



The Environmental Health Benefits of Four Different Selected Vegetables (Saluyot Spp, Melissa Spp, Ocimum Spp and Talinum Spp), Procured in Serrekunda Market for Cosmopolitan Consumption Rate in the Gambia

Vincent Oyareme^{1*}, Eunice I. O. Osaji², Alagie Bah³

¹School of Agriculture and Environmental Sciences, University of the Gambia, Faraba-Banta, The Gambia

²Department of Physical and Health Education, Faculty of Education, Delta State University, Abraka Delta State, Nigeria

³World Agroforestry, Sky Blue Plaza Bijilo Annex Layout, Banjul, The Gambia

Email: *oyareme@gmail.com

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Abstract

This study was conducted to analyse the health benefits and medicinal values of four different selected vegetable species (*Corchorus olitorius*, *Melissa officinalis*, *Ocimum gratissimum* and *Talinum triangulare*) in three different families; *Malvaceae*, *Lamiaceae* and *Talinaceae* procured in serrekunda market for cosmopolitan consumption rate in the Gambia. A qualitative research design is adopted. Leafy vegetables play specific roles and form an important part of human diet that provides a cheap supplement and other source of nutrients such as minerals, vitamins, proteins, etc. to the body. In West Africa, particularly the Gambia, vegetables are vulnerable farm/garden outputs, due to the fact that they are staple food for humans in most areas in which rich sources of carbohydrate are mostly derived from, like any other plants such as cassava and potato, rice and maize, sorghum and millet, scent leaf and nana mint leaf, etc. It is important to observe their necessary condition for their increased and improved production of leafy vegetables due to their high significant photosynthetic capacity productivity as a potential point, resulting in achieving an increase output in crop productivity. They are mostly C4 plants which showed higher photosynthetic strength by suppressing photorespiration that occur mainly at low atmospheric carbon dioxide concentration, high light, high temperature, drought and salinity than C3 plants. They also have the ability and capability to convert carbon dioxide gas into organic matter more efficiently than the C3 plants. Analyses of data using simple percentage correlation showed that strongly agreed recorded the highest percentage rate

of 51.52% from responses of 170 people and disagree recorded the lowest percentage rate of 6.06% from 20 people responses to the questionnaire statement made on item number 8 as “Do you know that Saluyot Spp (*Corchorus olerius*) increases sexual libido, fertility and reduces bladder problem”. Chi-square showed the probability level of insignificance at $P > 0.05$, showed the level of insignificance goodness of fits on the population of sampled vegetable species on environmental unawareness health benefits and its medicinal values in the Gambia, other than the leaves colour ratio of 3 green and 1 yellow category, data can also be more than two depending on their phenotypic generational appearance. Efficient harvesting of these different vegetable species and proper awareness to the people on its medicinal value and health benefits brings about a sustainable environmental vegetable garden farming in the Gambia.

Subject Areas

Environmental Sciences and Public Health

Keywords

Vegetables, Human Health Benefits, Environment, Cosmopolitan Consumption Rates

1. Introduction

Leafy vegetables play specific roles and form an important part of human diet as they provide a cheap and other source of supplement nutrients such as minerals, vitamins, proteins, etc. to the body. In West Africa particularly, they are vulnerable farm outputs because they are staple food in most areas in which rich sources of carbohydrate are derived from, like cassava and yam tuber, rice and plantain, sorghum and millet, scent leaf and nana mint leaf, etc. They are herbaceous plants that complete their life cycle in a short period of time; as such they are called ephemeral. However, it is important to observe the necessary condition for increased and improved production of leafy vegetables. Photosynthetic strength is significant in vegetable production output in terms of their leaves and their succulent stems which serve as a potential point to achieve an increase in crop productivity according to studies done by [1] [2] [3]. Generally, they are C4 plants which showed higher photosynthetic strength than C3 plants. This study is used to evaluate environmental health benefits of four different selected vegetables, such as Saluyot spp (*Corchorus olerius*), Nana leaf (*Melissa officinalis*), Scent leaf (*Occimum gratissimum*), and water leaf (*Talinum triangulare*) from three different families such as *Malvaceae*, *Lamiaceae* and *Talinaceae*.

