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## EFFECT OF DRENCHED APPLE CIDER VINEGAR ON THE PERFORMANCE OF WEST AFRICAN DWARF GOATS RAISED UNDER INTENSIVE SYSTEM

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### ABSTRACT

*Efficient diet utilization for maximum productivity is one of the major research areas for livestock sustainability. This study was designed to investigate effect of drenched apple cider vinegar on performance of West African Dwarf goats raised under intensive system. A total of twelve goats of both sexes were randomly assigned to three treatments containing four replicates where each animal is an experimental unit. The experiment was designed as G1, G2 and G3 which were drenched with 0, 1 and 2 ml, respectively of apple cider vinegar. The results showed that body weight gain (g) and total feed intake (kg) were significantly ( $P < 0.05$ ) influenced. Weight gain was highest (1298.75 g) in G2 while least similar values (894.00 and 910.75 g) were obtained in G1 and G3, respectively. The Panicum maximum intake had highest numerical value (11.54 kg) in G2 while the least (9.70 kg) was obtained in G1. The total feed intake was observed to be highest (23.37 kg) in G2, followed by G3 (20.10 kg) while least value (18.70 kg) was obtained in G1. The highest numerical value (22.38) for feed conversion ratio was obtained in G3. However, the least (19.97) FCR was obtained in G2 which gave the best value. Drenching West African Dwarf goats with 1 mL of apple cider vinegar had best performance on weight gain and total feed intake which invariably resulted in best feed conversion ratio of the animals, and hereby recommended as additive in water or direct drench in goats' production.*

**Keywords:** Apple cider vinegar, Diet utilization, Weight gain, Feed intake

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### INTRODUCTION

Nutritional constraint is one of the major challenges to goat production in Nigeria which involves seasonal availability as well as low quality of the forages couple with high cost of convectional feeds and competition with human diets (Adugna *et al.*, 2013). To counter this problem, it is important to supplement goat's diet with materials capable of improving the nutritional quality and stimulating digestion of the diets. This necessitates the use of products such as apple cider vinegar to investigate its effect on goats' performance. Apple cider vinegar has long been used as a folk remedy for humans and livestock alike. When offered to livestock, farmers claim it aids fibre digestion, increases milk production and acts as a anthelminths, among other benefits (Fcgagric, 2021). Apple cider vinegar (ACV), an acidic fermentation product, has been long advocated for its health benefits. It contains mainly acetic acid, as well as vitamins, mineral salts, amino acids, polyphenols, and other organic compounds (Johnston and Gaas, 2006). The use of apple cider vinegar at varying levels as a non-conventional means to improve the performance of goats has generated much attention considering its clinical effects on goats. Ayankoso *et al.* (2023) reported positive impact of drenched ACV on haematology and blood biochemical indices of West African Dwarf goats. It was opined that ACV will not constitute any health challenge on the consumer since there was reduction in cholesterol level in animals treated with it. However, paucity of information on its impact on the performance of West African Dwarf goats raised under intensive system necessitate this study.

### MATERIALS AND METHODS

#### Experimental site

The study was carried out at the Goat Unit, Teaching and Research Farms, Adekunle Ajasin University, Akungba Akoko (AAUA), Ondo State, Nigeria. The site is located in Akoko South West Local Government Area at Latitude 7°28'55" N and Longitude 5°46'05" E (PNigeria, 2015).

### Experimental animal and diet

A total of twelve (12) West African Dwarf goats were used for the experiment. The animals aged between 5 and 6 months, comprising of both sexes. These animals were fed with *Panicum maximum* (basal diet) cut around the farm, allowed to wilt overnight and chopped into small sizes for easy consumption. The concentrate (supplementary diet) was compounded as shown in Table 1 below. Both the forage and concentrate were fed to the animals at 4 % body weight and adjusted weekly throughout the period of the experiment. Fresh water was provided *ad-libitum* throughout the trial.

**Table 1: Gross composition (%) of the experimental concentrate diet**

Ingredients	Composition (%)
Maize	23
Cassava peel	10
Palm kernel cake	24
Rice bran	15
Wheat offal	25
Common salt	1.5
Bone meal	1.5
<b>Total</b>	<b>100.00</b>
<b>Determined analysis</b>	
Ash	8.40
Ether extract	6.55
Crude fibre	10.42
Crude protein	14.64
Dry matter	86.50
Carbohydrate	46.69

### Experimental design

The twelve animals comprising both sexes were randomly assigned to three treatments containing four replicates where each animal is an experimental unit. The experiment was designed as G1, G2 and G3 in which they were drenched with 0, 1 and 2 mL, respectively, of apple cider vinegar for a period of seventy days. The animals were drenched once daily at about 8:00 am before giving them feed.

