentata* Blume, *Alternanthera sessilis* (Linnaeus) R. Brown ex A.P. de Candolle, *Acmella paniculata* (Wallich ex A.P. de Candolle) R.K. Jansen and also with some grasses and ferns.

Sonchus asper (Linnaeus) Hill, Herbs. Brit. 1: 47. 1769; Hooker f., Fl. Brit. India 3: 414. 1881; Hajra *et al.*, Fl. India 12: 318. 1995. *Sonchus oleraceus* var *asper* Linnaeus, Sp. Pl. 2: 794. 1753.

Annual herbs; with white latex, 50 – 180 cm tall above a basal rosette; tap roots long, slender and pale yellowish, bushy with many lateral roots; stems erect, stout, hollow except at nodes, unbranched or slightly branched apically, often reddish; hairs glandular-tipped on upper stems. Leaves basal and cauline, alternate, basal ones with more or less winged petiole, caulines sessile; lamina obovate to oblanceolate, 4 - 18 cm x 0.5 - 5 cm, sometime lyrate pinnatifid, or pinnately parted with triangular sharply toothed, acute lobes, base auriculate, amplexicaule with rounded mucronate-dentated auricles. Capitula in corymbs, 14 – 26 x 10 – 14 mm, branches sometimes glandular hairy, outer bracts broadly lanceolate, small, acute, 5 – 6 mm long. Florets yellowish, 10 – 12 mm long, ligulate, perfect. Achenes 3 mm long oblanceolate, compressed, never winged, brown, 6 – 14 ribbed, rugose.

Flowering & Fruiting: April – September.

Exiccatus: Dibrugarh, *Santa Paul 0089*, dated 22.04.2012.

Distribution: Throughout India, Pakistan, Afghanistan, China, Iraq, Iran, Europe. Asia, Syria, Egypt, Libya, North America & South America.

Uses: It is used in various human disorders including wounds and burns, cough, bronchitis and asthma (Ahmad *et al.* 2006; Koche *et al.* 2008), gastrointestinal infection, inflammation, diabetes and cardiac dysfunction (Sabeen & Ahmad 2009), kidney and liver disorders (Zabihullah *et al.* 2006), reproductive disorder like impotence (erectile dysfunction) in humans (Kareru *et al.* 2007), jaundice (Jan *et al.* 2009) and cancer (Sammon 1998; Thomson & Shaw 2002). Its stems are given as a tonic and sedative (Gulcin, *et al.* 2002). The plant extract is applied to wounds and boils. The leaves and roots of the plant are used in indigestion and as a febrifuge, while its roots act as a vermifuge. Its stems are given as a tonic and sedative (Yildirim *et al.* 2001).

Association: Road sides, disturbed habitat like wastelands and cultivated fields and in moist areas like drain side. Grown in association with *Ageratum conyzoides* Linnaeus, *Amaranthus viridis* Linnaeus, *A. spinosus* Linnaeus, *Alternanthera sessilis* (Linnaeus) R. Brown ex A.P. de Candolle, *Euphorbia hirta* Linnaeus and also with some grasses.

Sonchus brachyotus A.P. de Candolle, Prodr. 7(1): 186. 1838; Boulos in Bot. Notiser 114: 61. 1961; Hajra *et al.*, Fl. India 12: 320. 1995. *Sonchus arvensis* auct. non Linnaeus, Hooker f., Fl. Brit. Ind. 3: 414. 1881; Prain, Beng. Pl. Beng. Pl. 629. 1903; Gamble, Fl. Pres. Madras 732. 1921; Haines, Bot. Bih. Or. 497. 1922; Fischer in Rec. Bot. Surv. Ind. 12 (2): 106. 1938; Kanjilal *et al.*, Fl. Ass. 3: 126. 1939; Hara, Fl. E. Himal. 1: 345. 1966.