Plant species procured in Serrekunda market for its cosmopolitan consumption rates in the Gambia which is one of the most common consumable leafy green vegetables in the West African communities' diet. Species of vegetables have dramatically decreased significantly compared to other renewable resources

of plants harvested in the environment that are procured in the market. The procured vegetable species richness and abundance diversity had significantly declined also; this is because of the approaches and methods deployed in harvesting, which involves total uprooting of these vegetable species. This does not make the harvesting sustainable but rather unsustainable supply and inefficient to the demand consumption rate. The harvesting of these vegetables is supposed to be either cutting of the succulent stems with a sharp knife that will enable multiple sprouting out of many branches which makes supply sustainable and sufficient for highly demand rates in the market. Unsustainable harvesting method of these vegetables has resulted to limited supply due to vegetable exploitation and over harvesting. On the other hand, the exploration harvesting method, that is the efficient strategy, had attracted a sustainable harvesting method that had been adopted; resulting in continues supply of vegetable species, hence making various individuals get the quantity they want for their daily consumption rate. But vegetable exploitation brings about a shortage supply in the market, due to unawareness of vegetable harvesting approaches to the farmers and gardeners in the Gambia, although they contained single cell protein and fibres, farming practices are poorly planned, according to work done by [4]. In the Gambia and other West African countries, scent leaf is commonly known as Basil, scientifically known as *Occimum gratissimum* plant species, it scientifically belongs to the mint family known as *Lamiaceae*. It is a homegrown shrub found in subsistence farms, gardens primarily used as spices for cooking food delicacies because of its fragrance flavour. The two common and popularly known species of plants in this family are the basil scent leaf (*Occimum gratissimum*) and Nana mint leaf commonly known as Lemon balm (*Melissa officinalis*), an ephemeral and annual, biennial and perennial herbaceous plant in the *Lamiaceae* mint family. It is a vegetable seasoning that adds a wonderful, distinct flavour and aroma to any dish. Any meal using fragrance leaves will make your mouth water, but there's more to it than that. Antibacterial, antifungal, and larvicidal activities abound in the plants. Scent leaf is useful in the treatment and prevention of infections and illnesses. It also contains necessary bioactive chemicals for human health, including iron, phosphorus, calcium, and vitamin A. The scent leaf is widely used among Nigeria's many tribes and other West African countries. It is mostly known for its cooking benefits in the preparation of a variety of dishes. It is a fragrance herb found in both tropics and subtropics part of the world. It is a plant species found in the southern and western parts of Nigeria, as well as other West African countries. This plant species is normally a perennial homegrown shrub, and it is usually used mainly as spices in cooking food delicacies as a result of its aromatic fragrance that gives a sweet taste to well prepared food. They have another sweet-smelling fragrance that makes it to be more popular than any other plant species in the *Lamiaceae* family. The plant act as an antioxidant booster against bacterial, fungal, and pyretic activities give it the prominent role in different diseases infections treatments and prevention in the environment; they are used also, as condiment and spices in food as well as its medicinal

health benefits like any other herbaceous vegetable plant species according to [5]. It also helps to keep wound surfaces medically sterile most especially neonatal umbilicus according to [6]. Scent leaf, unlike any other vegetable, is popularly and scientifically known as *Occimum gratissimum* that is developed fully into plant, bears flowers, propagated by seeds and stem cutting. It can grow in both tropical and subtropical parts of Africa with great characteristics of being variable according to [7]. Other species of plants like *Occimum africanum* are also found with similar characteristics. *Occimum africanum* is another related plant species with sweet fragrance that is used to spice our food to give a good taste. It is commonly and traditionally called basil leaf with lemon colouration, popularly called curry leaf in the plant family Rutaceae, other species like *Melissa officinalis*, popularly known as nana mint leaf used as local tea to boost the immune system in the Gambia. According to work done by [8], in his study, he stated that nutrients such as vitamins and minerals are good sources gotten from vegetables which help ease and quicken digestion of food in our body system. It also contains phytonutrients as well, which includes ascorbate, beta carotene, riboflavin, macro and micronutrients such as calcium, magnesium, iron, phosphorus, etc. according to the work done by [9]. Scent Leaves contain vital bioactive substances which confer it with the above-mentioned phytonutrient activities including; tannins, phenols, macro elements such as calcium, phosphorus, iron, vitamin A & C, and more, which are essential for human health. It is a fragrant plant that is cherished for its ability to improve food flavour as well as its medicinal properties. Species of scent leaf and other plant species in *Lamiaceae* mint family have been discovered to have antioxidant properties as against inflammatory, diabetic, antibacterial, antioxidant, anticancer, antimalaria, and anti-diarrhoea activities in variable degrees, as evidenced by multiple environmental scientist research. It also contains magnesium, a heart-friendly mineral that helps lower harmful cholesterol levels and enhances blood circulation in our body. Scent leaf is known also, by various names as a locally available plant in Nigeria and other African countries. It's worth noting that people have shown interest in, and even concern about, the effects of scent leaves on female fertility at various times. There are study suggestions that the herb can help female patients who are trying to conceive. Scent Leaf on female fertility nutritional values are about 100 g scent leaf contains the following as: Calories: 22, Fat: 0.6, Potassium: 295 mg, Protein: 3.2 g, Carbs: 2.7 g and Sodium: 4 mg. The best way of utilizing scent leaves is by preparing Scent Leaf Fertility Tea used for both males and females. Scent Leaf Fertility Tea (SLFT) for infection on female fertility. Scent leaf tea is made from the hot water and scent leaf mixture in your kettle; pour it into a cup, set it aside to warm, and sip. Simply said boiling your scent leaf extracts all of the nutrients present in the scent leaf and transfers them to the water in the kettle, which then becomes your scent leaf tea.

