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Performance Assessment of African Giant Land Snail (*Archachatinamarginata*) Fed Formulated Concentrate Diet and Municipal Organic Waste

Eneruvie, B.E.[1], Agunannah, M.U.[2], Umekwe, P.N.[3]

[1, 2]Department of Agricultural Technology, Akanu Ibiam Federal Polytechnic, Unwana-Afikpo, Ebonyi State

[3]Department of Horticulture and Landscape Technology, Akanu Ibiam Federal Polytechnic, Unwana-Afikpo, Ebonyi State

Abstract: ***This study was conducted to assess the performance of African giant land snail (Archachatina marginata) fed formulated concentrate diet (FCD) and municipal organic waste (MOW). Two hundred and twenty (220) hatchlings were used. The snails were divided into five (5) treatments groups and replicated four (4) times. Each replicate contains eleven (11) snails giving a total of 44 snails per treatment group. Five (5) experimental diets were formulated: T_1, T_2, T_3, T_4 and T_5 which contain T_1: 100% formulated concentrate diet (FCD), T_2: 75% FCD: 25% municipal organic waste(MOW), T_3: 50% FCD: 50% MOW, T_4: 25% FCD: 75% MOWand T_5: 100% (MOW) respectively. Each treatment group was given one of the five diets. Daily weight gain, feed conversion ratio, feed intake and carcass yield were determined. Average daily weight gain and feed conversion ratio was in the decreasing order of T_3>T_1> T_2> T_4> T_5. T_5 was significantly ($P<0.05$) higher in daily feed intake than other treatment groups. Based on the observation in term of daily weight gain and feed conversion ratio of 50% municipal organic waste inclusion level on snail performance, it is however, recommended that 50% (FCD):50% (MOW) will improve snail performance.***

Keywords: Municipal Organic Waste, Dress Percentage, Concentrate, Diet and Carcass Yield

1. Introduction

Snails are bilaterally symmetrical invertebrates with soft-segmented exoskeleton in the form of cancerous shell. They belong to the phylum mullusca. In West African, snails dwell in humid forest areas from where they are gathered by villagers for consumption and other uses (Ademosun and Omidiji, 1991). In recent times, the wild snail population has declined mainly due to the impact of man and other anthropologic factors; including deforestation, slash and burn agricultural practices and over exploitation of animal resource, stemming from the world increasing population. Hence, the few remaining species are captured before the reach maturity.

The need to embark on the mass production of snails cannot be over emphasized. Snail can be reared in both small and large scale production systems. Snail rearing can be seen as a veritable self-sufficient activity in hard times as presently experienced in Nigeria (Agbogidi *et al.*, 2008). But scarcity of feed ingredients are major concerned to researchers.

Municipal organic wastes are unwanted or unusable materials of plant and animal origin belonging to a town or city. These unwanted substances gotten from the city or town are discarded after their primary use because they are worthless, defective and of no use to the users. Government spend huge amount of money daily, weekly, monthly and yearly in disposing these waste from the city. Hence, this study seek to convert this waste to wealth by assessing the performance of African giant land snail (*Archachatina marginata*) fed formulated concentrate diet (FCD) and municipal organic waste (MOW).

2. Materials and Methods

Study Area
The study was conducted in the snail unit of the Teaching, Research and Demonstration farm of Akanu Ibiam federal Polytechnic, Unwana-Afikpo, Ebonyi State. Unwana is in the tropical rainforest zone of Nigeria and has air temperature range of 210C-320C with a total annual rainfall exceeding 3,500mm (Njoku *et al.*, 2006).

Materials Used
The ingredients used for the formulation of the concentrate diet were gotten from a feed mill within Enugu main town, Enugu State while the municipal organic waste was obtained from traders at Eke market in Afikpo town, Ebonyi State. The ingredients and composition of experimental diets are presented in Table 1 and 2.

Feed Preparation
The obtained municipal organic waste was sorted out to remove unwanted materials such as nylon, chopped/cutted and blended into paste for feeding the snails.

Formulate Concentrate Diets
This was formulated according to standard method as presented in table 1.

