

Exploring the underexplored genus *Chenopodium*, a potentially neglected underutilized species from Manipur North Eastern Region of India

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ABSTRACT

The Northeastern region (NER) of the India is home to a rich diversity of plant species. Many of them are underexplored and nurtured by indigenous communities for their potential value to humankind. The genus *Chenopodium* of family Amaranthaceae is one of the neglected and underutilized plant species known for its higher content of protein, minerals, vitamins and abiotic stress tolerance. However, taxonomically this genus is known to be a complex genus due to the lack of good morphological characters that can distinguish species. This genus has around 132 accepted species worldwide. In the present study, we have briefly described four *Chenopodium* species viz. *Chenopodium murale*, *C. ficifolium*, *C. giganteum* and *C. album* from Manipur, India. Of these, three species viz. *C. murale*, *C. ficifolium*, and *C. giganteum* are new records from Manipur, India.

KEYWORDS: Flora, New addition, Indo Burma Biodiversity Hotspot, Plant Taxonomy

INTRODUCTION

Neglected and Underutilized Species (NUS) are the species with under-exploited potential for contributing to food security, health, income generation, and environmental services (Jaenicke & Hoeschle-Zeledon, 2006). They are also referred to as Orphan or Minor or Underutilized species. NUS which are in general represented by wild species, ecotypes and landraces are considered to be locally abundant and important but globally rare (Padulosi *et al.*, 2008). Conservation and use of NUS is one of the main actions for the conservation and sustainable use of plant genetic resources.

The genus *Chenopodium* of the family Amaranthaceae is one among the existing known NUS of plants. This genus has gained importance because of the gluten free flour of its grains, high quality protein with an abundance of sulphur rich amino acids and high content of minerals and vitamins. It has around 132 accepted species worldwide (POWO, 2025). In India, it is represented by 8 species viz. *Chenopodium album*, *C. opulifolium*, *C. hybridum*, *C. murale*, *C. glaucum*, *C. botrys*, *C. ambrosioides* and *C. blitum* (Hooker, 1875). Additionally, 15 species were reported in India viz. *C. adpressifolium*, *C. album*,

C. atripliciforme, *C. cyanifolium*, *C. ficifolium*, *C. foliosum*, *C. giganteum*, *C. glaucum*, *C. hastatifolium*, *C. hybridum*, *C. karoi*, *C. murale*, *C. sagittatum*, *C. santoshei*, and *C. vulvaria*. However, *C. vulvaria* was later excluded from the list as there was no further record or collection of it from India after R.R. Stewart who reported this species from Ladakh (Paul, 2012). In the Himalayan and Tibet region, 9 *Chenopodium* species viz. *C. bengalense*, *C. ficifolium*, *C. pamiricum*, *C. atripliciforme*, *C. karoi*, *C. perttii*, *C. novopokrovskyanum*, *C. album*, and *C. harae* were recorded (Sukhorukov *et al.*, 2019) and two species viz. *C. ambrosioides* and *C. album* are reported in flora of Assam (Kanjilal *et al.*, 1940).

The Northeastern region (NER) of India is home to a rich diversity of plant species. Many of them are underexplored and nurtured by indigenous communities for their potential value to humankind. Manipur is one of the states of the North Eastern Region of India falling under the Indo-Burma Biodiversity Hotspot (<https://www.cepf.net/our-work/biodiversity-hotspots/indo-burma>). In the flora of Manipur, no species of the genus *Chenopodium* is recorded. There is also no other record on taxonomical description of *Chenopodium* species from Manipur, however, two species viz. *C. ambrosioides* and *C. album* were

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listed from Manipur for their antihelminthic properties (Zenith *et al.*, 2016). Considering the need of exploring *Chenopodium* species from Manipur, North Eastern Region (NER) of India, the present study focused on the collection and documentation of *Chenopodium* species from Manipur.

