EX-SITU CONSERVATION OF SOME MEDICINAL PLANTS IN M.U.C. WOMEN'S COLLEGE, PURBA-BARDHAMAN WITH REFERENCE TO THEIR THREAT STATUS

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Abstract

An ethnobotanical and floristic survey was conducted in the selected forests of Birbhum and Burdwan Districts for collection of medicinal plants. Some species were purchased from the suppliers for plantation and conservation in the medicinal plant garden of M.U.C. Women's College, Purba-Bardhaman. A total of 74 species including the earlier existing species have been reportedhere in this study. These medicinal taxa spread over 46 families of which Apocynaceae and Acanthaceae dominant with having 6 species each. All species have been tabulated with detailed information on their families, local names, medicinal uses, importance. Finally, conservation and threat status of documented species have also been scrutinized. It was found that about 24 %of the total 74 species, like *S.album, J. nana* var. *bengalense, A. vulgaris, C. laevifolium, E. prostrata, T. grandis, E. fusiformis, G. laxiflorum, R. sibua, A.indica,* etc. need priority for conservation and urgent management. This study offers valuable source of information about threatened species which will helpful for botanists and conservationists in promoting sustainable utilization and protection of floristic diversity.

Keywords: Ethnomedicinal plants, Diversity, Threats, *Ex-situ* conservation

Introduction

Conservation efforts at local level more precisely known as community-based conservation, is nowadays a prime focus among the biologists for future bioprospection studies and germplasm conservation. Introduction of wild plants in the local garden is an *ex-situ* conservation approach that can save plants in their natural habitats and which are at risk of population thinning. Some of the main alarming threats on wild plants include forest cutting, forest fires, discontinuation of natural associations due to drastic habitat destruction, voluminous or bulk collections, unsustainable harvesting practices and lack of awareness which put several species in more vulnerable stage towards extinction from natural habitats. On the other hand, ex-situ conservation measures are efforts that can be helpful to conserve plants which are at risk or

threatened in their original habitats. During last five years, we found some plants in the forest localities of Birbhum and Burdwan districts of West Bengal which are very important medicinal plants harvested in regular basis for ethnomedicinal purpose by the tribal people. Some recently published literature survey also confirmed that these plants are of ethnomedicinal importance, habitat specific and mostly of rare occurrence in the surveyed forest areas [1-7]. During survey in the pre-monsoon to post-monsoon seasons in the year 2015 to 2023, we found the population and the number of habitats of those species is declining day by day. In this view an attempt has been made to conserve a good number of rare and medicinally important plant species at our college campus with some existing plant species. Till date, we found no report on *ex-situ* conservation of wild medicinal plants in the college gardens of different colleges under the University of Burdwan. In this respect this study is the first report on conservation of medicinal plants treasury in our college campus.

Geography of the College Campus

Established in the year 1955, M.U.C. Women's College, is having a heritage building with wide assemblage of flora and fauna. The College campus is situated adjacent to the Office of Land Reforms (Govt. of West Bengal) in the east and to the Burdwan University Office, Rajbati in the west (Fig.1). The college area comes under latitude of 23.238847° N and a longitude of 87.852766° E.

Materials and Methods

Collection, Plantation and Identification of plants and documentation of their uses: Some plant species were procured from suppliers and rests were collected following Guided tour technique and through *inloco* identification [8] from the forest localities during repeated floristic surveys of Garh-Jungle Forest of West Bardhaman district, and Chorchor and Ganpur forests of Birbhum districts in monsoon (July – August) and post-monsoon (September – October) seasons from the year 2015 to 2023. Each of the plant species was collected in 3-5 numbers and planted in our College Medicinal Plant Garden as well as in Dr. E.K. Janaki Ammal Herbal Garden (established on February, 2023) with the soil inoculum taken from the forest habitats to maintain their natural growth. Regular monitoring, ploughing and watering were done for maintenance of their proper growth. After collection all the species were taxonomically studied following the best available taxonomic literatures and Flora [9-14].Literatures were also consulted to find out the documented uses of the maintained plants [2-4, 6, 15, 16].

Herborization: A few twigs of each of the plant specimens were collected from the forest locality and labelled herbarium sheets out of those dried specimens were prepared following the methods described in standard literatures [17, 18] and deposited in the herbarium section of the Department of Botany, M.U.C. Women's college, Purba-Bardhaman.

Nomenclatural updates and verification of conservation status: The nomenclature and correct author citation for all collected species were thoroughly checked and updated names were tabulated following the web-databases of Plants Of the World Online (https://powo.science.kew.org), International Plant Names Index (www.ipni.org) and the World Flora Online (www.worldfloraonline.org). Finally, the present conservation status of all

documented plants has been scrutinized by visiting the web-database of International Union for Conservation of Nature (IUCN) -Red List of Threatened Species (https://www.iucnredlist.org/). During filed observation we also studied population of some species following guided tour and walk-in-the-wood techniques [8] to document their threat status.