Perennial, rhizomatous herbs; stems erect, hollow, branched from the base with white latex, 40 – 185 cm tall. Leaves cauline, 5-8 cm x 1-4 cm, entire or spinous-toothed, obtuse, glabrous. Heads cylindrical, base slightly tomentose, erect, 12 – 23 mm x 8 – 18 mm; peduncle slender, 3 – 7.5 cm long, glabrous or sparsely tomentose. Involucral bracts tri- to tetra-seriate, outer ones short, lanceolate or oblanceolate, 3 – 6 mm long, margins transparent, apex obtuse;

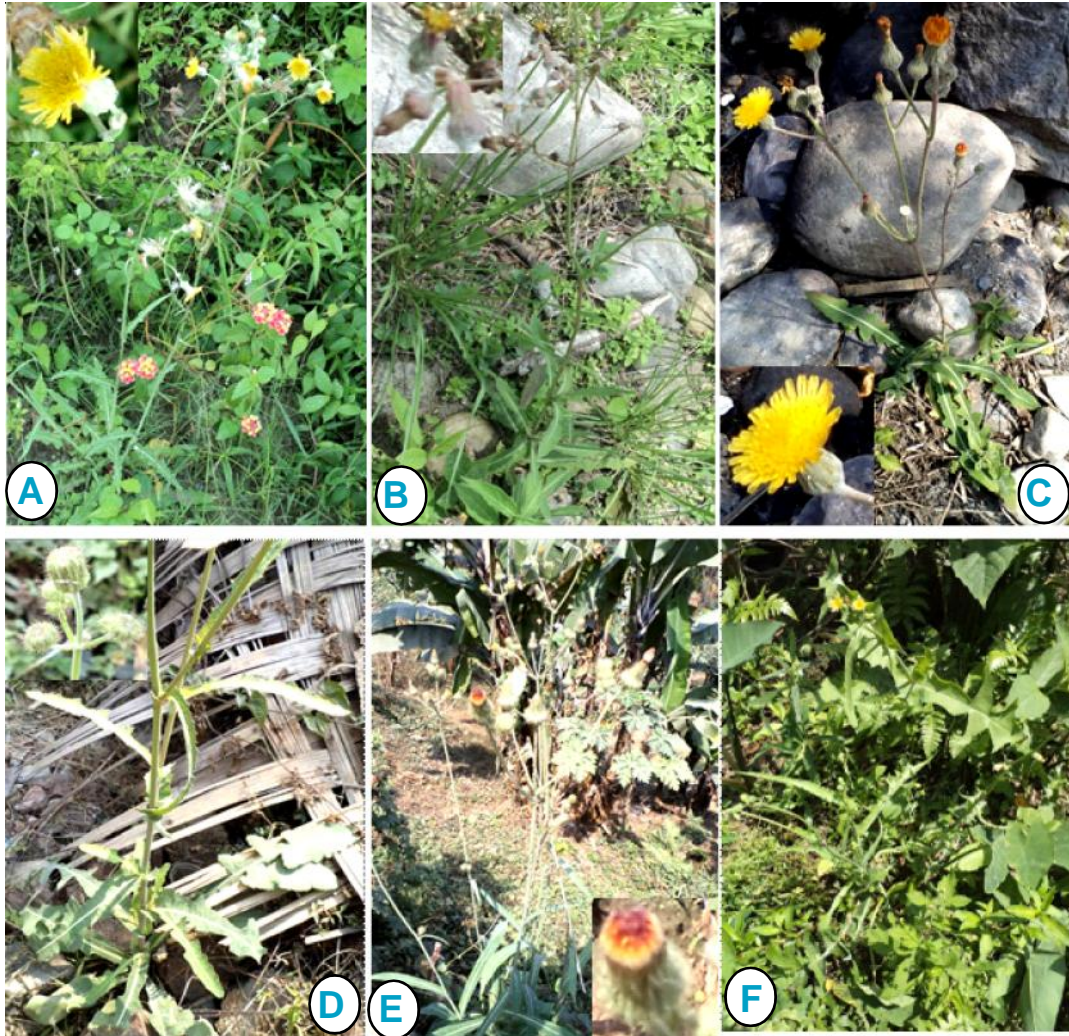


PLATE - I: Species of *Sonchus* Linnaeus in Assam. Fig. A - F: A. *S. asper*; B. *S. arvensis*; C. *S. wightianus* ssp. *wallichianus*; D. *S. wightianus* ssp. *wightianus*; E. *S. brachyotus*; F. *S. oleraceus*

