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Ethnobotany in the city: Medicinal tree species in university green space

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Abstract. The university's green open space (UGS) serves as the city's lungs, climate stabilization, improving bioclimate conditions, and reducing dust. In addition to these functions, UGS also acts as a provider of medical materials. The purpose of this study was to identify tree species containing medicinal properties on the Universitas Sumatera Utara (USU) campus in Padang Bulan. The field inventory was employed in this research by collecting data on all tree species in 120 hectares of the campus area. Furthermore, the utilization of each tree species identified was assessed using the book Indonesian Useful Plants. The research showed that, 65.29% tree species classified into 27 families on the USU campus could be a source of natural medicinal properties. *Polyalthia longifolia* had the largest number of individuals, while *Premna corymbosa* had the fewest. The leaf is the most commonly used organ based on the part used (55.69 %). Trees on the USU campus provide such a number of advantages, including treating cancer, antioxidants, anti malarial, and other therapies. Our research pointed out that, the presence of green space at the University is important to the conservation of biological diversity and potential tree species.

1. Introduction

The green campus concept has become a global trend that is used by several universities for scientific and educational purposes [1]. The concept of green open space in its application comprises trees, undergrowth, shrubs, and various other plants as component elements. As an important component of green space, the existence of trees should also include functions and benefits for campus residents and the surrounding community [2]. Trees have an important role in the control air pollution [3], providing food [4], supplying wood [5], fiber [6], medicines compounds [7], bioherbicides [8], and offering aesthetic value [9]. [10] showed a positive relationship between urban green open spaces and public health in a number of different ways. Physically and psychologically, green open space could serve the surrounding population by providing environmental services, one of which is the provision of herbal medicines through the vegetation it possesses [11].



Medicinal trees can also increase human carrying capacity in urban areas, thereby reducing environmental changes [12]. It is also an unique field of study inside ethnobotany [13]. Ethnobotany is a multidisciplinary science of studying the interactions between people of diverse cultures and the plants in their surroundings [14]. Ethnobotanists recognized in the late 1990s that biological and cultural knowledge is not restricted to marginal communities but is also part of the community and metropolitan areas. The researchers began conducting ethnobotanical studies in urban areas [15]. Several studies show the urban area's potential as a source of raw materials for traditional medicines [16-17]. Moreover, the utilization of herbal medicines has become one of the greatest latest clinical trends. It is also in accordance with a commitment to the intertwined conservation of human cultures and the plant conservation. Therefore, the purpose of this study was to identify tree species containing medicinal properties on the Universitas Sumatera Utara (USU) campus in Padang Bulan using ethnobotany studies.

2. Research Methods

2.1. Research location

This research was conducted on the USU campus Padang Bulan-Medan. The USU campus has an area of 120 hectares and is overgrown by various vegetation ranging from low-level vegetation such as moss to high-level vegetation such as trees. The USU campus is located at an altitude of about 2.5 – 37.5 m.asl. The temperature at the study site was recorded at 23-33.20 °C with air humidity ranging from 84-65%.

2.2. Data collection

Data on all trees on the USU campus were obtained through inventory method. All plant species found were preserved for herbarium purpose. Each plant sample collected is assigned a collection number, and the necessary data and information, such as plant morphological characteristics, habitat, location (height above sea level and geographical position), area name, and use, are recorded. Ambiguous species were further examined by sending herbarium samples to the Bogor Botany and Plant Taxonomy (FORDIA) laboratory for identification. To determine the usefulness of each species of tree located on the USU campus for health and its utilization, information was obtained from local communities and literature studies were performed. While classifying the potential usage of the collected plants, the additional uses of each part were also recorded [18].

3. Result and discussion

3.1. Medicinal tree species distribution

Plants have a variety of bioactive compounds that were used to treat and heal a variety of diseases in thousands of years [19]. Urban green space can also serve as sources of medicinal substances for the community even while supporting the function of urban areas in promoting sustainable development. Based on our results as many as 79 species (65.29 %) of medicinal trees were identified from a total of 121 tree species on the USU Campus (Table 1 and 2).

