Indian J. Applied & Pure Bio. Vol. 38(3), 1330-1340 (2023). **ISSN: 0970-2091**
A web of Science Journal

An ethno-medicinal survey of anthelmintic medicinal plants used by the local people of Sonitpur district, Assam

[1]Jupitora Devi, [1]Pritimani Bharali and [2*]Sanjib Kalita

[1]Department of Botany, Gauhati University, Guwahati-781014 (India)
[2]Department of Botany, Moridhal College, Dhemaji-785001 (India)
[*]Corresponding author, Email: ksanjib45@gmail.com

Abstract

In India, using herbal medicine as a kind of treatment is a popular practice. Since the North Eastern region is rich in such medicinal plants, the local people have intensively investigated it for medical purposes. Sonitpur district is primarily inhabited by Assamese, along with bodo, missing etc. tribes and other religious minorities and they rely on plant-based medicines. In today's scenario, helminth infection becomes one of the most common infections mainly due to poor sanitation practices. Though, some plants are known to be widely used against helminthiasis, but proper and detailed scientific documentation about the traditional knowledge of these plants and their use against helminthiasis are lacking from the area under this district. Hence, in this present study, a comprehensive document has been prepared about the plant used against helminthiasis by the Assamese and other tribes residing in this area.

Key words : Herbal medicine, Helminthiasis, Sonitpur.

An integral part of health-related issues relies on the traditional use of plants and animals, which is regarded as an age-old practice throughout the world. Utilization of plants as a source of medicine is considered as a major element of the Indian and global healthcare systems. The ethnomedicinal knowledge system is transferred from one generation to the next without any formal communication[62]. According to the WHO[64] Traditional Medicinal Strategy 2014-23, there is a high demand for ethnobotanical practices and practitioners all over the world. Due to availability and lesser side effects with may be more efficacious property, application of plant-based products and medicine is growing day by day[8,9,64]. Scientific studies revealed the bioactivity property of many plants, preeminent to development of various therapeutic drugs. Many studies have revealed medicinal properties against various diseases, including helminthiasis[2,8,9,14,42].

Helminthiasis is a severe tropical

disease that affects millions of people,livestock as well as the poultry industries (Kumar & Nain 2013; Das &Laha 2017; Dixit et al. 2017; Salam & Azam 2017).Soil-transmitted helminth (STH) infections are among the most common infections worldwide with an estimated 1.5 billion infected people or 24% of the world's population.Approximately 1 in 5 people in India are infected with soil transmitted helminths (STH), leading to anaemia and malnutrition[5]. Despite improved health facilities, sanitation, drinking water, and mass deworming programs, helminthiasis remain a major health issue in several states of India[56]. In addition to poor economic conditions, most rural Indians cannot access commercial anthelmintic drugs because of geographical isolation and the high cost of the drugs. However, as an alternative, locally available traditional medicines become the first choice for healthcare needs[59].

The northeastern region (NER) of India, consisting of eight member states, including Assam, covers an area of 262,184 km^2 (https://databank.nedfi.com). NER is one of the 36th biodiversity hotspots on earth with rich flora and fauna[25]. This region is inhabitat by more than 200 ethnic tribes who boast of their indigenous and authentic tradition.Sonitpur, is one of the major district of Assam predominantly inhabited by tribe groups like assamese, bodo, missing, adibashi, bengali, nepali peoples. These culturally active tribal people make herbal plants as their first choice as medicine. Thus, this survey aims a proper documentation of plants used against helminthiasis by the local people of Sonitpur, Assam. This will be helpful from the viewpoint of conservation of plant resources and their sustainable utilization for the management of helminthiasis and its related complications.

