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PROXIMATE COMPOSITION AND VITAMIN CONTENT OF CUCUMBER AS INFLUENCED BY VARIETY, FERTILIZER TYPE AND STAKING

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ABSTRACT

Cucumber (*Cucumis sativa* L.*)* market commands high price nowadays and the rate of consumption is surging as a result of its hydrating property and nutritional content which are functional in human diets. A field experiment was conducted in the late cropping seasons of 2025 at the The Federal Polythechnic, Ilaro, Ogun State Nigeria (Latitude 6^0 53^1N and Longitude 2^0 58^1E), to determine the effect of variety, fertilizer and staking on the production of quality nutritional content in cucumbers for consumer's acceptability. The field was demarcated into 30 plots, and individual plots measured 2mx 2m. The land was bedded up manually at a spacing of 1.0 m apart. The experiment was a 2x3x2 factorial experiment, fitted into Randomized Complete block design. The treatments includes, cucumber varieties (Darina and Nanga), staking (staked and unstaked) and fertilizer type (control, organic (Neem fertilizer) and inorganic fertilizer). Nutrient content varies based on different varieties, fertilizer types and cultural practice staking. Nanga variety was observed to be significantly higher in Fat, Crude fibre and Ash, vitamins A, C, K and B9 relative to Darina while higher Moisture content was observed in Darina relative to Nanga cucumber. Plant treated with Inorganic fertilizer had more crude protein and fat Vit. A, C and K, relative to organic fertilizer. Unstaked fruit was found to be higher in Crude protein, fat and all vitamin components. Nanga variety cultivated with 200kg/ha is recommended for optimum nutrient composition.

Keywords: Neem fertilizer, Crude protein, Vitamins

INTRODUCTION

Cucumber (*Cucumis sativa* L.*)* market commands high price nowadays and the rate of consumption is surging as a result of its hydrating property and nutritional content which are functional in human diets (Nema *et al.*, 2011). However, there are several research emphasis on the growth and yield of the crop other than evaluation of the nutrient composition and phytochemicals which is one of the postharvest activity that needs researchers' attention (Singh, *et al.*, 2020; Kazuya *et al.*, 2022; Rahman *et al.*, 2024).

The vegetable which belongs to the family Curcurbitaceae is a rich source of Vitamins A, C, K and phytochemicals (Chen *et al.*, 2005). The crop helps lower blood sugar levels while preventing complications related to diabetes. It acts as weight loss supplements in humans. Genetic factor plays a role for the production of nutrient and phytochemical content in the comparison of the different cucumber varieties (Makinde *et al.*, 2024 and Shariff *et al.*, 2021).

Proximate analysis of cucumber includes the determination of moisture content, ash, crude fibre and carbohydrates. It assists researchers in knowing the nutritional value of crops and its longevity for economic and health benefits (Sana *et al.*, 2023). Study has shown that moisture content ranges between (94 to 96 %), crude protein between (0.5 to 1 %) and carbohydrates is between (2 to 4 %) mainly depending on the type of variety used (Mohammed *et al.*, 2022). One of the factors affecting proximate quality is soil nutrient availability in soil which is closely linked to levels of protein and ash in cucumber (Oloyede *et a.l*, 2016).

Vitamin content in cucumbers is influenced by the type of fertilizers used for the growth, genetic and environmental factors. It was reported that organic fertilizers improve vitamin content better than inorganic which tend to dilute the vitamin concentration (Adekiya *et al.*, 2020). Cucumber contains vitamin C, K and B complex especially folate (B9). Vitamin C protects human cells from oxidative stress, vitamin K is important for bone metabolism and blood clotting while folate (B9) is useful for synthesis of DNA and division of cell. Staking is management techniques in cucumber production which can be employed for the increase of photosynthesis rate thereby improving the quality of assimilate accumulation and Cucurbitacin (Babatunde *et al.*, 2026 and Luyao *et a.l*, 2020). It provides additional support to crop vines for better exposure to sunlight and circulation of air thus increasing the production of synthates (Yibeltal *et al.*, 2025). In addition, it helps in the reduction of disease infestation while improving the quality of fruits.

