ANTINUTRIENT UTILIZATION AND LIVE-WEIGHT GAIN OF WEST AFRICAN DWARF GOATS FED *Panicum maximum* SUPPLEMENTED WITH UNTREATED COCOA POD HUSK MEAL

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ABSTRACT
A-56 day study was conducted to evaluate the antinutrient utilization and live-weight gain of West African Dwarf (WAD) goats fed *Panicum maximum* supplemented with untreated cocoa pod husk meal (CPHM). Five experimental diets were formulated such that *Panicum maximum* were supplemented with untreated cocoa pod husk meal at 0, 25, 50, 75 and 100% respectively and were fed to 20 WAD goats at 4 replicates per treatment in a completely randomized design experiment. Parameters assessed included; nutrient and antinutrient intake, nitrogen utilization, and weight changes. From the results, dry matter (DM) of the diets varied from 88.20% (diet A) to 89.47% (diet E); crude protein (CP) ranged from 10.37% (diet E) to 11.28% (diet A) and the highest theobromine concentration (0.93%) was recorded for diet E. The highest DMI (341.38g/day), CPI (43.65%) and live-weight gain (38.24g/day) was recorded for goats fed diet A but nutrients, anti-nutrients, digestibility coefficients, nitrogen intake and retention values of goats fed diet B had statistical ($P>0.05$) similar values with those fed diet A. Though, the highest feed gain ratio (8.89) recorded for goats fed diet A was statistically ($P>0.05$) similar with 9.48 recorded for those diet B (75% *P. maximum* + 25% CPHM), with no record of mortality. Thus, *P. maximum* could be combined with CPHM at 3:1 for WAD goats during dry season when the grass is in short supply, as it contained tolerable anti-nutrients, supported weight gain and would not pose any deleterious effect to the WAD goats.

Keywords: Theobromine, nutrient utilization, weight gain, untreated cocoa pod husk, WAD goat.

INTRODUCTION
Nutrition is the most important aspect in livestock management as it covers about 70% of the cost of production under intensive system of management. Improper attention to nutrition causes a challenge to animal performance. Equally, the seasonal fluctuation in the quality and quantity of forage available to ruminant animals has made Animal Nutritionist to seek alternative means of sustaining the sector without jeopardizing the quality of animals (meat and by-products) produced. Meanwhile, if West African Dwarf (WAD) goats are well harnessed, could continue to be a source of meat, means of livelihood and improve the economic standard of an individual or that of the nation (Fajemisin *et al.,* 2012). Guinea grass is generally accepted and palatable to all classes of ruminant animals and have been reported to contain 87.03 – 92.17% DM, 9.89 - 13.40% CP and 29.03 - 33.83% CF and have been proved to be effectively utilized by ruminant animals and supported growth performance (Yousuf *et al.,* 2007; Omotoso *et al.,* 2016). Though, its utilization is, however, restricted by the presence of certain compounds such as condensed tannins (CT) that reduce its nutritional quality. High CT intakes by ruminants may reduce diet intake and digestibility and hence adversely affect productivity of the animals (Makkar, 2003). Meanwhile, cocoa pod husks (CPH) are locally and abundantly available in Nigeria – especially Ondo State. This crop residue has nutritional qualities (9.14% CP, 35.74% CF, and 88.9% DM) to support the body maintenance and growth of ruminant (Agunbiade and Olubamiwa, 2002) but its effective utilization in small ruminant feeding is being limited by an alkaloid compound – theobromine, colourless and odourless substance with a slightly bitter taste, poisonous to animals (Alexander *et al.,* 2008) which reduce its raw intake and hinders utilization by livestock. It is therefore, imperative to know the supplementation level of

Table 1. Chemical Composition of Experimental Diets Fed to WAD goats

	Diets (%)					
Nutrients	**A**	**B**	**C**	**D**	**E**	**±SEM**
Dry matter	88.20^{d}	88.35^{d}	88.85^{c}	89.16^{b}	89.47^{a}	0.13
Crude protein	11.28^{a}	11.06^{b}	10.74^{c}	10.57^{d}	10.37^{e}	0.09
Crude fibre	28.76^{e}	29.86^{d}	30.93^{c}	32.02^{b}	33.10^{a}	0.41
Ether extract	2.20^{e}	3.21^{d}	4.26^{c}	5.34^{b}	6.42^{a}	0.40
Ash	10.71^{a}	10.33^{b}	9.74^{c}	9.33^{d}	8.74^{e}	0.19
Nitrogen free extract	35.82^{a}	34.33^{b}	33.28^{c}	31.73^{d}	30.53^{e}	0.50
Alkaloid	0.28^{a}	0.51^{b}	0.77^{c}	0.98^{d}	1.25^{e}	0.90
Oxalate	3.13^{e}	2.41^{d}	1.72^{c}	0.98^{b}	0.31^{a}	0.27
Phytate	3.07^{a}	4.15^{b}	5.22^{c}	6.26^{d}	7.36^{e}	0.40
Saponin	2.19^{a}	2.70^{b}	3.21^{c}	3.75d	4.28^{e}	0.20
Tannin	1.49^{e}	1.19^{d}	0.78^{c}	0.58^{b}	0.27^{a}	0.12
Theobromine	0.15^{a}	0.35^{b}	0.54^{c}	0.74^{d}	0.93^{e}	0.07

