Biological Forum – An International Journal **16(11): 122-126(2024)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Bioactive Components of Two Wild Edible Therapeutic Plants of *Clerodendrum*, Commonly Practices in Home Remedy Prescription

***M. Neshwari Devi*[1*], *S.R. Singh*[2] *and M. Homeshwari Devi*[3]**
[1]*Department of Chemistry, Waikhom Mani Girls' College, Thoubal (Manipur), India.*
[2]*Department of Life Science, MIU (Manipur), India.*
[3]*AINP SBB, ICAR- Indian Institute of Soil Science, Bhopal (Madhya Pradesh), India.*

(Corresponding author: M. Neshwari Devi)*
(Received: 16 August 2024; Revised: 17 September 2024; Accepted: 18 October 2024; Published: 14 November 2024)
(Published by Research Trend)

ABSTRACT: The ongoing challenge lies in the bioactive components of therapeutic herbal plants, which not only play a crucial role in health care as therapeutic treatment and general wellness tonic but also contribute to preserving genetic diversity through chemo diversification. The free radical scavenging activity, along with the percentage of Alkaloid, Saponin, total Flavonoid content, total Phenol and Tannin were measured in this study. Further, mineral nutrient content was also conducted, focusing on major elements like Calcium, Phosphorous, Potassium, Magnesium, and trace elements comprising Iron, Zinc, Copper, Manganese, and Sulfur. These components were chemically analyzed using standardized method *viz.,* potassium by the flame photometer, phosphorous by the vanado – molybdate yellow method, and Sulfur with a spectrophotometer, and calcium, iron, zinc, magnesium, copper, and manganese were determined using atomic absorption spectroscopy. The phytochemical analysis of the two test herbs *Clerodendrum colebrookainum* and *Clerodendrum chinensis* revealed the difference in the content of bioactive compounds *viz.,* antioxidant, alkaloids, flavonoids, phenols, saponins, tannins. Variance also concurred in coping with minerals *i.e.,* calcium, magnesium, potassium, sulfur, iron, zinc, phosphorus, copper, and manganese. These constituents highlight the synergistic effects of the compounds. The presence of bioactive compounds in these medicinal plants supports their therapeutic potential. Identifying and estimating the therapeutic components and their synergistic or antagonistic actions, effects on organisms and impact on cell tissue and metabolic functions emphasize the growing need for further research and development in medicinal plant-based industries.

Keywords: *Clerodendrum*, Phytochemicals, Minerals, home remedy prescription.

INTRODUCTION

A persistent challenge remains with the bioactive components of therapeutic herbal plants, which are not only valuable for health care management – serving as therapeutic treatments and general body fitness tonic- but also crucial for conserving genetic diversity through chemo diversification. To address this, a comparative study of two different studies of *Clerodendrum* has been undertaken to gain a deeper understanding of the potentianization of therapeutic compounds found in medicinal plants commonly used in traditional remedies and body fitness prescriptions.

Phytochemicals, long recognized for their numerous properties such as antioxidant, antiallergic, anti-inflammatory, antiviral, antiproliferative, and anticarcinogenic effects (Katzung, 2007), have played a vital role in human health care since ancient times. Medicinal plants, including trees and shrubs with nutritional values are essential components of human diets, providing minerals, vitamins, hormone precursors, proteins, and energy. The medicinal properties of plant are largely determined by their phytochemicals and other chemical constituents (Fallah *et al.,* 2005).

Clerodendrum, a valuable wild herb commonly found in North east India, belongs to the Verbenaceae family and is widely distributed across tropical and subtropical regions, with some species extending into temperate zones. The genus, first described by Linnaeus in 1753 is estimated to comprise between 560 and 580 species (Moldenke, 1971; Munir, 1989). The leaves of *Clerodendrum,* are traditionally used as a bitter tonic, vermifuge, laxative, and cholagogue. Fresh leaf juice is introduced into the rectum for the removal of ascarids and is also believed to have antihelmintic properties. Leaves and roots are used for external practices on tumors (Anonymous 2010). *Clerodendrum colebrookainum* has widely used by Indigenous people of North East India as medicinal purpose to lower the level of high blood pressure. Some workers have also reported the traditional uses of this herbs in controlling high blood pressure and related problems in eastern Himalayan regions of India (Nath and Bordoloi 1991; Lokesh and Amitsankar 2012).