Study site :

A survey was carried out in Sonitpur district of Assam, India, which was inhabited predominantly by the people of Assamese and Bodo-Kachari tribe, Adibashi (Tea-tribe), Nepali, Bengali, Missing, and Religious minorities. Sonitpurdistrict is one of the 31 districts of Assam.It is positioned in the valley of the Brahmaputra which forms its southern border.Geographically, Sonitpur district of Assam is located between 26042'03'' and 27001'00'' North Latitude and 92016'00'' and 93043'00'' East Longitude. District has an area of 2076.70 km^2 with a population of 1,311,619 (2011 census). The climate in district is characterized as sub-tropical humid climate with a hot summer with an average temperature of 29ºC and moderate winter with an average temperature 16ºC. South-west monsoon activates from June and continues up to September- October. The average rainfall of the district is 2,837.97 mm.Sonitpurdistrict is bounded by Arunachal Pradesh to the north and Lakhimpur District to the east. The Brahmaputra river flows in aneast-west-direction along the southern side, whileDarrang district is on the west. The district is divided into three sub divisions viz. Tezpur, Biswanath and Gohpur and seven revenue circles,It consists of 14 civil blocks and 159 Gaon Panchayats.

Data collection :

During the course of conducting the investigation, elderly members and local

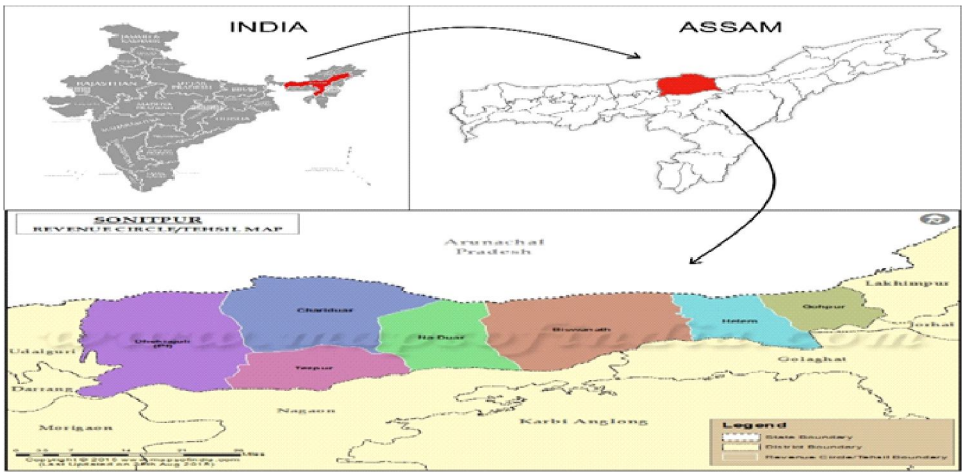

Figure 1: The study area of Sonitpur district, Assam (Source: MapsofIndia.com)

traditional healers, commonly known as "Bez" or "Ojah," of the villages of Sonitpur district were chosen to gather information about the medicinal plants used helmintic symptoms by the local people of the district. To collect data on these plants,we employed questionnaires and conducted personal interviews with the local community. The questionnaires included inquiries about local names of the plants, which specific parts were edible and used for helmintic treatment, as well as the duration of availability for these plants.

The data obtained during the investigation period is summarized in Table-1. A total of 50 plant species were recorded that were used by the local peopleof Sonitpur district to treat helmintic. The knowledge of these medicinal plants was typically passed down from previous generations, such as parents, grandparents, or great-grand parents. *Amaranthus spinosus* L., *Zingiber officinale* Roscoe*, Ocimum sanctum*, *Tinospora cordifolia*, *Curcuma longa* L. and *Azadirachta indica* were among the most commonly used plants in the area against helmintic. Table-1 provides ethnobotanical information on the parts of the plants used,and some of their previously reported antidiabetic activity. It had been observed that different parts of the same plant species were used to treat the disease and the plant parts were used either in decoction,infusion and raw form or consumed with different cuisines. Leaves were the most frequently used parts of most of the plants (Figure 1). The current study highlights the abundance of plant resources utilized by traditional healers belonging to tribal community in the Somitpur District of Assam for treating helmintic infections.Comparative ethnobotanical analysis of this study with other ethnobotanical surveys of plants used traditionally in treating helmintuc revealed some similarities in the plant species cited in the present study. Results of phytochemical and *in vitro* analyses in a number of previous studies on various plant species, which are also common in this survey (Table-1), signify the effectiveness of these plants in the management of helmintic and related complications.