Application of organic and inorganic fertilizers help increase the nutrient in leaf and fruit of cucumber when compared to those not grown with fertilizer (Aruna *et al.*, 2022). The use of organic fertilizer such as neem for the production of Cucumber plant can increase the proximate composition, Vitamin content and reduction in the production of cucurbitacin (Abhinav *et al.*, 2021). This research work is aimed to determine the effect of variety, fertilizer and staking (management practices) production of quality nutritional content in cucumbers for consumer's acceptability.

MATERIALS AND METHODS

A field experiment was conducted in the late cropping seasons of 2025 at the Horticultural Technology Research Farm, The Federal Polythechnic, Ilaro, Ogun State Nigeria (Latitude 6^0 53^1N and Longitude 2^0 58^1E). The field was demarcated into 30 plots, and individual plots measured 2mx 2m. The land was bedded up manually at a spacing of 1.0 m apart. The treatments were cucumber varieties (Darina and Nanga), staking (staked and un staked) and fertilizer source (organic and inorganic fertilizer) which were arranged in a split -split plot fitted into a Randomized Complete Block Design with three replications. Cucumber varieties constituted the main plot, staking constituted the sub plot treatment while fertilizer source constituted the sub- sub plot treatment. Neem Organic

fertilizer at 10t/ha was applied at two weeks before planting while inorganic fertilizer at 200 kg /ha was applied at three weeks after planting. Mature cucumber fruits harvested from each treatment were assessed and analyzed for the following nutritive parameters: Proximate composition and Vitamins Content.

Proximate Composition

The proximate analysis of the cucumber fruits for moisture, fiber, ash, fat and carbohydrate were determined randomly as described by the Association of Official Analytical Chemist AOAC (2010). Nitrogen was determined by the routine semi micro- Kjeldahl procedure while the crude protein content was determined by multiplying percentage Nitrogen by a constant factor of 6.25 % CP = % N x 6.25. Carbohydrates was obtained by subtracting the total sum of fat, protein, moisture, ash and crude fibre from 100.

Total carbohydrate =100 - (% crude fat + % crude protein + % moisture + %ash + % crude fibre).

Vitamin content of cucumber fruits was determined as described by the Association of Official Analytical Chemist AOAC (2010). Vitamin A., C., K. and B9 content of cucumber fruits was determined using spectrophotometric, titration and High –Performance Liquid Chromatography methods.

Statistical Analysis

All determinations were done in triplicates and were subjected to Analysis of Variance and means were separated using Least Significant Difference at $p<0.05$.

RESULTS AND DISCUSSION

Table1: The Effect of Variety, Fertilizer and Staking on Proximate Composition of Cucumber

Treatments	Crude protein (%)	Fat content (%)	Crude fibre (%)	Ash (%)	Moisture content (%)
Variety					
Darina	1.49	0.38	0.53	1.40	93.59
Nanga	1.5	0.43	0.57	1.49	93.21
LSD (P≤0.05)	ns	0.04	0.02	0.01	0.02
Fertilizer					
No fertilizer	1.52	0.43	0.49	1.46	92.9
Inorganic	1.58	0.52	0.52	1.40	92.42
Organic	1.38	0.28	0.63	1.47	94.88
LSD (P≤0.05)	0.03	0.05	0.03	0.01	0.02
Staking					
Stake	1.45	0.37	0.58	1.47	93.84
Unstake	1.54	0.45	0.52	1.42	92.96
LSD (P≤0.05)	0.03	0.05	0.03	0.01	0.02

Effect of Variety on the Proximate Composition of Cucumber

The effect of variety was significant ($p\leq0.05$) on the proximate composition of Cucumber. Nanga variety was observed to be significantly higher in fat, crude fibre and ash relative to Darina while higher Moisture content was observed in Darina relative to Nanga variety. Crude protein observed in Darina and Nanga cucumber were similar.