inner ones linear 10 – 12 mm x 2 – 3 mm. Florets many, tubular, 10 - 18 mm, yellowish; corolla 12 – 13 mm long. Anthers 9 – 13 mm long. Gynoecium 12 – 20 mm long. Achenes dark yellowish or pale brownish, oblong or oblong lanceolate, 2.5 – 3.5 mm x 0.8 – 1.2 mm, compressed, smooth. Pappus bristles slender, 8 – 10 mm long, white.

Flowering and Fruiting: March – November

Exiccatus: Guwahati, *Santa Paul* 0067, dated 12.03.2012.

Distribution: India [Himachal Pradesh, Arunachal Pradesh, Punjab, Madhya Pradesh], TAR, China, Thailand, Korea, Japan & Central Asia.

Uses: Stem and leaf decoction is used for the treatment of gastric trouble, stomach and waist pain. Boiled leaves are used as vegetables which is effective in stomach pain (Srivastava *et al.* 2010).

Association: Occurs in road sides, disturb habitat like wastelands and cultivated fields, in moist areas like drain side and old walls. Plants grow in association with *Acmella paniculata* (Wallich ex A.P. de Candolle) R.K. Jansen, *Eclipta prostrata* (Linnaeus) Linnaeus, *Ageratum conyzoides* Linnaeus, *Amaranthus spinosus* Linnaeus, *Alternanthera sessilis* (Linnaeus) R. Brown ex A.P. de Candolle, *Euphorbia hirta* Linnaeus and also in with some grasses.

Sonchus oleraceus (Linnaeus) Linnaeus, Sp. Pl. 2: 794. 1753; Hooker f., Fl. Brit. Ind. 3: 414. 1881; Kitamura, Acta. Phytotax. Geobot. 10: 28. 1941; Mem. Coll. Sci. Kyoto Imp. Univ., Ser. B. Boil. 23: 146. 1956; Li, Fl. Taiwan 4: 940, pl. 1254. 1978; Hajra *et al.*, Fl. Ind. 12: 321. 1995.

Annual or biennials herbs, erect (50 – 130 cm high), glabrous, over a basal rosette; latex milky; taproot with no rhizome. Stem glabrous, striate, stout, often branched, hollow. Leaves alternate, runcinate, lobed more or less and irregularly dentate, acute to apiculate, narrowed at the base, glabrous. Lower cauline leaves with winged petiole; lamina thin, oblong, 6 – 23 x 2.5 – 7.5 cm, pinnately parted to divided, segments oblong, 3 or 4 pairs, irregularly spiny-dentate, obtuse or acute, base narrowed; upper leaves oblong-lanceolate to lanceolate. Heads 1 – 1.8 x 0.8 – 1.2 cm, yellow; peduncle 1 – 6.5 cm long, glandular hairy; involucre 10 – 18 mm x 9 – 12 mm, bracts tri- or tetra- seriate, pilose on midrib outside, glandular, oblong-lanceolate, outer bracts 3 – 5 mm long, median bracts 5.5 – 8.5 mm long and inner bracts 8 – 1.1 mm long with transparent ciliate margins. Tubular florets yellowish, many 9 – 13 mm long. Achenes narrowly oblong, 2 – 3.5 x 1 – 1.5 mm, distantly muricate ribs. Pappus bristles slender, 5 – 7.5 mm long, white.

