CARCASS AND ORGAN CHARACTERISTICS OF GROWER RABBIT FED HYDROPONICALLY GROWN FODDERS

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ABSTRACT
This study was conducted to assess the carcass and organ characteristics of grower rabbits fed hydroponically grown fodders. The hydroponically grown fodder comprises of cereals namely: maize (Zea mays), millet (Pennisetum glaucum), sorghum (Sorghum bicolar) and wheat (Triticum aestivum), which were subjected to soaking durations of 90 minutes, respectively and 30 minutes for millet in hydroponic trials, which were used as experimental diets in the feeding trials. The fodders were offered to the experimental animals at 4% of their body weight in a trial that lasted for 8 weeks. The chemical composition of the diets was carried out following standard laboratory procedures and the carcass characteristics were carried out according to recommended standard procedures. Results indicated a reduction ($p<0.05$) in the dry matter and ether extract, composition while a significant ($p<0.05$) increase in hydroponically grown sorghum was observed in crude protein. The dressing percentage and edibles increased ($p<0.05$) significantly. The study concluded that the nutritive values of hydroponically grown sorghum was optimal for growth, but no difference on the growth of some visceral organs like liver, heart and lung.
Keywords: Hydroponic fodder, Grower rabbits, Concentrate, Carcass, Chemical composition.

INTRODUCTION

Hydroponic fodder production is a technology of growing plants without soil, but only with water or nutrient-rich solution. Several grains, like maize, barley, sorghum e.t.c., are usually employed in hydroponic fodder production spanning 7 to 10 days, when the fodder is fit for animal feeding. Hydroponic fodder presents various benefits ranging from improved animal health to highly enriched nutritional contents (Girma and Gabremariam, 2018). Feeding hydroponically grown fodder has also been reported to enhance nutrient digestibility and utilization in animals (Hassen and Dawid, 2022). At harvest, the plant is 20 to 25cm in height, consisting of stem, green leaves and roots (Shtaya, 2004). The animal consumes the whole plant including seed and roots (Resh, 1997). Due to its colour, taste and texture, it is considered highly palatable feed that promotes digestibility of other nutrients (FAO, 2001). The study aimed to assess the carcass characteristics of grower rabbits fed hydroponic fodder.

MATERIALS AND METHODS

Production of hydroponically grown fodders

A locally adapted hydroponic chamber (Odedire, 2018) were employed for this experiment, four (4) cereals namely Maize (*Zea mays*), Millet *(Pennisetum glaucum*), Wheat (*Triticum aestivum*) and Sorghum Red (*Sorghum bicolor*) were subjected to soaking durations of 90 minutes except for millet, that was soaked for 30 minutes. After 9 days of total growth period, the fodders were harvested, weighed and fed to grower rabbits.

Experimental station and duration

The experiment was carried out at the Rabbitry Unit, Obafemi Awolowo University Teaching and Research Farm, Ile-Ife.

Experimental diets

The rabbits were allotted to the following Treatment diets:
Treatment 1: Typically concentrate diet (control)
Treatment 2: Hydroponically grown sorghum soaked for 90 minutes
Treatment 3: Hydroponically grown maize soaked for 90 minutes
Treatment 4: Hydroponically grown millet soaked for 30 minutes
Treatment 5: Hydroponically grown wheat soaked for 90 minutes

The animals were weighed before the commencement of the experiment, to take the record of the initial live weight.

Determination of Carcass Characteristics of Grower Rabbit fed experimental diets.

Three grower rabbits were randomly selected from each treatment after a growth trial were reported. Selected animals were fasted for 16 hours overnight but were provided with clean water before they were slaughtered. The fasted weights and hot carcass weight of the animals were recorded before and immediately after slaughter. The head, feet, lungs, heart, liver, kidney were removed and weighed. Dressing percentage were calculated as the hot carcass weight in relation to live weight. Weight of edible parts i.e carcass without head, liver, heart, kidneys and lungs were recorded.