Effect of Fertilizer on the Proximate Composition of Cucumber

The effect of fertilizer was significant on the proximate composition of Cucumber. Cucumber treated with inorganic fertilizer recorded significantly ($p\leq0.05$) higher crude protein and fat relative to cucumber treated with organic fertilizers and the untreated ones. Conversely, cucumber treated with organic fertilizer recorded significantly ($p\leq0.05$) higher crude fibre and moisture content. Higher ash content was observed in cucumber treated with organic fertilizer and the untreated ones relative to cucumber treated with inorganic fertilizer.

Effect of Staking on the Proximate Composition of Cucumber

The effect of staking was significant on the proximate composition of Cucumber. Staked cucumber recorded significantly ($p\leq0.05$) higher Crude fibre, Ash, and Moisture content relative to the unstaked cucumber. Unstaked cucumber was observed to be significantly ($p\leq0.05$) higher in Crude protein and Fat relative to the staked ones.

Table 2: Interaction of Variety and Fertilizer, Variety and Staking and Fertilizer and Staking on the Proximate Content

Treatment		Crude protein (%)	Fat content (%)	Crude fibre (%)	Ash (%)	Moisture Content (%)
Variety	**Fertilizer**					
Darina	Inorganic	1.68	0.61	0.42	1.35	91.34
Darina	Organic	1.38	0.27	0.64	1.44	94.74
Darina	Unfertilized	1.40	0.27	0.52	1.40	94.68
Nanga	Inorganic	1.48	0.43	0.62	1.45	93.51
Nanga	Organic	1.38	0.28	0.62	1.50	95.02
Nanga	Unfertilized	1.65	0.59	0.46	1.52	91.11
LSD (P<0.05)		0.04	0.07	0.04	0.02	0.03
Variety	**Staking**					
Darina	Staked	1.49	0.38	0.52	1.41	93.62
Darina	Unstaked	1.48	0.39	0.53	1.39	93.55

Nanga	Staked	1.41	0.35	0.64	1.54	94.06
Nanga	Unstaked	1.60	0.51	0.5	1.44	92.36
LSD (P≤0.05)		0.03	0.05	0.03	0.01	0.02
Fertilizer	**Staking**					
Inorganic	Staked	1.48	0.41	0.56	1.44	93.47
Inorganic	Unstaked	1.68	0.63	0.49	1.36	91.37
Organic	Staked	1.33	0.26	0.69	1.49	95.15
Organic	Unstaked	1.43	0.29	0.57	1.45	94.61
No fertilizer	Staked	1.52	0.43	0.5	1.48	92.90
No fertilizer	Unstaked	1.52	0.43	0.48	1.43	92.89
LSD (P≤0.05)		0.04	0.07	0.04	ns	0.03

Interaction of variety and fertilizer on the proximate composition of cucumber varieties

Darina variety treated with inorganic fertilizer recorded the highest Crude protein, followed by the untreated Nanga variety and Nanga treated with inorganic fertilizer, then the untreated Darina, with the least crude protein recorded from both Darina and Nanga treated with organic fertilizer. Similarly, the highest fat content was recorded in Darina treated with inorganic fertilizer, followed by the untreated Nanga, then inorganic-treated Nanga, while the lowest fat content was yielded by the untreated Darina, organically treated Darina and Nanga cucumber. Conversely, organically treated Darina contained the highest crude fibre, followed by inorganic and organically treated Nanga cucumber, then the untreated Darina cucumber, with the least crude fibre observed in inorganic-treated Darina. Furthermore, Nanga cucumber treated with organic fertilizer and the untreated recorded the highest ash and moisture content, whereas the lowest values for both parameters were observed in Darina treated with inorganic fertilizer.

Interaction of Variety and Staking on the Proximate Composition of Cucumber Varieties

Interaction of Variety and Staking was significant on the proximate composition of cucumber. Unstaked Nanga cucumber recorded the highest crude protein, followed by staked Darina cucumber, unstaked Darina cucumber, and staked Nanga cucumber. Similarly, unstaked Nanga cucumber was the highest in fat content, followed by unstaked Darina, staked Darina, and staked Nanga cucumber. Conversely, staked Nanga cucumber was the highest in crude fibre, followed by unstaked Darina cucumber, staked Darina, and unstaked Nanga cucumber. Furthermore, staked Nanga cucumber recorded the highest ash and moisture content, followed by staked Darina, unstaked Darina, and unstaked Nanga.