Flowering & Fruiting: March – November.

Exiccatus: Karbi Anglong, *Santa Paul 0085*, dated 19.04.2012.

Distribution: Throughout India, Native to Eurasia and northern Africa, Pakistan, Afghanistan, Nepal, Bhutan, China, Iraq, Iran, Europe, Australia, N. & S. America.

Uses: The leaves and roots of the plant are used in indigestion and as a febrifuge, while its roots act as a vermifuge. Its stem is given as a tonic and sedative (Yang-Jun Xu *et al.* 2008). Antioxidant activities, including the free radical Scavenging effects and iron-chelating activities have been reported for *S. oleraceus* (Gulcin *et al.* 2002). It is also used as an abortifacient, anticancer (sap); antidiarrheal, anti-inflammatory. “blood purifier”, calms the nerves (leaves); cathartic (stem juice), clears infections, cure for opium addiction, digestive, purgative, diuretic, emmenagogue; emollient, febrifuge (leaves and roots infused); gynecological aid, heart medicine, hepatic; hydrogogue (stem juice), insecticide; poison, sedative, stop bleeding, to prevent, tonic, toothache remedy, vermicide. Since the plants are regarded as wild vegetables, the study was aimed at assessing their nutritional qualities and possible biological activities

Association: *Sonchus oleraceus* is mainly found in disturbed localities, including farmland, abandoned fields and recently burned fields. It also occurs in moist areas like old walls, drain side, slopes near cultivated fields. *Ageratum conyzoides* Linnaeus, *Achyranthes bidentata* Blume, *Alternanthera sessilis* (Linnaeus) R. Brown ex A.P. de Candolle, *Amaranthus viridis* Linnaeus, *Euphorbia hirta* Linnaeus, *Lantana camara* Linnaeus, *Lindernia crustacea* Muell., *Oxalis corniculata* Linnaeus, *Sida rhombifolia* Linnaeus, *Solanum nigrum* Linnaeus, *Acmella paniculata* (Wallich ex A.P. de Candolle) R.K. Jansen, *Sonchus arvensis* Linnaeus and also with grasses, ferns and in some cases with trees.

Sonchus wightianus A.P. de Candolle, Prodr. 7 (1): 187. 1838; Hajra *et al.*, Fl. India 12: 321 – 323. 1995. *Sonchus arvensis auct. non* Linnaeus, Hooker f., Fl. Brit. Ind. 3: 414. 1881.

Perennial herbs, with long cylindrical root stock; 50–130 cm high, glabrous or densely pilose. Leaves cauline, lanceolate, dentate auricled; upper leaves lanceolate, often acutely auricled, 5–25 x 3–6 cm; rosulate base, runcinate or pinnatifid; flattened or winged auricled. Heads cylindrical, broadly campanulate, 1.4–2.5 x 1–1.2 cm, erect, densely pilose glandular hairy, often with tomentum. Involucral bracts tri–tetra seriate, outer bracts shorter, oblanceolate, 3–7 x 1–2 mm, densely pilose-glandular hairy; inner bracts linear, acute, 10–13 x 1–2.5 mm. Florets many in each disc, yellowish, scarcely compressed, smooth, 14–18 mm long. Pappus white, bristles 8–12 mm long, many seriate.

Uses: The leaves are used in earache by rural communities of India (Squadriato & Peyor 1998).

Key to the Sub-Species

- 1a. Stems glandular hairy *Sonchus wightianus* ssp. *wightianus*
 1b. Stems glabrous *Sonchus wightianus* ssp. *wallichianus*

Sonchus wightianus ssp. *wallichianus* (A.P. de Candolle) Boulos in Bot. Not. 125:197. 1972; Gould in EFPN 3: 44. 1982; *Sonchus wallichianus* A.P. de Candolle, Prodr. 7: 187. 1838. Hajra *et al.*, Fl. India 12: 323. 1995. *S. arvensis* var. *laevipes* auct. non Koch; Kitamura in FIIH 345. 1966.