Table-1: Anthelmintic ethno-medicinal plants species used by the local people of Sonitpur District, Assam

Botanical name	Family	Local names	Habitat	Parts used	Formulation	Anthelmintic(*in vitro*/in vivo) from other studies
Aegle marmelos (L.) Correa	Rutaceae	Bel	Tree	Leaves	Decoction	Anthelmintic compounds were found in phytochemical analysis[63]
Allium sativum L.	Amaryllidaceae	Naharu	Herb	Tuber	Raw	*In vitro* anthelmintic activity were found[28]
Aloe vera (L.) Burm.f.	Xanthorrhoeaceae	Aloevera	Herb	Leaves, Jelly	Raw	In vivo anthelmintic activity were found[43]
Alstonia scholaris (L.) R. Br.	Apocynaceae	Sotiyana	Tree	Bark	Infusion	*In vitro* anthelmintic activity were found[60]
Amaranthus spinosus L.	Amaranthaceae	Kata khutura	Herb	Leaves	Decoction	*In-vitro* anthelmintic activity were found[35]
Ananas comosus (L.) Merr	Bromeliaceae	Anaras	Herb	Leaves	Raw	In-vivo anthelmintic activity were found[15]
Andrographis paniculata (Burm. f.) Nees	Acanthaceae	Kalmegh	Herb	Leaves	Raw	*In-vitro* anthelmintic activity were found[11]
Anthocephalus cadamba (Roxb.) Miq.	Rubiaceae	Kadam	Tree	Flower	Raw	Anthelmintic compounds were found in phytochemical analysis[1]
Azadirachta indica A. Juss.	Meliaceae	Neem	Tree	Leaves	Decoction	*In-vitro* anthelmintic activity were found[50]
Bryophyllum pinnatum (Lam.) Oken	Crassulaceae	Dupor tenga	Herb	Leaves	Deco ction	Anthelmintic compounds were found in phytochemical analysis[4]
Butea monosperma (Lam.) Taub.	Fabaceae	Polash	Tree	Flower, Seed	Infusion	Anthelmintic compounds were found in phytochemical analysis[41]
Calotropis gigantea (L.) Dryand.	Asclepiadaceae	Akon	Shrub	Leaves	Raw	*In-vitro* anthelmintic activity were found[61]

Carica papaya L.	Caricaceae	Amita	Tree	Root	Deco-ction	Anthelmintic compounds were found in phytoche-mical analysis[31]
Cassia fistula L.	Legum-inosae	Sonaru	Tree	Leaves	Raw	Anthelmintic compounds were found in phytoche-mical analysis[29]
Centella asiatica L.	Apiaceae	Manimuni	Herb	Leaves, Whole plant	Raw	Anthelmintic compounds were found in phytochemical analysis[3]
Cinnamomum verum J.S. Presl	Lauraceae	Dalsini	Tree	Bark	Raw	Anthelmintic compounds were found in phytoche-mical analysis[10]
Citrus limon (L.) Osbeck	Rutaceae	Nemu	Tree	Seed	Decoc-tion	Anthelmintic compounds were found in phytoche-mical analysis[33]
Cocos nucifera L.	Arecaceae	Narikol	Tree	Endos-perm	Decoc-tion	In-vivo anthelmintic activity were found[16]
Curcuma caesia Roxb.	Zingibe-raceae	Kola Halodhi	Herb	Rhizome	Raw	Anthelmintic compounds were found in phytoche-mical analysis[52]
Curcuma longa L.	Zingibe-raceae	Halodhi	Herb	Rhizome	Raw	In-vitro anthelmintic activity were found[48]
Ficus riligiosa Linn.	Moraceae	Anhotgos	Tree	Bark	Decoc-tion	*In-vitro* anthelmintic activity were found[23]
Holarrhena antidysenter ica (L.)	Apocyn-aceae	Dudkhuri	Tree	Bark	Infusion	Anthelmintic compounds were found in phytoche-mical analysis[45]
Justicia gendarussa Burm. f.	Acantha-ceae	Bishalya-karani	Herb	Leaves	Raw	In-vitro anthelmintic activity were found[54]
Leucas aspera (Willd.) Link.	Lamiaceae	durun	Herb	Leaves	Raw	Anthelmintic compounds were found in phytoche-mical analysis[24]
Mangifera indica L.	Anacar-diaceae	Aam	Tree	Seed	Raw	Anthelmintic compounds were found in phytoche-mical analysis[38]