Effect of Fertilizer and Staking On the Proximate Composition of Cucumber

Unstaked cucumber treated with inorganic fertilizer had the highest crude protein and fat content, followed by the staked and unstaked cucumber untreated with fertilizer, which both recorded similar values. These were followed by staked cucumber treated with inorganic fertilizer, while staked cucumber treated with organic fertilizer was the lowest.

Staked cucumber treated with organic fertilizer had the highest crude fibre, followed by unstaked cucumber treated with organic fertilizer and staked cucumber treated with inorganic fertilizer. These were followed by staked cucumber untreated with fertilizer, while unstaked cucumber treated with inorganic fertilizer and unstaked cucumber untreated with fertilizer recorded similar and lower concentrations. All treated and untreated cucumber subjected to staking and the unstaked were observed to contain similar in ash content

Furthermore, staked cucumber treated with organic fertilizer had the highest moisture content, followed by unstaked cucumber treated with organic fertilizer and staked cucumber treated with inorganic fertilizer. These were followed by staked and unstaked cucumber untreated with fertilizer, while unstaked cucumber treated with inorganic fertilizer recorded the lowest.

Table 3: Interaction of Variety, Fertilizer and Staking on the Proximate Composition of Cucumber

Variety	Fertilizer	Staking	Crude protein (%)	Fat content (%)	Crude fibre (%)	Ash (%)	Moisture content (%)
Darina	inorganic	staked	1.63	0.56	0.44	1.36	91.54
Darina	inorganic	unstaked	1.73	0.65	0.41	1.34	91.13
Darina	organic	staked	1.43	0.3	0.62	1.41	94.63
Darina	organic	unstaked	1.33	0.25	0.66	1.48	94.84
Darina	No fertilizer	staked	1.41	0.28	0.52	1.44	94.7
Darina	No fertilizer	unstaked	1.39	0.26	0.52	1.35	94.66
Nanga	inorganic	staked	1.33	0.26	0.68	1.51	95.41
Nanga	inorganic	unstaked	1.64	0.6	0.57	1.39	91.61
Nanga	organic	staked	1.23	0.22	0.76	1.58	95.67
Nanga	organic	unstaked	1.52	0.33	0.48	1.42	94.38
Nanga	No fertilizer	staked	1.65	0.58	0.47	1.52	91.11
Nanga	No fertilizer	unstaked	1.65	0.6	0.45	1.51	91.11
LSD (P≤0.05)			0.06	0.09	0.05	0.02	0.04

Interaction of variety, fertilizer and staking on the proximate composition of cucumber

Unstaked Darina treated with inorganic fertilizer had the highest crude protein and fat content. For crude protein, this was followed by staked and unstaked Nanga with no fertilizer, unstaked Nanga treated with inorganic fertilizer, and staked Darina treated with inorganic fertilizer. These were followed by unstaked Nanga treated with organic fertilizer, staked Darina treated with organic fertilizer, and staked Nanga treated with inorganic fertilizer. These were followed by staked and unstaked Darina with no fertilizer, while staked Nanga treated with organic fertilizer had the lowest crude protein and fat content.

Staked Nanga treated with organic fertilizer had the highest crude fibre, followed by staked Nanga treated with inorganic fertilizer and unstaked Darina treated with organic fertilizer. These were followed by staked Darina treated with organic fertilizer and unstaked Nanga treated with inorganic fertilizer. These were followed by staked and unstaked Darina with no fertilizer, staked Nanga with no fertilizer, and unstaked Nanga with no fertilizer, while staked and unstaked Darina treated with inorganic fertilizer had the lowest crude fibre.

