

BOTANICAL ATTRIBUTES AND UTILITY INDICES OF SOME GRASSES OF ANAMBRA STATE

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ABSTRACT

A scientific study of the grass species of Anambra State was undertaken between January and December, 2020. The aim is a holistic identification of the grasses and determination of their Botanical attributes and Economic relevance. Samples were collected from Awka, Nnokwa (Anambra Central), Onitsha, Igbariam (Anambra North), Nnewi and Uli (Anambra South) to cover the three Senatorial zones of the State. The Design of the Study is Descriptive Field survey method. Taxonomic key employed in the identification of the grasses was basically, the tentative physiognomic – Ecological classifications of plant formations of the Earth. Height category: Blade length and flower colour were all established directly in the field by means of meter rule, measuring tapes, matchets, camera and visual observations. Questionnaires were also employed to capture the utility indices. At the end of the studies, 42 grasses were identified all from the grass family-Poaceae; perennial and annual grasses were numerically almost at par (21:21); small, average (30cm-1m), and (1.2m) very small grasses (<30cm), were more preponderant than big (2-4m) and very big (>4m) grasses; white, green and purple dominated flower colour; most grasses were useful in erosion control, as animal fodder species, as human food, ornamentals and medicinal plants. The only grasses in Anambra State that are given a measure of regard (respect) include: food species, fodder species, ornamental grasses and very few that has industrial relevance. Others are treated as unwanted plants.

Keywords: *taxonomic keys, ecological classification, annual grasses, utility indices, botanical attributes.*

1. INTRODUCTION

On grasses, the Holy Bible KJV (2014) stated as follows: ‘all flesh is grasses – the implication: Grass-a member of the Poaceae group of Monocotyledonous flowering, photosynthetic plants is a principal sources of staple diet (food) for every civilization on earth (past and present). Other than the cereals (maize, rice, wheat etc,) the Bamboo, cane sugar and many animal fodder species are grasses – this therefore underlies the indispensability of the grass family poaceae to man, his offspring’s and his livestock. The Longman Dictionary of contemporary English 3rd Edition (2000) defines Grass as, ‘a very common plant with thin green leaves that grows in fields and is often eaten by animals’. In his own contribution, Hays, J (2011), stated that Grasses, or more technically graminoids, are monocotyledonous, usually herbaceous plants with narrow leaves growing from the base. They include the ‘true grasses’, of the family poaceae (Gramineae), as well as the sedges (Cyperaceous) and the rushes (Juncaceous).

The true grasses include cereals, bamboo and the grasses of lawns (turf) and grassland. Sedges include many wild marsh and grassland plants, and some cultivated ones such as water chestnut (*Eleocharis dulcis*) and papyrus sedge (*Cyperus papyrus*). Poaceae have hollow stems called culms plugged at intervals by solid

leaf-bearing nodes. Grass leaves are nearly always alternate and distichous (in one plane), and have parallel veins. Each leaf is differentiated into a lower sheath hugging the stem and a blade with entire (i.e., smooth) margins. The leaf blades of many grasses are hardened with silica phytoliths, which discourage grazing animals; some such as sword grass are sharp enough to cut human skin. A membranous appendage or fringe of hairs called the ligule lies at the junction between sheath and blade, preventing water or insects from penetrating into the sheath. Flowers of Poaceae are characteristically arranged in spikelets, each spikelet having one or more florets. The spikelets are further grouped into panicles or spikes. A spikelet consists of two (or sometimes fewer) bracts at the base, called glumes, followed by one or more florets. A floret consists of the flower surrounded by two bracts, one external-the lemma-and one internal-the palea. The flowers are usually hermaphroditic-maize being an important exception- and anemophilous or wind-pollinated. The perianth is reduced to two scales, called lodicules that expand and contract to spread the lemma and palea: these are generally interpreted to be modified sepals. The fruit of Poaceae is a caryopsis, in which the seed coat is fused to the fruit wall.