Morinda citrifolia L.	Rubiaceae	Noni	Shrub	Leaves	Decoc-tion	Anthelmintic compounds were found in phytoche-mical analysis[34]
Musa bulbiciana Colla	Musaceae	Athiakol	Tree	Fruit	Infusion	Enthnomedicinal recorded[12]
Ocimum basilicum L.	Lamiaceae	Ram tulsi	Shrub	Leaves	Raw	Anthelmintic compounds were found in phytoche-mical analysis[47]
Ocimum sanctum L	Lamiaceae	Tulsi	Shrub	Leaves	Raw	Anthelmintic compounds were found in phytoche-mical analysis[6]
Oroxylum indicum (L.) Kurz	Bignon-iaceae	Bhatghila	Tree	Bark, Flower	Decoc-tion	Anthelmintic compounds were found in phytoche-mical analysis[18]
Oxalis corniculata L.	Oxalid-aceae	Tengesi	Herb	Leaves	Decoc-tion	*In-vitro* anthelmintic activity were found[19]
Paederia foetida L.	Rubiaceae	Bhedailota	Climber	Leaves	Raw	Anthelmintic compounds were found in phytoche-mical analysis[32]
Phoenix dactylifera L.	Arecaceae	Khejur	Tree	Leaves	Raw	Anthelmintic compounds were found in phytoche-mical analysis[46]
Phyllanthus emblica L	Euphorbi-aceae	Amlokhi	Tree	Fruit	Raw	Anthelmintic compounds were found in phytoche-mical analysis[30]
Piper nigrum L.	Piperaceae	Jaluk	Tree	Seed	Raw	Anthelmintic compounds were found in phytoche-mical analysis[53]
Polygonum hydropiper L.	Polygon-aceae	Bihlongoni	Herb	Whole plant	Decoction	Anthelmintic compounds were found in phytoche-mical analysis[7]
Prunus persica (L.) Stokes	Rosaceae	Bon bogori	Tree	Leaves	Raw	Anthelmintic compounds were found in phytoche-mical analysis[36]
Psidium guajava L.	Myrtaceae	Madhuriam	Tree	Leaves	Raw	Anthelmintic compounds were found in phytoche-mical analysis[58]

Punica granatum L.	Lythraceae	Dalim	Shrub	Bark, Root	Raw	*In-vitro* anthelmintic activity were found[13]
Rauvolfia tetraphylla L.	Apocynaceae	Bar chandrika	Shrub	Leaves, Bark, Root	Raw	Anthelmintic compounds were found in phytochemical analysis[40]
Ricinus communis L.	Euphorbiaceae	Era gos	Shrub	Leaves	Raw	Anthelmintic compounds were found in phytochemical analysis[39]
Saccharum spontaneum L.	Poaceae	Konhuaful	Shrub	Leaves	Raw	Anthelmintic compounds were found in phytochemical analysis[49]
Scoparia dulcis L.	Plantaginaceae	Bondhonia	Herb	Leaves	Decoction	None
Solanum torvum Sw.	Solanaceae	Borbhekuri	Herb	Flower	Raw	Anthelmintic compounds were found in phytochemical analysis[22]
Spondia pinnata (L.f.) Kurz	Anacardiaceae	Amora	Tree	Bark	Decoction	Anthelmintic compounds were found in phytochemical analysis[44]
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Bhomora	Tree	Fruit	Raw	*In-vitro* anthelmintic activity were found[57]
Terminalia chebula Retz.	Combretaceae	Hilikha	Tree	Fruit	Raw	Anthelmintic compounds were found in phytochemical analysis[21]
Tinospora cordifolia (Willd.) Miers	Menispermaceae	Amor lata, giloi	Climber	Stem	Raw	*In-vivo* anthelmintic activity were found[51]
Zingiber officinale Roscoe	Zingiberaceae	Ada	Herb	Rhizome	Raw	*In-vivo* anthelmintic activity were found[28]
Ziziphus mauritiana Lam.	Rhamnaceae	Kasi bogori	Shrub	Leaves	Raw	Anthelmintic compounds were found in phytochemical analysis[55]