1.1. Health Benefits of Scent Leaf on Female Fertility

- It fights bad breath by killing germs in the mouth; it also treats fungal skin

infections.

- Its liquid extract (ascorbic acid) is effective against colds and catarrh.
- Food preservation is aided by the oil extract.
- Malaria and fever are treated with a mixture of scent leaves and bitter leaves.
- Its stick is particularly good for oral hygiene; chewing it cleans the mouth. It protects against halitosis.
- It's used to keep mosquitoes at bay.
- The juice of this plant (scent leaf juice) is used to treat earaches and colon pains.
- Scent leaves aids in the treatment of dysentery, diarrhoea, and vomiting.
- It improves digestion and relieves bloating
- It decreases blood sugar levels and protects the pancreas from harm.
- The arginine concentration of scent leaves helps preserve optimum penile health by repairing damage caused by smoking and nicotine.
- Scent leaf and fertility: The scent leaf contains the epigenin fenkhona and Eugenol, which aids rigidity.
- It encourages a breastfeeding woman to produce more milk. Scent leaf has a lactogenic effect.
- It helps to keep inflammation at bay that is anti-inflammation.
- Due to its antimicrobial properties, scent leaf oil can be used as a preservative.
- Scent leaf has been discovered to be beneficial to HIV/AIDS patients in recent studies.
- Traditionally, it was used to treat psychotic conditions.

1.2. Importance of Scent Leaf to Human in the Environment

1) Scent leaf can help in benefiting the eye health: Scent leaf contains relatively high amount of Vitamin A which has been proven to benefit eye health. It can also help to improve low light vision colour. Its deficiency could lead to health related issues including decline in eye health.

2) Scent leaf helps improve heart health: According to studies, Scent leaf contains certain minerals and antioxidants that can help reduce bad cholesterol in the body. This is one of the major reasons why it is used as a herbal medicine. It also helps in preventing heart arteries from clogging depending on the amount you took.

3) It helps in aiding digestion: If you are having digestion problems, taking scent leaf could really help you a lot. Drinking scent leaf tea could help speed up digestion and even prevent any possible heart burn.

4) It can help reduce blood sugar: Some research proves that scent leaf could help lower blood sugar. This study was made on mice, so more research needs to be made to prove this in human studies.

5) It could help treat anti-fungal infections: Research shows that scent leaf contains some anti-fungal properties that could help treat some infections when it is smeared and rubbed on the body.

Saluyot species are popular herbal species of plants, known for their excellent

sources of nutrients and minerals. Scientifically, it is called *Corchorus olitorius* that belongs to the *Malvaceae* family. It is commonly known as krin-krin in the Gambia and ewedu in Nigeria. Dried saluyot stalks are good sources of fuel used to support charcoal while cooking in the Gambia. The leaves also, are often used for its medicinal value, especially in boosting male sperm count. The health benefit of this plant species is what made it to be popular in West African countries.

1.3. Health Benefits of Saluyot Species

1) Saluyot plant species are rich in vitamins C and E, due to its antioxidants properties.

2) It also helps to improve vision (eyesight): because they are Vitamin A rich source.

3) This plant species are good for foetus during mother pregnancy, because it helps to reduce oxidative stress.

4) Saluyot plant species can also help to protect the liver: due to its antioxidant properties contained from the leaf extracts which help to protect the liver by detoxifying thioacetamide, a compound that is harmful to the organ.

5) It helps to fight against children ailment after delivery especially jaundice and other complicated issues that results to long-term damaging antibiotics.