Uses for graminoids include food (as grain, sprouted grain, shoots, or rhizomes), drink (beer, whisky, vodka), pasture for livestock, thatch, paper, fuel, clothing, insulation, construction, sports turf, basket weaving and many others. Many types of animals eat grass as their main source of food, and are called graminivores – these include cattle, sheep, horses, rabbits and many invertebrates, such as grasshoppers and the caterpillars of many brown butterflies. Grasses are also eaten by omnivorous or even occasionally by primarily carnivorous animals. Grasses are unusual in that the meristem is located near the bottom of the plant, hence can quickly recover from cropping at the top. Grass is important in many sports, notably with those played on fields such as American football, Association football, baseball, cricket, and rugby. Sports such as golf, tennis and cricket are particularly dependent on the quality of the grass on which the sport is played.

Ornamental grasses, such as perennial branch grasses, are used in many styles of garden design for their foliage, inflorescences, seed heads, and slope stabilization. They are often used in natural landscaping, xeriscaping, contemporary or modern landscaping, wildlife gardening, and native plant gardening. Agricultural grasses grown for their edible seeds are called cereals or grains (although the latter-term, cereals – rice, wheat and maize (corn) – provides more than half of all calories eaten by humans. Of all crops, 70% are grasses. Cereals constitute the major source of carbohydrates for humans and perhaps the major source of protein, and include rice in Southern and Eastern Asia, maize in Central and South America, and wheat and

barley in Europe, Northern Asia and the Americas. Sugarcane is the major source of sugar production. Many other grasses are grown for forage and fodder for animal feed, particularly for sheep and cattle, thereby indirectly providing more human calories. Grasses are used for construction. Scaffolding made from bamboo is able to withstand typhoon-force winds that would break steel scaffolding larger bamboos and *Arundo donax* have stout culms that can be used in a manner similar to timber, and grass roots stabilize the sod of sod houses. *Arundo* is used to make reeds for woodwind instruments, and bamboo is used for innumerable implements. Grass fiber can be used for making paper, and for biofuel production. *Phragmites australis* (common reed) is important in water treatment, wetland habitat preservation and land reclamation in Afro-Eurasia. Again, grasses are the primary plant used in lawns, which themselves derive from grazed grass-lands in Europe. They also provide an important means of erosion control (e.g., along roadsides), especially on sloping land (Lindstrom and Bartling (2003).

According to the Grolier Science Encyclopedia (2002), about ten percent of all plant species in the world are listed as endangered. Plants are a rich genetic resource, but everywhere wild plants are allowed to die out, even though there are many ignored or unknown plants which could be important in the future for food or medicine. Farmers and breeders alike are concentrating on growing fewer main species. Reserves and gene-banks have been set aside to protect the wild relatives of crop species – for example, there are 12,000 types of wheat and maize. In the future, powerful companies may try to copyright any new plants, together with their ‘own-brand’ herbicides, which farmers would have to buy. Natural environments most in danger include tropical forests, wetlands and coral reefs. Some experts warn that by the year 2050 half the species alive today could have vanished unless action is taken quickly. The loss of a single plant species is a tragedy, because with each plant, as many as 30 species of animals may also face extinction, depending as they do on that plant for food or shelter. Each species is a storehouse of genetic resources. The rosy periwinkle is a plant of the forests of Madagascar. Drugs made from this plant can help children suffering from leukemia (a form of cancer). If the periwinkle had died out, its medical value would never have been known.

