

DETERMINATION OF LEVELS OF SOME NUTRIENTS AND ANTI NUTRIENTS IN FIVE SELECTED VEGETABLES IN NIGER DELTA

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ABSTRACT

Research on the levels of some nutrients and anti nutrients of five selected vegetables was carried out in the Department of Food Science and Technology, Rivers State University of Science and Technology, Port Harcourt. The assessed vegetables were Bitter leaf, Okra, Sweet potato, Soybean and Spinach. It was observed that spinach had the highest level of moisture, Sodium and Phosphorus (90.55%, 82.55mg and 18.6mg respectively). Bitter leaf recorded the highest level of fiber (3.72%), soybean had the highest level of protein, carbohydrate and calcium (8.35%, 20.45% and 480mg), respectively. Okra was high in potassium and phosphorus (57.2mg 42.6mg) while sweet potato recorded high values for calcium (86.15mg), potassium (49.30) and sodium (56.30mg). The result also indicated that these vegetables have appreciable amount of nutrients such as vitamins, minerals and low level of toxicants.

Key Words, Nutrients, levels, anti nutrient, vegetables.

INTRODUCTION

Vegetable cultivation is one of the oldest practices in the history of agriculture (Purseglove, 1977), since it started with the early man. Vegetables are cultivated for many reasons, the most important being for food.

They are essential in the provision of fiber, trace minerals, vitamins, folacin, carbohydrate and protein (Achinewhu, 1996). Many vegetables, ranging from the leafy vegetables, fruits, root and tubers, rhizomes etc are found cultivated in the Niger Delta, the success of which depend on the local climate and seasons. These vegetables had been developed by selection from local wild plants and also through introduction from other regions of the world (George, 1989).

Vegetable production can be done on the subsistence or commercial level. Peasant farmers cultivate vegetables on a relatively small portion of their land or garden just for the family. Other large scale farmers clear a large portion of land where they cultivate one or two types of vegetables on a large scale. (Onuegbu, 2002). Vegetables are consumed in a variety of ways. Some vegetables are cooked before consumption (eg. *Telferia occidentalis*, *Amaranthus spp.*) While others are eaten fresh (lettuce, cabbage, *solanum melongena* etc) in form of dessert or as salads. In general, vegetables are highly recommended because of their high digestibility and low cholesterol. The succulent nature is an indication that the moisture values are high and as such easily digested and absorbed into the body. Fruits and leafy vegetables are known for their high magnesium content, low glycerin index. They

are valuable for persons with type II diabetes. It has been observed that serving green leafy vegetable once per day will lower the risk of diabetes by 9% (Olelke, 2005). Vegetables also contain a variety of nutrients.

Most vegetables are naturally low in fat and cholesterol (Olelke, 2005). Amongst all the cultivated crops, vegetables are known to be highly perishables and must be processed into some forms for better storage (Okaka, 1997). Considering all the attributes of vegetable all over the world, it is possible that variation may exist in their nutrient and anti nutrient among different vegetables found in the same locality.

This work therefore investigated the nutrient and anti nutrient composition of five vegetables (Okra, Sweet potato, Bitter leaf, Soy bean and Spinach) commonly grown in the Niger Delta. The knowledge will enhance the increase production of some of these vegetables and their recommendations for consumption.

MATERIALS AND METHODS

Collection of Vegetable Samples

Twenty leaf samples each were randomly collected from four-week old Okra, bitter leaf, sweet potato, soybean and spinach from an experimental plot in the Department of Applied and Environmental Biology, Research farm in the Rivers State University of Science and Technology, Nkpolu, Port Harcourt. The experimental plot is situated on latitude 4.5°N and latitude 7.01°E and on an elevation of 18 meters above sea level. It lies in the humid tropical zone. The leaf samples were taken to the Department of Food Science and Technology Laboratory where in Rivers State University of Science and Technology, Nkpolu, Port Harcourt for further studies.

Proximate Composition (Nutrient and Ant nutrient) Analysis.

The proximate and nutritional compositions of the five vegetables were estimated. The parameters assessed were the crude fiber, Lipid,

Protein, Carbohydrate, Fat, Ash, Phosphorus, Iron, Calcium, Potassium and Sodium. The vitamins and the anti nutritional compositions measured were vitamin C, Vitamin A, Tannin, Saponin, Oxalate and Cyanogenic glycosides. These parameters were estimated using the method of analysis by Pearson (1976).