In recent years, interest in plant- based medicines has resurged, fueled by concerns over the side effects of synthetic drugs and a growing preference for more natural treatments. Secondary metabolites and minerals include in diet act as nutraceuticals thus help in fighting various health problem (Payum, 2020). Plant based natural compounds as cardioprotective and antihypertensive agents rich in a variety of secondary metabolites such as flavonoids, alkaloids, tannins, and terpenoids are helpful (Ortai *et al.,* 2018). These two plants are indigenous therapeutic plants to the North Eastern parts of India (Jayashree *et al.,* 2024). However, there is seldom report of comparative studies of bioactive and mineral elements content in these two medicinal plants. Therefore, the present study gives better chance to determine the differences of secondary metabolites and minerals content in species levels and that will be highly applicable in medical practices, and to achieve this goal in -depth analysis.

MATERIALS AND METHODS

The test plants *Clerodendrum colebrookainum* and *Clerodendrum chinensis* were collected from the Kakching, Kakching District Manipur during August – September 2022. They were identified by Botanical Survey of India (BSI) Shilong, and the specimen was deposited at Waikhom Mani Girls' College, Thoubal, Manipur. The plant materials were cleaned, rinsed with deionized water and allowed to evaporate at room temperature and carefully ground into uniform powdered to avoid contamination by dust.

Mineral element determination: The major element of Potassium, Calcium, Magnesium, Phosphorous and trace element comprising Sulphur, copper, zinc, iron and manganese were determined chemically from the plant materials following the methods of analysis described by the standard methods (Caper *et al*., 1978; Tondon, 1993; Gupta, 2006). Potassium was measured by flame photometer method, Phosphorous by vanado – molybdate yellow method and Sulphur through spectrophotometer, and minerals of calcium, zinc, iron, copper, magnesium and manganese were determined using atomic absorption spectroscopy.

Phytochemical determination:

Determination of free radical. Free radical scavenging of plant extract enacted following DPPH radicals (Dudonne *et al.,* 2009).

Radical scavenging activity was calculated using the following formula

$$\% \text{ inhibition} = [(AB-AE) / AB] \times 100$$

Where

AB = Absorbance of the blank sample

AE = Absorbance of the plant extract.

Estimation of total flavonoid content: Total flavonoid content was estimated following standard method of Chang *et al*. (2002).

Total phenol determination: Total phenol was determined following approved method of Malick and Singh (1980).

Tannin determination: Tannin was determined following method of Sadasiyam and Manickan (1992).

Determination of percentage of alkaloid and saponin

The alkaloid and saponin percentage were determined following the method of Hamid *et al.* (2004); Obadoni and Ochuko (2001).

RESULT AND DISCUSSION

The present investigation on phytochemical constituents of *Clerodendrum* yields a number of organic compounds including antioxidant and allocate in different strengths' *viz.,* saponin 50 mg/g, flavonoid 20.64 mg/g, alkaloid 25 mg/g, phenol 19.36 mg/g, tannin 18.4 mg/g and antioxidant 60 µg/ml in *Clerodendrum colebrookainum* while saponin 45 mg/g, flavonoid 36.82 mg/g, alkaloid 20 mg/g, phenol 4.18 mg/g, tannin 1.01 mg/g and antioxidant 24.8 µg/ml in *Clerodendrum chinensis*. The accorded data of phytochemical constituents of *Clerodendrum* spp. are shown in Table 1 and 2, and graphically in Fig. 1 and 2. The test herbals was estimated with various minerals in different concentrations' *viz.,* Potassium account 6.4 mg/g, Calcium 10.3 mg/g, Magnesium 5.31 mg/g, Iron 0.38 mg/g, Sulfur 1.35mg/g, Zinc 0.13mg/g, Copper 0.06 mg/g, Manganese 0.66mg/g, Phosphorous 0.2 mg/g, Cobalt nil in *Clerodendrum colebrookainum* Potassium account 7.1 mg/g, Calcium 9.5 mg/g, Magnesium 5.81 mg/g, Iron 0.56 mg/g, Sulfur 2.3 mg/g, Zinc 0.10 mg/g, Copper 0.06 mg/g, Manganese 0.16mg/g, Phosphorous 0.66 mg/g, and Cobalt nil in *Clerodendrum chinensis.* The accorded data were tabulated in Table 2 and graphically represented in Fig. 2. Analysis in Table 1 revealed that the fully matured plants of Clerodendrum were full of resourceful resources of therapeutic organic compounds *viz*., antioxidant, phenol, saponin, flavonoid, alkaloid and tannin that are available in the wild in nature. The result of these bioactive compound is freely presence on the plant.