CHEMICAL ANALYSES

All feed samples and faeces were dried in an oven (at 70˚C) for 72 hours and the proximate composition of the experimental diets was determined using the standard procedures of the AOAC, 2006. The fibre fractions were determined using the method of Van Soest *et al.,* 2015.

STATISTICAL MODEL

$y_{ij} = \mu + t_i + \varepsilon_{ij}$

where: y_{ij} = Observation on subject (animal) j in treatment i, μ = The overall mean, t_i = The fixed effect of treatment i, ε_{ij} = Random error.

STATISTICAL ANALYSES

All data obtained were subjected to One - way analysis of variance analysed using the General Linear Model procedure of SAS, 2001. Significant differences between means were separated using the Duncan's Multiple Range Test of the same SAS package.

RESULTS AND DISCUSSION

Presented in Table 1 is the chemical composition of concentrate and hydroponically grown fodders. The dry matter (DM) content and ether extract in Diet 1 was significantly ($p<0.05$) higher than other diets, this is because Diet 1 was a conventional concentrate diet with high dry matter content (as reported by Naik *et al*., 2015) while Diets 2, 3, 4 and 5 were HGFs. HGFs are reported low in DM as a result of sprouting in starch, which catabolizes into soluble sugar for supporting the metabolism requirement of growing plants for respiration and cell wall synthesis (Naik *et al*., 2015; Odedire *et al*., 2019). The crude protein (CP) value (20.75%) obtained for this study was highest in Diet 2. (Akinropo, 2023) reported slightly higher crude protein value (21.60%) for hydroponic sorghum. The differences in the crude protein value for hydroponically grown sorghum might be due to differences in the seed varieties.

Table 1: Chemical Composition of the Concentrate and Hydroponically Grown Fodders

	Diets						
Parameters (%)	**1**	**2**	**3**	**4**	**5**	**SEM**	**P value**
Dry Matter	93.96^{a}	23.14^{b}	18.81^{c}	22.95^{b}	17.12^{d}	7.88	<0.0001
Ether Extract	6.34^{a}	4.42^{b}	3.52^{d}	4.12^{c}	3.37^{e}	0.28	<0.0001
Crude Fibre	9.00^{e}	19.44^{c}	23.17^{a}	21.68^{b}	17.78^{d}	1.33	<0.0001
Ash	8.68^{b}	7.85^{c}	9.37^{a}	7.70^{d}	6.69^{e}	0.24	<0.0001
Crude Protein	18.35^{c}	20.75^{a}	17.82^{d}	19.10^{b}	15.68^{e}	0.44	<0.0001
Nitrogen free Extract	57.49^{a}	47.55^{c}	46.13^{d}	47.41^{c}	56.49^{b}	1.32	<0.0001
	Fibre fractions						
Neutral detergent fibre	12.04^{e}	61.63^{c}	66.51^{a}	62.08^{b}	53.29^{d}	5.34	<0.0001
Acid detergent fibre	4.59^{e}	44.36^{c}	49.92^{a}	45.12^{b}	36.17^{d}	4.36	<0.0001
Acid detergent lignin	0.98^{e}	11.26^{c}	14.25^{a}	11.62^{b}	11.15^{d}	1.22	<0.0001
Hemicellulose	7.45^{e}	17.27^{a}	16.59^{d}	16.96^{c}	17.12^{b}	1.02	<0.0001
Cellulose	3.62^{e}	33.10^{c}	35.67^{a}	33.50^{b}	25.02^{d}	3.17	<0.0001

$^{a, b, c, d}$: Means within each row with different superscript are significantly different ($p< 0.05$) SEM (±): Standard error of mean; P value: Probability value; Diet 1: concentrate (control); Diet 2:hydroponically grown sorghum; Diet 3:hydroponically grown maize; Diet 4:hydroponically grown millet; Diet 5:hydroponically grown wheat.