Experimental Animals,
The experimental animals were two hundred and twenty (220) hatchlings from African Giant Land Snails. These hatchlings were housed in a plastic perforated container filled with moisted soil.

Experimental Diets
Five treatments comprising of experimental diets with the following formulations: T_1 = 100% FCD, T_2 = 75%

FCD:25% MOW, T_3 = 50% FCD: 50% MOW, T_4 = 25% FCD: 75% MOW, T_5 =100% MOW.

Experimental Design

Completely Randomized Design (CRD) was used for the study. The hatchlings were randomly divided into five (5) treatments units in four (4) replications. The treatments which comprised of the five formulated diets were fed each to the respective experimental units.

Data Collection

Data in performance indices including weight gain, average feed intake and feed conversion ratio were taken daily for 91 days, while data on carcass yield parameter including average edible carcass, weight of shell and viscera were taken at 120-150 days.

Statistical Analysis

Data obtained from the study were subjected to analysis of variance (ANOVA) according to Steel and Torries (2000), while mean separated FLSD (0.05) with SPSS Version 16.

Table 1: Nutrient Composition of Formulated Concentrate Diet (FCD)

Ingredients	Percentage (%)
Maize	30.00
Soybean Meal	28.00
Wheat Offal	15.00
PKC	8.50
Bone Meal	10.00
Limestone	8.00
Salt	0.10
Mineral Premix	0.20
Methionine	0.10
Lysine	0.10
Total	100.00

Table 2: Composition and Calculated Analysis of FCD and MOW fed to African Giant Land Snail (*Archachatina marginata*)

Feed Stuff (kg)	T_1 100% FCD	T_2 75% FCD: 25% MOW	T_3 50% FCD: 50% MOW	T_4 25% FCD: 75% MOW	T_5 100% MOW
MOW	___	25	50	75	100
FCD	100	75	50	25	___
Total	100	100	100	100	100
Chemical Composition (%)					
Moisture Content	7.45	10.25	17.07	24.86	57.14
Crude Protein	14.32	15.41	16.70	18.04	19.84
Crude Fibre	8.33	6.16	4.75	2.12	1.49
Fat	5.86	6.06	6.83	7.13	7.55
Ash content	5.42	5.97	6.45	6.84	6.96
Nitrogen Free Extract	58.63	56.16	48.21	41.02	7.04
Minerals (mg/100)					
Calcium	6.22	5.86	5.02	3.92	2.13
Sodium	23.67	28.43	32.13	35.31	40.37
Magnesium	52.41	88.33	93.51	99.18	139.41
Phoshorus	88.24	101.44	139.66	204.17	318.13
Potassium	103.16	118.44	131.54	203.41	260.24
Iron	3.86	4.01	4.21	5.03	5.42
Zinc	3.07	3.02	2.87	2.64	2.17
Phytochemical (mg/100g))					
Alkaloid	3.46	4.02	5.81	5.13	4.82
Saponin	0.47	0.91	1.18	1.93	3.21
Tannin	1.12	1.47	1.94	2.84	5.21
Flavonin	2.62	2.53	2.32	2.02	1.46
Cyaogenic glycosides	3.64	3.04	2.72	2.15	1.02
Calculated Composition(%)					
Crude Protein	18.91	19.14	19.38	19.61	19.84
Ether Extract	3.55	4.52	5.51	6.17	7.45
Crude Fibre	5.07	4.17	3.29	2.39	1.49

Where FCD is formulated concentrate diet and MOW is municipal organic waste

3. Results and Discussion

The performance of African giant land snail *(Archachatina marginata*) fed formulated concentrate diet and municipal organic wastes are presented in table 3. The result showed that average daily weight gain and feed conversion ratio was in the decreasing order of T_3> T_1> T_2> T_4> T_5. The higher daily weight gain observed in snails fed diet (T_3) could be due to the higher nutrient quality of the 50%:50% ratio diets. This finding is in line with observation made by Anigbogu *et al.*(2011b) who revealed that nutrient quality is more beneficial and important than the level of nutrient in the diet.

