

PERFORMANCE OF PRE-WEANED WEST AFRICAN DWARF GOATS FED SOYABEAN DIET AS REPLACER FOR MILK

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ABSTRACT

Thirty-five early weaned West African dwarf (WAD) goat kids weighing 1 - 1.5kg at birth were used to evaluate the performance of pre-weaned kids fed soyabean diet (SBD) as replacer for milk. Replacement of whole milk with soyabean diet up to 50% level had no significant ($P > 0.05$) effect on dry matter intake (g/day) of the kids. Replacement of whole milk with SBD up to 25% had no appreciable effect on weight gains, and efficiency of feed utilization of the kids ($P > 0.05$). Values observed for weight gains, and efficiency of feed utilization decreased significantly ($P < 0.05$) as 50% of whole milk was replaced with SBD. Kids running with their dam had lower weight gains ($P < 0.05$) when compared with those reared artificially on experimental diets between 7 and 13 weeks of age. Results suggested that replacement of milk with 25% SBD, will give adequate performance for pre-weaned kids. This level can be higher from 6 weeks after parturition but must not exceed 50% percent of replacement with SBD.

Key Words: Performance, Pre-weaned goats, Soyabean diet, milk replacer.

INTRODUCTION

Kids mortality in general and in particular just before weaning is high in goat rearing in Nigeria. Opasina, (1985) indicated malnutrition and starvation as the major factors responsible for mortality of pre-weaned kids. This can be attributed to the low milk yield of does with its resultant inability to cope with demands of the kids. Available information (Akinsoyinu, Mba and Olubajo, 1977) showed that West African Dwarf (WAD) and Red Sokoto does produce 400g

and 690g of milk per day respectively at the peak of lactation (3-4 weeks, after parturition). Since these animals are weaned at 3 months milk yield would have reached its ebb (50g/day) at 6 weeks after parturition. The situation becomes serious in case of multiple births and where does are unable to nurse their kids due to ill health or death. Result of a preliminary study revealed that blood glucose levels of the kids were low between 6 and 13 weeks, an evidence of inadequate milk intake. This calls for alternative system of feeding and management through meaningful research and early weaning.

Soyabean protein had been used in milk replacers for calves (Gaudreau and Brisson, 1980; Akinyele and Harshbarger, 1983; Silva Huber and DeGregorio, 1986) and lambs (Walker and Kirk, 1975, Malouf and Walker 1981). Information on its utilization by goat kids in general is limited while it is not available for WAD goat kids in particular. Also the use of soyabean - corn starch (crude) as replacer for milk by calves, lamb and kids had not been reported. The present study was therefore designed to investigate performance of pre-weaned (WAD) goat kids, fed soyabean - corn starch (crude) based diet as replacer for milk.

MATERIALS AND METHODS

1. Four isonitrogenous diets were prepared in such a way that dried whole milk, soyabean concentrate and corn starch served as the main source of protein.

1.1. Preparation of Corn Starch

1Kg of yellow maize was soaked in water for 5 days. Thereafter, the seeds were washed by changing the water on the fifth day, removing the dirt and stones and ground to paste in a local mill. Water was added to the paste in a bucket in a ratio of 1:3 (Paste:

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TABLE 1. INGREDIENT COMPOSITION OF THE EXPERIMENTAL DIETS (%)

Consituents	Diets			
	1	2	3	4
Soyabean Concentrate	-	11.25	22.50	33.75
Corn Starch	-	13.75	27.45	41.20
Dried whole milk	99.95	75.00	50.00	25.00
*Vitamin/Mineral premix	0.05	0.05	0.05	0.05

*Vitalyte (Analysis per 100g) - Vitamin A (I.U) 15,000,000, vitamin Ds (I.U) 4,400,000; vitamin E (I.U), 1,350; vitamin K (mg) 4,350; vitamin B₂ (mg) 11,350, vitamin C (mg) 1,000, Nicotinic acid (mg) 16,700, pantothenic acid (mg) 5,350, KCL, 87 g NaSO₄, 212g; NaCl 50g, MgSO₄, 12g; CuSO₄ 12g; ZnSO₄, 12g; MnSO₄, 12g; Lysine 15g, Methionine 10g Latose 1,000g.

Water). This was then mixed thoroughly to dislodge the lumps of paste and sieved using a fine nylon mesh to remove the chaff. Filtrate was then allowed to settle overnight. The excess water was decanted the following day and the sediment dried at 65°C in the oven to constant weight. The hard cake which is crude starch was then milled to obtain the corn starch.

Preparation of Soyabean Concetrate

1 kg of clean soyabean seeds was added directly to 5 litres of boiling water in which 0.05 percent sodium bicarbonate had been added and boiled for 10 mins. The water was then discarded and the partly cooked beans were transferred into 10 litres of boiling water containing 0.05 percent sodium bicarbonate in order to reduce the cooking time needed to destroy the anti-nutritional factors present in soyabean. The beans were then boiled for additional five minutes and allowed to cool. Thereafter it was ground in a local mill. The second blanch water was used in milling it. The soyabean paste was then dried in a force driven oven at 65°C to constant weight. The hard cakes were then milled to obtain the soyabean concentrate.