MATERIALS AND METHODS

The authors undertook field surveys at various places in Manipur, India, to explore and collect *Chenopodium* species. The collected plant specimens were grown in greenhouse of the Plant Systematics Conservation Laboratory, Institute of Bioresources and Sustainable Development, Manipur, India. Morphological studies of the collected specimens were carried out for proper taxonomical identification. For determining surface morphology of the seed coat, pericarp was removed from dried seeds and examined under the Scanning Electron Microscope (SEM) model JSM 6360 at Sophisticated Analytical Instrument Facility (SAIF), North-Eastern Hill University, Shillong-793022. With the help of floras, herbaria specimens, and scanning micrographs of seed coat surface morphology, collected plant specimens were identified as *C. murale*, *C. ficifolium*, *C. giganteum* and *C. album*.

RESULTS AND DISCUSSIONS

Altogether, four (4) plant species belonging to genus *Chenopodium* namely *C. murale*, *C. ficifolium*, *C. giganteum* and *C. album* were collected and identified. Of these, three species viz. *C. murale*, *C. ficifolium*, and *C. giganteum* are new distributional records from Manipur, India. The collected four species of *Chenopodium* are briefly described and discussed below.

Taxonomic Description

Chenopodium murale Linnaeus, Sp. Pl. 1: 219. 1753 (Amaranthaceae) (Linnaeus, 1753) (Figure 1)

Annual; herb 50-70 cm. Stem erect, branched, green to reddish striate. Leaf blade rhombic, irregularly lobed-dentate, retuse apex, adaxial green/reddish, abaxial green, granules present, 5.6 cm × 3.7 cm. Petiole reddish/green 5.7 cm × 1.7 mm. Inflorescence amarantiform 12-15 cm, leafy, loosely arranged in terminal or axillary branches. Flower bisexual, perianth 5, stamen 5. Seed ellipsoidal, black, 0.9-1 mm. Pericarp brown, persistent. Seed coat pitted (Figure 2).

Flowering & Fruiting: March-August

Habit: Paddy Fields, Vegetable Gardens, Peripheries of villages.

Specimen Examined: INDIA: Manipur, Imphal West, 780 m, Rajkumari Jashmi Devi & Biseshwori Thongam PSCL/MKB1 (Institute of Bioresources and Sustainable Development).

Note: Based on a molecular phylogenetic analysis, *C. murale* is now rearranged as *Chenopodiastrum murale* (L.) S. Fuentes, Uotila & Borsch (Fuentes-Bazan *et al.*, 2012)

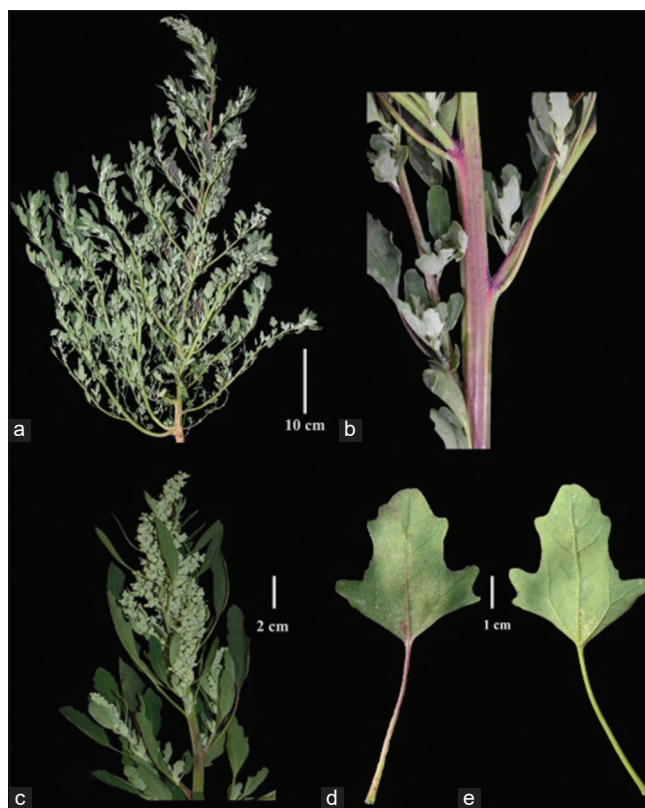


Figure 1: *Chenopodium murale* Linnaeus. a) Whole Plant, b) Stem, c) Inflorescence, d) Leaf (Ventral) and e) Leaf (Dorsal)

Uses: *C. murale* is locally consumed as vegetables in Manipur. It is known for its antibacterial, antifungal, anti-inflammatory properties and also for its analgesics, hepatoprotective, antioxidant, and hypotensive properties (Javaid & Amin, 2009; Abbas *et al.*, 2012; Saleem *et al.*, 2014; Zaman *et al.*, 2020).

