GROWTH PERFORMANCE AND WEIGHT GAIN BY GOATS FED BLACK PEPPER SUPPLEMENTED DIETS)

Ogundeyibi*, K.O., Omotoso, O.B., Fajemisin, A.N. and Akinyemi, O.F.
[1] Department of Animal Production and Health, Federal University of Technology, Akure Nigeria
** Correspondence mail address:kentom762@gmail.com*

ABSTRACT
(A Seventy (70) days study aimed at investigating growth performance and (weight gain by) goats fed black pepper supplemented diets was conducted. The study involved twelve (12) West African Dwarf goats aged 1-2 years with an average live weight of 5.02±0.23 kg. A (basal) diet was formulated and supplemented with varying levels of Black pepper as A= (Control diet) 0mg, B= 250mg, C= 500mg, and D= 750mg. Parameters investigated were (nutrient composition), nutrient intake, (nutrient digestibility nitrogen utilization) and performance characteristics of the goats. Data generated were subjected to one way Analysis of Variance (ANOVA) at (P<0.05) results revealed that, diet C had the highest numerical weight gain values (3.67kg), ranges from (5.13- 8.80), followed by diet D which is 5.07 – 8.62, Diet A ranges from 5.0- 8.28 and diet B from 4.90- 8.20. Goats fed diet C (65.48 g/day) had the highest daily weight gain while those fed diet D converted their feed to flesh (4.23) better than other goats however, any diets could be fed to enhance Performance of the goats since there was no significant (P>0.05) differences among the performance parameters. The study concluded that black pepper as an additive could serve as an affordable and sustainable way of improving protein quality of diet and fiber utilization by ruminants).
Keywords: Nutrition, Growth, Utilization, Supplement, Digestibility

INTRODUCTION

Goats are among the earliest domesticated animals and have been associated to humans for at least 10,000 years (Monteiro *et al.,* 2018). Due to their adaptability to different environmental and climatic conditions, they are dispersed all over the world (Mahmoud, 2010). Black pepper has been reported to contains high carbohydrate content of (72.4g), fat 8.8g, protein 5g, calories 397.8kcl so its consumption could provide the body with the energy needed for daily activities(.) (Okonkwo and Ogu, 2014). The seeds of black pepper are also rich in vitamins and minerals, the antioxidant and radical scavenging properties has been well documented (Gülcin, 2005; (Khalaf *et al.*, 2008). Black pepper *(Piper nigrum L.*) seeds have emerged as a promising candidate due to their diverse bioactive compounds with reported rumen fermentation-modulating and growth-promoting properties (Kumar *et al.,* 2015). Despite these promising individual properties, (the efficacy of black pepper seed supplementation in enhancing growth performance and weight gain in goats remains unclear). Limited research exists in this area, with inconsistent findings reported across different studies. Some studies have demonstrated significant improvements in feed intake, digestibility, and weight gain in (animals) fed black pepper-supplemented diets (Kumar *et al.,* 2017), while others have shown no significant effects. This study is therefore aimed at evaluating the (weight gain and growth performance) by West African Dwarf goats fed black pepper (*piper nigrum*) seed meal supplemented diets.

MATERIALS AND METHODS

Site of experiment, collection of materials and feed formulation

The experiment was carried out at the small ruminant unit, (of the) Teaching and Research Farm of the Federal University of Technology, Akure (FUTA), Black pepper seed (*Piper nigrum*) was obtained from a local market within Akure, sun-dried for 5 days and then milled into powder form. The sun-dried cassava peels were obtained from cassava processing industry at Igbatoro, Akure. The other non-pulverized ingredients were milled in order to get uniform particle size. The concentrated diets were formulated using milled cassava-peel (53.20 kg), wheat offal (22.00 kg), palm kernel cake (20.80 kg), urea (1.00 kg), bone meal (1.00 kg), salt (1.00 kg) and premix (1.00 kg). The powdered black pepper seed was added at varying levels of 0 (A), 250 (B), 500 (C) and 750 mg (D) to 100 kg of feed to formulate four experimental diets.