Waterleaf are another vegetables that is rich in vitamin A & C. Study had shown that eating plenty of waterleaf vegetable in your diet help to reduce the risk of developing a disease known as Alzheimer's, which affects the thinking and reasoning age-related people. It is ephemeral herbaceous plant species that has a short life span before growing in maturity for consumption purposes. It is found in West African countries with its health and medicinal values. Waterleaf is a vegetable crop grown in Africa, Asia, and Central and South America [10]. This crop belongs to the purslane family, called Portulacaceae. Waterleaf (*Talinum triangulare* (Jacq.) Wild) is often used interchangeably with *Talinum fruticosum* (L.) [11]. Waterleaf is commonly known as spinach, in Philippine. Waterleaf is a short life-span species (ephemeral) and takes an average of only 30 - 45 days from planting to harvesting according to [12]. The edible leaves are soft, succulent, and highly nutritious. The plants of this crop can adapt to varying climatic conditions and low soil fertility. Waterleaf production is economically attractive due to low cost for seeds, pesticides, and herbicides for producing the crop. Like other leafy vegetables, waterleaf can be grown in home gardens as well.

1.4. Uses of Waterleaf

Waterleaf can also be used for ornamental purposes in the urban cities for urban greening and environmental protection [13]. Waterleaf can also be used in bioremediation for accumulating heavy metals from soil exposed to anthropogenic activities. This crop also helps in minimizing the impact of soil erosion. Waterleaf can be used as forage for rabbits [14]. A component of the plant extract in drinking water boosts the immune response of broiler chicks against virulent

Newcastle disease virus (NDV) [15]. Waterleaf extract serves as inhibitors of mild steel corrosion in acidic medium [16].

1.5. Health Benefits of Waterleaf

Waterleaf has chemical preventive activity against colon and breast cancers due to its squalene content [17]. Waterleaf may also have the potential for regulating cardiovascular diseases such as stroke and obesity [18]. Waterleaf can serve as a part of a weight-loss diet due to its high fiber content, and its leaves is used to treat several diseases, including measles [19]. Also, leaf and root extracts are used for treating asthma, fresh cuts, scabies, anaemia, and high blood pressure (hypertension) [20], as outlined below as:

- 1) It Enhances Cognitive ability and adequate brain functioning: It also contains micronutrients also help to improve and strengthened the muscles of the brain.
- 2) It helps to improve the white and red blood cells in the body.
- 3) It helps to promotes heart health by reducing cardiovascular heart related diseases and prevents the risk of having stroke due to adequate supply of blood and oxygen to the needed areas of the body. It also helps to reduce cholesterol levels in the blood.
- 4) It helps to fight against diseases and eliminates due to its different properties such as antibacterial, antifungal, and anti-inflammatory.
- 5) It helps to repairs body tissues as well as improving skin smoothness and pigment. Due to its high content of vitamin A, it also improves eye sight and clarity.
- 6) It contains calcium that helps for strong bones and teeth, also improves bone malfunctioning into normality.
- 7) It helps in digestion of other food substances in our body and also good for weight loss.

1.6. Waterleaf and Its Phytonutritional Constituent Values

Table 1. Waterleaf dietary based calories consumption.

Nutrient Links	Constituent Values
Calories	23.00
Total Carbohydrates	4.00 g
Protein (Macromolecules)	2.00 g
Total Fat	0.40 g
Sodium	36.00 mg
Vitamin A (Retinol)	54.00%
Vitamin C (Ascorbic acid)	47.00%
Calcium (Mineral)	11.00%
Iron (mineral)	25.00%

As shown in **Table 1**, waterleaf contains phytonutrients such as Vitamin A & C, Protein, Calcium, Iron, Pectin, and other essential nutrients and minerals [9].

2. Methods of Study

The method used in this research study is the qualitative methods, which involves the use of questionnaire as well bio data for a simplified and meaningful understanding of other researchers and reviewers on different selected vegetables species procured in the study area for their health benefits as well as their consumption rates.

2.1. Description of the Study Area

Serrekunda market is one of the biggest markets in the west coast region in the Gambia. The market is located in Serrekunda town, it have Latitude 13°26'17"N and Longitude 16°40'41"W. The market is about 3.00 km away from the major Serrekunda West field express road, and about 13.40 km away from the country capital city, Banjul. Serrekunda town is made up of nine different communities collectively formed her Local Government Area Council. It has the highest geopolitical zone; it has a population of 390,000 people. The town is one of the busiest commercial centres that show economically significant in the country due to its climatic zone locations. Nowadays, the town is a converging place for many commercial different activities. These joined commercial activities have its environmental and economic benefits to the town, this is as a result of revenue generated and other valuable goods and services practices that attract many people in different geographical locations in the country, this is made Serrekunda town the most popular in the Gambia.

2.2. Design of the Study

The design of this study is that which is based on qualitative method in Environmental health benefits of four different selected vegetables procured in Serrekunda market, Saluyot spp, Melissa spp, Scent leaf and potato leaf consumed by different people in the Gambia. The qualitative approach of the research involves the use of questionnaire for a descriptive research survey method adopted as well as questionnaire in order to meet the aim of the researchers in terms of data collecting, data evaluating and data analyses of this research (Vincent *et al.*, 2021).