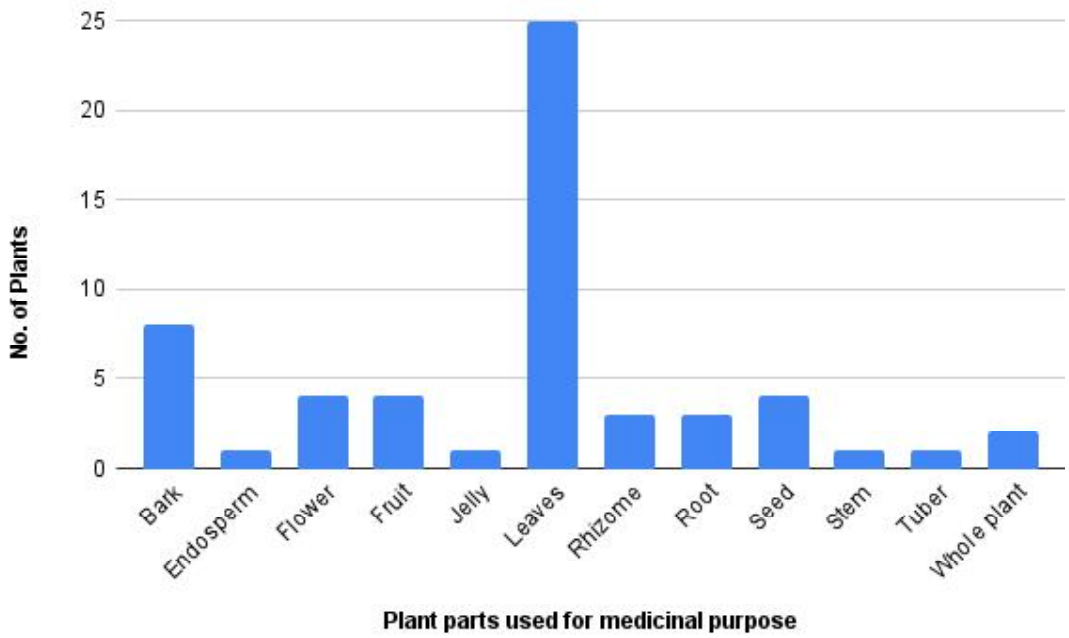

Figure 2. Parts wise use of various medicinal plant species used by local people community in Sonitpur District.

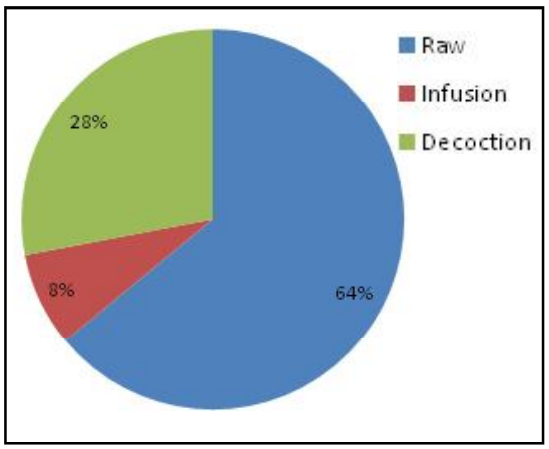

Figure 3. Diagram showing the various forms of medication practiced by local people in Sonitpur District.

