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A Preliminary Survey of Wild Flora of Atbara City- River Nile State - Sudan

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Abstract

This study was conducted in Atbara City, River Nile State, with the primary objectives of compiling a preliminary checklist of wild plant species, analyzing their taxonomic diversity and growth forms, contributing to the updating of Sudan's flora, and providing baseline data to support future ecological and applied studies on urban flora in Sudan A total of 103 angiosperm species belonging to 33 families were recorded—29 dicotyledonous and 4 monocotyledonous families. The Fabaceae was the most represented family, comprising 12 species, followed by Poaceae (Gramineae) with 10.species, and both Amaranthaceae and Asteraceae with 8 species each.The majority of the recorded species (84.5%) were herbs, while trees and shrubs constituted 15.5%. The most dominant species observed in the study area were *Calotropis procera* (Aiton) Dryand., *Leptadenia arborea* (Forssk.) Schweinf., *Senna alexandrina* Mill.and *Senna italica* Mill. The outcomes of this research establish a baseline for future studies, including quantitative ecological assessments, and invasive species monitoring. It is recommended that future research focus on examining the ecological functions, ethnobotanical relevance, and potential economic.

Keywords: *Wild Flora, Survey, Atbara City, Sudan.*

مسح اولي لفلورا النباتات البرية بمدينة عطبرة، بولاية نهر النيل ، السودان

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المستخلص

أُجريت هذه الدراسة في مدينة عطبرة بولاية نهر النيل، وهدفت بشكل رئيسي إلى إعداد قائمة أولية بأنواع النباتات البرية، وتحليل تنوعها التصنيفي وأشكال نموها، والمساهمة في تحديث فلورا السودان، فضلاً عن توفير بيانات أساسية تدعم الدراسات البيئية والتطبيقية المستقبلية حول النباتات الحضرية في السودان. وقد تم تسجيل عدد إجمالي بلغ 103 نوعًا من النباتات مغطاة البذور (كاسيات البذور)، تتبع 33 فصيلة نباتية، منها 29 فصيلة من ثنائيات الفلقة، و4 فصائل من أحاديات الفلقة. وكانت فصيلة البقوليات Fabaceaeهي الأكثرتمثيلا حيث شملت 12 نوعا تلتها الفصيلة النجيلية Poaeae ب 10 أنواع ثم كل من القصيلة القطيفية (Amaranthaceae) والفصيلة النجمية (Asteraceae) ب 8 أنواع لكل منهما. وأظهرت النتائج أن الغالبية العظمى(85.5%) من الأنواع المسجلة كانت من الاعشاب الأعشاب، في حين شكلت الأشجار والشجيرات ما نسبته (15.5%) وكانت الأنواع السلئدة في الدراسة *Calotropis procera* (Aiton) Dryand., *Leptadenia arborea* (Forssk.) Schweinf., *Senna alexandrina* Mill.and *Senna italica* Mill. تشكل نتائج هذه البحث أساسا للدراسات المستقبلية بما في ذلك تلك التي تتعلق بالتقيمات البيئية الكمية ومراقبة الأنواع الغازية. يوصى بأن تركز الأبحاث المستقبلية على دراسة الوظائف البيئية والأهمية الأثنونباتية والإمكانات الاقتصادية

الكلمات المفتاحية : *النباتات البرية ، مسح ، مدينة عطبرة .السودان*

Introduction

Flora represents the total composition of plant species in a given region and forms the basis for understanding biodiversity, ecological processes, and ecosystem services. Floristic studies are essential for documenting species richness, identifying ecologically important taxa, and providing baseline data for conservation and sustainable management (Nicolas *et al*., 2016) The first descriptive flora of the Sudan compiled by Broun and Massey (1929). The greatest compilation of the Sudan flora was achieved by Andrews **(**1950, 1952, 1956) which was considered as the standard reference of Sudan. . Recently, a great work has been done by Darbyshire, *et al.*(2015) Studies on regional floras include many works such as Hassan(1974) Wickens. (1976), El Ghazali (1985), Gumaa. (1988), Ibrahim (1996), Abdalla, (1997), Elsafori, (2000),Babiker (2001) Abdallah *et al.* (2016) Hamad (2020).

