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Influence of seed varieties and harvesting regimes on growth indices, yields and nutritional values of hydroponics maize fodder

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Target Audience: *Livestock farmers, Agricultural Extension Agents and Forage Scientists*

Abstract

This study was conducted to assess the influence of seed varieties and harvesting regimes on growth indices, yields and nutritional values of hydroponics maize fodder in other to ensure sustainable fodder for livestock production. The experiment was 2 x 3 factorial scheme fitted into a completely randomized design (CRD), comprising of two (2) varieties of maize seeds (OBA 98 and Local white maize) and three (3) harvesting regimes (6^{th}, 8^{th} and 10^{th} day). Growth indices, yields, nutritional values were assessed. Results shows a significant ($P<0.05$) effects of maize seed varieties and harvesting regimes on the growth indices, yields, nutritional values. The OBA 98 maize hydroponic fodder (OHF) had the highest ($P<0.05$) agronomic indices, yields, nutrients (CP (16.36 %), EE (4.41), CF (7.23), ash (7.13) and NFE (64.88)) than Local maize hydroponic fodder (LHF). The highest significant ($P<0.05$) contents of the nutrients was observed at 10^{th} day harvesting, while least ($P<0.05$) was obtained at 6^{th} day harvesting except NFE. The OHF had higher ($P<0.05$) neutral detergent fibre (NDF), acid detergent fibre (ADF), acid detergent lignin (ADL) and hemicellulose (HEM). The cellulose (CEL) were similar ($P>0.05$) in OHF and LHF. Similar ($P>0.05$) ADL, HEM and CEL were recorded across the harvesting regimes. The OHF and 10^{th} day harvesting regime had highest ($P<0.05$) mineral, tannin, phytate and oxalate contents. Conclusively, OHF had superior growth indices, yields and nutritional values, 10^{th} day harvesting was better than 6^{th} and 8^{th} day. Hence, OBA 98 seed variety and 10^{th} day harvesting regime is recommended for better hydroponics maize fodder production.

Key words: *Fodder, growth-indices, harvesting-regime, hydroponics, maize-seed, nutrients*

Description of Problem

Livestock production has been an integral part of livelihood in the tropical and sub-tropic regions; its production has been confronted with different multidimensional issues. The most prominent challenge for livestock production is the feed resources, which fodder is 80%. Fodder production has been limited with the exponential increased in the population which resulted to massive infrastructural developments, the environmental challenges global warming is also an issue.

It is expected that the global climatic change causes negative impact on the grazing lands in arid and semi-arid regions **(1).** The rainfall is reduced while environmental temperature is increased, so the grassland yields decrease and range and meadow deteriorate over time **(2)**. There has been a call for smart agriculture which hydroponic fodder production is inclusive.

Hydroponics is a method of growing plants without soil. Hydroponics fodder systems are usually used to sprout cereal grains such as barley, oats, wheat, sorghum, and corn or legumes such as alfalfa, clover or cowpea **(3).** Hydroponics fodder is a well-known technique for high fodder yield, year round production and least water consumption **(4)**.

The quality of seed and harvesting period determine the quality of fodder produced, this study aimed to evaluate the influence of grain varieties and harvesting regimes on growth indices, yields and the nutritional values of hydroponic maize fodder.

Materials and method

Experimental site

The study was carried out at the Forage Science Laboratory, Department of Animal Science, Faculty of Agriculture, University of Port Harcourt, Rivers State, Nigeria. Port Harcourt is a coastal city located in the Niger Delta region of Nigeria within latitudes 6^{o} 58' – 7^{o} 60'E and longitudes 4^{o} 40' – 4^{o}55'N. The monthly rainfall in Port Harcourt follows a sequence of increase from March to October before decreasing in the dry season months of November to February **(5)**.

Sources of maize seed and hydroponic fodder production

Hybrid maize seed (OBA 98) was purchased from the Agro-service Unit of Department of Crop and Soil Science, Faculty of Agriculture, University of Port Harcourt, while the Local white maize seeds were purchased in Choba market, Port Harcourt, Rivers State.

The maize seeds (hybrid and local) were soaked separately in sodium chloride solution (two (2) table spoons of table salt with 1 liter of water) per 1kg of maize seeds for 20 minutes. The maize seeds were washed separately again, then soaked with water for 24 hours. The water was drained and the seeds were incubated in top-perforated buckets for 24 hours, after 80 – 90% of sprouting, seeds were spread on the tray (36 x 45 cm with 3.5 cm depth). The maize seeds were water sprayed three times a day until the harvest time. Three replications of the experiment were observed for agronomic indices and yield at 6^{th}, 8^{th} and 10^{th} days. The sprouts were harvested on 6^{th}, 8^{th} and 10^{th} day with quadrat 0.25 x 0.25 cm. Fresh and dried weights were recorded. Drying was conducted at 60ºC in the oven for 4 days.