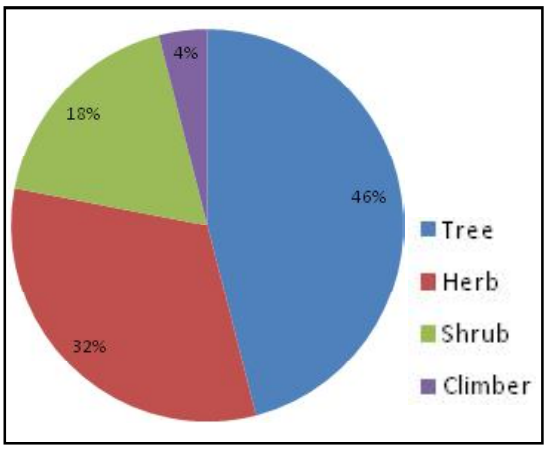

Figure 4: Diagram showing habits of documented plant species.

The current investigation reveals the remarkable variety of indigenous medicinal plants with anthelmintic properties found in Sonitpur district of Assam. These plants play a crucial role in the traditional treatment of helminthiasis within the local community. However, factors such as increase in urbanization, widespread deforestation, and the availability of modern health care facilities have led to a decline in the knowledge of these plants and their traditional uses. Herbal medicines are often favored for their potential to treat diseases with minimal side-effect. This study has the potential to preserve and transfer the ancient ethnomedicinal knowledge of the local people to future generations. Additionally, it may contribute to the development of effective plant-based remedies for helminthiasis, utilizing a coordinate multiomics approach in the near future. Furthermore, the finding can aid in planning conservation strategies for the unique plant resources and indigenous knowledge specific to this region and have the potential to be further explored in future scientific investigation within the field of core pharmacology and phytochemistry. These investigations can aim to uncover hidden novel entities present in the studied plants, which may have promising application for safe therapeutic uses.

References:

1. Acharyya S, DS Rathore, HKS Kumar, and N Panda (2011). *International Journal of Research in Pharmaceutical and Biomedical Sciences 2*(1): 297-300.
2. Adeniyi A, A Asase, PK Ekpe, BK Asitoakor, AAdu-Gyamfi, and PY Avekor (2018). *Journal of Herbal Medicine 14:* 76-87.
3. Aftab A, ZD Khan, Z Yousaf, S Javad, B Shamsheer, M Zahoor, ... and H Ramzan (2017). *American Journal of Plant Sciences 8*(2): 201-211.
4. Agyare C, V Spiegler, H Sarkodie, A Asase, E Liebau, and A Hensel (2014). *Journal of Ethnopharmacology 158*: 255-263.
5. Ajjampur SSR (2021). https://doi.org/10.1371%2Fjournal.pntd.0009338. PMID https://pubmed.ncbi.nlm.nih.gov/33930024
6. Asha MK, D Prashanth, B Murali, R Padmaja, and AAmit (2001). *Fitoterapia 72*(6): 669-670.
7. Ayaz M, M Junaid, F Subhan, F Ullah, A Sadiq, S Ahmad,... and SM Shah (2014). *BMC complementary and alternative medicine 14*: 1-9.
8. Aziz MA, AH Khan, M Adnan, and H Ullah H (2018). *Journal of Ethnobiology and Ethnomedicine 14:* 11.
9. Barkaoui M, A Katiri, H Boubaker, and F Msanda, (2017). *Journal of Ethnopharmacology 198:* 338-350.
10. Bhat P, S Jayagoudar, HV Hegde, and SG Ghane (2023). In *Bioactives and Pharmacology of Medicinal Plants* : 183-204 Apple Academic Press.
11. Bora M, L Kawlni, S Upadhyay, K Mukherjee, and J Hazra (2017). *International Journal of Ayurveda and Pharma Research 5*(11):
12. Buragohain, J. (2011). *Recent research in Science and Technology*, *3*(9):
13. Castagna F, D Britti, M Oliverio, A Bosco, S Bonacci, G Iriti,...and V Musella (2020). *Pathogens 9*(12): 1063.
14. Choudhury PR, MD Choudhury, SS Ningthoujam, D Das, D Nath, and A Das Talukdar (2015). *Journal of Ethnopharmacology 66:* 135-148.
15. Cormanes JMY, HP Portugaliza, and AMM Quilicot (2016). *Livestock Research*