Staked Nanga treated with organic fertilizer had the highest ash content, followed by staked Nanga treated with inorganic fertilizer, staked and unstaked Nanga with no fertilizer, and unstaked Darina treated with organic fertilizer. These were followed by staked Darina with no fertilizer, unstaked Nanga treated with organic fertilizer, and staked Darina treated with organic fertilizer. These were followed by staked and unstaked Darina treated with inorganic fertilizer, while unstaked Darina with no fertilizer had the lowest ash content.

Staked Nanga cucumber treated with organic fertilizer had the highest moisture content, followed by staked Nanga treated with inorganic fertilizer and unstaked Darina treated with organic fertilizer. These were followed by staked Darina with no fertilizer, unstaked Darina with no fertilizer, and staked Darina treated with organic fertilizer. These were followed by unstaked Nanga treated with organic fertilizer, while staked and unstaked Nanga with no fertilizer, unstaked Nanga treated with inorganic fertilizer, and staked and unstaked Darina treated with inorganic fertilizer had the lowest moisture content.

Table 4: Effect of Variety, Fertilizer and Staking On the Vitamin Content of Cucumber

Treatment	Vitamin C (mg/100g)	Vitamin K (mg/100g)	Vitamin B9 (ug/100g)	Vitamin A (ug/100g)
Variety				
Darina	2.64	17.49	7.06	101.07
Nanga	2.85	17.82	7.54	101.4
LSD (P<0.05)	0.01	0.03	0.02	0.01
Fertilizer				
No fertilizer	2.88	18.48	7.64	105.15
Inorganic	2.94	18.41	7.86	105.92
Organic	2.43	16.07	6.39	92.64
LSD (P≤0.05)	0.02	0.04	0.03	0.01
Staking				
Stake	2.59	17.04	6.88	97.76
Unstake	2.91	18.26	7.72	104.71
LSD (P≤0.05)	0.02	0.04	0.03	0.01

Effect of Variety on the Vitamin Content of Cucumber

Nanga cucumber exhibited a significantly (p≤0.05) higher concentration of vitamins A, C, K, and B9 relative to the Darina variety.

Effect of Fertilizer on the Vitamin Content of Cucumber

Cucumber treated with inorganic fertilizer recorded significantly (p≤0.05) higher vitamins A, C, and B9 followed by the untreated ones, with the least values for these vitamins observed in cucumber treated with organic fertilizers. Conversely, significantly (p≤0.05) higher vitamin K was observed in the untreated cucumber, followed by those treated with inorganic fertilizer, with the least vitamin K concentration recorded in cucumber treated with organic fertilizers.

Effect of Staking On the Vitamin Content of Cucumber

Unstaked cucumber was observed to be significantly (p≤0.05) higher in vitamins A, C, K, and B9 relative to the staked cucumber.

Table 5: Interaction Variety and Fertilizer, Variety and Staking, Fertilizer and Staking

Variety	Fertilizer	Vitamin C (mg/100g)	Vitamin K (mg/100g)	Vitamin B9 (ug/100g)	Vitamin A (ug/100g)
Variety	**Fertilizer**				
Darina	Inorganic	3.27	20.19	8.67	115.33
Darina	Organic	2.35	16.07	6.28	91.12
Darina	Unfertilized	2.32	16.2	6.22	96.76
Nanga	Inorganic	2.6	16.62	7.05	96.51
Nanga	Organic	2.51	16.08	6.5	94.15
Nanga	Unfertilized	3.44	20.75	9.07	113.54
LSD (P<0.05)		0.02	0.05	0.04	0.02
Variety	**Staking**				

Variety	Fertilizer	Vitamin C (mg/100g)	Vitamin K (mg/100g)	Vitamin B9 (ug/100g)	Vitamin A (ug/100g)
Darina	Staked	2.62	17.02	6.91	102.28
Darina	Unstaked	2.67	17.95	7.20	99.87
Nanga	Staked	2.56	17.07	6.85	93.24
Nanga	Unstaked	3.14	18.57	8.23	109.56
LSD (P≤0.05)		0.02	0.04	0.04	0.01
Fertilizer	**Staking**				
Inorganic	Staked	2.62	22	7.08	98
Inorganic	Unstaked	3.25	19.99	8.64	113.84
Organic	Staked	2.27	15.82	5.89	90.09
Organic	Unstaked	2.6	16.32	6.88	95.18
No fertilizer	Staked	2.88	18.48	7.66	105.18
No fertilizer	Unstaked	2.87	18.47	7.63	105.11
LSD (P≤0.05)		0.02	0.05	0.04	