Stems glabrous; heads densely white tomentose.

Flowering & Fruiting: April– November.

Exiccatus: Nameri, *Santa Paul 0065*, dated 22.02.2012.

Distribution: India [Bihar, Assam], Nepal, Bhutan, Afghanistan and Pakistan.

Association: On old walls, roadsides, bank of rivers and streams, drain sides, moist areas. In association with *Ageratum conyzoides* Linnaeus, *Alternanthera sessilis* (Linnaeus) R. Brown ex A.P. de Candolle, *Amaranthus viridis* Linnaeus, *A. spinosus* Linnaeus, *Euphorbia hirta* Linnaeus, *Lindernia crustacea* (Linnaeus) F. Mueller, *Mimosa pudica* Linnaeus, *Oxalis corniculata* Linnaeus, *Sida rhombifolia* Linnaeus, *Solanum nigrum* Linnaeus, *Acmella paniculata* (Wallich ex A.P. de Candolle) R.K. Jansen and also with grasses, ferns and trees.

Sonchus wightianus ssp. *wightianus*: Hajra *et al.*, Fl. Ind. 12:323. 1995.

Stems glandular hairy; heads glandular hairy, often mixed white tomentum at base.

Flowering & Fruiting: Throughout the year.

Exiccatus: Manas, *Santa Paul 0005*, dated 08.05.11.

Distribution: Throughout India; Nepal, Bhutan, Myanmar, China, Afghanistan, Indonesia, Philippines and Pakistan.

Association: Moist areas such as old walls, roadsides, bank of rivers and streams, drain sides. In association with *Ageratum conyzoides* Linnaeus, *Alternanthera sessilis* (Linnaeus) R. Brown ex A.P. de Candolle, *Amaranthus viridis* Linnaeus, *A. spinosus* Linnaeus, *Euphorbia hirta* Linnaeus, *Lindernia crustacea* (Linnaeus) F. Mueller, *Mimosa pudica* Linnaeus, *Oxalis corniculata* Linnaeus, *Sida rhombifolia* Linnaeus, *Solanum nigrum* Linnaeus, *Acmella paniculata* (Wallich ex A.P. de Candolle) R.K. Jansen and also with grasses, ferns and trees.

DISCUSSION

When compared with the existing knowledge of the elements of *Sonchus* Linnaeus in Assam (as discussed under the 'Introduction') it is now clear that the knowledge on this taxon was not good enough for the Assam flora (Kanjilal *et al.*, 1939) and further exploration and detailed characterization of its different population may lead to the discovery of some more interesting elements.

Many species of *Sonchus* Linnaeus have long been used as folk medicines for the treatment of numerous diseases and can be considered for further scientific evaluation and that may lead to the formulation of some important drugs for the benefit of the mankind.