Procurement of Dried Whole Milk

Already commercially prepared Peak brand powdered whole milk (prepared by Cofriesland cooperative, Cc; Holland) obtained from the supermarket was used.

Preparation of Experimental Diets

The dried corn starch and soyabean concentrate were analysed separately for their protein contents and formulated into a 24% CP diet and was then used to replace the milk

protein at 0,25, 50 and 75% levels. Having formulated the different diets, the soyabean concentrates, corn starch and dried whole milk were thoroughly mixed to assume a uniform concentration and powder - like texture. Each diet was then reconstituted with water to obtain a 14.5% total solid solution with water.

Animals and their Management

Twenty-eight pre-weaned kids, weighing 1 - 1.5 kg at birth were divided at random into four groups. Each group was placed on one of the experimental diets (Table 1) for a period of twelve weeks. The kids were allowed to receive colostrum from their dams for the first 6 days and on the 7th day, they were separated from the does and housed indoor in individual metabolic cages. The control group also consists seven kids which were allowed to run with their dams.

Early weaned kids were bottle - fed daily from graduated glass feeding bottles at 0800, 1300 and 1800 hours. Experimental diets were warmed to 35°C and fed *ad-libitum*. Kids were dipped monthly in a solution of 1:500 gamalin 20 against ectoparasites. Early weaned kids were weighed regularly first at birth, on the seventh day of life, before being assigned to the experimental diets and thereafter at weekly intervals before the morning feed. Those weaned naturally were also weighed weekly.

Height at withers and length of body of the kids were measured at birth and 13 weeks of age.

Samples of feeds, were analysed for proximate constituents by AOAC (1984) methods. Lactose in milk was determined by

SOYABEAN DIET FOR PREWEANED GOATS
TABLE 2: CHEMICAL COMPOSITION OF EXPERIMENTAL DIETS

Nutrients	Diets			
	1	2	3	4
Dry matter (%)	96.90	95.66	95.4	94.7
On dry matter basis				
Crude protein (%)	24.0	23.66	23.56	23.0
Nitrogen-free extract (%)	-	46.56	50.65	56.12
Lactose (%)	42.96	-	-	-
Crude fibre (%)	-	1.02	1.48	2.20
Milk fat (%)	28.0	-	-	-
Ether extract (%)	-	23.81	19.71	14.34
Total ash (%)	5.04	4.95	4.60	4.34
Gross energy (Kcal/g)	5.92	5.43	4.92	4.29
Iron (ppm)	50.0	79.0	97.0	120.0
Copper (ppm)	20.0	92.0	160.0	230

Marier and Boulet (1959) method. The energy content of the feed, was determined using the Ballistic bomb calorimeter. All parameters measured were subjected to analysis of variance and treatment mean compared using the Duncan's Multiple range tests (Steel and Torrie 1980).

RESULTS AND DISCUSSION

Summary of dry matter (DM) intake (g/day) of the kids is shown in Table 3. The mean DM intake of Kids fed diets 1, 2 and 3 was not significantly different ($P > 0.05$) giving mean values of 43.3 ± 0.9 , 52.5 ± 1.1 , 65.7 ± 0.08 and 74.9 ± 0.7 at 4, 6, 9 and 13 weeks respectively. DM intake, however, increased ($P < 0.05$) with age of the kids. All kids reared on diet 4 died. Values observed for DM intake as % of liveweight of kids in this study were within the range of 1.56 to 3.08, 1.96 to 3.12 and 2.41 to 2.41 to 2.77 observed for WAD goat kids at the 2nd, 8th and 12th weeks of age respectively (Awah, 1981). Values observed for efficiency of feed utilization by the kids are shown in Table 3. Replacement of whole milk with SBD up to 25% had no appreciable ($P > 0.05$) effect on efficiency of feed utilization of the kids. However, efficiency of feed utilization decreased ($P > 0.05$) with 50% replacement of whole milk with SBD between 0 and 6 weeks of age. After 6 weeks, the effect of substitution of SBD for milk up to 50 percent in the diet on efficiency of feed utilization was not significant

($P > 0.05$). The result of this study is in agreement with reports on calves (Silva *et al* 1986) and kids (Tanabe and Kameoka, 1977) reported lower value for utilization of soyabean than milk proteins.

The growth pattern of the kids is illustrated in figure 1. Treatment effects on weight gains of the kids were not significant ($P > 0.05$) during the first week of life, giving an overall mean value of 78.3 ± 2.5 . Weight gain of the kids was reduced with partial replacement of milk with SBD up to 50% during the first 4 weeks of the study. Replacement of milk with SBD up to 75% had deleterious effect, as all kids fed that diet died before the end of the third week. Reduced weight gains observed for the kids in this study between 2 and 6 weeks of age, with replacement of milk proteins with soyabean proteins agree with previous reports on calves (Pejic and Kay, 1979, Silva *et al* 1986).