Data collection

The agronomic indices: - fodder mat thickness, leaf length, plant height, number of leaves and width of leaf were measured at 6^{th}, 8^{th} and 10^{th} day.

Herbage yield: - The herbage yield was collected according to **(6)** at 6^{th}, 8^{th} and 10^{th} day.

Chemical analysis

Proximate composition: The dry matter, crude protein, ether extract and ash contents of the milled hydroponics fodder samples were determined according to AOAC **(7)**. Non-fibre carbohydrate was calculated as NFC = 100 - (CP + Ash + EE + NDF)**.**

Mineral contents such as calcium, potassium, sodium, zinc, copper, magnesium and Phosphorus were determined by AOAC **(8)** methods using the Atomic Absorption Spectrophotometer**.**

***Fibre fractions and anti-nutritional factors analysis*:** Neutral detergent fibre (NDF), Acid detergent fibre (ADF) and Acid detergent lignin (ADL) of the milled hydroponic fodder sample were determined with the procedure of **(9)**. Cellulose content was taken as the difference between ADF and ADL while hemicellulose content was also calculated as the difference between NDF and ADF.

Tannin and saponin contents were determined according to the methods described by **(10)**. Oxalate was according to **(11)** while phytate was determined as described by **(12)**.

Data analysis

The experiment was a 2 x 3 factorial scheme (2 varieties of maize seeds i.e. OBA

98 hybrid and Local) and three (3) different harvesting periods (6^{th}, 8^{th}, and 10^{th}) into a completely randomize design (CRD). All data obtained were subjected to the analysis of variance (ANOVA). Means were separated using Duncan's Multiple Range Test **(13)** package.

Results and Discussion

Table 1 presents the effects of maize seed varieties and harvesting regimes on agronomic indices and yields of hydroponic maize fodder. There was a significant (P<0.05) effects of varieties of maize seed and harvesting regime on the growth indices and yield of hydroponic maize fodder. The OBA 98 hydroponic maize fodder (*OHF*) had higher (P<0.05) values in all the growth indices and yields than the Local hydroponic maize fodder (*LHF*). The harvesting regime has a significant (P<0.05) effects on the growth indices. The leave numbers (*LVN*) and fodder mat (*FMT*) were similar (P>0.05) at 8^{th} and 10^{th} day, higher (P<0.05) than what was obtained at 6^{th} day of harvest. Plant height, leave length and leave width were significantly (P<0.05) higher at 10^{th} day of harvesting regime. There was no significant (P<0.05) effect of harvesting regime on the herbage yield and dry matter yield.

Table 1: Effects of maize seed varieties and harvesting regimes on the agronomic indices and yield of hydroponically grown maize fodder

Parameter	LVN	PLH (cm)	LLT (cm)	LVW (cm)	FMT (cm)	FHY (g/0.25m^2)	DMY (g/0.25m^2)
Factors							
Seed variety							
OBA 98	2.12^a	5.21^a	18.23^a	2.92^a	2.33^a	528.00^a	174.83^a
Local	1.60^b	2.34^b	5.30^b	1.72^a	1.07	262.31^b	124.78^b
SEM	0.04	0.13	0.45	0.07	0.03	20.40	9.50
P-value	0.000	0.000	0.000	0.000	0.00	0.00	0.00
LOS	**	**	**	**	**	**	**
Harvesting regime							
6^{th} day	1.75^b	2.37^c	9.11^c	1.94^b	1.60^b	421.47	133.67
8^{th} day	1.86^a	4.17^b	11.90^b	1..89^b	1.75^a	379.75	173.75
10^{th} day	1.97^a	4.78^a	14.29^a	3.13^a	1.75^a	384.25	142.00
SEM	0.05	0.15	0.55	0.08	0.03	24.99	11.63
P-Value	0.020	0.000	0.000	0.000	0.010	0.460	0.720
LOS	**	**	**	**	**	NS	NS
S * H							
O*6days	1.79	2.66	10.12	1.95	2.00	527.50	125.50
O*8days	2.22	6.02	20.14	2.37	2.50	576.50	241.50
O*10days	2.36	6.95	24.42	4.43	2.50	480.00	147.50
L*6days	1.71	2.09	8.09	1.93	1.20	315.43	141.83
L*8days	1.50	2.33	3.65	1.40	1.00	183.00	106.00
L*10days	1.57	2.62	4.16	1.84	1.00	288.50	126.50
SEM	0.07	0.22	0.78	0.12	0.05	35.34	16.45
P value	0.000	0.000	0.000	0.000	0.000	0.270	0.000
LOS	**	**	**	**	**	NS	**