The aims of this study are to identify the botanical attributes and utility indices of some common grasses of Anambra and ascertain their economic importance

2. LITERATURE REVIEW

In the tropical ecosystem, Grasses are found in Savannahs. According to Chapman and Reiss (1992), Savannahs are tropical grasslands, often with scattered trees (Whittaker, 1975). They are most extensive in

Africa, but are also found in Australia, South America and Southern Asia. Savannah is subject to fire. Fires may result from lightening or be started by humans. Much of the African Savannah is burnt each year. Savannah trees have thick bark which insulates the living cambium from the heat of the fire (Friday and Ingram, 1985). The savannah or grassland of East Africa is famed for its abundance of wildlife. Ecologists are only beginning to unravel the interspecific relationships in Savannah ecosystems. In Africa for example, the near extinction of elephants in certain areas may lead to an increase in woodland and accompanying decrease in grasslands. This has obvious consequences for the relative numbers of grazers and browsers. The removal of one species may therefore greatly affect the populations and species composition both of the flora and the fauna.

Hays, J. (2011) opines that the grass family is one of the most widely distributed and abundant groups of plants on earth. Grasses are found on every continent, and are absent only from central Greenland and much of Antarctica. Grass blades grow at the base of the blade and not from elongated stem tips. This low growth point evolved in response to grazing animals and allows grasses to be grazed or mown regularly without severe damage to the plant. Three general classifications of growth habit are present in grasses: Bunch type (caespitose), stoloniferous, and rhizomatous.

The success of the grasses lies in part in their morphology and growth processes, and in part in their physiological diversity. Most of the grasses divided into two physiological groups, using the C3 and C4 photosynthetic pathways for carbon fixation. The C4 grasses have a photosynthetic pathway, linked to specialized Kranz leaf anatomy, which allows for increased water use efficiency, rendering them better adapted to hot, arid environments and those lacking in carbon dioxide. The C3 grasses are referred to as cool season grasses, while the C4 plants are considered 'warm season' grasses; they may be either annual or perennial.

Akobundu and Agykawa (1998) recorded almost 90 grass and sedge species in their ground breaking pioneer work on West African weeds.

3. MATERIALS AND METHODS

3.1. Description of the Study Area.

Anambra State lies in South East Nigeria and was created in 1991. The State is made up of about 181 communities distributed in three senatorial zones of Central, North and South. Grass samples were collected from Awka, Nnokwa, Onitsha, Igbariam, Nnewi and Uli. Three of the towns mentioned represent campuses of the University (COOU) with subtle differences in climate biology and vegetation distribution grasses are

encountered in all outlying areas of the state. Anambra State lies in the tropical twin forest zone of Nigeria, although most parts have fallen into Southern Guinea Savannah vegetation as a result of Erosion, deforestation, paucity of fertile Agricultural lands, Grazing pressure and Infrastructural Development. Rainfall is preponderant from March to October yearly. Soil characteristics range from lateritic to clay; sandy soils and other mixes. Anambrarians are primarily entrepreneurs, civil servants, artisans, farmers and businessmen and women.

The taxonomic key utilized in this work was the 'tentative Physiognomic – Ecological classification of plant formations of the Earth (revised from Ellenberg and Mueller – Dombois, 1967a):

V. Terrestrial Herbaceous Communities. Grasses, graminoid and other herbaceous plants are predominant in the cover, but woody plants may be sparingly present (i.e., covering not more than 30%).

A. Savannas and related grasslands (tropical or subtropical grasslands and parklands). Trees or shrubs almost regularly present, often fire-scarred (fires frequent in the dry season).

I. Tall-grass savannas, dominated by broad-leaved and tall grasses (corresponding to relatively humid conditions within the tropics and sub-tropics). Hemieryptophytic caespitose grasses most frequent, yellowing, during the dry season, in general without cryptogams. Subdivisions are based on the distribution pattern and height of woody phanerophytes in the grassy matrix:

- a. Woodland with patches of tall grass savanna (woodland savanna) tree groups and isolated trees which are interspersed by small patches of grassland.
- b. Tall-grass savanna with isolated trees (tree savanna). Isolated trees dispersed more or less regularly over the grassy matrix with (i) evergreen broad-leaved trees (ii) palms (iii) deciduous trees and (iv) with extremely xeromorphic trees or succulents
- c. Tall-grass savanna with shrubs (scrub savanna). Strands of shrubs alternating in various patterns with grassland.
- d. Tall-grass savanna (grass savanna) practically without woody phanerophytes, in general due to anthropogenic influence. Normally called 'tropical grassland', but the grass cover is physiognomically identical to above –mentioned units.
- e. Flood savanna: Periodically inundated in various mosaic patterns with either palms or groups of other trees on raised positions. 1. with trees; 2. With scrub; 3. Without woody plants.