Based on tree distribution, medicinal trees on the USU campus are classified into 27 families and 79 species. Fabaceae is the family that has the highest number of species (13 species) with a total of 1115 individuals. Meanwhile, based on the distribution of individuals, *P. longifolia* is the species with the highest number of individuals (625 individuals), while *P. corymbosa* is the species with the lowest number of individuals (1 individual). Studies on green spaces have confirmed their potential for biodiversity conservation [20]. Furthermore [21] noted many species cultivated for ornamental, food or medicinal purposes in urban parks. This path shows that green space has a major role in improving food security, especially in underdeveloped areas [22].

Table 1. List of medicinal tree species in USU campus.

No	Scientific name	Family	Individu	Utilized part	Utilization
1	<i>Polyalthia longifolia</i>	Annonaceae	625	Leaf, bark	Fever medicine, antidiabetic, reducing blood pressure
2	<i>Annona muricata</i>	Annonaceae	29	leaf	blood pressure
3	<i>Annona squamosa</i>	Annonaceae	1	fruit	antidiabetic, fever, rheumatism, gout digestive disorders, anti-inflammatory
4	<i>Annona montana</i>	Annonaceae	2	leaf, fruit	antioxidant, anticancer
5	<i>Stelechocarpus burahol</i>	Annonaceae	1	fruit	antiinflammatory, gout
6	<i>Alstonia scholaris</i>	Apocynaceae	67	bark, sap	fever medicine, treat boils, anti-dandruff,
7	<i>Plumeria acuminata</i>	Apocynaceae	8	leaf, flower	antioxidant, tooatche
8	<i>Plumeria alba</i>	Apocynaceae	12	leaf, flower	antiinflammatory, antioxidant
9	<i>Plumeria rubra</i>	Apocynaceae	13	leaf, flower	antiinflammatory, antioxidant
10	<i>Ceiba pentandra</i>	Bombacaceae	2	flower	fever, heartburn, diarrhea
11	<i>Garcinia atroviridis</i>	Clusiaceae	14	leaf, flower	weight loss, blood sugar
12	<i>Garcinia dulcis</i>	Clusiaceae	1	fruit	fever medicine, antioxidant
13	<i>Garcinia mangostana</i>	Clusiaceae	37	fruit	antioxidant, anticancer
14	<i>Platycladus orientalis</i>	Cupressaceae	77	leaf	bronchitis, worm medicine
15	<i>Diospyros discolor</i>	Ebenaceae	4	leaf	reduce cholesterol, risk of heart
16	<i>Muntingia calabura</i>	Elaeocarpaceae	38	flower	gout, headache, cough
17	<i>Elaeocarpus grandiflora</i>	Elaeocarpaceae	1	flower, fruit	kidney inflammation
18	<i>Aleurites moluccana</i>	Euphorbiaceae	22	fruit	inflammatory, anticholesterol
19	<i>Antidesma buniis</i>	Euphorbiaceae	28	leaf, root	antioxidant, antidiabetic
20	<i>Hura crepitans</i>	Euphorbiaceae	5	fruit	antioxidant
21	<i>Adenanthera pavonina</i>	Fabaceae	249	leaf	antirheumatic, anti thrush
22	<i>Bauhinia purpurea</i>	Fabaceae	26	leaf, fruit	gastric and burn medicine
23	<i>Caesalpinia pulcerrima</i>	Fabaceae	2	flower, bark	gastric, fever
24	<i>Cynometra cauliflora</i>	Fabaceae	2	fruit	antioxidant, wound healing
25	<i>Leucaena leucocephala</i>	Fabaceae	19	fruit	antidiabetic, blood sugar reduction
26	<i>Parkia timoriana</i>	Fabaceae	2	fruit	gastric
27	<i>Pterocarpus indicus</i>	Fabaceae	289	bark	gum and mouth disorder
28	<i>Samanea saman</i>	Fabaceae	138	leaf	fever, diarrhea, headache
29	<i>Tamarindus indica</i>	Fabaceae	305	leaf	fever, anticonstipation
30	<i>Pithecellobium dulce</i>	Fabaceae	4	bark	wound healing, antinfection
31	<i>Senna siamea</i>	Fabaceae	5	leaf, root	antimalarial, skin infection
32	<i>Erythrina crista-galli</i>	Fabaceae	72	leaf,	antimalarial
33	<i>Intsia bijuga</i>	Fabaceae	2	leaf, fruit	antiinflammatory
34	<i>Gnetum gnemon</i>	Gentianaceae	29	fruit	reduce stroke attack
35	<i>Peronema canescens</i>	Lamiaceae	5	leaf	fever medicine
36	<i>Persea americana</i>	Lauraceae	17	fruit	antihypertensive, antidiabetic
37	<i>Cinnamomum verum</i>	Lauraceae	7	bark	antiinfective, indigestion
38	<i>Cinnamomum burmannii</i>	Lauraceae	2	leaf, bark	antiinfective, indigestion
39	<i>Barringtonia asiatica</i>	Lecythidaceae	30	fruit	stomach ache, open wounds
40	<i>Lagerstroemia speciosa</i>	Lythraceae	9	leaf	anticholesterol, diarrhea
41	<i>Durio zibethinus</i>	Malvaceae	66	fruit	antioxidant, anticancer
42	<i>Theobroma cacao</i>	Malvaceae	5	fruit	lower blood pressure, anticancer
43	<i>Hibiscus tilaeceus</i>	Malvaceae	9	leaf	gastritis
44	<i>Sterculia foetida</i>	Malvaceae	7	leaf, fruit	fever, antiinflammatory
45	<i>Magnolia champaca</i>	Magnoliaceae	4	leaf, fruit	fever, gum and mouth disorder
46	<i>Lansium domesticum</i>	Meliaceae	13	fruit	antioxidant, antimalaria, anticancer
47	<i>Swietenia mahagoni</i>	Meliaceae	214	fruit	Antidiabetic, antimalaria, inflammatory
48	<i>Sandoricum koetjape</i>	Meliaceae	9	fruit	antidiabetic, antimalaria, inflammatory
49	<i>Melia azedarach</i>	Meliaceae	2	leaf	dental and mouth problems, hemorrhoids
50	<i>Ficus benjamina</i>	Moraceae	69	leaf	influenza, antimalarial, dysentery
51	<i>Ficus microcarpa</i>	Moraceae	7	leaf	influenza, antimalarial, dysentery