Chenopodium ficifolium J.E. Smith, Fl. Brit. 1: 276. 1800. (Amaranthaceae) (Smith, 1800) (Figure 3)

Annual; herb 50-70 cm. Stem decumbent, branched, green to reddish striate. Leaf blade oblong, margin entire, irregularly lobed, apiculate apex, adaxial green/reddish, abaxial green, granules present, 2.5 cm × 0.6 cm. Petiole reddish/green 1.3 cm × 0.4 mm. Inflorescence glomerulate 20-27 cm, leafy, arranged in terminal or axillary branches. Flower bisexual, perianth 5, stamen 5. Seed ellipsoidal, black, 0.8-1 mm. Pericarp brown. Seed coat hexagonally pitted (Figure 2).

Flowering & Fruiting: January-June

Habit: Paddy fields, Vegetable Gardens.

Specimen Examined: INDIA: Manipur, Imphal West, 780 m, Rajkumari Jashmi Devi & Biseshwori Thongam PSCL/MKB2 (Institute of Bioresources and Sustainable Development).

Distribution: India, Eastern Himalaya, West Bengal, North Eastern India; Europe; Korea; China.

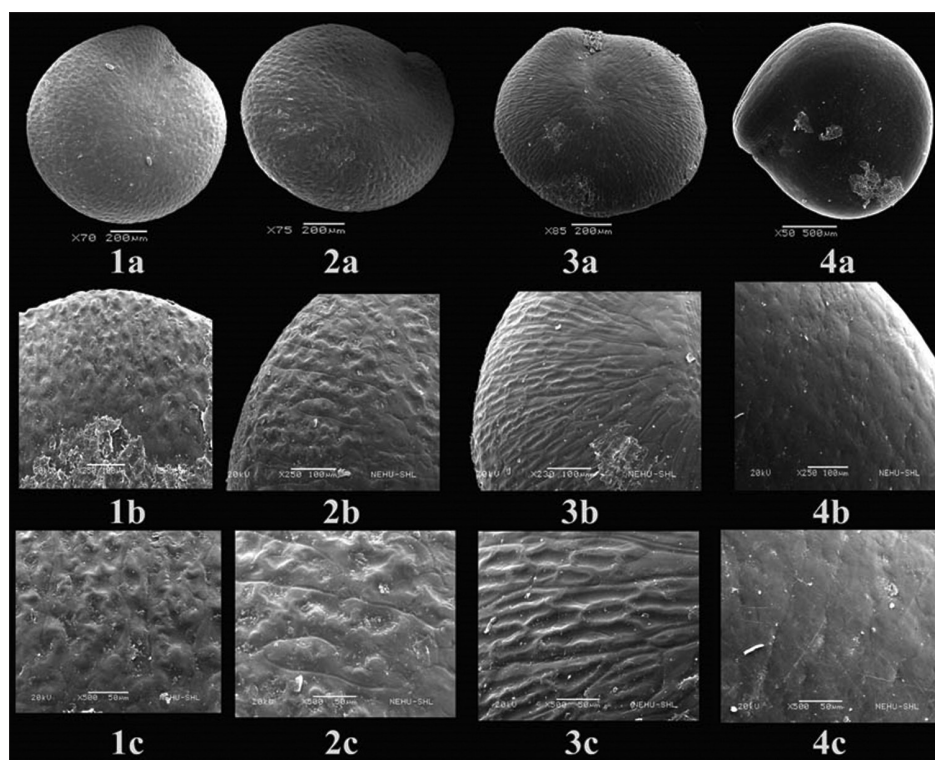


Figure 2: Scanning micrographs of seed coat surface morphology. 1. *Chenopodium murale* Linnaeus, 2. *Chenopodium ficifolium* J.E. Smith, 3. *Chenopodium giganteum* D. Don, 4. *Chenopodium album* Linnaeus a) Whole seed (50-75x), b) Portion of seed coat surface (250x), and c) seed coat surface (500x)