Interaction of Variety and Fertilizer on the Vitamin Component of Cucumber

Untreated Nanga variety recorded the highest vitamins C, K, and B9, followed by Darina variety treated with inorganic fertilizer and Nanga cucumber treated with inorganic fertilizer. For vitamins C and B9, the trend continued with Nanga cucumber treated with organic fertilizer, then Darina cucumber treated with organic fertilizer, with the least concentrations observed in the untreated Darina; however, for vitamin K, the untreated Darina cucumber outperformed both Nanga and Darina cucumber treated with organic fertilizer.

Darina cucumber treated with inorganic fertilizer was the highest in vitamin A, followed by the untreated Nanga cucumber, the untreated Darina, Nanga cucumber treated with inorganic fertilizer, and Nanga cucumber treated with organic fertilizer, while Darina cucumber treated with organic fertilizer was the lowest.

Interaction of Variety and Staking on Vitamin Components of Cucumber

Unstaked Nanga recorded the highest in all the vitamin components (Vit. A, C, K and B9), followed by Unstaked Darina, while Staked Nanga had the least concentrations for all Vitamins observed (Vit. A, C, B9) except Vit. K.

Interaction of Fertilizer and Staking on the Vitamin Component of Cucumber

Unstaked cucumber treated with inorganic fertilizer had the highest Vitamin C, followed by staked and unstaked cucumber untreated with fertilizer, which recorded similar values. These were followed by staked cucumber treated with inorganic fertilizer and unstaked cucumber treated with organic fertilizer, while staked cucumber treated with organic fertilizer had the lowest Vitamin C.

Staked cucumber treated with inorganic fertilizer had the highest Vitamin K, followed by unstaked cucumber treated with inorganic fertilizer and the staked and unstaked cucumber untreated with fertilizer, which were both similar. These were followed by unstaked cucumber treated with organic fertilizer, while staked cucumber treated with organic fertilizer had the lowest Vitamin K.

Unstaked cucumber treated with inorganic fertilizer had the highest Vitamin B9, followed by the staked and unstaked cucumber untreated with fertilizer, which recorded similar values. These were followed by staked cucumber treated with inorganic fertilizer and unstaked cucumber treated with organic fertilizer, while staked cucumber treated with organic fertilizer had the lowest Vitamin B9.

Unstaked cucumber treated with inorganic fertilizer had the highest Vitamin A, followed by the staked and unstaked cucumber with no fertilizer were both similar. These were followed by staked cucumber treated with inorganic fertilizer and unstaked cucumber treated with organic fertilizer, while staked cucumber treated with organic fertilizer had the lowest Vitamin A.

Table 6: Interaction of Variety and Staking on Vitamin Components of Cucumber

Variety	Fertilizer	Staking	Vitamin C (mg/100g)	Vitamin K (mg/100g)	Vitamin B9 (ug/100g)	Vitamin A (ug/100g)
Darina	Inorganic	Staked	3.05	18.31	8.1	112.36
Darina	Inorganic	Unstaked	3.48	22.07	9.25	118.31
Darina	Organic	Staked	2.48	16.56	6.4	97.67
Darina	Organic	Unstaked	2.22	15.57	6.15	84.58
Darina	No fertilizer	Staked	2.33	16.19	6.23	96.80
Darina	No fertilizer	Unstaked	2.3	16.22	6.2	96.72
Nanga	Inorganic	Staked	2.19	15.34	6.07	83.64
Nanga	Inorganic	Unstaked	3.02	17.91	8.04	109.38
Nanga	Organic	Staked	2.05	15.09	5.39	82.50
Nanga	Organic	Unstaked	2.97	17.07	7.61	105.79
Nanga	No fertilizer	Staked	3.44	20.77	9.09	113.57
Nanga	No fertilizer	Unstaked	3.44	20.72	9.05	113.50
LSD (P<0.05)			0.03	0.07	0.06	0.02