2. Short grass savannas, dominated by narrow leaved and more or less short grasses (indicating relatively drier conditions). In addition to perennial grasses, annuals are more frequent than in 1, in some places even predominant.
 - a. Short-grass savanna with isolated trees, with (i) evergreen trees (ii) deciduous trees (iii) xeromorphic trees except succulents, and (iv) with tree succulents
 - b. Short-grass savanna with shrubs.

In Anambra State both tall and short grasses are found all through the State often interspersed with each other and woody species. Prominent grasses in Anambra State could be categorized into *very big, average, small and very small grasses* groups.

3.2. Methodology

Grasses encountered in each of the three Senatorial Districts of Anambra State: Central (Awka and Nnokwa); South (Nnewi and Uli) and North (Onitsha and Igbariam) were identified, categorized, flower colour ascertained and finally the leaf blades were measured using measuring tape. Plants were snapped using a camera and blade lengths were recorded for every leaf found on the grass. At the end of the field survey, the lengths were reported as ranges in the result.

For the utility indices, questionnaires were employed to extract as much useful information as possible about the plant. Two hundred and forty questionnaires having twenty core questions were distributed to lecturers and farmers at the six towns under survey, at forty per town.

At the end, one hundred and eighty were recovered. The test item was face validated by lecturers at Uli (COOU) and test-retest method was used to establish reliability.

4. RESULTS

A total of 42 grass species belonging to the plant Family (Poaceae) were identified. 18 were perennials while 24 were annual grass species (Table 1). Small and very small grasses (22) dominated the grass species, while big and very big grass species were eighteen (18). Average-sized grasses were in the minority (Table 1). Blade length ranged from 2 to 150 cm; Flower colour was dominantly green-, yellow- and white hues, followed by purple and pink hues. Red, brown and bluish hues were less common (Table 1).

Table 1- Botanical attributes of Grass Species of Anambra State

Keys: VB = > 4m ; B = 2-4m; A= 1-2m; S=30-1m;VS < 30cm					
S/N	Botanical Name	Habit	Flower Colour	Blade length (cm)	Height category
1	Bambusa vulgaris Schrad.ex wendel	Perennial		14.5-31.5	Very big
2	Saccharum officinarum L.		Whitish	Whitish	Very big
3	Pennisetum purpureum	Perennial	Yellow white	>1m	Very big
4	Pennisetum pedicellatum	Annual	Purplish white		Average
5	Pennisetum Polystachion trin (linn.) schult	Annual/Perennial	Purple	10.7.46	Big
6	Andropogon gayanus kunthvarigayanus lowe	Perennial		±1m	Big
7	Andropogon tectorum Schum & thonn.	Perennial	Pale blue	94.5-140cm	Big
8	Cymbopogon citratus (DC) stapf.	Perennial	Brown	67-73.5	Small
9	Panicum maximum Jacquin	Perennial	Greenish	83-133	Big
10	Oplismenus burmanni	Annual	Pinkish red	3cm	Very small
11	Sorghum arundinaceum	Perennial		±1m	Big
12	Rottboellia cochinchinensis (lour.)clayton	Annual	Green	±1m	Big
13	Paspalum conjugatum Berg.	Perennial	Greenish yellow	15cm	Small
14	Imperata cylindrica (L.) Rauschel var. (Anderss.) C.E. Hubbard	Perennial	Silvery white	Entire length 130.5-188.8	Small
15	Hackelochloa granularis (Linn.) O. ktze	Annual	Greenish	13-80	Big
16	Zea mays L.	Annual	Golden yellow		Big
17	Oryza sativuum	Annual	Multicolouration		Big
18	Rhynchelytrum repens (Willd.) C.E. Hubbard	Annual	Purple-pinkish	5.1-21.5	Small
19	Setaria barbata (Lam.) kunth	Annual	Bluish	3-31	Average
20	Cynodon dactylon (L.)Persoon	Perennial		2.5-14.5	Very small
21	Sporobolus pyramidalis	Perennial	Green	2.5-27cm	Very small
22	Brachiana deflexa (Shumach) C.E. Hubbard ex Robyns	Annual		6.5-22cm	Very small
23	Eleusine indica (L.) Gaertn.	Annual	Light green	9.5-35.5	Very small