Table 1: The phytochemical constituents of the *C. colebrookainum* and *C. chinense* in µg/ml and mg/gm.

Plant species	Antioxidant IC_{50} (µg/ml)	Flavonoid (mg/gm)	Phenol (mg/gm)	Alkaloid (mg/gm)	Saponin (mg/gm)	Tannin (mg/gm)
C. colebrookainum	60	20.64	19.36	25	50	18.4
C. chinense	24.8	36.82	4.18	20	45	1.01

Table 2: Composition of Mineral elements of *C. colebrookainum* and *C. chinensis* in mg/g.

Plant part	K	Ca	Mg	P	S	Fe	Zn	Cu	Mn	Co
C. colebrookainum	6.4	10.3	5.31	0.2	1.35	0.38	0.13	0.06	0.66	ND
C. Chinensis	7.1	9.5	5.81	0.66	2.3	0.56	0.10	0.06	0.16	ND

Perusal on Table 1 of the present investigation revealed that the fully matured plants of *Clerodendrum colebrookianum* and *Clerodendrum chinensis* plants were free resources of therapeutic organic compounds of antioxidant, phenol, saponin, flavonoid, alkaloid and tannin that available wild in nature. The presence of these bioactive compounds has empathetically emphasized the medicinal potentials of the tested herbal. Similar results have been reported from different plants and countries (Neshwari *et al.,* 2023; Ngpoore *et al.,* 2024)

The phytochemical constituents of the two test *Clerodendrum* spp. *viz., Clerodendrum colebrookainum* and *Clerodendrum chinensis* reflect the variances in the content of bioactive constituents exceeding *C. colebrookainum* exceeds in phenol, alkaloid, saponin, tannin while the *C. chinensis* exceed in antioxidant and flavonoids (Table 1 and Fig. 1). Regarding mineral elements, *C. colebrookainum* scored less value than that of *C. chinensis*. However, both species evidence the significant composition of bioactive *viz.,* Antioxidants, flavonoids, phenols, alkaloids, saponin, tannin, and minerals *viz.,* K, Ca, Mg, P, S, Fe, Zn, Cu, Mn accentuate the synergistic activities of the constituent compounds. (Table 2).

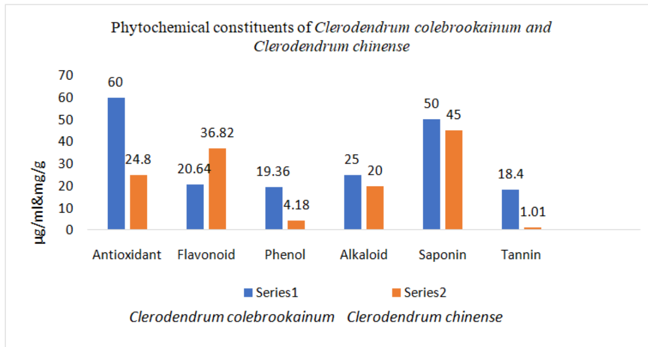

Fig. 1. Phytochemical composition of *Clerodendrum colebrookainum* and *Clerodendrum chinensis.*

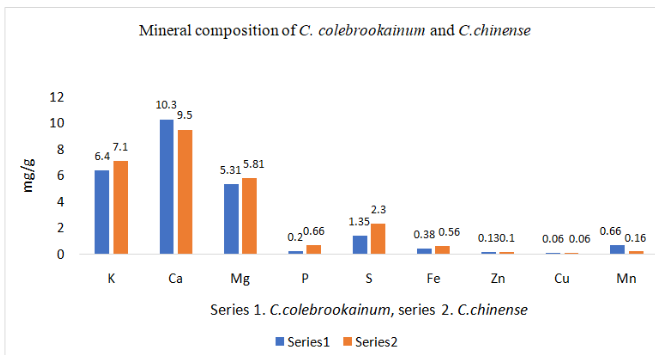

Fig. 2. Mineral composition of *Clerodendrum colebrookainum* and *Clerodendrum chinensis.*