Statistical Analysis

The data generated from this study were analyzed statistically using simple percentages, means, probability and ANOVA.

RESULTS

Food Values of Vegetables

The results of the basic nutrient and some mineral composition of the five vegetables leaves are presented in Tables 1 and 2, and Appendix 1 and 2. The vegetable studied were Spinach, Bitter leaf, Sweet potato, Okra and Soybean. The moisture content of the five vegetable leaves ranges between 65.3 to 90.5%. Moisture content was significantly similar between Bitter leaf and Soybean with values of 517.61 and 533.82 respectively. There were no significant differences from the other attributes since $F(0.1819701) < P(0.938110552)_{0.05}$. Ash value ranged between 1.27 to 2.45mg/100g, ANOVA analysis further indicate no significant different among vegetable in ash content; $F(0.5255233) < P(0.723597814)_{0.05}$.

Lipid content varied between 0.45 to 2.4mg/100g, sweet potato was significantly similar to soy bean, while the others were significantly similar ($P > 0.05$). Crude fiber ranged from 0.05 to 3.7 mg/100g. Spinach was significantly different, while the others showed no significant difference.

Protein in spinach and Okra were significantly similar, while the others are significantly different. Carbohydrate in bitter leaf and soybean were significantly similar,

sweet potato was significantly similar to okra while spinach was significantly different from the others ($P>0.05$). The micro nutrient composition showed that phosphate was significantly different for all the five vegetable. Spinach (48.6), Bitter leaf (38.3), Sweet potato (27.3) Okra (42.6) and Soybean (35.2). Iron content was also significantly different for all the five vegetables, with the following values for spinach (4.5), Bitter leaf (5.75) Sweet potato (3.06), Okro (0.71) and Soy bean (0.89).

Calcium was significantly different for all the vegetables. Spinach recorded (14.55) Bitter leaf (150), Sweet potato (86.15), Okra (50.8) and Soybean (480). Potassium content of spinach and sweet potato showed no significant difference (50.35 and 49.30) while others are significantly similar. Sodium content was significantly different for all the five vegetables ($P<0.05$), with these recorded values for spinach (82.55) Bitter leaf (26.05) Sweet potato (56.3), Okra (24.8) and Soy bean (35.85)

Table 1: Proximate and Nutritional Composition of Five Selected Vegetables.

	Parameters	Spinach	Bitter leaf	Sweet potato	Okra	Soybean
1	Moisture (%)	90.55	64.4	14.55	12.35	65.3
2	Ash (%)	1.27	1.84	1.68	2.3	2.5
3	Lipid (%)	0.48	0.45	2.40	0.97	1.28
4	Fiber (%)	0.51	3.72	2.25	3.3	2.28
5	Protein (%)	5.6	7.75	4.89	5.4	8.35
6	Carbohydrate (%)	2.5	20.31	14.3	15.7	20.45
7	Phosphorus mg	48.6	38.3	27.3	42.6	35.1
8	Iron mg	4.5	5.75	3.06	0.71	0.89
9	Calcium mg	14.55	150	86.15	50.8	480
10	Potassium mg	50.35	40.5	49.30	57.2	60.15
11	Sodium mg	82.55	26.05	56.3	24.8	25.85

Table 2: Vitamins and Anti-nutritional Composition of Some Vegetables.

S/N.	Sample	Vitamin C mg/100g	Vitamin A mg/100g	Tannin (%)	Saponin (%)	Oxalate (%)	Cyanogenic Glycosides mg/ 100g
		mg/100g					
1	Spinach leaves	68.20	4.85	0.25	1.22	1.40	30.76
2	Bitter leaf	25.40	5.55	0.90	1.75	3.08	31.04
3	Sweet potato leaves	39.50	3.40	0.11	1.11	1.04	25.12
4	Okra leaves	59.38	0.28	1.57	2.31	2.35	39.52
5	Soybean leaves	53.20	2.80	0.40	1.54	1.66	32.50

Table 3: Anlysis of Variance for the Proximate and Nutritional Composition of Five Selected Vegetables