The result for average daily feed intake reveals that T_5 was significantly (P<0.05) higher than other treatment groups. This may be due to lower dry matter content of the diet when compared to other treatment diets. This finding is in line with the observation of Do (2006) who reported that dry matter affect feed intake in ruminant.

The carcass yield of snail fed FCD and MOW is presented in table 4. The average live weight of snails was in the decreasing order of T_3> T_4> (T_1) > T_2> T_5. This could be due to higher nutrient qualityin diet containing 50% FCD: 50% MOW inclusion as earlier noted in this study. The average

dress percentage was generally better in all the treatment groups. This was in line with observation made by Cobbinah, Vink and Onwuka, (2008) who reported average edible carcass percentage to be 45%. Average shell percentage was statistically ($P<0.05$) higher in T_1 compared to what was observed in other treatment groups. This could be attributed to the higher level of calcium in T_1(control). Amata (2004) also gave a similar report using formulated concentrate diets. Average viscera percentage was higher in T_5 andT_4, followed by T_3, T_1(control),and T_2. This high viscera weight recorded in this study could be attributed to high fat content, which was in line with report made by Kalu (2014), who reported high fat content in untreated municipal organic waste.

4. Conclusion

The snails fed 50% FCD: 50% MOW had better weight gain and feed conversion ratio and compared favourably with the control treatment (T_1). The average edible percentage of snails was generally better across all treatment groups. Based on the result of these findings, it is however recommended that 50% FCD:50% MOW ratio in snail diet will yield better performance.

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Table 3: Performance Analysis

	T_1 FCD 100%	T_2 FCD 75%: MOW 25%	T_3 FCD 50%: MOW 50%	T_4 FCD 25%: MOW 75%	T_5 MOW 100%
Initial Weight of Snail (g)	5.973±0.0144	5.963±0.0218	5.955±0.0210	5.988±0.0296	5.955±0.0185
Final Weight of Snail (g)	$24.713±0.8431^{ab}$	$23.673±1.5158^{ab}$	$25.285±1.5039^{a}$	$23.66±1.6032^{ab}$	$20.93±0.8464^{b}$
Average Daily Weight Gain (g)	$0.208±0.0103^{ab}$	$0.195±0.0156^{ab}$	$0.213±0.0170^{a}$	$0.195±0.0156^{ab}$	$0.165±0.0096^{b}$
Average Daily Feed Intake	$5.760±0.1822^{c}$	$5.748±0.1377^{c}$	$5.710±0.0634^{c}$	$6.708±0.1812^{b}$	$7.803±0.0851^{a}$
Feed Conversion Ratio	$0.310±0.0147^{a}$	$0.328±0.0266^{ab}$	$0.300±0.0196^{a}$	$0.383±0.0263^{b}$	$0.525±0.0239^{c}$

Table 4: Carcass Yield of Snail

	T_1 FCD 100% (control)	T_2 FCD 75%: MOW 25%	T_3 FCD 50%: MOW 50%	T_4 FCD 25%: MOW 75%	T_5 MOW 100%
Average Live Weight of Snail (g)	$175.545±6.6499^{a}$	$161.635±8.1044^{ab}$	$179.030±10.9937^{a}$	$177.980±15.0741^{a}$	$133.250±2.8944^{b}$
Average Edible Carcass Weight (g)	$82.170±3.6168^{a}$	$76.710±4.6663^{a}$	$81.925±4.6945^{a}$	$82.275±6.6657^{a}$	$58.160±2.1307^{b}$
Average Edible Carcass (%)	$46.840±1.3686^{a}$	$47.390±0.7905^{a}$	$45.798±0.4993^{ab}$	$46.268±0.4743^{ab}$	$43.613±0.8376^{b}$
Average Shell Weight (%)	$21.842±0.6808^{a}$	$19.363±0.6318^{b}$	$19.005±0.1335^{b}$	$18.038±0.2932^{bc}$	$16.778±0.5697^{c}$
Average weight of Viscera (%)	$25.343±0.6399^{c}$	$25.268±0.4669^{c}$	$27.598±0.6674^{b}$	$29.318±0.7584^{ab}$	$29.720±0.4767^{a}$