Kids running with their dams had lower weight gains when compared with those reared artificially on diets in which up to 50% of milk was replaced with SBD between 7 and 13 weeks of age. This suggests that kids performance can be improved with artificial rearing. The temporary fall in liveweight of kids reared artificially at the second week, observed in this study may be attributed to adjustment of early weaned kids to milk-substituted diets.

Skeletal development of kids in this study was encouraging, as height at withers and body

TABLE 3: DRY MATTER IN TAKE AND EFFICIENCY OF FEED UTILISATION OF PRE-WEANED WAD GOATS FED SOYA BEAN DIET AS REPLACER FOR MILK

Age in Weeks		4			6			9			13		
DMts		1	2	3	1	2	3	1	2	3	1	2	3
Parameters													
Mean Liveweight (kg)													
		1.63 ^a ±0.2	1.62 ^a ±0.1	1.5 ^b ±0.2	1.93 ^a ±0.2	1.86 ^a ±0.1	1.60 ^b ±0.2	2.43 ^a ±0.2	2.37 ^b ±0.2	2.01 ^b ±0.2	3.22 ^a ±0.2	2.94 ^b ±0.2	2.71 ^c ±0.2
Total DM intake (g/day)													
		42.6 ^a ±1.1	44.8 ^a ±0.7	42.6 ^a ±6.2	54.7 ^a ±1.2	51.1 ^a ±1.1	51.8 ^a +1.1	65.4 ^a ±0.9	65.4 ^a ±0.6	65.4 ^a ±0.9	74.7 ^a ±0.5	75.1 ±0.75	75.1 ±0.7
Dry matter intake as percentage of liveweight													
		2.6 ^a ±0.3	2.7 ^a ±0.2	2.8 ^a ±0.3	2.8a ±0.3	2.7a ±0.2	3.2 ^b ±0.3	2.7 ^a ±0.2	2.8 ^a ±0.1	3.2 ^b ±0.1	2.3 ^a ±0.1	2.5 ^b ±0.1	2.7 ^c ±0.1
Efficiency of feed utilisation.													
		0.54 ^a +0.2	0.9 ^a ±0.1	2.0 ^b ±0.3	0.32 ^a ±0.1	0.44 ^a ±0.15	0.94 ^b ±0.26	0.36 ^a ±0.1	0.0.38 ^a ±0.1	.42 ^a ±0.1	0.39 ^a ±0.1	0.42 ^a ±0.1	0.38 ^a ±0.06
± Standard error of the mean													

abc Means along the same row within the same age bracket with different superscripts are significantly different (P < 0.05).

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TABLE: 4 MEAN LIVEWEIGHT CHANGES, LENGTH OF BODY AND HEIGHT AT WITHERS OF PRE-WEANED (WAD) GOATS REARED CONVENTIONALLY AND ARTIFICIALLY

Diets	1	2	3	Kids running with their dams
Parameters				
Initial body wt. (kg)	1.46±0.01 ^a	1.45±0.01 ^a	1.47±0.04 ^a	1.43±0.01 ^a
Final body wt. (kg)	3.31±0.36 ^a	3.18±0.00 ^a	3.83±0.02 ^b	2.75±0.24 ^b
Body weight changes (g)	1850.0±9.20 ^a	1730.0±5.25 ^a	1331.9±161.8 ^b	1272.0±7.41 ^b
Daily weight gains (g)	20.32±1.3 ^a	19.01±0.84 ^a	14.95±0.96 ^b	15.98±0.16 ^b
Initial height at withers (cm)	23.70±0.3 ^a	25.5±0.5 ^a	27.2±0.4 ^a	26.3±0.5 ^a
Final height at withers (cm)	35.2±0.7 ^a	31.2±0.6 ^a	30.4±0.4 ^a	30.6±0.3 ^a
Initial Length of body (withers to pin) (cm)	23.7±0.4 ^a	23.2±0.3 ^a	23.6±0.3 ^a	23.3±0.6 ^a
Final Length of Body (cm)	31.5±0.5 ^a	30.9±0.5 ^a	31.4±0.5 ^a	31.3±0.4 ^a

^a Standard error of the mean

^{abc} Means along the same row with different superscripts are significantly ($P < 0.05$) diets. Standard error of the mean

length (Table 4) of the kids fed whole milk or diets with 50 percent SBD were similar.

Health:

No mortality was recorded for kids reared on whole milk and diets in which up to 50% of the milk was replaced with SD. However, 75% replacement of milk with SD resulted in death. Postmortem examination showed that kids died as a result of diarrhoea of nutritional origin, leading to dehydration. This confirms earlier reports on calves fed soyabean proteins (Coblents, Morrill, Parrish and Dayton, 1976). Results suggested that replacement of milk with 25 percent SBD will give adequate performance in terms of feed intake, weight gains and efficiency of feed utilization of pre-weaned kids without any adverse effect. This level can be higher from six weeks after parturition but must not exceed 50 percent of milk replacement with SBD. The results also suggested that kids performance can be highly improved with artificial rearing.

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