Table 2. List of medicinal tree species in USU campus.

No	Scientific name	Family	Individu	Utilized part	Utilization
1	<i>Ficus variegata</i>	Moraceae	2	leaf	antioxidant, anticancer
2	<i>Ficus racemosa</i>	Moraceae	18	Leaf, fruit, flower, root	anticancer, skin treatment antibacterial
3	<i>Ficus ampelas</i>	Moraceae	3	leaf	kidney medicine
4	<i>Artocarpus integer</i>	Moraceae	2	fruit	anticancer, antimalaria, blood sugar reduction
5	<i>Artocarpus altilis</i>	Moraceae	31	leaf, fruit	blood sugar reduction, anti inflammatory
6	<i>Moringa oleifera</i>	Moringaceae	1	leaf, fruit	anticancer, inflammatory
7	<i>Syzygium aqueum</i>	Myrtaceae	56	leaf, fruit	anticancer, antioxidant
8	<i>Syzygium paniculatum</i>	Myrtaceae	28	leaf, fruit	antioxidant, antidiabetic
9	<i>Syzygium polyanthum</i>	Myrtaceae	24	leaf	antibacterial, blood pressure control
10	<i>Psidium guajava</i>	Myrtaceae	65	leaf, fruit	antioxidant, antidiabetic, dengue fever
11	<i>Psidium guajava red malaysia</i>	Myrtaceae	2	leaf, fruit	antioxidant, antidiabetic, dengue fever
12	<i>Myristica fragrans</i>	Myrtaceae	6	fruit	anti insomnia, digestive problems
13	<i>Averrhoa carambola</i>	Phyllanthaceae	12	fruit	boost immunity, control blood sugar
14	<i>Averrhoa bilimbi</i>	Phyllanthaceae	13	fruit	antihypertensive, antidiabetic
15	<i>Morinda citrifolia</i>	Rubiaceae	11	fruit	anticancer, arthritic, fever
16	<i>Flacourtia rukam</i>	Salicaceae	6	fruit	antibacterial, antiviral, antimicrobial
17	<i>Salix babylonica</i>	Salicaceae	3	leaf	antirheumatic, analgesic
18	<i>Dimocarpus longan</i>	Sapindaceae	44	fruit	antioxidant, antidiarrhea
19	<i>Nephelium lappaceum</i>	Sapindaceae	126	fruit	bone health, heart, digestive system
20	<i>Filicium decipiens</i>	Sapindaceae	243	leaf	diarrhea
21	<i>Schleichera oleosa</i>	Sapindaceae	17	fruit	Antibacterial, skin diseases
22	<i>Pometia pinnata</i>	Sapindaceae	40	fruit	anticancer, digestive problems
23	<i>Manilkara zapota</i>	Sapindaceae	7	fruit	diarrhea, lung disease
24	<i>Mimusops elengi</i>	Sapindaceae	707	leaf, bark	fever, headache, gout
25	<i>Chrysophyllum cainito</i>	Sapotaceae	1	fruit	antioxidant, antidiabetic
26	<i>Aquilaria malaccensis</i>	Thymelaeaceae	4	leaf, wood	anticancer, cough, rheumatic
27	<i>Gmelina arborea</i>	Verbenaceae	25	leaf, bark	fever, antihelmintic
28	<i>Premna corymbosa</i>	Verbenaceae	1	leaf	gout