Results and Discussion

The M.U.C. Women's College of Purba-Bardhaman district is not only serving as an educational institute but also a home of diverse plant species with immense medicinal values. It is a home to an impressive array of flora, with about 145 distinct species of herbs, shrubs, trees and climbers. In the present study, altogether 74 species are reported as newly introduced species in the college campus (Figure 1), about 76 % of which are dicotyledons, 20% is monocotyledons and rest 4% comes under pteridophytes. These medicinal taxa spreads over 46 families, of which 31 Dicotyledon families, 12 Monocotyledon families and rest 3 belong to Pteridophyte group. Among the families, Apocynaceae and Acanthaceae hold the maximum number plant species (6 spp.for each). The second highest number of species is found for the Asteraceae with 5 species. Literature survey revealed that these three families *viz*.- Apocynaceae, Acanthaceae and Asteraceae have been reported to have great phytochemical and medicinal values [19-21] due to presence of large number of phytochemical groups like flavonoids, alkaloids, glycosides, phenols, terpenoids, etc and many active principles. The family Lamiaceae secured third position with having 4 species. It has been reported by Uritu el al. [22] that the members of this family are very useful in the treatment of pain. Out of the 74 species collected,19 spp. are wild, 24 spp. naturally grown in the college garden and 31 mature plants selected and procured from suppliers which are not found in the forest locality. Some of the collected wild species like *E. fusiformis, P. crotalarioides, J. nana* var. *bengalense, G. laxiflorum, E. explanata,* etc. are ephemeral in nature with having dormant root stocks which starts sprouting only in monsoon.

We have also collected few seeds of *Shores robusta* from the forests and successfully germinated in our medicinal garden. Presence of *Shorea robusta* in the garden is significant since mycorrhizal associations of *S. robusta* and leaf-litter after senescence of leaves helps to enrich the soil nutrients which promotes growth of the other medicinal plants [23].These species are employed in the treatment of a good number of diseases and disorders. Some notable uses of plants as reported in some current literatures are tabulated with proper reference citation in table number1. Each species in the collection offers unique medicinal properties, contributing to the enrichment of campus biodiversity and therapeutic resources of the region and their future prospects and applications in pharmacology.

The IUCN Red List of Threatened Species status of the 74 medicinal plant species was scrutinized and tabulated in Table 1. A thorough scrutiny in the web-database of the IUCN reveals that 10 species are presently Red listed under IUCN-threatened category, which needs immediate protection in their natural habitat. Mass propagation with the help of tissue culture laboratory will be helpful to maintain the number of populations following *inter-situ* conservation (restoration of declining species in areas that are outside their current range for ensuring species' survival) method. It has been found that out of a total 10, two taxa- *S.album* (https://www.iucnredlist.org/species/31852/2807668) and *J. nana* var. *bengalense* (https://www.iucnredlist.org/species/88425992/88425995) are presently included under IUCN-

Vulnerable (VU) category therefore, they need special concern for immediate *ex-situ* conservation which is taken in the present work. Of the rest, 6 species:
A. vulgaris (https://www.iucnredlist.org/species/202936/2758117),
C. asiatica (https://www.iucnredlist.org/species/168725/88308182),
C.laevifolium (https://www.iucnredlist.org/species/150213479/250195104),
E. prostrata (https://www.iucnredlist.org/species/164051/121894451),
G. superba (https://www.iucnredlist.org/species/44393073/44403733)
and *H. speciosa* (https://www.iucnredlist.org/species/158548274/158548791) came under Least Concern (LC) category. Population of one species *viz*., *S. mahagoni* is now Near Threatened (https://www.iucnredlist.org/species/32519/68104916). Only one species, *T. grandis* is listed as Endangered one (https://www.iucnredlist.org/species/62019830/62019832). The plants which presently come under Least Concern category might fall in any of the core IUCN threat categories(VU, EN, CR, EW, EX) in near future if the reasons for population decline is continued.

However, during the field study, we found there are 8 species existing with rare and discrete presence in the forest pockets, for example *E. explanata, E. fusiformis, G. laxiflorum, R. sibua, A. philippense, A.indica,* etc. which also seek conservation measures. One of the major threats to these plants is the severe use- pressure which is due to collection by the local men for preparation of ethnomedicines. Forest cutting and habitat destruction are also imposing critical threats to those species and it may be assumed that in near future these plants will be faded out of the forests.