Moisture					
	Spinach	Bitter	Sweet Potato	Okra	Soya Bean
Mean	90.55	64.35	74.55	72.35	65.35
Mean Average	45.275	32.175	37.275	36.175	32.675

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	135.825	67.9125	1024.9128
Bitter	2	96.525	48.2625	517.61531
Sweet Potato	2	111.825	55.9125	694.71281
Okra	2	108.525	54.2625	654.31531
Soya Bean	2	98.025	49.0125	533.82781

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	498.654	4	124.6635	0.1819701	0.938110552	5.1921678
Within Groups	3425.3841	5	685.0768125			
Total	3924.0381	9				

Ash

	Spinach	Bitter	Sweet Potato	Okra	Soya Bean
Mean	1.265	1.835	1.68	2.25	2.45
Mean Average	0.6325	0.9175	0.84	1.125	1.225

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	1.8975	0.94875	0.2000281
Bitter	2	2.7525	1.37625	0.4209031
Sweet Potato	2	2.52	1.26	0.3528
Okra	2	3.375	1.6875	0.6328125
Soya Bean	2	3.675	1.8375	0.7503125

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	0.9908663	4	0.247716563	0.5255233	0.723597814	5.1921678
Within Groups	2.3568563	5	0.47137125			
Total	3.3477225	9				

Lipid

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
<i>Mean</i>	0.475	0.45	2.625	0.935	1.275
<i>Mean Average</i>	0.2375	0.225	1.3125	0.4675	0.6375

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	0.7125	0.35625	0.0282031
Bitter	2	0.675	0.3375	0.0253125
Sweet Potato	2	3.9375	1.96875	0.8613281
Okra	2	1.4025	0.70125	0.1092781
Soya Bean	2	1.9125	0.95625	0.2032031

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	3.580965	4	0.89524125	3.6471238	0.094204635	5.1921678
Within Groups	1.227325	5	0.245465			
Total	4.80829	9				

Protein

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
<i>Mean</i>	5.55	7.75	4.885	5.4	8.355
<i>Mean Average</i>	2.775	3.875	2.4425	2.7	4.1775

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	8.325	4.1625	3.8503125
Bitter	2	11.625	5.8125	7.5078125
Sweet Potato	2	7.3275	3.66375	2.9829031
Okra	2	8.1	4.05	3.645
Soya Bean	2	12.5325	6.26625	8.7257531

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	10.869221	4	2.717305313	0.5086342	0.73389653	5.1921678
Within Groups	26.711781	5	5.34235625			
Total	37.581003	9				

Carbohydrate

	Spinach	Bitter	Sweet Potato	Okra	Soya Bean
Mean	2.5	20.295	14.3	15.715	20.45
Mean Average	1.25	10.1475	7.15	7.8575	10.225

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Spinach	2	3.75	1.875	0.78125
Bitter	2	30.4425	15.22125	51.485878
Sweet Potato	2	21.45	10.725	25.56125
Okra	2	23.5725	11.78625	30.870153
Soya Bean	2	30.675	15.3375	52.275313

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	241.18338	4	60.29584594	1.8728461	0.253348748	5.1921678
Within Groups	160.97384	5	32.19476875			
Total	402.15723	9				

Fibre

	Spinach	Bitter	Sweet Potato	Okra	Soya Bean
Mean	0.505	3.715	2.25	3.3	2.275
Mean Average	0.2525	1.8575	1.125	1.65	1.1375

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Spinach	2	0.7575	0.37875	0.0318781
Bitter	2	5.5725	2.78625	1.7251531
Sweet Potato	2	3.375	1.6875	0.6328125
Okra	2	4.95	2.475	1.36125
Soya Bean	2	3.4125	1.70625	0.6469531

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	6.9389663	4	1.734741563	1.9721727	0.237164983	5.1921678
Within Groups	4.3980469	5	0.879609375			
Total	11.337013	9				

PO₄

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
<i>Mean</i>	48.55	38.3	27.6	42.6	35.1
<i>Mean Average</i>	24.275	19.15	13.8	21.3	17.55

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	72.825	36.4125	294.63781
Bitter	2	57.45	28.725	183.36125
Sweet Potato	2	41.4	20.7	95.22
Okra	2	63.9	31.95	226.845
Soya Bean	2	52.65	26.325	154.00125