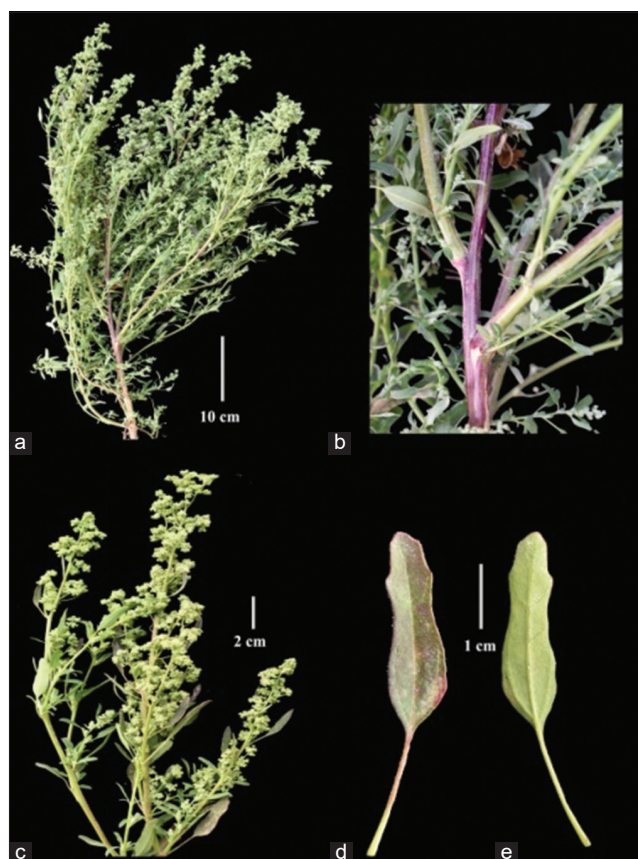


Figure 3: *Chenopodium ficifolium* J.E. Smith. a) Whole Plant, b) Stem, c) Inflorescence, d) Leaf (Ventral), and e) Leaf (Dorsal)

Uses: *C. ficifolium* is reported to have insecticidal property and also contain triterpene saponins (Gohar *et al.*, 2002; Le Dang *et al.*, 2010)

Chenopodium giganteum D. Don, Prodr. Fl. Nepal. 75. 1825. (Don *et al.*, 1825) (Amaranthaceae) (Figure 4)

Annual; herb 200-220 cm. Stem erect, branched, green to reddish striate. Leave blade rhombic, irregularly lobed, obtuse apex, adaxial reddish, abaxial reddish, granules present, 7.3 cm \times 3.4 cm. Petiole reddish/green 2.5 cm \times 1.0 mm. Inflorescence intermediate 22-26 cm, leafy, arranged in terminal or axillary branches. Flower bisexual, perianth 5, stamen 5. Seed ellipsoidal, black, 0.8-1 mm. Pericarp brown. Seed coat hexagonally pitted (Figure 2).

Flowering & Fruiting: May-November

Habit: Vegetable Gardens, roadsides, Peripheries of villages

Specimen Examined: INDIA: Manipur, Imphal West, 780 m, Rajkumari Jashmi Devi & Biseshwori Thongam PSCL/MKB3 (Institute of Bioresources and Sustainable Development).

Distribution: India; Jammu & Kashmir, Himachal Pradesh, Uttarakhand, West Bengal, Northeastern states; Korea.

Uses: The leaves of *C. giganteum* are reported to be used in assessment for accumulation of heavy metals like Zn, Fe, Cr, Cu, Ni and Cd (Bhargava *et al.*, 2008). The plant also contains