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

Table 2. Intake and apparent digestibility by WAD goats fed experimental diets

Parameters	**A**	**B**	**C**	**D**	**E**	**±SEM**
Intake (g/day)						
Dry matter	341.38^{a}	334.60^{a}	316.97^{ab}	305.77^{b}	162.69^{c}	0.17
Crude protein	43.65^{a}	41.90^{a}	38.30^{b}	36.25^{b}	18.87^{c}	2.40
Crude fibre	111.31^{a}	113.10^{a}	110.33^{a}	109.81^{a}	60.20^{b}	5.57
Ether extract	8.52^{d}	12.17^{c}	15.19^{b}	18.32^{a}	11.68^{c}	0.91
Nitrogen free extract	138.65^{a}	130.04^{ab}	118.74^{bc}	108.91^{c}	55.50^{d}	0.08
Alkaloid	1.08^{a}	1.91^{b}	2.76^{d}	3.37^{c}	2.28^{c}	0.21
Oxalate	12.11^{e}	9.13^{d}	6.15^{c}	3.37^{b}	0.56^{a}	1.09
Phytate	11.87^{a}	15.72^{b}	18.61^{c}	21.49^{d}	13.39^{a}	0.95
Saponin	8.48^{a}	10.24^{b}	11.45^{c}	12.87^{d}	7.78^{a}	0.51
Tannin	5.77^{e}	4.50^{d}	2.79^{c}	1.98^{b}	0.49^{a}	0.50
Theobromine	0.56^{a}	1.31^{b}	1.94^{d}	2.54^{e}	1.70^{c}	0.18
Digestibility (%)						
Dry matter	73.84^{ab}	67.01^{bc}	65.97^{abc}	61.63^{a}	57.91^{c}	1.73
Crude protein	81.31^{ab}	80.63^{bc}	77.67^{abc}	76.10^{a}	72.97^{c}	0.98
Crude fibre	90.74^{b}	87.97^{b}	86.62^{ab}	85.32^{a}	84.30^{b}	0.76
Ether extract	72.41	68.26	63.91	61.81	53.32	2.81
Nitrogen free extract	71.31^{ab}	70.14^{ab}	67.13^{a}	65.52^{a}	55.53^{b}	2.73
Alkaloid	73.56	64.91	68.87	67.09	64.30	1.93
Oxalate	81.80^{a}	78.15^{a}	80.51^{a}	59.91^{b}	61.48^{b}	2.83
Phytate	77.66^{a}	72.89^{ab}	71.15^{b}	64.63^{b}	61.81b	1.65
Saponin	78.39^{a}	73.96^{a}	74.45^{a}	73.86^{a}	62.42^{b}	1.84
Tannin	79.75^{a}	78.48^{ab}	66.31^{bc}	66.97^{abc}	57.33^{c}	2.68
Theobromine	83.64^{a}	72.40^{abc}	75.45^{ab}	66.51^{bc}	58.00^{c}	2.93

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

Table 3 Performance Characteristics of WAD Goats Fed Experimental diets

Parameters	**A**	**B**	**C**	**D**	**E**	**±SEM**
Dry matter intake (g/day)	341.38^{a}	334.60^{a}	316.97^{ab}	305.77^{b}	162.69^{c}	0.17
Crude protein intake (g/day)	43.65^{a}	41.90^{a}	38.30^{b}	36.25^{b}	18.87^{c}	2.40
Initial weight (kg)	7.18	7.18	7.13	7.16	7.18	0.07
Final weight (kg)	9.32^{a}	9.17^{ab}	7.81^{bc}	7.55^{c}	7.47^{c}	0.10
Weight gain (kg)	2.14^{a}	1.98^{ab}	0.69^{bc}	0.40^{c}	0.28^{c}	0.10
Weight gain (g/day)	38.24^{a}	35.34^{ab}	12.32^{bc}	7.15^{c}	4.99^{c}	2.39
Feed gain ratio	8.89^{a}	9.48^{ab}	25.73^{bc}	42.75^{d}	32.48^{c}	3.78
Mortality (%)	0.00^{a}	0.00^{a}	25.00^{b}	25.00^{b}	25.00^{b}	0.01

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