Table 2 and 3 reported the carcass characteristics of grower rabbit fed experimental diets. Results showed that the carcass and cut parts value of animals depends on how adequately the animals utilize nutrients in feed to synthesize body tissues (Odoemelam *et al*., 2014). The dressing percentage was significantly ($p<0.05$) higher in Diet 1 than the other diets, this may be as a result of better feed utilization of the ration. Slaughter weight and hot carcass weight were significantly ($p<0.05$) high in diets 1 and 2

Table 2a: Carcass Characteristics of Grower Rabbits fed Experimental diets

	Diets						
Parameters	**1**	**2**	**3**	**4**	**5**	**SEM**	**P value**
Dressing (%)	56.92^{a}	52.58^{b}	47.68^{c}	49.91^{bc}	49.52^{bc}	0.99	0.0045
Slaugther weight (kg)	2.28^{a}	2.17^{a}	1.52^{b}	1.67^{b}	1.68^{b}	0.09	0.0007
Hot carcass weight (kg)	1.28^{a}	1.14^{a}	0.73^{b}	0.83^{b}	0.83^{b}	0.06	<0.0001
Offals (%)	13.14^{b}	20.94^{a}	22.98^{a}	21.59^{a}	22.60^{a}	1.15	0.0094
Edibles (%)	61.04^{a}	56.94^{b}	52.66^{b}	54.59b^{c}	54.27^{bc}	0.90	0.0049
Inedibles (%)	38.96^{c}	43.06^{b}	47.34^{a}	45.41^{ab}	45.73^{ab}	0.90	0.0049
Total edibles (g)	1.39^{a}	1.24^{a}	0.80^{b}	0.91^{b}	0.91^{b}	0.06	<0.0001
Total inedibles (g)	0.89^{ab}	0.94^{a}	0.73^{c}	0.76^{bc}	0.77^{bc}	0.03	0.0403

$^{a, b, c, d}$: Means within each row with different superscript are significantly different ($p< 0.05$); SEM: Standard error of mean; P value: Probability value; Diet 1: concentrate (control); Diet 2: hydroponically grown sorghum; Diet 3: hydroponically grown maize; Diet 4:hydroponically grown millet; Diet 5:hydroponically grown wheat

Table 2b: Carcass characteristics of internal organs of grower rabbits fed experimental diets

	Diets						
Parameters(%)	**1**	**2**	**3**	**4**	**5**	**SEM**	**P value**
Liver	2.93	2.99	3.36	3.28	3.07	0.13	0.8532
Kidney(left)	0.21^{c}	0.24b^{c}	0.33^{a}	0.28^{ab}	0.33^{a}	0.01	0.0047
Kidney(right)	0.22^{c}	0.24^{bc}	0.34^{a}	0.30^{ab}	0.33^{a}	0.01	0.0124
Heart	0.28	0.28	0.26	0.25	0.30	0.01	0.7991
Lung(left)	0.25	0.29	0.34	0.27	0.42	0.02	0.1359
Lung(right)	0.23	0.32	0.36	0.30	0.30	0.02	0.5016
Pelt	10.51^{a}	9.56^{a}	9.52^{a}	9.66^{a}	7.85^{b}	0.28	0.0129
Hind limb(left)	7.06	6.49	7.00	7.10	6.39	0.16	0.4852
Hind limb(right)	7.17	7.15	6.50	6.87	6.18	0.16	0.1858
Forelimb(left)	4.38	3.89	2.69	4.00	4.09	0.08	0.0516
Forelimb(right)	4.59	3.76	3.72	3.92	4.57	0.14	0.0694
Head	7.93	8.54	9.30	8.73	9.49	0.20	0.0714

$^{a, b, c, d}$: Means within each row with different superscript are significantly different ($p< 0.05$); SEM: Standard error of mean; P value: Probability value; Diet 1: concentrate (control); Diet 2: hydroponically grown sorghum; Diet 3: hydroponically grown maize; Diet 4:hydroponically grown millet; Diet 5:hydroponically grown wheat.

CONCLUSION

The study concluded that the nutritive values was optimal for hydroponically grown sorghum soaked for 90 minutes on growth and better carcass quality

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