Animal procurement and management

Twelve (12) West African Dwarf (WAD) goats aged 1 - 2 years with an average live weight of 5.03 kg were selected from the flock of goat's unit of the Teaching and Research Farm, FUTA. The goats were placed on prophylactic treatment against bacterial infections using oxytetracycline LA at a dosage of 0.5mL per 5kg body weight per animal, and also against ecto and endo-parasites using ivermectin. The goats were randomly selected into four groups of three goats per treatment. The goats were fed according to their body weight of the basal diet supplemented with varying levels (0 – 750 mg) of Black pepper and fresh water *ad libitum* in the morning at 8.00 am throughout the 70 days. The feed intake was determined by subtracting the daily left over from the feed given each day. During the last 14 days of experimental period, the goats were transferred to metabolism cages for total collection of faeces and urine and 10% of faecal and urine samples were stored in refrigerator until they were required for chemical analysis. The parameters assessed were dry matter, protein, growth performance, weight gain and feed conversion ratio.

Laboratory analysis and statistical analysis

(At the end of experimental period, the separate collected samples diets, faeces and urine were bulked, mixed thoroughly and sub-samples analyzed for (chemical composition) according to the AOAC (2002) procedures). Data generated were subjected to one-way analysis of variance (ANOVA) using SPSS 26 and where significant differences among the means were compared using Duncan Multiple range test of the same statistical package at 0.05 level of significance.

RESULTS AND DISCUSSION

The (chemical composition) of the experimental diets containing black pepper is presented in Table 1. The dry matter values observed in this study is different from the values reported by Omotoso and Arilekolasi (2019) when WAD goat-buck were fed molasses-treated biodegraded rice husk. The obtained crude protein contents of the diets were higher than the crude protein requirement value (8%) recommended by Norton (2003) for ruminant animal for optimum microbial activities in the rumen compartment of the ruminant animal however, crude protein values of diets B, C and D increased across the dietary treatment as the black pepper seed supplementation increased. The increased black pepper seed supplementation across the treatment groups could be attributed to increase observed on crude fiber content of diets(.) Thus, the results observed in this might be due to texture and particle sizes of black pepper.

Table 1: (Nutrient composition and intake by West African Dwarf goats fed diet supplemented with black pepper)

Parameters	A	B	C	D	SEM	P value
Nutrients (%)						
Dry matter	89.38	89.16	89.02	88.28	0.21	0.38f
Crude protein	16.77	16.32	16.34	17.37	0.26	0.52
Crude fiber	25.54^{b}	27.20^{a}	26.24^{b}	27.33^{a}	0.25	0.00
Ash	6.03^{c}	5.04^{c}	8.54^{b}	11.59^{a}	0.81	0.00
Ether Extract	14.56^{a}	14.65^{a}	13.87^{b}	11.79^{c}	0.35	0.00
Nitrogen free extract	37.10^{a}	36.78^{a}	34.98^{ab}	31.91^{b}	0.76	0.03
Intake (g/d)						
Dry matter	314.03	270.91	298.31	269.41	14.26	0.69
Crude protein	58.86	49.70	54.98	52.94	2.81	0.76
Crude fiber	89.60	82.63	88.05	83.52	4.06	0.94
Ash	21.82^{ab}	15.34^{b}	28.80^{ab}	35.32^{a}	2.88	0.05
Ether Extract	51.09	44.54	44.49	36.00	2.60	0.23
Nitrogen free extract	129.48	111.58	116.78	97.39	5.70	0.27

a,b,c = means within the same row with different superscripts are significantly ($P<0.05$) different.