Table 1. Botanical attributes of Grass Species of Anambra State (continued)

Keys: VB = > 4m ; B = 2-4m; A= 1-2m; S=30-1m;VS < 30cm					
S/N	Botanical Name	Habit	Flower Colour	Blade length (cm)	Height category
24	Axonopus compressus (SW.) palisot de beauvois	Perennial		3.8-12.0	Very small
25	Chloris pilosa (Poir)	Annual	Purplish black	±20cm	Very big
26	Setaria pumila Roem & Shultz	Annual	Pinkish green	±15cm	Small
27	Sorghastrum bipennatum (Hack.) Pilger	Annual	Darkbrown	70-88.5	Very big
28	Pennisetum violaceum (Lam.) L. Rich	Annual	Yellowish purple	±150cm	Big
29	Paspalum scrobiculatum Linn.	Perennial	Reddish brown	5.5-31.5	Very small
30	Loudetia arundinacea (Hochst. Ex. A. Rich). Steud	Perennial	Golden brown	±70cm	
31	Cymbopogon giganteus Chiov.	Perennial		±60cm	
32	Echinochloa colona (Linn.)	Annual	Purplish green	±30cm	Small
33	Brachiara lata (Schumark) Link. C.E Hubbard	Annual	Reddish brown	±20cm	Small
34	Dactyloctenium aegyptium (Linn.) P. beauv.	Annual		±15	Very small
35	Eragrostis tremula Hochst. ex steud	Annual	Pinkish purple	±15	Small
36	Digitaria gayana (kunth) Stapf ex A. chev.	Annual	Grey green	±25	Small
37	Panicum repens Linn.	Perennial	Whitish green	±20cm	Small
38	Eragrostis tenella Linn.	Annual	Pale white-pink	±8cm	Very small
39	Perotis indica	Annual	Purple	2.0-5.5	Very small
40.	Hyparrhenia involucreta stapf	Annual	Greenish/Pink	±60cm	Small
41.	Hyperthelia dissoluta	Perennial	Yellow	±50cm	Big
42.	Setaria longiseta P. beauv.	Annual	Greenish yellow		Small

Blade length ranged from 2.0 to 150 cm. Grass flower colour were dominated by greenish, yellowish and whitish hues, followed by purplish and pinkish hues, while reddish, brownish and bluish hues were less common (Table 1).

In terms of economic relevance, it was observed that the bulk of the grasses are relevant for erosion control, followed by animal fodder species, ornamental grass species and grasses that have medicinal relevance. Quite a very small percentage is relevant as sources of food for man and industrial raw materials for the industries (Table 2).