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	279.22275	4	69.8056875	0.3658329	0.824288544	5.1921678
Within Groups	954.06531	5	190.8130625			
Total	1233.2881	9				

Fe₂

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
<i>Mean</i>	4.5	5.075	3.055	0.705	0.885
<i>Mean Average</i>	2.25	2.5375	1.5275	0.3525	0.4425

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	6.75	3.375	2.53125
Bitter	2	7.6125	3.80625	3.2194531
Sweet Potato	2	4.5825	2.29125	1.1666281
Okra	2	1.0575	0.52875	0.0621281
Soya Bean	2	1.3275	0.66375	0.0979031

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	18.199373	4	4.549843125	3.2143635	0.116154512	5.1921678
Within Groups	7.0773625	5	1.4154725			
Total	25.276735	9				

Ca

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
<i>Mean</i>	145.5	150	86.15	528	480
<i>Mean Average</i>	72.75	75	43.075	264	240

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	218.25	109.125	2646.2813
Bitter	2	225	112.5	2812.5
Sweet Potato	2	129.225	64.6125	927.72781
Okra	2	792	396	34848
Soya Bean	2	720	360	28800

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	195806.98	4	48951.74475	3.4948303	0.101217111	5.1921678
Within Groups	70034.509	5	14006.90181			
Total	265841.49	9				

K

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
<i>Mean</i>	50.35	40.5	49.305	57.6	60.15
<i>Mean Average</i>	25.175	20.25	24.6525	28.8	30.075

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	75.525	37.7625	316.89031
Bitter	2	60.75	30.375	205.03125
Sweet Potato	2	73.9575	36.97875	303.87288
Okra	2	86.4	43.2	414.72
Soya Bean	2	90.225	45.1125	452.25281

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	269.03275	4	67.25818688	0.1986634	0.92871037	5.1921678
Within Groups	1692.7673	5	338.5534506			
Total	1961.8	9				

Na

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
Mean	82.05	26.05	56.3	24.75	35.85
Mean Average	41.025	13.025	28.15	12.375	17.925

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	123.075	61.5375	841.52531
Bitter	2	39.075	19.5375	84.825313
Sweet Potato	2	84.45	42.225	396.21125
Okra	2	37.125	18.5625	76.570313
Soya Bean	2	53.775	26.8875	160.65281

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	2647.44	4	661.86	2.1216386	0.215346475	5.1921678
Within Groups	1559.785	5	311.957			
Total	4207.225	9				

* IF *F* is less than *F* Crit, it means that there is no significant difference between the variables** IF *F* is greater than *F* Crit, it means that there is a significant difference between the variables**Table 4:** Analysis of Variance for the Vitamins and Anti-Nutritional Composition of Some Vegetables**Vitamin C**

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
Mean	68.2	25.4	39.5	59.38	53.2
Mean Average	34.1	12.7	19.75	29.69	26.6

Anova: Single

Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	102.3	51.15	581.405
Bitter	2	38.1	19.05	80.645
Sweet Potato	2	59.25	29.625	195.03125
Okra	2	89.07	44.535	440.74805
Soya Bean	2	79.8	39.9	353.78

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1283.78466	4	320.94617	0.9716165	0.4971044	5.1921678
Within Groups	1651.6093	5	330.32186			
Total	2935.39396	9				

Vitamin A

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
Mean	4.85	5.55	3.4	0.28	2.8
Mean Average	2.425	2.775	1.7	0.14	1.4

Anova: Single

Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	7.275	3.6375	2.9403125
Bitter	2	8.325	4.1625	3.8503125
Sweet Potato	2	5.1	2.55	1.445
Okra	2	0.42	0.21	0.0098
Soya Bean	2	4.2	2.1	0.98

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	18.918585	4	4.7296463	2.5633758	0.1648995	5.1921678
Within Groups	9.225425	5	1.845085			
Total	28.14401	9				

Tannin %

	<i>Spinach</i>	<i>Bitter</i>	<i>Sweet Potato</i>	<i>Okra</i>	<i>Soya Bean</i>
Mean	0.25	0.9	0.11	1.57	0.4
Mean Average	0.125	0.45	0.055	0.785	0.2