*for Rural Dev*elopment *28*(5): 82.
16. Costa CTC, CML Bevilaqua, SM Morais, ALF Camurça-Vasconcelos, MV Maciel, RR Braga, and LMB Oliveira (2010). *Research in veterinary science 88*(1): 101-103.
17. Das M, R Laha(2017). *Archives of Parasitology 1:* 107.
18. Deori K, and AK Yadav (2016). *Parasitology research 115*(3): 1275-1285.
19. Dighe SB, BS Kuchekar and SB Wankhede (2012). *Research Journal of Pharmacology and Pharmacodynamics 4*(1): 1-4.
20. Dixit A K, G Das, and R P Singh Baghel (2017). *Journal of Parasitic Diseases 41:* 414-416.
21. Dwivedi S. (2008). *Ethnobotanical Leaflets*, *1:* 101.
22. Firdous J, V Bharathi, NoorzaidMuhamad (2018). *Asian Journal of Pharmaceutical and Clinical Research 11*(7): DOI: http://dx.doi.org/10.22159/ajpcr.2018.v11i7.25806.
23. Hari BV, PS Kumar, and DR Devi (2011). *Journal of Phytology*, *3*(3):
24. Hiremath S, and AJ Pradeep (2022). *Journal of Ayurvedic and Herbal Medicine 8*(1): 48-54.
25. Hrdina A, and D Romportl D (2017). *Journal of Landscape Ecology 10*(1): 108-115.
26. https://databank.nedfi.com retrieved on June 15, 2023.
27. Iqbal Z, M Lateef, MS Akhtar, MN Ghayur and AH Gilani (2006). *Journal of ethnopharmacology*, *106*(2): 285-287.
28. Iqbal Z, QK Nadeem, MN Khan, MS Akhtar and F N Waraich (2001). *International Journal of Agriculture and Biology 3*(4): 454-457.
29. Irshad M, S Man, and M A Rizvi (2010). *Middle East Journal of Scientific Research 5*(5): 346-349.
30. Jamil K, M Asmuddin, B Ranawat, and C Rao (2017). *International Journal of Dentistry and Oral Health 3(9)*: 100-104. DOI: 10.25141/2471-657X-2017-9.0087.
31. Kanthal LK, P Mondal, S De, S Jana, S Aneela, and K Satyavathi (2012). *International Journal of Life Science and Pharma Research 2*(1): 10-12.
32. Karmakar UK, S Akter, and S Sultana. (2020). *Jordan Journal of Pharmaceutical Sciences*, *13*(2).
33. Khatiwora E, VB Adsul, R Torane, and S Gaikwad (2020). *Journal of Advanced Scientific Research*, *11*(3 Sup 7): 234-237.
34. Kumar A, K Lakshman, KN Jayaveera, R Nandeesh, B Manoj, and D Ranganayakulu (2010). *Archives of Biological Sciences 62*(1): 185-189.
35. Kumar KT, DS Panda, UN Nanda, and S Khuntia (2010). *International Journal of Pharm Tech Research 2*(2): 1030-1032.
36. Kumar N, and A Chaudhary (2015). *Asian Journal of Pharmaceutical and Clinical Research* 163-165.
37. Kumar P, and MS Nain (2013). *Indian Journal of Applied Research 3:* 3-6.
38. Latha MS, KP Latha, HM Vagdevi, VP Vaidya, SB Virupaxappa, and GA Swetha (2010). *Biomed 5*(2): 125-131.
39. Mahadev ND, AT Thorat, and BP Vitthaln (2017). *Journal of Pharmacognosy and Phytochemistry 6*(4): 1845-1847.
40. Mahalakshmi SN, HG Achala, KR Ramyashree, and TR Prashith Kekuda (2019). *International Journal of Pharmacy and Biological Sciences 9*(2): 664-682.
41. Mahanthesh MT, D Ranjith, R Yaligar, R Jyothi, G Narappa, and MV Ravi (2020).