Potassium (K) plays a key role in nerve to functions and muscles to contraction, helping to regulate heartbeat. It also aids in transporting nutrients into cells and removing waste products from them. A potassium rich diet can help counteract some of sodium's negative effects on blood pressure. Studies have also shown that a diet high in potassium may reduce the risk of strokes (Jie Tang, 2024; Jerlyn Jones 2024). Besides K, calcium is a vital nutrient accounting for about 2 percent of body weight, making it the fifth most abundant element in the body after oxygen, carbon, hydrogen, and nitrogen. Its primary role is providing strength to the skeleton by forming insoluble salts with phosphoric acid. The regulation of calcium levels by parathyroid hormone and vitamin D underscores its importance in the neuromuscular system, heart function, enzyme-driven reactions, and various metabolic processes. When calcium is depleted from bones, the bone matrix is also resorbed, leading to osteoporosis rather than osteomalacia (Singh *et al.,* 2024). On the other hand, magnesium is crucial for essential for over 300 biochemical reactions in the body's metabolism. It supports normal nerve and muscle function, strengthen immune system, maintains a steady heartbeat, and helps in keeping bones strong. Moreover, it also regulates blood glucose levels and enhance more energy and protein. Magnesium also plays a role in preventing and managing conditions like high blood pressure, heart disease, and diabetes. However, magnesium supplements is not currently recommended. Diets high in protein, calcium, or vitamin D can increase the body's need for magnesium (Anonymous, 2024).

Sulfur, along with calcium and phosphorus is one of the most essential minerals in the human body. It plays the key role in crucial processes such as protein synthesis, gene regulation, DNA repair, and supporting metabolic functions. Sulfur is also vital for producing and recycling glutathione, a major antioxidant that reduce inflammation and protects cells from oxidative damage.

Sulfur also plays a crucial role in preserving the integrity of connective tissues including skin, tendons, and ligaments. As an essential mineral in the diet, sulfur is a key part of important amino acids like methionine and cysteine. Its potential health benefits include relieving arthritis pain, improving skin health, and promoting liver function. Sulfur-containing compounds found in cruciferous vegetables, called glucosinolates, are associated with a reduced risk of heart disease (Sowmya Binu 2022). Sulfur is also important for a healthy heart, as its movement in and out of cells helps regulate the heartbeat. However excessively high blood sulfur levels can cause the heart to become weakened and dilated, potentially leading to abnormal heart rhythms (Akiyuki Nishimura *et al*., 2024).

Antioxidants inhibit molecule oxidation which, in turn, produces free radicals capable of starting chain reactions. When the chain reaction starts in a cell, it could injure the cell or cause its death. By removing free radicals, antioxidants restrict these chain reactions and inhibit other oxidation reactions by being oxidized (Ross, 1999). Plants and animals have complex systems of multiple types of antioxidants, including glutathione, vitamins A, C, and E, as well as enzymes like superoxide dismutase, catalase, and several peroxidases (Nickenig and Harrison 2002; Rafieian Kopaei *et al.,* 2013). The diets rich in fruits and green vegetables can reduce blood pressure in hypertensive and normotensive patients (Weiss *et al.,* 2001). A study found that increasing fruit and vegetable consumption in the diet of hypertensive individuals over 6- months period resulted in higher blood antioxidant levels and a reduction in both systolic and diastolic blood pressure (Rajagopalan *et al.,* 1996). Diets rich in antioxidants from sources like fruits and vegetables may help in lowering blood pressure and reducing the risk of cardiovascular diseases, but the same benefits maynot typically seen with diet supplementation (Azumi and Inoue 2002). Flavonoids, a type of phytonutrients from the polyphenol family, are plant-based compounds. Consuming foods rich in flavonoids, anthocyanins and polymers has been shown to lower systolic blood pressure and pulse pressure (Clark *et al.,* 2015). Phenolic compounds comprise different families of compounds widely distributed in nature and found in most foods of vegetable origin. Their large chemical unpredictability includes several thousands of compounds, from simple phenolic acids to complex flavonoids. These compounds have attracted a lot of attention because they influence different organoleptic parameters, such as color or taste. However, at present, the interest focused on these components is even higher and relies on the beneficial health benefits that they are thought to confer (Lorena and Lung 2018). Phenolic compounds are usually very powerful antioxidants, although some of them are also regarded as antimicrobial or anticarcinogenic.

The Bioactive compounds found in these medicinal plants confirm their therapeutic properties. The potential of these herbs highlights their suitability for use in enhancing crude drugs. Incorporation herbal components is essential in identifying and determining bioactive compounds for use in herbal pharmaceutical preparations and medical treatments. The detection, identification, and analysis of therapeutic components associated with medicinal plants, their synergistic and antagonistic effects, interaction with pathogens, and influence on cellular tissues and metabolic functions, emphasize the growing need for research and development in the medicinal plant-based industry.