[a, b, c] Means on the same column with different superscripts differ significantly (P<0.05)

SEM=Standard error of mean; LOS=Level of significance; ** = significant; NS= not significant; LVN= leaves number; PLH = plant height; LLT = leaf length; LWT = leaf width; FMT = fodder mat; DMY= dry matter yield; FHY = fresh herbage yield S= seed varieties; H= harvesting regime; L= local variety of maize seed; O= OBA 98 hybrid of maize seed

The effects of maize seed varieties and harvesting regimes on the nutrients composition of hydroponic maize fodder were indicated in Table 2. The seed varieties and harvesting regimes has a significant (P<0.05) effects on the crude protein (CP), ether extract (EE), crude fiber (CF), ash and nitrogen free extract (NFE). The *OHF* had higher (P<0.05) CP (16.36 %), EE (4.41), CF (7.23), ash (7.13) and NFE (64.88) compared with *LHF*. The highest significant (P<0.05) contents of the nutrients (17.34 % CP, 4.48 % EE, 7.09 % CF and 7.26 % ash) was observed at 10th day harvesting regime, while least (P<0.05) (13.53 % CP, 4.02 % EE, 5.09 % and 6.56 % ash) was noticed at 6th day harvesting regime, except NFE which was higher (P<0.05) (69.67 %) at 6th day harvesting regime compared to the least (P<0.05) (63.85 %) at 10th day harvesting regime.

Table 2: Effects of maize seed varieties and harvesting regimes on the proximate composition (%DM) of hydroponic maize fodder

Parameter	DM	CP	EE	CF	Ash	NFE
Factors						
Seed varieties (S)						
OBA 98 (O)	93.54	16.36^{a}	4.41^{a}	7.23^{a}	7.13^{a}	64.88^{b}
Local (L)	94.84	14.83^{b}	4.08^{b}	5.82^{b}	6.74^{b}	68.54^{a}
SEM	0.94	0.02	0.01	0.01	0.01	0.01
P-value	0.34	0.00	0.00	0.00	0.00	0.00
LOS	NS	**	**	**	**	**
Harvesting regime (H)						
6th day	94.23	13.53^{c}	4.02^{c}	5.94^{c}	6.56^{c}	69.97^{a}
8th day	94.74	15.93^{b}	4.24^{b}	6.55^{b}	6.98^{b}	66.31^{b}
10th day	94.60	17.34^{a}	4.48^{a}	7.09^{a}	7.26^{a}	63.85^{c}
SEM	5.66	0.02	0.01	0.01	0.01	0.01
P-Value	0.40	0.00	0.00	0.00	0.00	0.00
LOS	NS	**	**	**	**	**
S * H						
O*6days	94.40	14.33	4.17	6.70	6.85	67.99
O*8days	94.68	16.93	4.41	7.34	7.21	64.12
O*10days	94.55	17.84	4.66	7.64	7.33	62.54
L*6days	95.07	12.73	3.88	5.17	6.28	71.96
L*8days	94.81	14.93	4.07	5.77	6.74	68.50
L*10days	94.65	16.84	4.29	6.53	7.19	65.16
SEM	2.45	0.03	0.01	0.01	0.01	0.02
P value	0.40	0.00	0.00	0.00	0.00	0.00
LOS	NS	**	**	**	**	**

[a, b, c] Means on the same column with different superscripts differ significantly (P<0.05)
SEM=Standard error of mean; LOS=Level of significance; ** = significant; NS= not significant; DM= dry matter; CP= crude protein; EE= ether extract; CF= crude fibre; NFE= nitrogen free extract

Table 3 shows the effects of seed varieties and harvesting regimes on the fibre fractions of hydroponic maize fodder. The seed varieties had significant (P<0.05) effects on the fibre fractions. The *OHF* had higher (P<0.05) neutral detergent fibre (NDF), acid detergent fibre (ADF), acid detergent lignin (ADL) and hemicellulose (HEM) compared to *LHF*. The cellulose (CEL) were similar (P>0.05) within the seed varieties. The

harvesting regimes significantly (P<0.05) affected the NDF and ADF. Higher (P<0.05) NDF (26.40%) and ADF (14.05%) was recorded at 6th and 10th day respectively. Similar (P>0.05) ADL, HEM and CEL were recorded across the 6th, 8th and 10th day.