Table 2- Utility indices of Grass species of Anambra State								
S/N	Botanical name	Common name	Food plant	Medicinal plant	Ornamenta l plant	Fodder species	Industrial raw materials	Erosion control
1	Bambusa vulgaris	Bamboo	✓	✓	✓	✓	✓	✓
2	Saccharum officinarum	Cane sugar	✓	✓		✓	✓	✓
3	Pennisetum purpureum	Elephant grass		✓		✓		✓
4	Pennisetum pedicellatum					✓		✓
5	Pennisetum polystachion	Feathery pennisetum				✓		✓
6	Andropogon gayanus	Ganbagrass				✓	✓	✓
7	Andropogon tectorum	Giant bluestem				✓	✓	✓
8	Cymbopogon citrattus	Lemon grass		✓		✓	✓	✓
9	Panicum maximum	Guinea grass				✓		✓
10	Oplismenus burmanii							✓
11	Sorghum arundinaceum							✓
12	Rottboellia cochinchinensis	Corn grass						✓
13	Paspalum conjugatum	Sour grass						✓
14	Imperata cylindrica	Spear grass		✓				✓
15	Hackelochloa granularis							✓
16	Zea mays	Corn/maize	✓	✓		✓	✓	✓
17	Oryza sativum	Rice	✓			✓	✓	✓
18	Rhyncheltrum repens	Blanket grass				✓		✓
19	Setaria barbata	Bristly foxtail				✓		✓
20	Cynodon dactylon	Couch/bahama grass			✓	✓		✓
21	Sporobolus pyramidalis							✓
22	Brachiara deflexa							✓
23	Eleusine indica	Bull grass				✓		✓

Table 2- Utility indices of Grass species of Anambra State (continued)								
S/N	Botanical name	Common name	Food plant	Medicinal plant	Ornamenta l plant	Fodder species	Industrial raw materials	Erosion control
24	Axonopus compressus	Broadleaf/ carpet grass			✓	✓		✓
25	Chloris pilosa	Finger grass						✓
26	Setaria pumila	Cattail grass						✓
27	Sorghastrum bipennatum							✓
28	Pennisetum violaceum							✓
29	Paspalum scrobiculatum	Ditch millet			✓			✓
30	Loudetia arundinaceum							✓
31	Cymbopogon giganteus					✓		✓
32	Echinochloa colona	Jungle rice						✓
33	Brachiara lata							✓
34	Dactyloctenium aegyptium	Crowfoot grass				✓		✓
35	Eragrostis tremula	Love grass						✓
36	Digitaria gayana							✓
37	Panicum repens	Couch/torpedo grass						✓
38	Eragrostis tenella	Feathery lovegrass						✓
39	Perotis indica							✓
40	Hyparrhenia involucreta	Roofing grass					✓	✓
41	Hyperthelia dissoluta	Tamborkie grass					✓	✓
42	Setaria longisetia P. beauv.							✓

5.1. DISCUSSION

Grasses are opportunistic, successional species that appear in any ecosystem where favorable conditions exist. 41 grass species were recorded in this work as opposed to 68 recorded by Akobundu and Agyakwa (1998). The difference was made up mainly of Aquatic species. In the book, 'Plants from the Niger Delta recorded by Nyananyo (2006), 18 grass species were highlighted as opposed to the 41 recorded in this work. Again the blade lengths recorded in Nyananyo's work was an almost replica of the ones encountered in this work. The diverse flower colour encountered in this work especially multi-coloured and colour combination (grass) inflorescence, matched very closely with those recorded by Akobundu and Agyakwa (1998) on the one hand, and Nyananyo (2006) on the other. Utility indices of the grass species also were in agreement with those of Barkill (1985), Nigeria Natural Medicine Development Agency (2008) which agreed that grasses are sources of food, medicine, fodder, ornamentals, industrial raw materials and erosion control agent for man and his livestock.

5.2. CONCLUSION

Grasses of Anambra State are quite vast and diverse! Most are evident during the rainy season, especially, annual species; perennial species are found holding the fort during the dry season because they are very hardy plant species. The greatest usefulness of grasses in Anambra State is in erosion control because the state is leading the erosion susceptible states in Nigeria, while, the greatest threat is incessant fire and trampling from pastoralists and their herds, mainly during the dry season. To save the grass of Anambra State from extinction, conservation through sustainable management is key.

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