### Data collection and analyses

All animals were weighed at the beginning of the experiment and subsequently every week at about 8:00 am before offering them feed to obtain the daily weight gain. Daily dry matter intake was obtained by finding the differences between the daily feed offered and leftover. Weight gain was divided by number of days used for the study to obtain average daily weight gain. Feed conversion ratio was calculated by dividing feed intake by weight gain of each animal. Proximate analysis of the experimental concentrate was carried out according to the method described by AOAC (2008). All data collected on performance during the study were subjected to one-way Analysis of Variance (ANOVA) using SPSS 2015 Version 23.

## RESULTS AND DISCUSSION

Table 1 showed the gross composition of the experimental concentrate for ash, ether extract, crude fibre, dry matter and carbohydrate with the following values: 8.40, 6.55, 10.42, 14.64, 86.50 and 46.69 %, respectively. The values obtained for crude protein and crude fibre in this study were above 8 and 10-12 %, respectively, recommended by Adekanbi *et al.* (2020) healthy WAD goats. The higher analysis values obtained for crude protein and fibre might be due to the good quality of the feed ingredients, handling and processing method used. Dry matter obtained for concentrate falls within the range (86-92 %) recommended by Adekanbi *et al.* (2020) for successful goat producer. This suggests that the quality of the diet met the requirements for effective rumen function.

Table 2 showed the results obtained on the effect of varied level of apple cider vinegar on performance of West African Dwarf goats. The results showed that among parameters observed only weight gain (g) and total feed in take were significantly ( $P < 0.05$ ) influenced. Weight gain was highest

(1298.75 g) G2 while least similar values (894.00 and 910.75 g) were obtained in G1 and G3, respectively. The *Panicum maximum* intake (PMI) had highest numerical value (11.54 kg) in G2 while the least (9.70 kg) was obtained in G1. The total feed intake (TFI) was observed to be highest (23.37 kg) in G2, followed by G3 (20.10 kg) while least value (18.70 kg) was obtained in G1. It could be noted that increased *Panicum maximum* and total feed intake in groups drenched with ACV showed that it has potential to stimulate consumption and digestion of feeds which could be due to the presence of acetic acid and other phytochemicals present. However, the average daily weight gain range was lower than the range (18.9 – 41.9) reported by Mhomga *et al.* (2022), respectively for WAD goats, this variation might be attributed to the variation in age and ACV used as test ingredient. The highest numerical value (22.38) for feed conversion ratio (FCR) was obtained in G3, however the least (19.97) was obtained in G2 which gave the best value. The FCR values obtained in this study were at variance with earlier findings of Adekanbi *et al.* (2020) who reported range of 7.56 – 9.76 in WAD goats fed *Chromolaena odorata*, this variation might be due to the effect of different ages of the animals. Animals in G2 had the best FCR ratio value which might be the optimum level of ACV for highest feed utilization by the animals. The FCR obtained in this study was higher than the value (11.24) reported by Makun *et al.* (2016) as the best FCR for WAD goats which might be due to the differences in test ingredients, diets and ages of the animals.

**Table 2: Effect of Varied Level of Apple Cider Vinegar on Performance of West African Dwarf Goats**

Parameters	G1(0 mL)	G2(1.0 mL)	G3(2.0 mL)	SEM	P- Value
Initial weight (kg)	6.02	6.17	5.68	0.22	0.70
Final weight (kg)	6.88	7.47	6.59	0.21	0.25
Weight gain (kg)	0.89	1.29	0.91	0.11	0.22
Weight gain (g)	894.00 <sup>b</sup>	1298.75 <sup>a</sup>	910.75 <sup>b</sup>	105.93	0.02
Average daily weight gain (g/day)	12.77	18.55	13.01	1.51	0.24
<i>Panicum maximum</i> intake (kg)	9.70	11.54	10.20	2.23	0.56
Concentrate intake (Kg)	9.00	11.83	9.91	1.02	0.56
Total feed intake (kg)	18.70 <sup>c</sup>	23.37 <sup>a</sup>	20.10 <sup>b</sup>	1.36	0.03
Average daily feed intake (g)	267.24	333.92	287.23	19.32	0.39
Dry matter intake (g)	293.67	366.94	315.64	21.226	0.39
Feed conversion ratio	20.92	17.99	22.06	1.91	0.88

<sup>a,b,c</sup> = means with different superscripts along rows were significantly different (P<0.05)

## CONCLUSION

From this study, it could be concluded that drenching West African Dwarf goats with 1 mL of apple cider vinegar had best performance on weight gain and total feed intake which invariably resulted in best feed conversion ratio of the animals and could be recommended as an additive either in water and direct drench in commercial goats' production. It could also be recommended that the trial should be replicated in animals with high fat deposition like pigs and broiler.

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