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LITERATURE CITED

- Ahmad, M.; Khan, M.A.' Manzoor, S.; Zafar, M. & Sultana, S. 2006. Check list of medicinal flora of Tehsil Isakhel, District Mianwali Pakistan. *Ethnobot. Leafl.* 10: 41 – 48.
- Barua, I.C. & Nath, S.C. 1998. A systematic census of the Asteracean members growing in Assam. *J. Econ. Tax. Bot.* 22 (1): 1 – 17.
- Choudhury, S. 2005. *Assam's Flora*. ASTEC, Guwahati, Assam.
- Dam, N. 1994. *Flora of Cherapunji Sub-division, East Khasi hills, Meghalaya*. Ph. D. thesis. G.U.
- Deb, D. 1983. *The Flora of Tripura State*. Vol. II. Today & Tomorrow's Print. and Publ., New Delhi.
- El-Khayat, E.S. 2009. Cytotoxic and antibacterial constituents from the roots of *Sonchus oleraceus* L. growing in Egypt. *Pharmaco. Mag.* 5(20): 324 – 328.
- Gulcin, I. Oktay, M. Kufrevioglu, I.O. and Aslan, A. 2002. Determination of antioxidant activity of Lichen *Cetraria islandica* (L) Ach. *Journal of Ethnopharmacology.* 79: 325 - 329.
- Hajra, P.K.; Rao, R.R. & Singh, D.K. 1995. *Flora of India*. 13: 114 – 144. Botanical Survey of India, Calcutta.
- Haridasan, K. & Rao, R.R. 1987. *Forest flora of Meghalaya*. Vol. II, Botanical Survey of India. Bishen Singh and Mahendra Pal Shing, Derhadun.
- Holm, L.D. Eric, P. & Jaun, H.J. 1997. *World weeds: natural histories and distribution*. John Wiley & Sons.
- Hooker, J.D. 1881. *Flora of British India*. 3: 260 – 270. L. Reeve & Co., Ltd. Ashford, Kent, London.
- Jain, S. K. & Rao, R. R. 1977. *A Handbook of Field and Herbarium Methods*. Today and Tomorrow's Publication, New Delhi.
- Jan, G.; Khan, M.A. & Gul, F. 2009. Ethnomedicinal Plants Used against Jaundice in Dir Kohistan Valleys (NWFP) Pakistan. *Ethnobot. Leafl.* 13: 1029 – 1041.
- Joseph, J. 1968. *Flora of Nongpoh and its Vicinity*. Ph.D. Thesis, Gauhati University.

- Kanjilal, U. N.; Das, A.; Kanjilal, P. C. and De, R. N. 1939. *Flora of Assam*, Vol. 3. Govt of Assam. Press, Shillong.
- Koche, D.K.; Shirsat, R.P.; Imran, S.; Nafees, M.; Zingare, A.K. & Donode, K.A. 2008. Ethnomedicinal Survey of Nageria Wild Life Sanctuary, District Gondia (M.S.). India-Part II. *Ethnobot. Leafl.* 12: 532 – 537.
- Sabeen, M. & Ahmad, A.A. 2009. Exploring the Folk Medicinal Flora of Abbotabad City, Pakistan. *Ethnobot. Leafl.* 13: 810 – 833.
- Sammon, A.M. 1998. Protease Inhibitors and Carcinoma of the Esophagus. *Cancer.* 83: 405 – 408.
- Srivastava, R.C.; Singh, R.K.; Apatani community & Mukherjee, T.K. 2010. Indigenous biodiversity of Apatani plateau: Learning on biocultural knowledge of Apatani tribe of Arunachal Pradesh for sustainable livelihoods. *Indian J. Trad. Knowl.* 9 (3): 432 – 442.
- Squadriato, G.L. & Peyor, W.A. 1998. Oxidative chemistry of nitric oxide: the role of superoxide, peroxynitrite, and carbon dioxide. *Free Rad. Biol. Med.* 25: 392-403.
- Thomson, B. & Shaw, I. A. 2002. Comparison of Risk and Protective Factors for Colorectal Cancer in the Diet of New Zealand Maori and non-Maori. *As. Pacif. J. Canc. Prev.* 3: 319 – 324.
- Yang-Jun Xu, Shao-Bo Sunb, Li-Mei Sun, Dong-Feng Qiu, Xiu-Jin Liu, Zhi-Bo Jiang. 2008. Qunic acid esters and sesquiterpenes from *Sonchus arvensis*. *Food Chem.* 111: 92 – 97.
- Yildirim, A. Oktay, M. and Bilaloglu, V. 2001. The antioxidant activity of the leaves of *Cydonia vulgaris*. *Turk. J. Med. Sci.* 31: 23 – 27.
- Zabihullah, Q.; Rashid, A. & Akhter, N. 2006. Ethnobotanical survey in kot Manzary baba valley malakand agency, Pakistan. *Pak. J. Pl. Sci.* 12: 115 – 121.