CONCLUSIONS

The present investigation vividly revealed that the *Clerodendrum colebrookianum* and *Clerodendrum chinensis* have unique medicinal value with high phytochemicals and minerals which can be utilized to treat numerous dreadful diseases and be explored for use in consumption in pharmaceutical, in cosmetic industries, and chemo diversity conservation. Eventually, make a proposition to the prestigious *C. colebrookianum* and *C. chinensis* for plantations in suitable region for sustainable development, the way of right utilization of resources without compromising future users. Furthermore, consequent to the high phytochemicals and mineral content, the *Clerodendrum* may be used as a compulsive resource of potential sources for useful food in a daily diet and needful drugs. Studies in depth are highly needed for full exploration of plantation, harvest, postharvest, and storage of products for enhancement of standardization of phytochemicals.

FUTURE SCOPE

(i) For better understanding of chemo diversity (ii) For conserving natural bioactive chemical compounds.

Acknowledgement. The authors are thankful to the Central Agricultural University, Iroisemba, Imphal, Manipur, for providing the necessary research facilities for these studies.

REFERENCES

Azumi, N. and Inoue, Y. (2002). Superoxide generation in directional coronary atherectomy specimens of patients with angina pectoris: important role of NAD(P)H oxidase. *Arter ThrombVasc Biol., 22,* 1838–1844.

Anonymous (2010). http://www.aturemagics.com/ayuveda. 2010 .

Akiyuki, N. Xiaokang, T. Liuchenzi, Z. and Yuri, T. (2024). Sulphur metabolism as a new therapeutic target of hearth failure. *Journal of pharmacological Science, 155*(3)*,* 75-83.

Anonymous (2024). https://www.nationalnutrition.ca/articles/supplements/magnesium/

Chang, C. Yang, M. Wen, H. and Cherr, J. (2002). Estimation of total flavonoid content in protein by two complementary colorimetric method. *J. Food Drug Analy, 10,* 178-182.

Capar, S. G., Tanner, J. T., Friedman, M. H. and Boyer, K. W. (1978). Multielement analysis of animal waste and sewage. *Sludge Environ. Sci. Technol., 12,* 785.

Clark, J. L. (2015). Efficacy of flavonoids in the management of high blood pressure. https://integrisok.com/resources/on-your-health/2021/december/flavonoids.

Dudonne, S. Vitrax, X. Coutricre, P. Woilez, M. and Merillon, J. (2009). Comparative study of antioxidant properties and total phenolic content at 30 plants extract at industrial Interest using DPPH, ABTs, FRAP, DOS and ORAC Assay *J. Agri Chem, 57,* 1768-1774.

Fallah, H. S. M., Alavian, H. R., Heydari, M. R., and Abolmaali, K. (2005). The efficacy of Liv- 52 on liver cirrhotic patients: a randomized double blind, placebo-controlled first approach. *Phytomedicine, 12*(9), 619-624.

Gupta, P. K. (2006). Soil, plant, water and fertilizer analysis. Agrobios (India) Agro House, Behind Nasrani Cinema Chopasani Road, Jodhpur, 438.

Hamid, R.M. Ali, G. and Mehrdad, I. (2004). Anticeptive effects of *Peganum harmala*, L. alkaloid extract of mouse formalin test. Canadian society of pharmaceutical science.

Jie Tang (2024). Dietary Sodium and Potassium Intakes and Kidney Stone Prevelence: The national health nutritional examination 2011-2018.

Jerly Jones (2024). https://www.healthline.com/nutrition/what-does-potassium-do

Jayashree, B. Twahira, B, Dipanka, and D. Mohan, L. (2024). *Clerodendrum colebrookainum* (Walp) – A wonder plant and its ethno medicinal importance and pharmacological activities: A review. *Pharmacological research- Natural Products 4*, 100080

Katzung, B. G. (2007). Basic and Clinical pharmacology, 10thEdn. Mc.Graw Hill Boston.

Lokesh, D. and Amitsankar, D. (2012). Evaluation of mechanism for antihypertensive action of *Clerodendrum colebrookainum* (Walp), used by folklore healers in north -east india. *J. Ethnopharmacol, 143(*1), 207-212.

Lorena, M. and Lung, G. (2018). Phenolic compounds: A good choice against chronic degenerative disease. Studies in Natural Product Chemistry. https://www.sciencedirect.com/topics/chemistry/phenolic-compound.