Table1. Plants conserved in the medicinal plant garden, M.U.C. Women's College, Burdwan

Sl. No. with source of collection (a , b and c)	**Botanical name and Family**	**Local name/ vernacular name of the species**	**Diseases / Disorders cured / Uses (references) using the drugs collected from the species**	**Threat statusof the species(as per IUCN Red-list data/ author's personal observations and annotations and from other reports)**
1.a	*Adiantum philippense* L.; Pteridaceae	Kalijhap	Dysentery, ulcers, fever, pimples, baldness, poisonous bites, etc. [24]	Rare in the wild (Personal observation)
2.b	*Aegle marmelos* (L.) Corr.;Rutaceae	Bel	Fever, abdominal pain, urinary problems, ophthalmia, inflammation [25]	Status not determined
3.c	*Aloe vera* (L.) Burm. f.; Asphodelaceae	Ghritkumari	Constipation, dyspepsia, piles, eczema, diarrhea, etc. [25]	Status not determined
4.b	*Alstonia scholaris* (L.) R.Br.; Apocynaceae	Chatim	Snake bites, rheumatic swellings, intestinal worms, etc. [25]	Status not determined

5.a	*Aristolochia indica* L.; Aristolochiaceae	Iswarmul	Antidote to fever, asthma, snake bites, dyspepsia of cattle, dry cough, etc. [24, 25]	Rare in the wild; population decreasing (Personal observation)
6. c	*Artemisia vulgaris* L.; Asteraceae	Nagdona	Bowel complaint, headache, asthma, itching, ulcers, contraceptive [25]	Least Concern
7.c	*Asparagus racemosus* Willd.; Asparagaceae	Satamuli	Infertility, dysuria, weakness, hypotension, menstrual problems [7]	Status not determined
8.b	*Averrhoa carambola* (L.); Oxalidaceae	Star fruit / Kamranga	Chronic fever, piles, diarrhea, liver colic, etc. [25]	Status not determined
9.b	*Centella asiatica* (L.) Urb.;Apiaceae	Thankuni	Blood dysentery, brain tonic, cough, fever, stomachache, liver problems, etc. [24]	Least Concern
10.c	*Cinnamomum verum* J.Presl; Lauraceae	Darchini	Coung, diarrhoea, nausea, vomiting [24]	Status not determined
11. c	*Cissus quadrangularis* L.; Vitaceae	Harjora	Bone fracture, cuts and wounds [24]	Status not determined
12. b	*Clerodendrum laevifolium* Blume;Lamiaceae	Ghentu	Skin diseases, leaf is edible vegetable [24]	Least Concern
13. b	*Clitoria ternatea* L.; Fabaceae	Aparajita, Gokarni	Leprosy, snake bite, goitre, stomachache, abdominal swelling of veterinary animals [24]	Status not determined
14.c	*Coleus amboinicus* Lour.; Lamiaceae	Porno Joyan, Pathar chur	Urinary discharge, asthma, bronchitis, dyspepsia [25]	Status not determined
15.b	*Commelina benghalensis* L.; Commelinaceae	Kanshira, Tropical spiderwort	Hypertension, infertility, sore throats, burns, dysentery, infant's thrush, burns, wound healing, urethral pain, demulcent, emollient, bitter, refrigerant, malaria, rashes, leprosy [26]	Status not determined
16.a	*Crinum macowanii* Baker;Amaryllidaceae	Ban piyanj	Gout, chest pain, abdominal worm, filaria, skin burn [7]	Status not determined
17.a	*Curculigo orchioides* Gaertn.; Hypoxidaceae	Bantal	Menstrual problems, gout, muscular pain, filaria, headache [7]	Status not determined
18. a	*Curcuma longa* L. Zingiberaceae	Halud	Malnutrition [7]	Status not determined

19. a	*Dillenia pentagyna* Roxb.;Dilleniaceae	Poproo, Banchalta	Labour pain, asthma, bole, dropsy, rheumatism [24]	Status not determined
20. c	*Ealeocarpus sphaericus* (Gaertn.) Heer; Elaeocarpaceae	Rudraksha	Antidepressant, antidiabetic, anti-inflammatory, antibacterial, antiulcerogenic [27]	Status not determined
21.b	*Ecbolium viride* (Forssk.) Alston; Acanthaceae	Sotapua	Rheumatism, jaundice [24], infertility [7]	Status not determined
22. b	*Eclipta prostrata* (L.) L.; Asteraceae	Bringaraj, Kaikeshi	Jaundice, antifertility, asthma, antidote in poisonous bites, ulcers, hair loss [24]	Least Concern
23.c	*Elettaria cardamomum* (L.) Maton; Zingiberaceae	Elach	Asthma, bronchitis, scabies, earache, toothache, toothache, kidney problems, etc. [25]	Status not determined
24.a	*Eulophia explanata* Lindl.; Orchidaceae	Gitiya, Rabanmatha, Tempur, Patra	Gout, indigestion, kidney pain [7]	Rare in the wild (personal observation), Endemic to India
25.a	*Euphorbia fusiformis* Buch. -Ham. ex D. Don.; Euphorbiaceae	Dudhmul	Galactagauge, menstrual problems, gout, eczema, malnutrition, etc. [28]	Very Rare, Endemic to India, Nepal and Bangladesh; population decreasing [28]
26.b	*Ficus religiosa* L.; Moraceae	Asothwo	Sore, pain [7]	Status not determined
27.a	*Geodorum laxiflorum* Griff.; Orchidaceae	Gite, Birfol	Placental expulsion of cows [7]	Very rare, Endemic to India, population decreasing [29]
28.c	*Gloriosa superba* L.; Colchicaceae	Agnisikha, Kidingkatkom	Scorpion bite poisoning [7]; antiasthmatic, anticancer, antimalarial, piles, skin diseases, etc. [25]; cholera, asthma, tumors, small pox of veterinary animals [24]	Least Concern
29. c	*Gymnema sylvestre* (Retz.)R. Br. ex Sm.; Apocynaceae	Gurmar	Hyperglycemia [7]	Status not determined
30.c	*Gynura procumbens* (Lour.) Merr.; Asteraceae	Longevity Greens, Leaves of the	Inflammation, herpes simplex virus, rashes, fever, rheumatism, kidney	Very rare in India from Abor Hills of Arunachal Pradesh [31]

