The Role of Elephant Grass (*Pennisetum purpureum* L. Schumach) "Achara" in Global Food Security

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INTRODUCTION

Wild and neglected plants with nutritional potentials, such as elephant grass, constitute dietary diversity and have great under-exploited capacity for contributing to food security. Although primarily utilized as forage, elephant grass tender shoot is edible and a traditional relish from prehistoric times among some Igbo communities in Nigeria. It is used in combination with leafy vegetables in preparing soups which are consumed alongside *fufu*. Elephant grass has unique agronomic characteristics among them high stress tolerance, adaptability and yielding capacity. It is in fact judged one of the highest yielding Tropical forage grasses. Adopting stress-tolerant and high yielding crop varieties by agricultural systems was considered one of the mitigation options to override the negative impacts of climatic change, improve household food security and achieve sustainable livelihood (CGIAR, 2009).

The objective of the study was to

- determine the nutrient composition of elephant grass edible shoot and thus assess its potential contribution to alleviating the global burden of hidden hunger and food insecurity.

MATERIALS and METHODS

Fresh stem shoots of elephant grass *(Pennisetum purpureum* L. Schumach) were harvested from a farm in the University of Nigeria Nsukka Community and authenticated at the University Herbarium. The samples were cleaned to remove inedible parts, weighed and treated appropriately for the following analysis: proximate, mineral, vitamins, fatty acids, phytochemicals and antioxidant activity, using standard methods. Minerals were determined using an atomic absorption spectrophotometer (Model: GBC Avanta, version 2.02) equipped with the appropriate hollow cathode lamps of the various minerals. Vitamins were determined by reverse-phase high-performance liquid chromatography technique using Agilent 1100 series Model HPLC system. Fatty acids profile were determined by a gas chromatograph (HP 6890 version A.03.03, USA).

RESULTS AND DISCUSSION

Elephant grass edible stem was characterized by low calories (19.22 Kcal/100g), low sodium (4.59 mg/100g), high levels of iron (3.12 mg/100g) and potassium (515.43 mg/100g), and high K/Na ratio (K factor) of 112 compared to the K/Na ratio of 6-20 reported for some conventional vegetables. The level of iron in hundred gram portion of elephant grass edible matrix represent 17.35-39.04% adult Recommended Dietary Allowances (RDAs) of 8-18 mg/day for iron (Broadley and White, 2007). Elephant grass edible stem is therefore an important dietary source of Fe with potentials for reducing the prevalent Fe malnutrition which is considered a widespread problem affecting 60-80% of the world's population (Broadley and White, 2007). The high level of K in elephant grass also suggests that it has potentials for alleviating chronic diseases such as hypertension, congestive heart failure, cardiac arrhythmias, serious muscle weakness and bone fragility which are associated with K deficiency (Elson, 1992). The high K/Na ratio recorded for elephant grass edible stem further shows that it is capable of promoting excellent healthy body functions. Foods with high K factor are reported to prevent chronic disorders like heart disease and cancer and to promote health metabolic processes.

The edible matrix also contained high levels of B-group vitamins which are reported to occur in trace to insignificant amounts in all vegetables (Claudia, 1992). In fact, the concentrations of vitamins B_1, B_2, B_3 and B_6 (mg/100g fresh weight) in 100 g portion of the edible stem (1.23 mg/100g, 4.37 mg/100g, 12.35 mg/100g, 2.40 mg/100g and 17.23 mg/100g, respectively) adequately satisfy the RDAs for the respective B-vitamins (1.2, 1.2, 15, and 1.3 mg/100g, respectively) for normal healthy adults. All B- groups of vitamins are known to act as coenzymes in various important metabolic processes.

Elephant grass edible stem contained high levels of flavonoids (4.10%) and anthocyanins (0.20%) which have very high antioxidant activity. It also contained significant quantity of oil with high level of linolenic acid (11.45%), occurring at a level comparable to the concentration found in soybean (8%) which is the conventional source of linolenic acid. Essential fatty acids like linolenic acid are needed for normal biochemical processes and are supplied through dietary sources. They are especially implicated in lowering blood cholesterol, platelet aggregation, thrombosis and cardiovascular diseases (CVDs).

Elephant grass (*Pennisetum purpureum* L. Schumach)

Fresh elephant grass (*Pennisetum purpureum* L. Schumach) shoots

Fresh culms of bamboo shoot (*Phyllostachys bambusoides* Sieb) showing morphological resemblance to fresh elephant grass shoots

Edible inner tender stem (matrix) (soup/sauce-size cuts) of fresh elephant grass (*Pennisetum purpureum* L. Schumach) shoots

Table 1: Nutrient composition of fresh edible stem (matrix) of elephant grass (Pennisetum purpureum L. Schumach) shoots

Nutrient	Composition(mg/100 g Fresh weight)
Iron	3.12±1.22
Sodium (Na)	4.59±2.31
Potassium (K)	515.43 ±13.72
Zinc	0.48±0.04
Copper	0.13±0.02
Manganese	0.27±0.06
K/Na Ratio	112.29
Vitamin B_1	1.23±0.05
Vitamin B_2	4.37±0.44
Vitamin B_3	12.35±0.86
Vitamin B_6	2.40±0.11
Vitamin C	17.23±1.29
Folate (µg/100g)	332.83
Vitamin E	28.49
Alkaloids (%)	1.05±0.23
Flavonoids (%)	4.10±0.18
Anthocyanins (%)	0.20±0.03
Linolenic acid (18:3) (%)	11.45
Linoleic acid (18:2) (%)	15.67
Oleic acid (18:1) (%)	6.04
Ash (%)	1.59±0.01
Crude fiber	0.57±0.03
Fat (%)	1.03 ±0.01
Moisture (%)	94.32±0.13
Protein (%)	1.36±0.13
Carbohydrate (%)	1.13±0.07
Energy content (Kcalories/100g)	19.22±1.22

CONCLUSION

Elephant grass edible stem is an excellent source of B-vitamins, iron, potassium, phytochemicals and essential fatty acids, in addition to having attractive agronomic characteristics. Elephant grass therefore has enormous potentials for alleviating hidden hunger and providing food security. It is completely a stem vegetable that has an enjoyable crunchy textural quality after cooking, similar attributes reported for edible bamboo shoot. It can be included into all soups/sauces. Soups are daily consumed alongside *fufu* in Nigeria and many other parts of Africa. The implication is that elephant grass can be consumed daily to harness its dietary benefits. Indeed, integrating elephant grass into agricultural systems will not only significantly contribute to reducing the prevalent malnutrition and food insecurity in the world, but will also make significant economic contribution like edible bamboo shoot which is reported to be an important economic plant in China where it earns her over 20 million US dollars annually.

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