In Sudan, floristic surveys have traditionally focused on natural ecosystems such as riverbanks, islands, and valleys. However, urban flora remains largely understudied despite its increasing ecological relevance. Wild urban plants play a significant role in biodiversity conservation, support pollinators and birds, regulate urban microclimates, and act as bio indicators of environmental changes Kowarik, (2011) Mckinney (2008).

Urban plants come in two main forms: one cultivated by man and the other called spontaneous (Nicolas *et al*., 2016). Wild flora of cities composed of individual plants that grow independently, without being planted, and often without being cared for by people, such as wild grasses that can grow between the cracks in the ground; weeds that grow spontaneously in gardens where the soil has been turned over and trees or shrubs that grow on their own in empty lots.

In recent years, there has been growing scientific interest in the study of urban wild flora (Milica *et al.,*2017; Sadyrova *et al*., 2018; Alessandrini *et al*.. 2025). This interest is driven by the recognition that cities are home to the majority of the global population, and that urban vegetation provides essential ecosystem services such as air purification, temperature regulation, and enhancement of human well-being. Furthermore, research on urban flora contributes to our understanding of biodiversity conservation, tracks species' responses to urbanization and climate change, helps detect invasive species, and supports sustainable urban development in alignment with the Sustainable Development Goals (SDGs) (Aronson *et al.*, 2017). Therefore this study deals with investigation of the floristic composition and diversity of urban habitats in Atbara city. It represents the first systematic attempt to document the wild urban flora in a Sudanese city, focusing on Atbara, River Nile State. The aims of this study are to compile a preliminary checklist of wild plant species, analyze their taxonomic diversity and growth forms, also to contribute in updating the flora of Sudan, and to provide baseline data to inform future ecological and applied studies on Sudanese urban flora.

Materials and Methods

The Study Area

Atbara city is located in the River Nile State in northeastern Sudan, at the confluence of the Nile and Atbara rivers (17°42′7.9″ N, 33°59′11″ E).Atbara has a hot desert climate (Köppen climate classification *BWh*). The annual mean temperature reaches over 30 °C (86 °F) and the average highs exceed 40 °C (104 °F) during 7 months of the year. The annual average rainfall is 60 mm, mostly from July and August. The soil is **d**ark alluvial clays. The region also contains Aridisols/Calcisols (with calcretes, gypsum, and halite) and Vertisols (with characteristic slickensides and a large amount of smectite). These soils indicate past transitions between arid, semi-arid, and more humid climates.

Collection of materials and preparation of specimens:

Plant specimens were collected from different sites of the study area at different times of the year 2024 and 2025. The whole plant was collected in case of herbs and twigs with leaves and flowers and /or fruits in case of shrubs and trees.

The specimens were stretched to dry between newspapers and firmly pressed inside a herbarium press. Newspaper was continuously changed during the drying to avoid rotting of material. Subsequently, the specimens were mounted and labeled. Voucher herbarium specimens of different plant samples were deposited at the Herbarium of Biology Department, Faculty of Education, Nile Valley University.

Plants Identification Method:

Fresh specimens were examined through the aid of hand lenses and binocular dissecting microscope. The identification of plant specimens was confirmed using published keys by Andrews **(**1950, 1952, 1956) and by comparing specimens with those in "virtual herbaria" available online: https://www.gbif.orgThe identified species were compared with already identified herbarium specimens from herbarium of Biology Department, Faculty of Education, Nile Valley University. Name of the species with authority and family were verified by using the online database Tropicos (https://www.tropicos.org)

The vernacular names of species were recorded from local inhabitants within the study area and also extracted from Braun and Massey (1929), Andrews, (1949) and Wickens. (1976).

Photography:

The photography of selected plants was done with Smart Phone.

Data Presentation:

A table was prepared including scientific name, family, local name, and growth form for each species.