Based on tree distribution, medicinal trees on the USU campus are classified into 27 families and 79 species. Fabaceae is the family that has the highest number of species (13 species) with a total of 1115 individuals. Meanwhile, based on the distribution of individuals, *P. longifolia* is the species with the highest number of individuals (625 individuals), while *P. corymbosa* is the species with the lowest number of individuals (1 individual). Studies on green spaces have confirmed their potential for biodiversity conservation [20]. Furthermore [21] noted many species cultivated for ornamental, food or medicinal purposes in urban parks. This path shows that green space has a major role in improving food security, especially in underdeveloped areas [22].

3.2. Prospective utilization

Ethnobotany is the study of the use of medicinal and pharmacological plants by particular ethnic groups in urban areas. However, due to ambiguous policies and the interaction of policies and practices of urban communities outside the formal policy circle, this study has received less attention. Natural sources and environments have long played an integral role in creating cultural performances and generating certain social meanings, particularly for religious and ceremonial purposes. Pharmacological investigations and community wisdom indicates that several tree in USU campus have the potential to treat a variety of diseases (Table 1). As much as 55.69% was used for the leaves, 11.4% for the stems, 1.25% for the wood, 1.25% for the roots. 50,635 fruits, 10.13% flowers, 3.79% roots.

Based on these findings, it is possible to conclude that, in addition to providing ecological

benefits to the environment, the trees on the USU campus have the potential to find a new source of natural medicinal substances for the community surrounding the university. The existence of trees with medical potential indicates that, in addition to being a biodiversity conservation area, the USU campus is also an area to provide potential herbal medicines for the community. Urban area with a diverse plant species composition provide an important role as habitats for biodiversity in urban systems, contributing to biodiversity conservation [23-24].

4. Conclusion

There are 65.29% of tree species in USU campus Padang Bulan poses medicinal properties, with the dominance of the Fabaceae family. Based on the part used, the leaf is the part that is often used, with the percentage reaching 55.69%. Meanwhile, based on their use, these tree species have various potentials such as anti-cancer, antimalarial, and fever medicine. The existence of information related to the possibility of these medicine provider is expected to increase the awareness of campus residents and managers in efforts to conserve potential tree species.