Interaction of variety, fertilizer and staking composition of cucumber varieties

Unstaked Nanga treated with inorganic fertilizer had the highest Vitamin C. This was followed by unstaked Nanga with no fertilizer and staked Nanga with no fertilizer. These were followed by unstaked Darina treated with inorganic fertilizer, staked Darina treated with inorganic fertilizer, unstaked Darina with no fertilizer, and staked Darina with no fertilizer. These were followed by staked Nanga treated with inorganic fertilizer, unstaked Nanga treated with organic fertilizer, and unstaked Darina treated with organic fertilizer. These were followed by staked Darina treated with organic fertilizer, while staked Nanga treated with organic fertilizer had the lowest Vitamin C.

Staked Nanga treated with inorganic fertilizer had the highest Vitamin K. This was followed by unstaked Nanga treated with inorganic fertilizer. These were followed by staked Nanga with no fertilizer, unstaked Nanga with no fertilizer, unstaked Darina treated with inorganic fertilizer, and staked Darina treated with inorganic fertilizer. These were followed by unstaked Darina with no fertilizer and staked Darina with no fertilizer. These were followed by unstaked Nanga treated with organic fertilizer and unstaked Darina treated with organic fertilizer. These were followed by staked Darina treated with organic fertilizer, while staked Nanga treated with organic fertilizer had the lowest Vitamin K.

Unstaked Nanga treated with inorganic fertilizer had the highest Vitamin B9. This was followed by staked Nanga with no fertilizer and unstaked Nanga with no fertilizer. These were followed by unstaked Darina treated with inorganic fertilizer, staked Darina treated with inorganic fertilizer, staked Darina with no fertilizer, and unstaked Darina with no fertilizer. These were followed by staked Nanga treated with inorganic fertilizer and unstaked Nanga treated with organic fertilizer. These were followed by unstaked Darina treated with organic fertilizer and staked Darina treated with organic fertilizer, while staked Nanga treated with organic fertilizer had the lowest Vitamin B9.

Unstaked Nanga treated with inorganic fertilizer had the highest Vitamin A. This was followed by staked Nanga with no fertilizer and unstaked Nanga with no fertilizer. These were followed by unstaked Darina treated with inorganic fertilizer, staked Darina treated with inorganic fertilizer, staked Darina with no fertilizer, and unstaked Darina with no fertilizer. These were followed by staked Nanga treated with inorganic fertilizer and unstaked Nanga treated with organic fertilizer. These were followed by unstaked Darina treated with organic fertilizer and staked Darina treated with organic fertilizer, while staked Nanga treated with organic fertilizer had the lowest Vitamin A.

Discussion

Nutrient variation among the different types of cucumbers were non-significant in crude protein, while fiber, ash, fat and moisture were significant, however variety contributes only slightly on nutrient variability, which is in line with study done on cucumbers where there was a difference in nutritional composition among different varieties of cucumbers, but not all nutrient components varied in response (Shariff *et al*., 2021; Makinde *et al*., 2024). However fertilizer have the highest significant effect on all parameters and it is observed that availability of nutrient contents are very significantly determined by nutrient management which is also in line with study done by Kuhlein 2000; Kasalie *et al*., 2024 on nutrients contents, it is proved that nutrients contents in food are influenced by many factors such as; natural variations within the species, soil quality and genetic factors of species and also factors such as the season. The significant effect of staking on cucumber proximate composition, agree with the findings of Ahmad and Prasad (2022) that variation in farming practice such as nutrients management, affect yield and nutritional values of cucumber, indicating that there could be optimized techniques for superior quality.

The significance of the interaction of variety and fertilizer on proximate composition of cucumber is in line with the results of Makinde *et al*., (2024), it was observed that, proximate composition of cucumber is affected by genotype (variety) and fertilizer rate significantly.