Results and Discussion

The present study revealed a total of 103 species of angiosperms belonged to 33 families (29 Dicotyledonous and 4 Monocotyledon). Results are shown in Table 1

Table: 1. List of the plant species in the study area

S. No	Family	Scientific Name	Vernacular name	Habit
1	**Acanthaceae**	*Ruellia tuberosa* L.	Tagtaq	Herb
2	**Aizoaceae**	*Glinus lotoides* L.	Terba	Herb
3	_	*Sesuvium sp*	_	Herb
4	_	*Trianthema portulacastrum* L	Danab el naga	Herb
5	_	Zaleya pentandra (L.) Jeffery	Al- raba'a	Herb
6	**AMARANTHACEAE**	*Aerva javanica* (Burm. f.) Juss. exSchult	Ras El- shayeb	Herb
7	_	*Alternanthera nodiflora* R. Br.	Abu tamra	Herb
8	_	*Amaranthus graecizans* L.	Lissan el Tair	Herb
9	_	*Amaranthus spinosus* L.	Lissan el Tair Abushouk	Herb
10	_	*Amaranthus viridis*	Lissan el Tair	Herb
11	_	*Chenopodium album* L.	_	Herb
12	_	*Chenopodium murale* L.	Efain	Herb
13	_	*Digera muricata* (L.) Mart.	Lablab ahmer	Herb
14	**Apocynaceae**	*Calotropis procera* (Aiton) Dryand.	Usher	Shurb
15	_	*Leptadenia arborea* (Forssk.) Schweinf.a	Lewais/ Sho'bait	Vine
16	_	*Oxystelma esculentum* (L. f.) Sm.	Lewis	Vine
17	**ARECACEAE (PALMAE)**	*Hyphaene thebaica*(L.) Mart	Dom	Tree
18	_	*Phoenix dactylifera* L.	Nakhil	Tree
19	**Aristoiochiaceae**	*Aristolochia bracteolata* Lam.	Umm Glagel	Herb
20	**Asteraceae**	*Ageratum conyzoides* (L.) L.	RehanElguroof	Herb
21	_	*Amborosia maritima* L.	Damseesa	Herb
22	_	*Eclipta prostrata* (L.) L.	_	Herb
23	_	*Pulicaria crispa* Sch.Bip.	Ghubeira	Herb
24	_	*Pulicaria undulata* (L.)Mey.	Al Tagar. Rabl	Herb
25	_	*Sonchus oleraceus* L.	Molita	Herb
26	_	*Sphaeranthus suaveolens* (Forssk) DC.	Sirr Elward	Herb
27	_	*Xanthium brasilicum* Wallr	Lusseig	Shrub
28	**Brassicaceae**	*Brassica nigra* (L.) K.Koch		Herb
29	_	*Lepidium niloticum* (Delile) Sieber	Rashad	Herb
30	_	*Morettia canescens* Boiss	Ghubeira	Herb
31	**Boraginaceae**	*Echium rauwolfii* Del.	_	Herb
32	_	*Heliotropium bacciferum* Forssk	Ghubeira	Herb
33	_	Heliotropium europaeum L	_	Herb
34	_	Heliotropium pallens	Zanab El Akrab	Herb
35	**Capparaceae**	*Capparis decidua* (Forssk.) Edgew	Tundub	Shrub