Journal of Pharmacognosy and Phytochemistry 9(3): 1799-1809.
42. Maphosa V, and PJ Masika (2010). *Pharmaceutical Biology 48:* 697-702.
43. Meenakshisundaram A, TJ Harikrishnan, and T Anna (2017). *Indian veterinary Journal 94*(7): 23-27.
44. Mondal S, GK Dash, and RR Chhetree (2010). *Research Journal of Pharmacognosy and Phytochemistry 2*(2): 129-130.
45. Nahar UJ, M Akter, MMR Bhuiyan, and M Rahmatullah (2017). *World Journal of Pharmaceutical Res*earch *7:* 172-178.
46. Najm OA, FH Addnan, NF Mohd-Manzor, MA Elkadi, WO Abdullah, A Ismail, and FAF Mansur (2021). *International Journal of Fruit Science 21*(1): 848-867.
47. Osei Akoto C, A Acheampong, YD Boakye, AA Naazo, and DH Adomah (2020). *Journal of Chemistry*. https://doi.org/10.1155/2020/2153534.
48. Pandey J, S Mishra, and K Jaiswal (2018). *Asian Journal of Pharmaceutical and Clinical Research 11*(12):
49. Pueblos KRS, M Bajalla, D Pacheco, S Ganot, D Paig, and R Tapales (2017) *AIP Conference Proceedings,* 1803 (020027).
50. Rabiu H, and M Subhasish (2011). *International Journal of Drug Development and Research 4*(3): 94-100.
51. Ramakrishnan V, P Gokul, R Hemalatha, AT Karthika, RM Raj, and R Shankar (2023). *The Journal of Phytopharmacology 12*(2): 76-81.
52. Randeep G, K Vandna, and S Amandeep (2011). *Journal of Ethnopharmacol*ogy *2*: 1-4.
53. Reddy NLN, K Yamini, and V Gopal (2011). *Journal of Applied Pharmaceutical Science 01*(03): 140-142.
54. Saha MR, PC Debnath, MA Rahman, and MAU Islam (2012). *Bangladesh Journal of Pharmacology 7*(1): 50-53.
55. Sajid Bhutta M, Z Iqbal, RZ Abbas, and MA Raza (2011). *The Journal of Animal & Plant Sciences 21*(4): 781-786.
56. Salam N, and S Azam (2017). *BMC Public Health 17:* 201.
57. Siju EN, D Vivek, M Minil, B Vatakeel, and KP Chaithanya (2020). *World Journal of Pharmaceutical Research 9*(6): 643-661.
58. Silva LP, RR Debiage, JL Bronzel-Junior, RMD Silva, and ECM Peixoto (2020). *Anais da Academia Brasileira de Ciências*, *92*.https://doi.org/10.1590/0001-3765202020190074
59. Tandon V, AK Yadav, B Roy, and B Das (2011). Phytochemicals as cure of worm infections in traditional medicine systems, in: Srivastava U.C. and Kumar S. (Edn.), in book: Emerging Trends in Zoology, Narendra Publishing House, New Delhi, pp. 351-378.
60. Vinod R, and W Shailendra (2016). *Asian Journal of Pharmaceutical Research and Development*, *4*(1): 1-05.
61. Vishal B, B Pallavi, and K Anand (2017). *World Journal of Pharmaceutical Research 6*(6): 1011-1020. DOI: 10.20959/wjpr20176-8552
62. Vitalini S, M Iriti, C Puricelli, D Ciuchi, A Segale, and G Fico (2013). *Journal of Ethnopharmacology 145*(2): 517-529.
63. Wagh P, L Deshmukh, and P Thakur (2017). *Journal of Pharmacology & Clinical Research 2*(3): 1-3.
64. WHO. (2013). WHO Traditional Medicine Strategy 2014-23.https://www.who.int/publications/i/item/ 9789241506096