Table 3: Effects of maize seed varieties and harvesting regimes on the fibre fractions of hydroponic maize fodder

Parameter	NDF	ADF	ADL	HEM	CEL
Factors					
Seed varieties					
OBA 98 (O)	28.53	13.89	6.94	14.64	6.95
Local (L)	25.79	12.83	4.83	12.96	7.99
SEM	0.01	0.24	0.49	0.24	0.54
P-value	0.00	0.01	0.01	0.00	0.20
LOS	**	**	**	**	NS
Harvesting regimes					
6th days	26.40[a]	12.89[b]	5.08	13.51	7.81
8th days	27.36[b]	13.14[b]	6.56	14.22	6.58
10th days	27.73[c]	14.05[a]	6.02	13.6	8.03
SEM	0.01	0.30	0.60	0.29	0.67
P-Value	0.00	0.04	0.25	0.23	0.29
LOS	**	**	NS	NS	NS
Seed varieties* Harvesting regimes					
O*6th days	27.60	12.47	5.88	14.13	7.59
O*8th days	28.81	13.85	8.30	14.96	5.55
O*10th days	29.19	14.36	6.65	14.83	7.71
L*6th days	25.19	12.31	4.28	12.88	8.03
L*8th days	25.91	12.43	4.83	13.48	7.60
L*10th days	26.27	13.74	5.40	12.53	8.34
SEM	0.01	0.42	0.85	0.41	0.94
P value	0.00	0.63	0.40	0.43	0.66
LOS	**	NS	NS	NS	NS

[a, b, c] Means on the same column with different superscripts differ significantly (P<0.05)
SEM= standard error of mean; LOS=level of significance; ** = significant; NS= not significant;
NDF = neutral detergent fibre; ADF = acid detergent fibre: ADL = acid detergent lignin; HEM = hemicellulose; CEL = cellulose

Table 4 effects of maize seed varieties and harvesting regimes on mineral contents of hydroponic maize fodder. There was a significant (P<0.05) effects of maize seeds varieties and harvesting regimes on the minerals profile of hydroponically maize fodder. The *OHF* had higher (P<0.05) Na (0.28%), K (0.88%), Ca (0.34%), Mg (0.37%), P (0.46%), Zn (86.12), Cu (17.42), Mn (36.31) and Fe (224.74) compared to *LHF*. The 10th day harvesting regime had highest (P<0.05) mineral contents, followed by 8th and 6th day. The contents varied (P<0.05) from 0.26 – 0.29 %, 0.78 – 0.94 %, 0.30 – 0.36 %, 0.32 – 0.39 %, 0.41 – 0.49 %, 66.43 – 84.55, 14.18 – 18.83, 28.07 – 45.00 and 195.20 – 239.03 for Na, K, Ca, Mg, P, Zn, Cu, Mn and Fe, respectively.

Table 4: Effects of maize seed varieties and harvesting regimes on mineral contents of hydroponic maize fodder

Parameter	Na (%)	K (%)	Ca (%)	Mg (%)	P (%)	Zn (mg/g)	Cu (mg/g)	Mn (mg/g)	Fe (mg/g)
Factors									
Seed varieties									
OBA	0.28[a]	0.88[a]	0.34[a]	0.37[a]	0.46[a]	86.12[a]	17.42[a]	36.31[a]	224.74[a]
Local	0.26[b]	0.83[b]	0.32[b]	0.35[b]	0.44[b]	67.22[b]	15.67[b]	34.13[b]	213.79[b]
SEM	0.00	0.00	0.00	0.00	0.00	0.12	0.05	0.48	0.01
P-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOS	**	**	**	**	**	**	**	**	**
Harvesting regimes									
6th day	0.26[c]	0.78[c]	0.30[c]	0.32[c]	0.41[c]	66.43[c]	14.18[c]	28.07[c]	195.20[c]
8th day	0.27[b]	0.85[b]	0.33[b]	0.37[b]	0.44[b]	79.03[b]	16.63[b]	32.58[b]	222.65[b]
10th day	0.29[a]	0.94[a]	0.36[a]	0.39[a]	0.49[a]	84.55[a]	18.83[a]	45.00[a]	239.03[a]
SEM	0.00	0.00	0.00	0.00	0.00	0.14	0.06	0.06	0.01
P-Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOS	**	**	**	**	**	**	**	**	**
S * H									
O*6th days	0.27	0.82	0.31	0.33	0.42	72.45	15.00	28.67	198.74
O*8th days	0.28	0.87	0.34	0.38	0.45	89.55	17.57	33.80	226.83
O*10th days	0.30	0.96	0.36	0.40	0.50	96.35	19.70	46.45	248.67
L*6days	0.25	0.74	0.29	0.31	0.39	60.40	13.37	27.47	191.67
L*8days	0.26	0.82	0.31	0.36	0.43	68.50	15.70	31.37	218.48
L*10days	0.28	0.93	0.35	0.38	0.48	72.75	17.95	43.55	229.40
SEM	0.00	0.00	0.00	0.00	0.00	0.20	0.09	0.08	0.01
P value	0.66	0.00	0.04	0.40	0.01	0.00	0.42	0.00	0.00
LOS	NS	**	**	NS	**	**	NS	**	**