2.3. Study of the Population

The population study comprises both male gender and female gender, between the ages of 18 - 50 year old. A total of three hundred and thirty (330) populations were selected in the Serrekunda market. Both educated and non-educated persons selected, were staying in this research area where those vegetables are sold.

2.4. Sample and Sample Techniques

Sampling techniques is randomly based on a systematic way of sample selection, for the purpose of this research for the station. Three hundred and thirty (330) persons were given questionnaire, which represent the population of those males

and females that responds to the questionnaire administered to them in the market on the health benefits of these selected vegetables to humans and the Environment for hygiene and public health of the people in the Gambia.

2.5. Tool for Data Collection (Research Instrument)

The tools for data collection in this research are the questionnaire. The questionnaires are subdivided in two different categories, category 1 & 2. Category 1 represents bio-data information and category 2 represent answers to responses of questions asked in this research as: Strongly Agree (SA), Agree (A), Strongly Disagree (SD) and Disagree (D).

2.6. Techniques for Collecting Data

The techniques used for data collection is the questionnaire. Questionnaire was administered to different people in the study commercial location, in order to ascertain the study aim and objectives. In addition to this, the questionnaires that were given out were interpreted in the best way understood by the respondents. According to [21], the confident interval (C.I), of 0.95% and the probability sample error of 0.05%; the letter 'n' represent the size of the sample, it is determined by a letter 'N' indicating people's total number (individuals) procuring these selected different vegetable species in Serrekunda market for their family consumption and environmental health benefits. A sufficient and appropriate sample survey for primary data collection was employed; furthermore, an arranged questionnaire statement is used for the people in the market for the health benefits of these different selected vegetable species.

2.7. The Analysis of Data

The analyses of data in this research employed simple correlation percentage, chi-square measurements to determine goodness of fit and association used in characterizing the respondent's responses. All analysis regarding to this research was done using descriptive statistics for statistical package for social sciences (SPSS) to characterize the data analyzed and represent them in the form of charts, figures and tables.

2.8. The Study Validity

The validity of the study quality is genuine with its authenticity test measures, it is designed on how it can be measured. It is constructed, structured and edited by colleague in the research team; from different Schools in University of The Gambia (UTG), as well as error substitution formed the final drafted questionnaire for this research.

2.9. Data Analysis Methods

The methods used in the data analysis in this research, employs simple correlation coefficient percentage, chi-square analyses for this research. As shown in

the expression below,

$$\text{Percentage}(\%) = \frac{\text{Total number of outcome}(N)}{\text{Total number of sample}(F)} \times 100$$

where,

F = Responses frequency,

N = responses number, and

% = Correlation coefficient percentage.

$$\text{Chi-Square} = \sum \frac{(\text{Observed frequency}(O) \text{ minus Expected frequency}(E))^2}{\text{Expected frequency}(E)}$$

$$\chi^2 = \sum (O - E)^2 / E$$

where,

O = observed frequency (People questionnaire were given to)

E = frequency expected (people questionnaire were not given to)

3. Results

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your journal for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper.

3.1. Data Analysis

Hypothesis Check

Null Hypothesis (H_0): States that these species of vegetables used as organic medicinal purposes for humans in the Environment does not show any significant difference.

Alternate Hypothesis (H_A): States that there is a significant difference of these species of vegetables used as organic medicinal purposes for humans in the Environment.

Table 3 show questionnaire statement 8 made in **Table 2**, to test for their level of significant in different responses as shown below.

Observed frequency for Agree (A) and strongly agree (SA) = 30.30 + 51.52 = 81.82% = 82%

Observed frequency for disagree (D) and strongly disagree (SD) = 6.06 + 12.12 = 18.18% = 18%

*To calculate for Expected frequency, f_1 3:1 Genetic existence is applicable:

$$E_1 = 100 (3/4) = 75, E_2 = 100 (1/4) = 25$$

Category of Response:	(A & SA)	(D & SD)
Observed frequency (O) =	82	18
Expected frequency (E) =	75	25
$(O - E) =$	7	-7
$(O - E)^2 =$	49	49

Table 2. The environmental and health benefits of four different selected vegetables: Saluyot Spp, Scent leaf, Melissa Spp and Water leaf procured in Serrekunda Market for cosmopolitan consumption rate in the Gambia.