		gods	diseases, migraines, diabetes mellitus, cancer, and hypertension [30]	
31. a	*Hellenia speciosa* (J.Koening) S.R.Dutta; Costaceae	Keu, Orop	Intestinal worm, cold fever, skin disease, ringworm, urinary troubles, fever, aphrodisiac, piles [25]	Least Concern
32.a	*Hemidesmus indicus* (L.) R. Br.; Apocynaceae	Anantamul	Menstrual problems, tuberculosis, diarrhea, renal dysfunction, etc. [7]	Rare in wild
33. c	*Hibiscus* x *rosa-sinensis* L.; Malvaceae	Joba	Anti-inflammatory, anti-cancer, hypotensive, anti-pyritic, wound healing, abortifacient activities, hair growth promotion, antifertility, anti-bacterial, anti-diabetic, etc. [32]	Status not determined
34.a	*Holarrhena pubescens* Wall ex G. Don.; Apocynaceae	Kurchi, Haatbaha	Diarrhea, cuts, headache [7]	Frequent in wild
35.b	*Hygrophila auriculata* (Schumach.) Heine; Acanthaceae	Kulekhara	Abdominal worm [7]	Status not determined
36.a	*Jatropha nana* var. *bengalense* C.H.Rahaman & S.Mondal; Euphorbiaceae	Birbherenda, Kirkundi, Birpinde	Galactagogue fodder for milking cows [6]; Biodiesel production from seeds [33]	Vulnerable, Endemic to India from Maharashtra, Jharkhand, West Bengal; population decreasing [34]
37.b	*Justicia adhatoda* L.; Acanthaceae	Basak	Cough and cold, tuberculosis [7]	Status not determined
38.c	*Kalanchoe sp.*; Crassulaceae	Patharkuchi, Patherchut, Amarpui	Constipation, wounds, dysuria [7]; boils, sore, headache, kidney stone [24]	Status not determined
39.b	*Lagerstroemia sp.;* Lythraceae	Nana	Stomachache [24]	Status not determined
40.b	*Lawsonia inermis* L.; Lythraceae	Mehndi, Momjaathi	Jaundice, muscular pain, weakness, burning [24]	Status not determined
41. a	*Lygodium flexuosum* (L.) Sw.; Lygodiaceae	Durgajhap, Kukri-bisi, Maha-jal	Abdominal pain, eczema, fever, scabies, ulcer [24]	Status not determined
42. c	*Madhuca longifolia*	Mool	Menstrual problems,	Status not determined

	(L.) J. F. Macbr.; Sapotaceae		abdominal worms, jaundice, hydrocele, skin allergy [7]	
43.b	*Mikania micrantha* Kunth;Asteraceae	Bitter vine	Mental health, anti-inflammatory, wound healing of sores, antimicrobial effects, anti-inflammatory and anti-dermatophyte activities [35]	Status not determined
44.b	*Mimosa pudica* L.; Fabaceae	Lojjaboti	Diarrhea, gonorrhea [7]	Status not determined
45.b	*Moringa oleifera* Lam.; Moringaceae	Sajne, Sojina	Hyperglycemia [7]	Status not determined
46.a	*Nephrolepis sp.;* Nephrolepidaceae	Seratongenjen	Cuts, wounds, loss of appetite, breathing problems [24]	Status not determined
47.c	*Nerium oleander* L.; Apocynaceae	Karabi, Karab-baha	Bronchitis, asthma, dysentery, blisters, gum problems [24]	Status not determined
48.c	*Ocimum kilimandscharicum* Gürke; Lamiaceae	Koppur tulsi	Cough and cold, bronchitis, microbial infections anorexia [25]	Status not determined
49.c	*Olea europaea* L.; Oleaceae	Olive	Antidiabetic, anticonvulsant, anti-inflammatory, analgesic, antimicrobial, antiviral, antihypertensive, anticancer, antihyperglycemic, antinociceptive, gastroprotective, and wound healing [36]	Status not determined
50. b	*Phyllanthus niruri* L.; Phyllanthaceae	Bhuiamla	Antipyretic, antiseptic, diuretic, jaundice, ulcers, asthma, etc. [25]	Status not determined
51. b	*Pigea enneasperma* (L)P.I.Frost.; Violaceae	Nunbora	Leucorrhoea, dysuria, diarrhoea, urinary infections, inflammationsterility, diuretic for gonorrhoea, asthma, antivenom activity against snake and scorpion sting, epilepsy, cholera [37]	Status not determined