36	**CHENOPODIACEAE**	Salsola baryosma (Schult) Dandy	Abo Elfein	Herb
37	_	Salosla imbricate		
38	**Cleomaceae**	*Cleome gynandra* L.	Tamalaika	Herb
39	**Convolvulaceae**	*Convolvulus arvensis* L.	Al ulliq	Vine
40	**CUSCUTACAE**	*Cuscuta hyalina Roth*	Hamool	Vine
41	**Cucurbitaceae**	*Citrullus colocynthis* (L.) Schrad.	Hundal	Herb
42	_	*Cucumis melo* L.	Hummeid	Vine
43	**Cyperaceae**	*Cyperus michelianus* (L.) Link.	Siada	Herb
44	_	*Cyperus rotundus* L.	Siada	Herb
45	**Euphorbiaceae**	*Chrozophora plicata* (Vahl) A. Juss. Ex Spreng.	Tirba	Herb
46	_	*Euphorbia hirta* L	Um Lebaina	Herb
47	_	*Euphorbia hypericifolia* H.K.F.	Um Lebaina	Herb
48	_	*Euphorbia granulata* Forssk	Um Lebaina	Herb
49	_	*Euphorbia prostrate* Ait.	Um Lebaina	Herb
50	_	*Ricinus communis* L.	Khirwia	Shrub
51	_	*Phyllanthus niruri L.*	Al - Rageega	Herb
52	**Fabaceae**	*Alysicarpus monilifer* (L.) DC	Fraish	Herb
53	_	*Indigofera hochstetteri* Bak.	_	Herb
54	_	*Indigofera oblongifolia Forssk*	Dahasseir	Under shrub
55	_	*Mimosa pigra* L.	Al sit -El Mustahia	Shrub
56	_	*Pithecellobium dulce* (Roxb.) Benth.	Tamr Hindi	Tree
57	_	*Prosopis glandulosa* Torr	Mesquite	Shrub
58	_	*Rhynchosia minima* (L.) DC.	Adan El Far	Herb
59	_	*Senna alexandrina* Mill	Sanamaka	Herb
60	_	*Senna italica* Mill	Sanamaka	Herb
61	_	*Sesbania hepperi* J.Gillett..	_	Herb
62	_	*Tephrosia apollinea* (Delile) Link.	Amayoga	Under Shrub
63	_	*Tephrosia uniflora* Pers.	Amayoga	Herb
64	**Lamiaceae**	*Ocimum basilicum* L.	Rehan	Under shrub
65	**Lythraceae**	*Ammannia baccifera* L.	Tamar Alfar	Herb
66	**Malvaece**	*Abutilon figarianum* Webb.	Humbuk	Herb
67	_	*Abutilon pannosum* (G.Forst.) Schltdl	Hambuk/ Gargadan	Under shrub
68	_	*Corchorus depressus* (L.) Stocks	Suteiha	Herb
69	_	*Corchorus tridens* L.	Molokhia	Herb
70	_	*Hibiscus trionum* L	_	Herb
71	**Meliaceae**	*Azadirachta indica* Adr. Juss.	Neem	Tree
72	**Molluginaceae**	*Glinus lotoides*	Terba	Herb
73	**Nyctaginaceae**	*Boerhavia coccinia* Mill.	_	Herb

74	_	*Boerhavia erecta*	Terba	Herb
75	_	*Boerhavia repens* L	Shukal el kheil	Herb
76	**Orobanchaceae**	*Striga hermonthica* (Delile) Benth.	EL.Boda	Herb
77	**Papaveraceae**	*Argemone mexicana* L.	Khashkhash	Herb
78	**Poaceae**	*Chloris virgata* Sw.	Umm faru	Herb
79	_	*Cynodon dactylon* (L.) Pers	Nagil	Herb
80	_	*Dactyloctenium aegyptium* (L.) Willd.	Umm asabee	Herb
81	_	*Desmostachya bipinnata* (L.) Stapf	Halfa	Herb
82	_	*Dichanthium annulatum* (Forssk.) Stapf.	Umm Firada	Herb
83	_	*Digitaria ciliaris (*Retz.) Koeler	Umm Faru	Herb
84	_	*Dinebra retroflexa (*Vahl) Panz	Umm Mamleha	Herb
85	_	*Echinochloa colonum* (L.) Link	EL -Difra	Herb
86	_	*Eragrosits ciliaris* (L.) R.Br.	Zeal ALghed	Herb
87	_	*Polypogon viridis*	_	Herb
88	**Portulacaceae**	*Portulaca oleracea* L.	Regla	Herb
89	_	*Portulaca quadrifida* L.	_	Herb
90	**Rhamnaceae**	*Ziziphus spina Christi* (L.) Willd	Sider	Shrub
91	**Rosaceae**	*Potentilla supina* L.	Sifairt el Bahr	Herb
92	**Sapindaceae**	*Cardiospermum halicacabum* L	_	Vine
93	**Solanaceae**	*Datura innoxia* Mill.	Sakran	Undershrub
94	_	*Datura stramonium* L.	Sakran	Undershrub
95	_	*Physalis angulata* L.	_	Herb
96	_	*solanum Dubium* Fresen	Gubein	Herb
97	_	*Solanum nigrum* L.	Enab El Deep	Herb
98	_	*Withania somnifera* L.	Sem Alfar	Herb
99	**Typhaceae**	*Typha domingensis* Pers.	_	Herb
100	**Zygophylaceae**	*Balanites acgyptiaca* (L.) Del.	Higleeg - Laloub	Tree
101	_	*Fagonia indica* Burm. f.	Um-shweeka	Herb
102	_	*Tribulns pentandrus* Forssk	Deresia	Herb
103	_	*Tribulus terrestris* L.	Dereisa	Herb

The Fabaceae is the most common family with12 species in the study area. It followed by Poaceae (Graminae) with 10 species, then Amaranthaceae and Asteraceae with 8 species for each one. These families were well represented in the study area, which may be attributed mainly to the suitability of these habitats of the members belonging to these families, this result is in consistent with patterns observed in disturbed and xeric habitats in Sudan. In contrast, certain families were poorly represented, with some having only a single recorded species, while others were entirely absent. This discrepancy may reflect both ecological specificity and anthropogenic influences such as land-use change and habitat degradation (.Fig. 1) some species seen in their growth environments.