No	QUESTIONNAIRE STATEMENT	RESPONSE							
		A	A %	SA	SA %	D	D %	SD	SD %
1	Are these species of vegetables used for medicinal purposes?	100	30.30	150	45.46	50	15.15	30	9.09
2	I'm not of aware of the health benefits of Scent leaf?	80	24.24	100	30.30	90	27.27	60	18.18
3	Are you aware that ascorbic acid (Vitamin C) is been gotten from <i>Occimum gratificimum</i> juice extracts?	70	21.21	120	36.36	60	18.18	80	24.24
4	Are you aware that Scent leaf is used for cardiac medication by cigarette smokers due to high amount of ascorbic acid extracts it contained?	70	21.21	60	18.18	30	9.09	170	51.52
5	Do other vegetables like water leaf contain vitamin C?	60	18.18	85	25.76	90	27.27	95	28.79
6	Are you aware that <i>Melissa officinalis</i> (mint plants) makes the body fits?	80	24.24	90	27.27	100	30.30	60	18.18
7	Do you know that species of Scent leaf (<i>Occimum gratificimum</i>) and mint plant <i>Melissa officinalis</i> are used as mosquitoes repellent in our homes?	120	36.36	110	33.33	50	15.15	50	15.15
8	Do you know that Saluyot Spp (<i>Corchorus olitorius</i>) increases sexual libido, fertility and reduces bladder problem?	100	30.30	170	51.52	20	6.06	40	12.12
9	Are you aware that Saluyot spp increases collagen production of the body to keep the skin firm and young looking?	80	24.24	65	19.70	50	15.15	135	40.19
10	Are you aware that <i>Corchorus olitorius</i> controls blood pressure and improve eyesight?	120	36.36	150	45.46	30	9.09	30	9.09
11	Do you know that <i>Corchorus olitorius</i> lowers the risk of asthma and also controls diabetes?	95	28.79	115	34.85	91	27.8	29	8.79
12	I am aware that Saluyot Spp (<i>Corchorus olitorius</i>) reduces stomach aches, ulcer and reduces Arthritis?	85	25.76	80	24.24	75	22.23	90	27.27
13	Do you know that waterleaf vegetables contain vitamin A for essential healthy eyes clarity?	100	30.30	120	36.36	65	19.70	55	16.67
14	Are you aware that Saluyot spp reduces Arthritis and strengthens the bones and teeth because of its high calcium contents?	100	30.30	130	39.40	80	24.24	20	6.06
15	Are you aware that leafy vegetables nourish the body circulatory system?	85	25.76	120	36.36	65	19.70	60	18.18
16	Are you aware that vegetable delicacy help to reduce body fat instead of going to the gym centre?	100	30.30	150	45.46	30	9.09	50	15.15
17	Are you aware that vegetables have the essential vitamins needed by the body building?	80	24.24	130	39.39	50	15.15	60	18.18
18	Are you aware that vegetables helps in bioremediation of the soil and add fertility to the soil?	30	9.09	70	21.21	130	39.40	100	30.30

Sample size, N = 330, Correlation coefficient percentage (%), Probability Confidence interval (C.I) of Pro. level, 0.95%, Pro. error, 0.05%.

Table 3. Level of significant in different responses.

No.	QUESTIONNAIRE STATEMENT	RESPONSES			
		A %	SA %	D %	SD %
8	Do you know that Saluyot Spp (<i>Corchorus olitorius</i>) increases sexual libido, fertility and reduces bladder problem?	30.30	51.52	6.06	12.12

Apply the formula,

$$\chi^2 = \sum (O - E)^2 / E$$

or

$$\begin{aligned} (O - E)^2 / E &= 49/75 + 49/25 \\ &= 0.623 + 1.96 \\ &= 2.583 \end{aligned}$$

Chi-Square, $\chi_{cal}^2 = 2.583$ **

Chi-Square, $\chi_{0.05 \text{ tab. } 1}^2 = 3.841$

Calculated value 2.583 is less than the critical value 3.841 ($2.583 < 3.841$), we accept null hypothesis at ($P > 0.05$), which showed the level of insignificance goodness of fits on the population of sampled vegetable species Environmental unawareness health benefits and medicinal values in the Gambia, other than the leaves colour ratio of 3 green; 1 yellow, the category of data can be more than two depending on their phenotypic generation.

3.2. Discussion

The results summarized in **Table 2** showed the number of people that responded to the statement number 1 “Are these species of vegetables used for medicinal purposes”. The highest response was found from 150 people, which recorded 45.46% in strongly agree, followed by agree, in which 100 people responds, recorded 30.30% and the lowest response percentage rate was recorded in strongly disagree, which had 9.09% from 30 persons respond.