[a, b, c] Means on the same column with different superscripts differ significantly (P<0.05)
SEM=Standard error of mean; LOS=Level of significance; ** = significant; NS= not significant

There was a significant effect of seed varieties on tannin, phytate and oxalate contents of the hydroponic maize fodders. The *OHF* had higher content of tannin, phytate and oxalate compared to *LHF*. The saponin content was similar (P>0.05) among the seed varieties. Harvesting regimes had a significant (P<0.05) effects on the tannin, saponin, phytate and oxalate. At 10th day harvesting regime higher (P<0.05) contents of tannin, saponin, phytate and oxalate were recorded compared to other harvesting regime (6th and 8th day).

Table 5: Effects of maize seed varieties and harvesting regimes on anti-nutritional factors (%DM) of hydroponic maize fodder

	Parameter			
Factors	Tannin	Saponin	Phytate	Oxalate
Seed varieties				
OBA 98 (O)	0.011[b]	0.140	0.011[b]	0.012[b]
Local (L)	0.023[a]	0.137	0.019[a]	0.017[a]
SEM	0.00	0.01	0.00	0.00
P-value	0.00	0.70	0.00	0.00
LOS	**	NS	**	**
Harvesting regimes				
6th day	0.012[b]	0.110[c]	0.010[c]	0.010[c]
8th day	0.027[a]	0.131[b]	0.015[b]	0.014[b]
10th day	0.027[a]	0.172[a]	0.117[a]	0.018[a]
SEM	0.00	0.01	0.00	0.00
P-Value	0.02	0.04	0.00	0.00
LOS	**	**	**	**
S * H				
O*6days	0.010	0.111	0.010	0.010
O*8days	0.010	0.131	0.010	0.010
O*10days	0.020	0.181	0.000	0.010
L*6days	0.020	0.121	0.010	0.010
L*8days	0.020	0.143	0.010	0.010
L*10days	0.030	0.152	0.010	0.100
SEM	0.00	0.02	0.00	0.00
P-value	0.55	0.40	0.00	0.15
LOS	NS	NS	**	NS

[a, b, c] Means on the same column with different superscripts differ significantly (P<0.05)
SEM=Standard error of mean; LOS=Level of significance; ** = significant; NS= not significant

The higher growth indices, herbage yield and dry matter yield recorded for OBA 98 over the Local maize seeds means that seed varieties has effect on agronomic indices and yield this might be attributed to the fact that OBA 98 was a hybrid and improved varieties, sourced from Agricultural Institution over the Local seeds which was purchased from the open market, this corroborate the report of Odedire *et al.* **(14)** that maize sourced from the open market where improper harvesting technique and inadequate preservation technologies are a serious challenge that predispose seeds to insect and mould infestation. Among the harvesting regime, 10th day harvesting regime had appreciable values over the other (6th and 8th day) harvesting regimes. The similar herbage yield and dry matter yield recorded in this study was in line with the finding of (**2**).

The CP recorded for seed varieties (14.83 - 16.36%) and harvesting regimes (13.53 – 17.34%) in this study were below 18.35% CP reported by Alalade *et al.* **(2)** for hydroponic maize fodder harvested at 12th day of planting. The reasons for the variation in the findings might be attributed to the different in the seeds and harvesting time of the study.