References

- [1] Tichomirova E and Sukhinina E 2021 Justification of educational institutions environmental reconstruction in accordance with the UI green metric rating and environmental standards *Arhitectură* **12**(2) pp 133-44
- [2] Nero B F, Benjamin B, Campion B B, Agbo N, Daniel C D C and Manfred D 2017 Tree and trait diversity, species coexistence, and diversity functional relations of green spaces in Kumasi, Ghana *Proc Eng* **198** pp 99-115
- [3] Nowak D J, Hirabayashi S, Doylec M, MCGovern M and Pasherc J 2018 Air pollution removal by urban forests in Canada and its effect on air quality and human health *Urban For Urban Green* **29** pp 40-8
- [4] Carol U, Colin R and John W 2005 *Trees Dorling Kindersley Limited* (London)
- [5] Sudha P and Ravindranath N H 2007 A Study of Bangalore urban forest landsc *Urban Plan* **47** pp 47-63
- [6] Webb R 1999 Urban and peri-urban forestry in South- East Asia: A comparative study of Hong Kong, Singapore and Kuala Lumpur in: *El-Lakany H* (Eds.) *Urban and Peri Urban Forestry: Case Studies in Developing Countries* (Fao Rome: Rome)
- [7] Scholl K, Gulwadi G and Betrabet G 2015 Recognizing campus landscapes as learning spaces *J Learn Spaces* **4**(1) pp 16-24
- [8] Wania A, Bruse M, Blond N and Weber C 2012 Analyzing the influence of different street vegetation on traffic-induced particle dispersion using microscale simulations *J Environ Manag* **94**(1) pp 91-101
- [9] Poursafar Z 2016 The Functions of plants in Asian Gardens: A Review on Asian Landscape Architecture *Int J Appl Environ Sci* **11** pp 525-533
- [10] Kondo M C, Fluehr J M, McKeon T and Branas C C 2018 Urban green space and its impact on human health *Int. J. Environ* **15**(445) pp 1- 28
- [11] Lee A C K and Maheswaran R 2010 The health benefits of urban green spaces: a review of the evidence *J. Public Health* **33**(2) pp 212-222
- [12] Susilowati A, Rangkuti A B, Rachmat H H, Iswanto A H, Harahap M M, Elfiati D, Slamet B and Ginting I M 2021 Maintaining tree biodiversity in urban communities on the university campus *Biodiversitas* **22**(5) pp 2839-47
- [13] Fonseca F N and Balick M J 2018 Plant-Knowledge Adaptation in an Urban Setting: Candomblé Ethnobotany in New York City *Econ Bot* **72** pp 56-70
- [14] Balick M J and Lee R 2001 Looking within: Urban ethnomedicine and ethnobotany: Alternative Therapies in Health and Medicine **7**(4) pp 114-5

- [15] Reiff M, O'Connor B, Kronenberg F, Balick M J, Lohr P, Fugh-Berman A and Johnson K D 2003 Ethnomedicine in urban environment: Dominican healers in New York city *Hum Organ* **62**(1) pp 12–26
- [16] Battersby J and McLachlan 2013 Urban food insecurity: A neglected public health challenge *S Afr Med J* **103**(10)
- [17] Monteiro M V B, Bevilaqua C M L, Palha M D C, Braga R R, Schwanke K, Rodrigues S T and Lameira O A 2011 Ethnoveterinary knowledge of the inhabitants of Marajó Island, Eastern Amazonia, Brazil *Acta Amazon* **41**(2) pp 233-42
- [18] Lemmens R H M J, Jansen P C M, Siemonsma J S and Stavast F M 2008 Basic List of Species and Commodity Grouping Version *Wageningen: Plant Resources of South-East Asia (PROSEA)*
- [19] Dogra K S, Chauhan S and Jalal J S 2015 Assessment of Indian medicinal plants for the treatment of asthma *Journal of Medicinal Plants Research* **9**(32) pp 851-862
- [20] Eichemberg M T, Amorozo M C M and Moura L C 2009 Species composition and plant use in old urban homegardens in Rio Claro, Southeast of Brazil *Acta Bot Brasilica* **23** pp 1057-75
- [21] Eichemberg M T and Amorozo M C M 2013 Contributions of the old urban homegardens for food production and consumption in Rio Claro, Southeastern Brazil *Boletim do Museu Paraense Emílio Goeldi* **8** pp 745-55
- [22] Leitao F, Leitao S G, Fonseca-Kruel V S, Silva I M and Martins K 2014 Medicinal plants traded in the open-air markets in the State of Rio de Janeiro, Brazil: an overview on their botanical diversity and toxicological potential *Revista Brasileira de Farmacognosia Brazilian Journal of Pharmacognosy* **24** pp 225-47
- [23] Ceuterick M I, Vandebroek, and Pieroni A 2011 Resilience of andean urban ethnobotanies: a comparison of medicinal plant use among Bolivian and Peruvian migrants in the United Kingdom and in their Countries of Origin *J. Ethnopharmacol* **136** pp 27-54
- [24] Ladio, A H and Molares S 2013 Evaluating traditional wild edible plant knowledge among teachers of patagonia: patterns and prospects *Learn Individ Differ* **27** pp 241-249