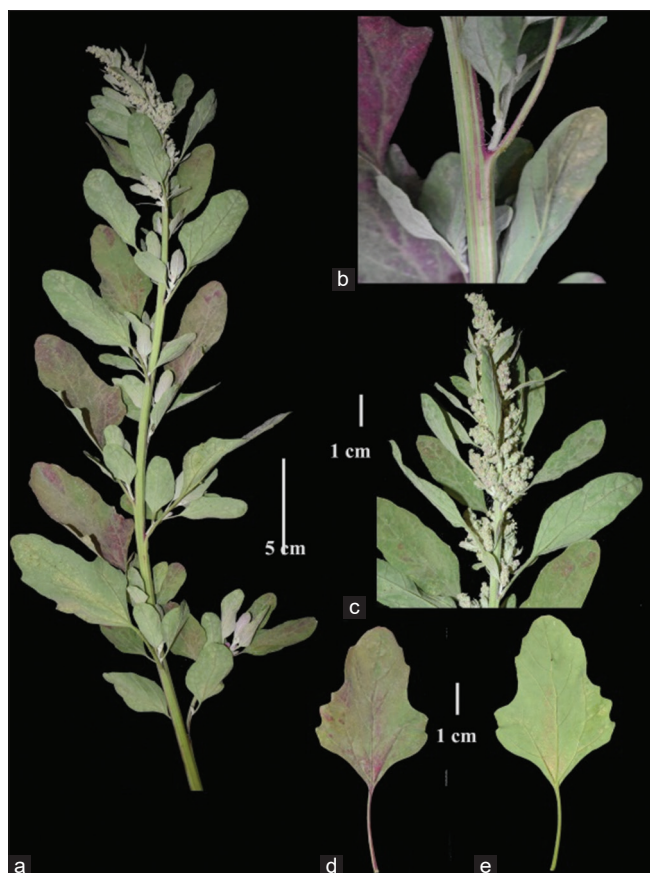


Figure 4: *Chenopodium giganteum* D. Don. a) Whole Plant, b) Stem, c) Inflorescence, d) Leaf (Ventral), and e) Leaf (Dorsal)

oxalic acid and saponin which in excessive concentration can be harmful to humans (Mroczek, 2015).

Chenopodium album Linnaeus Sp. Pl. 1: 219.1753. (Amaranthaceae) (Figure 5)

Annual; herb 90-130 cm. Stem erect, branched, green striated. Leaf blade rhombic, irregularly dentate, acute apex, adaxial green, abaxial green, granules present, 5.8 cm × 3.0 cm. Petiole green 3.5 cm × 1.0 mm. Inflorescence glomerulate 15-30 cm, leafy, arranged in terminal or axillary branches. Flower bisexual, perianth 5, stamen 5. Seed ellipsoidal, black, 0.8-1 mm. Pericarp brown, can be scraped off the seeds easily. Seed coat surface smooth and shiny (Figure 2).

Flowering & Fruiting: January-August

Habit: Forest margins, roadsides, Peripheries of villages

Specimen examined: INDIA: Manipur, Ukhrul, 1879 m, Rajkumari Jashmi Devi & Biseshwori Thongam PSCL/MKB4 (Institute of Bioresources and Sustainable Development).

Uses: *C. album* is locally consumed as leafy vegetables in Manipur. It is used traditionally as laxative, cardiotonic, anthelmintic, digestive, diuretic and carminative property. Fine powder of the leaves is used for irritation and also for treatment