52. c	*Piper nigrum* L.; Piperaceae	Golmorich	Menstrual problems, cough, constipation, hypogalactia, indigestion, epilepsy, etc. [7]	Status not determined
53. a	*Pistia stratiotes* L.; Araceae	Jolkofi	Hydrocele [7]	Status not determined
54.c	*Pleurolobus gangeticus* (L.) J. St.-Hil. ex H. Ohashi & K. Ohashi; Fabaceae	*Salparni*	Antiurolithiatic, antioxidant, antibacterial [38]	Status not determined
55.b	*Plumbago zeylanica* L.; Plumbaginaceae	Sitapari	Appetite, eczema, fever, leprosy, malaria, muscular pain, piles, skin disease [24]; encephalitis, cough and cold [7]	Status not determined
56.a	*Polygala crotalarioides*; Polygalaceae	Nilkathi, Nil kantha	Aphrodisiac, cough, headache [7]; measles, toothache, epilepsy, vomit out poison [24]	Frequent in wild
57.c	*Psidium guajava* L.; Myrtaceae	Piyara, Guava	Gastrointestinal diseases such as vomiting and simple diarrhea to the treatment of wounds, caries, diabetes and cough [39]	Status not determined
58.b	*Rauvolfia serpentina* Benth. ex Kurtz; Apocynaceae	Sarpagandha	High blood pressure, epilepsy, eczema, snake poisoning, rheumatism [25]	Status not determined
59.b	*Ruellia prostrata* Poir. ; Acanthaceae	Bell weed, Dhamani	Wound, hair loss, gonorrhea, hypoglycemic, diuretic, eye and ear diseases, anti-cancer agent [40]	Status not determined
60.a	*Ruellia sibua* (Nees)I.M. Turner; Acanthaceae	Ranu ran	Headache [7]	Very rare in wild, population decreasing
61. c	*Ruellia simplex* C.Wright;Acantheceae	Mexican petunia	Antinociceptive, anti-inflammatory, antidiabetic[41]	Status not determined
62.c	*Santalum album* L.; Santalaceae	Indian Sandalwood, Chandan	Fever, dysentery, epilepsy, snake poisoning, detergent [24]	Vulnerable
63.a	*Scadoxus multiflorus* (Martyn) Raf.; Amaryllidaceae	Blood lily	Fever, cough, gastrointestinal problems, and wound healing [42]	Status not determined

64. c	*Shorea robusta* C. F. Gaertn.; Dipterocarpaceae	Saal	Dysentery, skin burn, bone fracture [7]	Frequent, in Laterite belt of West Bengal
65.c	*Sphagneticola trilobata* (L.) Pruski; Asteraceae	Bhirngaraj	Ulcer, sore throat, varicose, headache, fever, epilepsy, amenorrhea, snakebite, wounds, kidney dysfunction, hepatitis, cold, and indigestion,antimicrobial, anti-inflames, hepatoprotective, antidiabetic, and antitumor [43]	Status not determined
66. c	*Swietenia mahagoni* (L.) Jacq.;Meliaceae	Mehogoni	Antidiabetes type 2; antipyretic,antihypertensive, antimicrobial, antidiarrheal, anti-inflammatory, astringent, antimalarial, hepatoprotective, anticonvulsant, antiulcer, antidepressant, anticancer[44]	Near Threatened; population deceasing
67.c	*Syzygium aromaticum* (L.) Merr. & L. M. Perry; Myrtaceae	Labanga	Infertility, tuberculosis, cough, toothache[7]	Status not determined
68.b	*Tectona grandis* L.f. ; Lamiaceae	Segun	Hypoglycemic, wound healing, antioxidant, antipyretic, analgesic [45]	Endangered; population deceasing
69.c	*Terminalia bellirica* (Gaertn.) Roxb.;Combretaceae	Bahera, Lopungja	Diarrhea, gastric problems, indigestion [7]	Status not determined
70. c	*Terminalia chebula* Retz.; Combretaceae	Haritaki, Soparom	Infertility, cough, gastric problems, indigestion, diarrhea, malaria [7]	Status not determined
71.c	*Tinospora cordifolia* (Willd.) Miers ex Hook. f. & Thomson; Menispermiaceae	Guloncho	Antipyretic, asthma, bronchitis, [24]; fever, diabetes, rheumatic pain, syphilis, anemia, skin disease, etc. [25]	Status not determined
72.c	*Turnera ulmifolia* L. *Passifloraceae*	Yellow alder	Anti-inflammatory, expectorant, albuminuria, leukorrhea, furunculosis,	Status not determined