Anova: Single

Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	0.375	0.1875	0.0078125
Bitter	2	1.35	0.675	0.10125
Sweet Potato	2	0.165	0.0825	0.0015125
Okra	2	2.355	1.1775	0.3081125
Soya Bean	2	0.6	0.3	0.02

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1.600785	4	0.4001963	4.5612908	0.0635647	5.1921678
Within Groups	0.4386875	5	0.0877375			
Total	2.0394725	9				

Seponin %

	Spinach	Bitter	Sweet Potato	Okra	Soya Bean
Mean	1.22	1.75	1.11	2.31	1.54
Mean Average	0.61	0.875	0.555	1.155	0.77

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	1.83	0.915	0.18605
Bitter	2	2.625	1.3125	0.382813
Sweet Potato	2	1.665	0.8325	0.154013
Okra	2	3.465	1.7325	0.667013
Soya Bean	2	2.31	1.155	0.29645

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	1.027935	4	0.256984	0.761958	0.592306	5.192168
Within Groups	1.6863375	5	0.337268			
Total	2.7142725	9				

Oxalate %

	Spinach	Bitter	Sweet Potato	Okra	Soya Bean
Mean	1.4	3.08	1.04	2.35	1.66
Mean Average	0.7	1.54	0.52	1.175	0.83

Anova: Single Factor

SUMMARY

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Spinach	2	2.1	1.05	0.245
Bitter	2	4.62	2.31	1.1858
Sweet Potato	2	1.56	0.78	0.1352
Okra	2	3.525	1.7625	0.690313
Soya Bean	2	2.49	1.245	0.34445

ANOVA

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	2.97216	4	0.74304	1.428504	0.347149	5.192168
Within Groups	2.6007625	5	0.520153			
Total	5.5729225	9				

Cyanogenic Glycosides

	Spinach	Bitter	Sweet Potato	Okra	Soya Bean
Mean	30.76	31.04	25.12	39.52	32.5
Mean Average	15.38	15.52	12.56	19.76	16.25

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Spinach	2	46.14	23.07	118.2722
Bitter	2	46.56	23.28	120.4352
Sweet Potato	2	37.68	18.84	78.8768
Okra	2	59.28	29.64	195.2288
Soya Bean	2	48.75	24.375	132.0313

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	119.66544	4	29.91636	0.231966	0.909086	5.192168
Within Groups	644.84425	5	128.9689			
Total	764.50969	9				

DISCUSSION

The results of the proximate, nutritional, vitamins and anti-nutritional composition of five selected vegetables in the Niger Delta showed that the five vegetables possessed high nutritional qualities that qualify them as very important vegetables. This finding is in line with early researchers on the high nutritional qualities of most tropical fruits, nuts and vegetables (Ngoddy, 1985); Achinewhu (1996) and Okaka (1997).

The vitamin C contents of spinach leaves (68.20) was significantly higher than okra and soybean (59.38 and 53.20) with that of okra and soybean being similar but differed significantly from that of bitter leaf and sweet potato (25.40 and 39.50) ($P > 0.05$) Table 2 and Appendix 2. The results obtained for vitamin C agrees with other researchers on high vitamin C values on the cotyledon of *Irvingia gabonensis* variety *gabonensis*, okra fruits; Aloe vera,

Trichosanthes curcumerina, *Allium cepa*, *Hibiscus sabdariffa* and *guava* fruits (Chuku *et al.*, 2002, 2003, 2008 and Chuku, 2006, and Chuku, 2010).

The vitamin A values for spinach leaves and bitter leaf were significantly higher than those of sweet potato, okra and soybean (Table 2 and Appendix 2). Okra leave however recorded the least vitamin A value ($P > 0.05$). The anti-nutritional values comprising saponins, tannins, oxalate and cyanogenic glycosides were also assessed. The tannins, saponin and oxalate values were generally low in these vegetables except the cyanogenic glycosides that was high in all the vegetables with okra recording the highest value (Table 2 Appendix 2). These anti nutrients especially the cyanogenic glycosides are easily destroyed by heat or during some kinds of processing as found in bitter leaf where the leaves are squeezed and washed and in some cases soaked in water over night before

consumption. The minute levels of the anti nutritional components of these vegetables do not pose any health danger when consumed. In order to avoid their accumulation in the blood, it is advised that the vegetables must be cooked on fire in order to destroy these anti-nutrient elements.

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