The significance of interaction of variety and staking on proximate composition of cucumber is in line with the study of Eifediyi and Remison, 2020 that staking improves light and aerates cucumber plant. Enhanced light interception by canopy has been known to increase photosynthesis and nutrient accumulation in crops (Yang *et al*., 2022). Generally, crop management practices affected plant physiological response and nutrient distribution in crops (Kyriacou *et al.*, 2021).

Variety and staking had some interactive effects on the proximate composition of the fruits of cucumber, suggesting that the effect of staking is varietal dependent. The Nanga variety showed a greater reaction to staking compared to Darina. Higher levels of crude protein and fat were obtained in unstaked Nanga while the levels of crude fiber and ash increased in staked fruits of Nanga. However, only very small variations occurred between the staked and unstaked treatments for Darina.

The outcome suggests that cucumber genotype variations on growth habits and assimilate partitioning are the underlying mechanism for the responses of cucumber cultivars to canopy manipulations. Modification of plant structure through staking, which allows for greater vertical growth, light interception and air movement, subsequently influences photosynthesis and assimilate allocation between structural and storage compounds. The rise in fiber and ash in the staking plants, especially in Nanga, may be attributed to increased synthesis of structural carbohydrates and uptake of minerals under a greater exposure of canopy.

The limited variation of Darina shows that for certain kind of cucumber, nutrient content is constant and unresponsive toward canopy manipulation irrespective of growth or within plant resource utilization. This finding supports earlier studies that report vegetable quality is influenced by genotype and management practice (Kyriacou *et al.*, 2021) and that the better light interception leads to enhanced photosysnthesis and accumulate of assimilates (Yang *et al*., 2022). Furthermore, it has also reported that agronomic practices can modulate plant physiological characteristics and nutrient distribution within the plant body (Ibrahim *et al*., 2023).

The major interaction effects between fertilization and staking on proximate composition of cucumber prove that not only nutrient availability but also canopy management interactively affects cucumber fruit biochemical quality. Cucumber quality parameters are affected by fertilizer type. Si *et al*. (2021) suggested that "clear differences were observed among the cucumber groups with respect to the physicochemical characteristics and multi-element profiles". Nutrient availability is indeed important for cucumber composition.

While staking is seldom tied to proximate composition directly in one sentence, canopy management has been reported to enhance the physiological efficiency of crops by enhancing light interception and plant environment. Therefore, the interaction of fertilizer supply and staking is probable, that better availability of nutrients and optimized

canopy architecture enhances assimilation production and allocation to fruits which finally leads to enhancement of fruit composition.

From the result, it can be clearly seen that varieties of cucumber are responsible for differences in the vitamin contents. Nanga has been performing better than Darina in all the vitamins determined. This difference proves that variety of cucumber plays a greater role in determine the nutrient content of the fruit, which agrees with the study made by Makinde *et al*., 2024 that planting Poinsett variety of cucumber at GOF rate of 10 t.ha1 is optimum for the crude and Vitamin contents of the fruit. In the same way, Gajanana *et al*. (2022) established that varieties are responsible for variations in vitamin C and provitamin A.

The better performance on Nanga may then be explained by its genetics for increased accumulation of nutrients and synthesis of metabolites affecting the expression of vitamins in fruits. Application of fertilizers indirectly changes the vitamin content of cucumber by affecting the availability of nutrients and plant metabolic activity. There are evidences that both nitrogen and mineral fertilization affect the content of vitamins and general composition of vegetables and deficiency of nutrients could decrease vitamin accumulation (Kyriacou *et al*., 2021; Olaniyi *et al.,* 2022; Snchez *et al*., 2022. Physico-chemical and chemical properties of cucumber are influenced by the practices adopted for growing cucumber.

CONCLUSION

It can be concluded that Unstaked Nanga variety treated with inorganic fertilizer (200kg/ha) gave optimum Nutrient composition. Therefore, Nanga variety cultivated with 200kg/ha of fertilizer is recommended for optimum nutrient composition.

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