			asthma, rheumatism [46]	
73.b	*Vanda tessellata* (Roxb.) Hook. ex G. Don; Orchidaceae	Banda	Chest pain due to cough, bone fracture, filaria [7]antifertility, bone fracture, night blindness, earache, etc. [24]	Status not determined
74. c	*Zingiber officinale* Roscoe; Zingiberaceae	Aada	Cough and cold, tuberculosis, indigestion [7]	Status not determined

[a: Plants collected from wild; b: Plants naturally grown; c: Plants procured from suppliers]

Conclusion

The detailed documentation of newly introduced medicinal plant species within the college campus boosts the interests and knowledge of people including researchers and students of different branches of plant sciences. The existing plant resource offers students and other visitors a unique opportunity to explore and learn about various plant species in their *ex-situ* and *in-situ* habitats. Importance of this work not only defines the unique role of our college as an educational institution but also as a crucial and unique botanical mini-hotspots under the University of Burdwan, where the rare and important medicinal plants are studied and preserved. Moreover, this study covers the importance of saving biodiversity, which is needed to maintain ecological stability. In future this plant-repository could be explored for phytochemical analysis and bioprospecting of their different medicinal uses.

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References:

[1] Mondal, S., and Rahaman, C. H., 2012, "Medicinal plants used by the tribal people of Birbhum district of West Bengal and Dumka district of Jharkhand in India," Indian J. Tradit. Knowl., 11(4), pp. 674-679.
[2] Jain, V., and Jain, S. K., 2016 Compendium of Indian Folk Medicine and Ethnobotany(1991-2015), Deep. Publ., New Delhi.
[3] Jain, S.K., and Jain, V. (Ed.), 2017, Methods and Approaches in Ethnobotany. Deep Publ., New Delhi.
[4] Santhosa, G. R., and Kar, A., 2017,Medicinal Plant Resources of South Bengal, Vol. 1 & 2. Research Wing, Directorate of Forest, Government of West Bengal, Kolkata.
[5] Pradhan,B., and Rahaman, C. H., 2019,"Documentation of Medicinal Flora of Birbhum District, West Bengal, India," Remarking An Analisation, 3(10), pp. 120-124.