(Table 2 shows the nutrients intake of the WAD goats fed diet A had the highest dry matter intake (314.03 g/day). The high dry matter intake values obtained in this study might be attributed to the protein quality, acceptability and palatability of the diet hence, sources of energy and nitrogen content

of the diet enhanced the rumen microbial activity (Omotoso and Fajemisin, 2020). The crude protein intake in this study was lower than the values reported by Adeduntan *et al*.(,) (2020) for goats fed dietary *Tometosa nilotica* seed meal.

The crude fiber (89.6 g/day) intake of goats fed diet A was higher compared to crude fiber consumption of goats fed others diets, this observation might be attributed to increased peppery aroma and taste of the diets B, C and D.

Table 2: Nutrient digestibility and nitrogen utilization by West African Dwarf goats fed diet supplemented with black pepper

Parameters	A	B	C	D	SEM	P value
Digestibility (%)						
Dry matter	54.11^{b}	50.90^{b}	57.46^{b}	68.73^{a}	2.23	0.00
Crude protein	63.94^{ab}	55.33^{b}	61.07^{b}	72.49^{a}	2.21	0.01
Crude fibre	59.47^{b}	58.88^{b}	64.59^{b}	77.56^{a}	2.54	0.00
Ether Extract	8.62	88.52	88.64	90.22	1.24	0.48
Nitrogen free extract	50.68	53.02	53.30	56.75	1.02	0.22
(Intake (g/d)						
Nitrogen intake	9.42	7.95	8.80	8.47	0.45	0.76
Nitrogen in Faeces	1.82^{d}	2.15^{c}	2.24^{b}	2.37^{a}	0.06	0.00
Nitrogen Urine	1.86^{a} 1	1.71^{b}	1.27^{d}	1.35^{c}	0.07	0.00
Nitrogen Balance	5.73	4.09	5.27	4.75	0.45	0.68
(Nitrogen Output	3.68^{b}	3.85^{a}	3.52^{c}	3.71^{b}	0.37	0.00)
Nitrogen Retention	60.03	50.31	58.54	55.01	2.38	0.54

a,b,c = means within the same row with different superscripts are significantly (P<0.05) different.

Table 3 shows (weight gain and feed conversion to flesh by the experimental goats), there was no significant (P<0.05) differences observed among the parameters assessed. The average weight gain of the goats fed diet A (58.63 g/day) was the least compared to the weight gain of the other goats however, the highest weight gain (65.48 g/day) was obtained in goats fed diet C. Since there were no significant (p<0.05) differences among the values of dry matter intake and weight gain of the goats, it implied that any of the diets could be fed to the goats to enhance their growth performance. The result of feed gain/ratio revealed that the feed conversion to flesh varied from 4.23 (diet D) to 5.34 (diet A). It was observed that goats fed diet D converted their diet to flesh better than the other goats. The observed feed gain/ratio in the goats fed diet D might be attributed to the crude protein quality and intake that might enhanced the growth performance of the goats and rumen microbial protein required by the goats to convert their diet to flesh (Lu *et al.*, 2008).

Table 3. (Growth performance of (WAD) goats fed basal diets supplemented with Black pepper)

Parameters	A	B	C	D	SEM	P-value
Initial body weight (kg)	5.00	4.90	5.13	5.07	0.23	0.99
Final body weight (kg)	8.28	8.20	8.80	8.62	0.28	0.90
Body weight gain (kg)	3.28	3.30	3.67	3.55	0.07	0.14
Daily weight gain (g/day)	58.63	58.93	65.48	63.39	1.27	0.14
Feed gain/ratio	5.34	4.58	4.57	4.23	0.22	0.40

abc= Means on the row with difference superscripts are significantly varied (p<0.05)

CONCLUSION

This study revealed that black pepper seed with crude protein content above recommended protein for maintenance of ruminant serves as a very important additive in goat's diet. Goats fed diet D (supplemented with 750mg/kg black pepper), were more efficient at converting feed into flesh compared to goats fed other diets. Therefore, the use of black pepper as an additive at 750mg/100kg could serve as an affordable and sustainable way of improving protein quality in the nutrition of ruminants, particularly goats.

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