The majority of recorded species were ephemeral and annual herbs, accounting for approximately 87 species (84.5%), whereas trees and shrubs were represented by only 16 species (5 tree and 11 shrub species), making up to 15.5% of the total flora. The dominance of herbaceous and annual plants is indicative of their capacity to rapidly colonize disturbed soils and vacant urban plots, while shrubs and trees indicate species capable of tolerating arid conditions and human disturbances.

The abundant flora of Atbara city is particularly the following species: *Calotropis procera* (Aiton) Dryand, *Leptadenia arborea* (Forssk.) Schweinf, *Senna alexandrina* Mill and *Senna italica* Mill, the dominant above mentioned species of the wild flora in Atbara City can be attributed to their strong ecological adaptability to the semi-arid climate of the region. These species are drought-tolerant xerophytes that thrive under high temperatures and low rainfall conditions typical of northern Sudan (Hassan *et al*., 2015).

Senna alexandrina and *Senna italica* are legumes capable of tolerating poor, sandy soils while contributing to soil fertility through biological nitrogen fixation (Gutterman, 2002). *Calotropis procera*, on the other hand, is highly tolerant to salinity and nutrient-poor substrates, which gives it a competitive advantage in disturbed and marginal habitats (Sharma et al., 2010). These species also exhibit effective seed dispersal mechanisms: *Calotropis procera* and *Leptadenia arborea* produces light, hairy seeds dispersed by wind over long distances, while Cassia species produce hard-coated seeds that can remain viable under harsh conditions and germinate after rainfall. Hard or impermeable seed coat is a mechanism that insures the survival of Senna (Abdulazeez, 2016).

Although the current survey was conducted within Atbara, which is part of the four southern localities of River Nile State, earlier studies were conducted about 25 years ago and concentrated in documentation of plants natural habitats, including riverbanks, islands, valleys, and agricultural areas, while the present research targets urban habitats, such as streets, vacant lots, parks, and industrial zones. Accordingly, riparian Acacia trees along the Nile and Atbara rivers and grasses in large irrigated agricultural projects were deliberately excluded to focus on truly urban wild flora.

Comparison with historical data reveals notable differences in species composition and dominance. While families such as Fabaceae and Poaceae were abundant in both surveys, several species recorded previously in natural habitats are absent in the urban environment,

likely reflecting habitat modification, urbanization pressures, and altered ecological dynamics. This comparison underscores the emergence of unique urban plant communities and highlights the importance of documenting and monitoring urban flora as a distinct component of regional biodiversity.

Conclusion

This survey provides the first comprehensive documentation of wild urban flora in Atbara City, Sudan, recording around 103 species from over 33 plant families. The study highlights the resilience of urban plants in semi-arid environments and their contributions to biodiversity and urban ecological functions. While the current work focused on species presence and classification, it establishes a baseline for future studies, including quantitative ecological assessments, and invasive species monitoring.

Recommendations:

This study provides a comprehensive floristic inventory of wild plants in Atbara City, documenting species diversity, families, local names, and growth forms. It is recommended that further studies be conducted to analyze the ecological roles, ethnobotanical uses, and potential economic importance of the urban flora. Such follow-up research will complement the current inventory and provide a deeper understanding of the functional and applied aspects of Atbara's wild urban plants.

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https://www.gbif.org.

https://www.tropicos.org.

Appendix (Fig. 1)

Hyphaene thebaica (L.) Mart

Tribulus terrestris L.

Corchorus depressus (L.) Stocks

Leptadenia arborea (Forssk.) Schweinf.a

Calotropis procera (Aiton) Dryand

Typha domingensis Pers

+Fig.1. Some species seen in their growth environments