[6] Pradhan, B., and Mondal, S., 2023,"A Quantitative Ethnobotanical Approach to Assess Knowledge Richness on the Use of Plants among the Santal Medicine Men of Birbhum District, West Bengal, India,"Ethnobot. Res. and Appl.,26,pp. 1-21.
[7] Mondal, S., 2020,"Studies on Traditional Phytotherapies Practiced among the Tribals in the Border Areas of Dumka (Jharkhand) and Birbhum (West Bengal) Districts with Reference to PharmacogeneticInvestigation, Ph.D. Thesis, Submitted in Visva- Bharati, Santiniketan.
[8] Albuquerque, U.P.,Cruz da Cunha, L.V.F., Lucena, R.F.P., and Alves, R.R.N., 2014, Methods and Techniques in Ethnobiology and Ethnoecology, Humana Press, Springer.
[9] Prain, D., 1903, Bengal Plants, Vols. 1 & 2. Calcutta, India, Botanical Survey of India.
[10] Sanyal, M. N., 1994, Flora of Bankura District, West Bengal,Bishen Singh Mahendra Pal Singh, Dehradun, India.
[11]Anonymous, 1997, Flora of West Bengal, Vol. 1. Botanical Survey of India, Calcutta, India.
[12] Paul, T. K., Lakshminarasimhan, P., Chowdhery, H. J., Dash, S. S., Singh, P., 2015, Flora of West Bengal, Vol. 2. Kolkata, Botanical Survey of India, Ministry of Environment, Forests and Climate Change.
[13]Ranjan, V., Lakshminarasimhan, P., Chowdhery, H. J., 2016, Flora of West Bengal, Vol. 3. Kolkata, Botanical Survey of India, Ministry of Environment, Forests and Climate Change.
[14] Lakshminarasimhan, P., Dash, S. S., Singh, P., and Chowdhery, H. J., 2019, Flora of West Bengal, Vol. 4. Botanical Survey of India, Ministry of Environment, Forests and Climate Change. Kolkata.
[15] Kirtikar, K. R., and Basu, B. D., 1975. Indian Medicinal Plants, Vol.I-IV, New Delhi (Repr.).
[16]Khare, C., 2007, Indian Medicinal Plants- an Illustrated Dictionary, Springer.
[17]Maity, D., (ed.), 2012, Perspective of Plant Taxonomy – Exploration, Herbarium, Nomenclature and Classification, Naya Udyog, Kolkata, pp 1-189.
[18] Mehrotra, B.N., 2017, Collection and Processing of Plants for Biological Screening,in"Methods and Approaches in Ethnobotany" Jain and Jain (ed.), Deep Publ., New Delhi.
[19] Bhadane, B. S., Patil, M. P., Maheshwari, V. L., and Patil, R. H.,"Ethnopharmacology, Phytochemistry, and Biotechnological Advances of Family Apocynaceae: A Rreview," Phytother. Res., 32(7), pp. 1181-1210.
[20]Zakaria, S. M., Amri C. N. A., and Shahari, R., 2020,"Ethnobotany and Traditional Knowledge of Acanthaceae in Peninsular Malaysia A Review," Pharmacog. J., 12(6), pp.1482-1488.
[21]Rolnik, A., and Olas, B., 2021,"The Plants of the *Asteraceae* Family as Agents in the Protection of Human Health," Int. J. Mol. Sci., 22(6), p. 3009.
[22] Uritu, C. M., Mihai, C. T., Stanciu, G. D., Dodi, G., Alexa-Stratulat, T., Luca, A., Leon-Constantin, M. M., Stefanescu, R., Bild, V., Melnic, S., and Tamba, B. I., 2018,"Medicinal Plants of the Family Lamiaceae in Pain Therapy: A Review," Pain. Res. Manag., 2018(1), p. 7801543.
[23] Tah, J., and Mukherjee, A.K., 2018,"Joint Forest Management and Adaptation of Sal (Shorea robusta) and Its Flexibility in Wide Range of Ecological factors in Forest." Asian J. App. Sci. Technol., 2(2), pp. 873-893.
[24]Jain, S.K., 2015, Dictionary of Indian Folk Medicine and Ethnobotany, Deep Publications, New Delhi.

[25] Paria, N. D., 2005, Medicinal Plant resources of South West Bengal. Research Wing, Directorate of Forests, Govt. of West Bengal, Kolkata.
[26] Fibrich, I., and Namrita, L., 2020, *Commelina benghalensis* in Namrita, L., (ed.),"Underexplored Medicinal Plants from Sub-Saharan Africa," Academic Press, pp. 77-85.
[27] Aryal, P., 2021, "Medicinal value of *Elaeocarpus sphaericus*: A review", Asian J. of pharmacog., 6(3), pp. 15-21.
[28] Mondal,S., and Balakrishnan, N.P., 2022,"A review on Taxonomy, ethnobotany and conservation aspects of *Euphorbia fusiformis* (Euphorbiaceae): A review", J. Econ. and Taxon. Bot., 46(3-4), pp. 111-120.
[29] Mondal, S., Charkrabary, K, Chakrabarty, S., Sarkar, S., Sardar, S., and Bhattacharjee, A., 2023, "*Geodorum laxiflorum* (Orchidaceae) relectotypified", Nordic J. Bot., e03908, pp. 1-7.
[30] Mou, K.M., and Dash,P.R., 2016,"Comparative Review on *Gynura procumbens*Leaves," J. Pharmacogno., 3(4),pp. 167-174.
[31] Eflora(BSI), 2024, Checklist of Plants: *Gynura procumbens*, https://efloraindia.bsi.gov.in/eFlora/speciesDesc_PCL.action species_id =23370. Accessed on 2 March, 2024.
[32] Missoum, A., 2018,"An Update Review on *Hibiscus rosasinensis*Phytochemistry and Medicinal Uses," J. Ayurvedic Herbal Medic., 4(3), pp. 135-146.
[33] Banerji, R., 1991,"Jatropha nana seed oil for energy," Biomass Bioen., 1(4), p. 247.
[34] Mondal, S., andRahaman, C.H.,2015, "New record of *Jatropha nana* var. *bengalense* C.H.Rahaman & S.Mondal (Euphorbiaceae) for the state of Jharkhand, India", J. Non-Tim. Forest Prod.,22(1), pp. 17-20.
[35] Das, G., Farhan, M., Sinha, S., Bora, H. K., Singh, W. R.,and Meeran, S. M., 2023,"Mikania Micrantha Extract Enhances Cutaneous Wound Healing Activity Through the Activation of FAK/Akt/mTOR Cell Signaling Pathway,"Injury,54(8),p. 110856.
[36] Hashmi, M. A., Khan, A., Hanif, M., Farooq, U., and Perveen, S.,2015, "Traditional Uses, Phytochemistry, and Pharmacology of Olea europaea (Olive)," Evid Based Complement Alternat Med. 2015(1), p. 541591.
[37] Rajsekhar, P.B., Bharani, A. R., Angel, K. J., Ramachandran, M., and Rajsekhar, S. P. V., 2016, "*Hybanthus enneaspermus* (L) F. Muell: A phytopharmacological Review on Herbal Medicine," J. Chem. Pharmaceutical Res., 8(1), pp. 351-355.
[38] Mohan, P.K., Krishna, T.P.A., Thirumurugan, A, Kumar, T.S., and Kumari, B.D.R.,2022, "Chemical Profiling and *In Vitro* Antiurolithiatic Activity of *Pleurolobus gangeticus* (L.) J. St.-Hil. ex H. Ohashi & K. Ohashi Along with Its Antioxidant and Antibacterial Properties", Appl Biochem Biotechnol,194(11), pp. 5037-5059.
[39] Gutierrez-Montiel, D., Guerrero-Barrera, A. L., Chávez-Vela, N. A., Avelar-Gonzalez, F. J., and Ornelas-García, I. G., 2023, "*Psidium guajava* L.*:* From Byproduct and Use in Traditional Mexican Medicine to Antimicrobial Agent,"Front Nutr. 10, 1108306.
[40] Akhter, S.,Hossain, Md. W., Sultana, S., Jharna, J.F., Meghla, N.S., Alam,R., Anis-Ul-Haque, K.M., and Rahman, M.Md., 2022, "*Ruellia prostrata* Poir. activity evaluated by phytoconstituents, antioxidant, anti-inflammatory, antibacterial activity, and in silico molecular functions",Journal of Saudi Chemical Society, 26(1), pp. 1-20.
[41] Ukwubile, C. A., Nettey, H., Malgwi, T. S., and Menkiti, N. D., 2022,"*Ruellia simplex* C. Wright (Acanthaceae): Antinociceptive, Anti-inflammatory, and Antidiabetic Activities of a novel Fatty Acid Isolated from its Leaf Extract," Int.J. Plant Based Pharmaceuticals, 3(1), pp. 32–40.