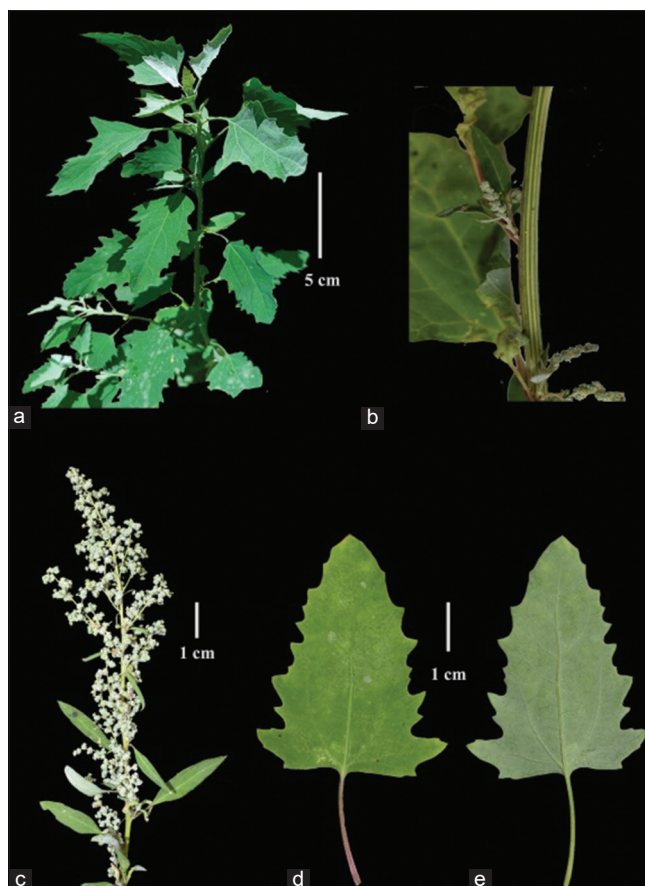


Figure 5: *Chenopodium album* Linnaeus. a) Whole Plant, b) Stem, c) Inflorescence, d) Leaf (Ventral), and e) Leaf (Dorsal)

of burns. The decoction of aerial parts of the plant when mixed with alcohol is used for rheumatism and arthritis (Prajapati *et al.*, 2003; Pal *et al.*, 2011). The leaves of the plant contains good amount of vitamin C and potassium. And hence used for treatment of spleen enlargement, hepatic disorders, intestinal ulcers and burns (Sarma *et al.*, 2008).

CONCLUSION

Altogether, three potential neglected underutilized *Chenopodium* species viz. *C. ficifolium*, *C. giganteum*, *C. album* and one in *Chenopodisatrum murale* (syn *Chenopodium murale*) were collected from Manipur, India. No taxonomical description is available at present for any of the *Chenopodium* species from Manipur. Though a taxonomical description is not available for *C. album* from Manipur, this plant is reported as a wild leafy vegetable, income generating wild edible plants, and also reported for its ethno medicinal uses in Manipur (Singh *et al.*, 2012; Devi *et al.*, 2022). Therefore, the present study reported three species viz. *C. murale*, *C. ficifolium*, and *C. giganteum* as new taxonomical records for Manipur, India.