Item number 2 questionnaire statements reads “I’m not of aware of the health benefits of Scent leaf” about 100 people responds gave 30.30% strongly agree on the statement as the highest percentage rate, followed by 27.27% for disagree from 90 people and the lowest percentage rate was found in strongly disagreed, in which 60 people responds recorded 18.18% because they are not really aware of the health benefits of this plant species, hence the research aim and objectives. With regards to statement number 3 from the **Table 2**, which reads “Are you aware that ascorbic acid (Vitamin C) is been gotten from *Occimum gratissimum* juice extracts”, 70 people responds here, accounted for 21.21% for agree, 120 people responds gave 36.36% for strongly agree, 60 people responds recorded 18.18% on disagree and 80 people responds had 24.24% from strongly disag-

ree. The highest percentage rate was found in strongly agreed to the statement having 36.36% and lowest percentage was recorded in strongly disagree, which had 18.18% from 60 people responses. This goes in line with the vegetable research work done by [8]. Regarding to the questionnaire statement number 4, in **Table 2**, reads “Are you aware that Scent leaf is used for cardiac medication by cigarette smokers due to high amount of ascorbic acid extracts it contained”, 70 people responds from agree resulted to 21.21%, strongly agree recorded 18.18% from 60 people, disagree had 9.09% from 30 people and strongly disagree recorded the highest percentage, which had 51.52% from 170 people responses and the lowest percentage was found in disagree having 9.09% from responses made by 30 people regarding to the questionnaire administered to them.

Item number 5 in **Table 2** statement, says “Do other vegetables like water leaf contain vitamin C”, 60 people agreed responds gave 18.18%, 85 people response correlation had 25.76% for strongly agreed, 90 people responds accounts for 27.27% for disagreed and the highest response percentage was recorded in strongly disagreed, which had 28.79% from 95 people and lowest percentage was observed from agreed which had 18.18%.

In item number 6, in **Table 2**, the questionnaire statement reads “Are you aware that *Melissa officinalis* (mint plants) make the body fits different number of people responded to this statement”. Results from the analysis showed that the highest percentage rates recorded in disagree which had 30.30% from 100 people responses, followed by agree which had 27.27% from 90 people, agreed had 24.24% from 80 people and the lowest percentage rate was recorded in strongly disagree which had 18.18% from 60 people responses.

In item number 7, responses of 120 people resulted to agreed percentage of 36.36% as the highest percentage, followed by strongly agreed with percentage of 33.33% rate from responses of 110 people and the lowest percentage rate was recorded from disagree and strongly disagree, which had 15.15% rates from responds of 50 people respectively, on the statement “Do you know that species of Scent leaf (*Occimum gratissimum*) and mint plant *Melissa officinalis* are used as mosquitoes repellent in our homes. In item number 8, 100 people responded for an average percentage rate of 30.30% for agrees, 51.52% for strongly agreed percentage from 170 people, disagree percentage had 6.06% from 20 people responds and 40 people response accounted for 12.12%. The highest percentage was found in strongly agreed which had 51.52% and the lowest was recorded in disagreed with 6.06% from the statement “Do you know that Saluyot Spp (*Cochorus olitorius*), increases sexual libido, fertility and reduces bladder problem”. Item number 9 statements reads “Are you aware that Saluyot spp increases collagen production of the body to keep the skin firm and young looking”, the responses from different people here are 80 people responds recorded 24.24% for agreed, 87 people response resulted to percentage of 19.70% for strongly agreed, 50 people responded to strongly disagreed which recorded 15.15% and the highest percentage recorded 40.19% strongly disagreed from the responds of 135