The crude protein content in hydroponic maize fodder was higher compared to 8.7% in maize seed. This observation has been reported by other authors **(15; 16)**. The CP value for seed varieties (*OHF* and *LHF*) (14.83 - 16.36%) and harvesting regimes (6th, 8th and 10th) (13.53 – 17.34%) recorded in this study contains the required CP for microbial fermentation. McDonald *et al.* **(17)** suggested

threshold of about 7 to 8% CP to guarantee sufficient utilization of feed. Therefore, the hydroponic maize fodders of two different seed varieties (*OHF* and *LHF*) and harvesting at any different regimes (6^{th}, 8^{th} and 10^{th} days) would provide adequate nitrogen requirement by rumen micro-organism to maximally digest the main components of dietary fiber leading to the production of volatile fatty acid **(18; 19)** which in turn facilitates microbial protein synthesis **(20)** and latter for production of meat and milk for human use.

The EE for *OHF* and *LHF* (4.08 – 4.41%) and harvesting regime (4.02 – 4.48%) reported in this study favorably compared with 3.20 – 4.21% EE reported by Alalade *et al*. **(2)**. The increase in the EE content of the hydroponics fodder may be due to the increase in the structural lipids and production of chlorophyll associated with the plant grown **(16)**. However, the agronomic parameters (Table 1) also corroborate the findings, the *OHF* had higher number of leaves, plant height etc. compared to *LHF*, likewise the harvesting regime 6^{th} versus 10^{th} day, these growth indices will aid the process of photosynthesis **(20)**.

The NFE is an indicator of carbohydrate content of feedstuff or ingredient that is soluble or easily digested and available for animal. It implies that the soluble carbohydrate could support the production of volatile fatty acids in the rumen during fermentation **(21)**.

The level of ADF is an indicator of digestibility. Shroeder **(22)** states that as the ADF content increases, forage digestibility decreases. The range of ADF recorded for hydroponic maize fodders in this study 12.83 – 13.89% for seed varieties and harvesting regimes 12.89 – 14.05% indicated that it's of good feed resources. Ball *et al*. **(23)** classified forages with ADF values greater than 43.00 – 45.00% as low quality forages.

Oxalate has been shown to deplete that calcium reserve, but browse plant were found to contain responsibility amount of calcium, magnesium and phosphorus **(26).** The tannin content of hydroponic maize fodder show the range for seed varieties (0.011 – 0.023%) and harvesting regimes (0.012 – 0.027%) this tannin level is much lower than the level of 5% at which goat may reject feed **(27)**. The saponin value ranged from 0.110 – 0.172%, feedstuff containing saponin had been shown to be defaunating agent **(28)** and capable of reducing methane production **(29)**. Alalade *et al*. **(2)** reported that saponin have effect on erythrocyte haemolysis, reduction of blood and liver cholesterol, depression of growth rate, bloat (ruminant) inhibition of smooth muscle activity, enzyme inhibition and reduction in nutrient absorption. Saponin have been reported to alter cell wall permeability and therefore to produce some toxic effect when ingested **(30; 2)**.

The mineral profile of the hydroponic maize fodders recorded in the study were within the dietary requirements of goat as recommended by NRC **(24)** for Ca, K and Na, 0.18 – 1.04, 0.50 – 0.80 and 0.04 – 0.10 % respectively. The Mg content of the hydroponic maize fodder was in line with the recommended range (0.25 – 0.29%) for ruminant animals **(25)**.

This is an indication that the hydroponic maize fodder will supply the required minerals for body metabolism for ruminant animal without mineral fortification.

Conclusion and Applications

1. OBA 98 hydroponic maize fodder had superior growth indices and exhibited higher nutrients content compared to Local maize hydroponic fodder. While, 10^{th} day harvesting regime had a better growth indices and guarantee better nutrients than 6^{th} and 8^{th} day. Meanwhile, similar fodder mat, leaf number and yields (herbage and dry matter yield) were obtained at any harvesting regime (6^{th}, 8^{th} and 10^{th} day).
2. The mineral contents, fibre fractions and anti-nutritional factors for OBA 98 and Local hydroponic maize fodders guarantee maximum performance for

ruminant and livestock production.

3. Though, the nutrients provided by the hydroponic fodders of the two varieties of maize (OBA 98 and Local) and at different harvesting regimes (6^{th}, 8^{th} and 10^{th}) will meet the requirements of ruminant and other livestock especially during the dry season as a supplements or basal feed. These are the indication that hydroponic maize fodder from the two different varieties of maize seeds and harvesting at any regime is a feed resource for ruminant and livestock production. Hence, harvesting can be done at 6^{th}, 8^{th} and 10^{th} day depending on the target of the famer.

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