[42] Das, R., and Ray, S., 2024,"Unraveling the Ethnomedicinal Uses, Phytochemistry, and Pharmacology of an Under-investigated Species, *Scadoxus multiflorus* (Martyn) Raf.," South African J. Bot., 165, pp. 394-404.
[43] Mardina, V., Ilyas, S., Halimatussakdiah, H., Harmawan, T., Tanjung, M., and Yusof, F., 2021,"Anticancer, Antioxidant, and Antibacterial Activities of the Methanolic Extract from *Sphagneticola trilobata* (L.) J. F Pruski Leaves," J. Adv. Pharm. Technol. Res., 12(3), pp. 222-226.
[44] Roy, D., Sahu, S., Mandal, S., Parua, P., Rakshit, S., Ghosh, T., and Mahata, P., 2022,"A Review on Phytochemical Studies and Biological Activities of *Swietenia mahagoni*," 26(1), pp. 423-434.
[45] Asdaq, S. M. B., Nayeem, N., Alam, M. T., Alaqel, S. I., Imran, M., Hassan E. W. E., and Rabbani, S. I., 2022, "*Tectona grandis L.f:* A comprehensive review on its patents, chemical constituents, and biological activities," Saudi J. Biol. Sci., (3), pp. 1456-1464.
[46] Nascimento, M. A., Silva, A. K., França, L. C. B., Quignard, E. L. J., López, J. A., and Almeida, M. G., 2006 "*Turnera ulmifolia* L. (Turneraceae): Preliminary Study of its Antioxidant Activity, Biores. Technol., 97(12), pp. 1387-1391.

Figure 1. **A-C:** Plant conservation sites in medicinal plant garden of the college; **D:***Shorea robusta;* **E:***Tectona grandis* L.f.; **F:***Turnera ulmifolia* L.; **G:***Mikania micrantha*; **H:** *Justicia adhatoda* L;I: *Olea europaea* L.;**J:***Dillenia pentagyna* Roxb.; **K:***Clitoria ternatea* L. **L:***Ealeocarpus sphaericus* (Gaertn.) Heer; **M:***Elettaria cardamomum* (L.) Maton; **N:***Averrhoa carambola* (L.); **O:***Pistia stratiotes* L. **P:***Cinnamomum verum* J.Presl ; **Q:***Nephrolepis sp.*; **R:***Jatropha nana* var. *bengalense* C.H.Rahaman & S.Mondal.


MEDICINAL PLANT GARDEN
M.U.C. WOMEN'S COLLEGE.
BURDWAN.
A


DR. JANAKI AMMAL HERBAL GARDEN
Estd. 09th February 2024
Maintained by
Dept. of Botany
M.U.C. Women's College, Purba Burdwan
B


C


D


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