people. Item number 10, had the highest percentage rate of 45.46% recorded against strongly agreed with 150 people responds, followed by 120 people responses with a percentage rate of 36.36% against agreed and the lowest percentage rates were both recorded in disagree and strongly disagree which had 9.09% from 30 people responses on the statement “Are you aware that *Corchorus olitorius* controls blood pressure and improve eyesight. Research questionnaire statement made on item number 11, reads “Do you know that *Corchorus olitorius* lowers the risk of asthma and also controls diabetes”, from this statement 95 people responded to a percentage rate of 28.79% for agreed, 115 people response accounted for 34.85%, for strongly agreed, 27.89% disagree from responses of 91 people and strongly disagree was recorded as the lowest, having 8.78% from responses of 29 people. Item number 12 questionnaire statement says “I am aware that Saluyot Spp (*Corchorus olitorius*) reduces stomach aches, ulcer and reduces Arthritis” responses from this statement showed that 85 people responds resulted to a percentage rate of 25.76% for agreed, 80 people responds accounted for 34.24% rate, for strongly agreed, 75 people percentage rated for 22.23% against disagreed as the lowest and the highest percentage rate was found in strongly disagreed on the responses of 90 people which gave 27.27%. Questionnaire statement item number 13, from the data analysis showed that 100 people response gave rise to percentage rate of 30.30% for agreed, strongly agreed had 36.36% from 120 people responds, as the highest percentage rate, 65 people responds recorded a percentage rate of 19.70% for disagreed and 55 people responds recorded a percentage rate of 16.67% as the lowest percentage against strongly disagreed while the highest percentage rate was found in strongly agreed with a percentage rate of 36.36% from the statement “Do you know that waterleaf vegetables contain vitamin A for essential healthy eyes clarity?”. Data analysis here showed that the agreed responds of 100 people recorded a percentage rate of 30.30%, strongly agreed response of 130 people recorded a percentage rate of 39.40%, 80 people responds accounted for a percentage rate of 24.24% recorded against disagree and 20 people response, resulted to a percentage rate of 6.06% against strongly disagree. The highest percentage was found in strongly agreed with a percentage rate of 39.40% and the lowest was recorded against strongly disagreed having a percentage rate of 6.06% as regard to the questionnaire statement made in item number 14. “Are you aware that Saluyot spp reduces Arthritis and strengthens the bones and teeth because of its high calcium contents?” These agree to the work done in Nigeria on vegetables by [19]. In item number 15, the analysis of data showed agreed responds percentage rate of 25.76% came from the responses of 85 people, percentage rate of 36.36% was gotten from 120 people responses against strongly agreed as the highest percentage rate in this category, 65 people responds recorded percentage rate of 19.70% as second to the last percentage rate recorded under disagree category and the lowest percentage among them was found in strongly disagree, having 60 people responses which had a percentage of 18.18% against the statement

made on “Are you aware that leafy vegetables nourish the body circulatory system”. The agreed percentage rate of item number 16 questionnaire statements which recorded 30.30% from the responds of 100 people, strongly agreed had a percentage rate of 45.46% from 150 people as the highest in this item sixteen category, disagreed recorded 9.09% from 30 questionnaire statement “Are you aware that vegetable delicacy help to reduce body fat instead of going to the gym centre”? The analysis of data from questionnaire statement made on item number 17, showed that the percentage rate of 24.24% are gotten from the response of 80 people that answered agreed, strongly agreed had a percentage rate of 39.39% from 130 people responds, as the highest number of people as well as that of percentage in this item 17 category, 50 people responses from the data analysis resulted to a percentage rate of 15.15% people as the lowest and strongly disagreed had 15.15% from the responds of 50 people as against the against disagreed as the lowest percentage here, and strongly disagreed had its percentage rate of 18.18% from the responds of 60 people as stated in the questionnaire statement of “Are you aware that vegetables have the essential vitamins needed by the body building”. This agrees with work done by [22] [23]. Item number 18 questionnaire statement states “Are you aware that vegetables helps in bioremediation of the soil and add fertility to the soil” from analysis data here, it showed that 30 people responds recorded a percentage rate of 9.09% for agreed, 70 people responses resulted to percentage rate of 21.21% of strongly agreed, strongly disagreed had 30.30% from 100 people and disagreed had 39.40% from 130 people, which recorded the highest percentage in this item and the lowest was found in agreed from just 30 people responses.

4. Summary

This research emphasized the importance of environmental awareness and exposure regarding the public health benefits of these vegetables in the study area. The study also stressed the sustainability of these vegetables as well as how they remediate the environment for a sustainable food resilience that brings about standardized health safety in the Gambia geopolitical zones.

4.1. Recommendations

The recommendations are based on the following findings observed in the study area:

- 1) Government should make it compulsory for everyone in the country to be a vegetarian.
- 2) Government should encourage farmers through her subsidy to embark on different vegetable productivity outputs.
- 3) The ministry of Gambia Agricultural Department (GAD) should also look into the modern way of oil extraction from these vegetables which may act as her export to other neighbouring countries.
- 4) The oil gotten vegetables (vegetable oil) are very good for body treatment of

stroke.

5) It will create job opportunities in the country if it is well implemented and managed sustainably.

4.2. Conclusion

The results of this research from data analysis showed that many people are not aware of the benefits of these vegetables that are cultivated in a farm/garden that is not polluted. An electronic heavy metal device detector should be encouraged by Government in different markets in the Gambia, to be used by government representatives, to check any vegetables and fruits that are brought to the market for sale, to ensure the safety and public health impact assessment of people in the Gambia.

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Author's Contribution

The co-author made an important contribution to this research, especially during the period of data collection in the field, interpretation of analysis of each questionnaire statement made on this research; she is part of the critical reviewing of this article, for future intellectual benefits, collectively efforts, agreed to submit to this journal, recently give the trust for the final approval of this paper version of the article to be published and agreed to be responsible for all other areas of this work.

Conflicts of Interest

The authors declare no conflicts of interest.

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