Moldenke, H. N. (1971). A fifth summery of verbenacea eriocaulaceae and nymphacacea of the world as to valid taxa geographic distribution synonumy vol. 1. Braun- Brumfielt, Inc. Ann. Abor, Michigan, 312-314.

Munir, A. A. (1989). A taxonomic revision of the genus *Clerodendrum* L. Verbenaceae in Australia *J. Adelaide Bot. Gard, 11*(2), 101-173.

Malick, C. P. and Singh, M. B. (1980). In: Plant Enzymology and Histoenzymology, Kalyani publication, New Delhi, 286.

Nath, S. C. and Bordoloi, D. N. (1991). *Clerodendrum colebrookainum*, a Folk Remedy for the treatment of Hypertension in North eastern India. *Pharmceutical biology, 29*(2), 127-129.

Ngpoore, N. K., Agrahari, S., Yadav, H., Rana, T., Thakur, M., Pandey, V. N., and Brahma, N. (2024). Antioxidant, Antidiabetic and Antimicrobial properties of *Tinospora cordifolia* (Thumb) Miers from different Geo -Ecological Regions of India. *Indian Journal of Agricultural Biochemistry, 37*(1), 31-38.

Neshwari, M. Sangbanabi, N. and Singh, S. R. (2023). Studies on Phytochemicals, minerals, Antioxidants and Efficacy of Crude Extracts of Therapeutic Herbal *Potentilla reptan* L. on Certain Pathogenic Causal Agents. *Asian Journal of Organic and Medicinal Chemistry, 7*(4) 291-294.

Nickenig, G. and Harrison, D. G. (2002). The AT1-type angiotensin receptor in oxidative stress and atherogenesis part of oxidative stress atherogenesis. *Circulation, 105,* 3936.

Obadoni, B. O. and Ochuko, P. O. (2001). Phytochemical studies and comparative efficacy of crude extracts of some homeostatic plants in Edo and Delta states of Nigeria Global *J. Pure and Applied Science, 8,* 203-208.

Oratai, N., Panadda, K., and Kamonvadee, B. (2018). Medicinal plants used for hypertension treatment by folk lore healers in Songkhla province. *Journal of ethnopharmacology,* 58-70.

Ross, R. (1999). Atherosclerosis: an inflammatory disease. *N Engl J Med., 340*, 115.

Rafieian Kopaei, M. Baradaran, A. and Arietian, M. (2013). Oxidative stress and the paradoxical effects of antioxidants. *J Res Med Sci., 18*, 628.

Payum, T. (2020). Phytoconstituents and proximate composition of *Clerodendrum colebrookainum* walp: A widely used Anti High Blood pressure Medicinal Food plant in Eastern Himalayas. *Pharmacogn J., 12*(6), 1534-1540.

Rajagopalan, S., Meng, X. P., Ramasamy, S., Harrison, D. G., and Galis, Z. S. (1996). Reactive oxygen species produced by macrophage-derived foam cells regulate the activity of vascular matrix metalloproteinases in vitro: implications for atherosclerotic plaque stability. *J Clin Invest., 98*, 2572–2579.

Sadasiyam, S. and Manickan, A. (1992). In: Biochemical method for Agricultural Sciences, Wiley Eastern Ltd. New Delhi, 189-191.

Singh Widhilika (2004). *Horm Metab Res., 56*(5), 329-340.

Sowmya Binu (2022). Sulfur Functions, Health Benefits, Food sources And Side Effects of this vital minerals. https://www.netmeds.com/health-library/post/sulfursulphur-functions-health-benefits-sfood-sources-and-side-effects-of-this-vital-mineral

Tandon, H. L. S. (1993). Method of analysis of soils, plants, waters and Fertilizers. Fertilizer development and consultation organization 204-402A Bhanot corner 1-2 Pamposh Enclave. New Delhi, 143.

Weiss, D., Kools, J. J., and Taylor, W. R. (2001). Angiotensin II-induced hypertension accelerates the development of atherosclerosis in apo E-deficient mice. *Circulation., 103*, 448-454.

How to cite this article: M. Neshwari Devi, S.R. Singh and M. Homeshwari Devi (2024). Bioactive Components of Two Wild Edible Therapeutic Plants of *Clerodendrum*, Commonly Practices in Home Remedy Prescription. *Biological Forum – An International Journal, 16*(11): 122-126.