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REFERENCES

- Abbas, M. N., Rana, S. A., Shahid, M., Rana, N., Mahmood-ul-Hassan, M., & Hussain, M. (2012). Chemical evaluation of weed seeds mixed with wheat grains at harvest. *Journal of Animal & Plant Sciences*, 22(2), 283-288.
- Bhargava, A., Shukla, S., Srivastava, J., Singh, N., & Ohri, D. (2008). *Chenopodium*: a prospective plant for phytoextraction. *Acta Physiologiae Plantarum*, 30, 111-120. <https://doi.org/10.1007/s11738-007-0097-3>
- Devi, T. S., Devi, M. H., Singh, S. S., Thokchom, R., & Singh, P. K. (2022). Studies on the income-generating wild edible wetland plants traditionally consumed by the people of Bishnupur district, Manipur. *The Pharma Innovation*, 11(11), 915-920.
- Don, D., Hamilton, F., & Wallich, N. (1825). *Prodromus florae Nepalensis: Sive enumeratio vegetabilium quae in itinere per Nepaliam proprie dictam et regiones conterminas, ann. 1802-1803. Detexit atque legit D. D. Franciscus Hamilton (olim Buchanan) accedunt plantae A. D. Wallich nuperius missae*. J. Gale. <https://doi.org/10.5962/bhl.title.86>
- Fuentes-Bazan, S., Uotila, P., & Borsch, T. (2012). A novel phylogeny-based generic classification for *Chenopodium* sensu lato, and a tribal rearrangement of *Chenopodioideae* (*Chenopodiaceae*). *Willdenowia*, 42(1), 5-24. <https://doi.org/10.3372/wi.42.42101>
- Gohar, A. A., Maatooq, G. T., Niwa, M., & Takaya, Y. (2002). A new triterpene saponin from *Chenopodium ficifolium*. *Zeitschrift für Naturforschung C*, 57(7-8), 597-602. <https://doi.org/10.1515/znc-2002-7-808>
- Hooker, J. D. (1875). *The flora of British India*. L. Reeve. <https://doi.org/10.5962/bhl.title.678>
- Jaenicke, H., & Hoeschle-Zeledon, I. (2006). *Strategic framework for underutilized plant species research and development*. Colombo, Sri Lanka: ICUC; Rome: GFU; Rome: IPGRI.
- Javadi, A., & Amin, M. (2009). Antifungal activity of methanol and n-hexane extracts of three *Chenopodium* species against *Macrophomina phaseolina*. *Natural Product Research*, 23(12), 1120-1127. <https://doi.org/10.1080/14786410802617433>
- Kanjilal, U. N., Kanjilal, P. C., De, R. N., & Das, A. (1940). *Flora of Assam - Nyctaginaceae to Cycadaceae* (Vol. 4). Government of Assam: Assam, India.
- Le Dang, Q., Lee, G. Y., Choi, Y. H., Choi, G. J., Jang, K. S., Park, M. S., Soh, H. S., Han, Y. H., Lim, C. H., & Kim, J.-C. (2010). Insecticidal activities of crude extracts and phospholipids from *Chenopodium ficifolium* against melon and cotton aphid, *Aphis gossypii*. *Crop Protection*, 29(10), 1124-1129. <https://doi.org/10.1016/j.cropro.2010.06.009>
- Linnaeus, C. (1753). *Species plantarum* (Vol. 1). Holmiae: Impensis Laurentii Salvii.
- Mroczek, A. (2015). Phytochemistry and bioactivity of triterpene saponins from *Amaranthaceae* family. *Phytochemistry Reviews*, 14, 577-605. <https://doi.org/10.1007/s11101-015-9394-4>
- Padulosi, S., Hoeschle-Zeledon, I., & Bordon, P. (2008). Minor crops and underutilized species: lessons and prospects In N. Maxted, B. V. Ford-Lloyd, S. P. Kell, J. M. Iriando, M. E. Dulloo & J. Turok (Eds.), *Crop wild relatives, conservation and use*. Wallingford, UK: CAB International.
- Pal, A., Banerjee, B., Banerjee, T., Masih, M., & Pal, K. (2011). Hepatoprotective activity of *Chenopodium album* Linn. plant against paracetamol induced hepatic injury in rats. *International Journal of Pharmacy and Pharmaceutical Sciences*, 3, 55-57.
- Paul, T. K. (2012). A synopsis of the family *Chenopodiaceae* in India. *Pleione*, 6(2), 273-297.
- POWO. (2025). *Plants of the World Online*. Royal Botanic Gardens, Kew.
- Prajapati, N. D., Purohit, S. S., Sharma, A. K., & Kumar, T. A. (2003). *Hand book of medicinal plants: A complete source book*. Rajasthan, India: Agrobios India.
- Saleem, M., Ahmed, B., Qadir, M. I., Mahrukh, Rafiq, M., Ahmad, M., & Ahmad, B. (2014). Hepatoprotective effect of *Chenopodium murale* in mice. *Bangladesh Journal of Pharmacology*, 9(1), 124-128. <https://doi.org/10.3329/bjp.v9i1.17785>
- Sarma, H., Sarma, A. M., & Sarma, C. M. (2008). Traditional knowledge of weeds: A study of herbal medicines and vegetables used by the Assamese people (India). *Herba Polonica*, 54(2), 80-88.
- Singh, S. J., Batra, V. K., Singh, S. K., & Singh, T. J. (2012). Diversity of underutilized vegetable crop species in North-East India with special reference to Manipur: A review. *NeBio*, 3(2), 87-95.
- Smith, J. E. (1800). *Flora Britannica* (Vol. 1). Londini: Typis J. Davis; veneunt apud J. White. <https://doi.org/10.5962/bhl.title.125864>
- Sukhorukov, A. P., Liu P. L., & Kushunina, M. (2019). Taxonomic revision of *Chenopodiaceae* in Himalaya and Tibet. *PhytoKeys*, 116, 1-141. <https://doi.org/10.3897/phytokeys.116.27301>
- Zaman, U., Naz, R., Khattak, N. S., ur Rehman, K., Iqbal, A., Ahmad, S., & Shah, L. A. (2020). Investigating the thermodynamic and kinetics properties of acid phosphatase extracted and purified from seedlings of *Chenopodium murale*. *International Journal of Biological Macromolecules*, 165, 1475-1481. <https://doi.org/10.1016/j.ijbiomac.2020.10.041>
- Zenith, N., Nimai, W., & Romharsha, H. (2016). An overview of plants used as anthelmintic in Manipur. *International Journal of Sciences and Applied Research*, 3(12), 1-5.